

Cambridge IGCSE™

MATHEMATICS**0580/41**

Paper 4 (Extended)

October/November 2024**MARK SCHEME**Maximum Mark: 130

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the October/November 2024 series for most Cambridge IGCSE, Cambridge International A and AS Level components, and some Cambridge O Level components.

This document consists of **11** printed pages.

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptions for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Mathematics-Specific Marking Principles

- 1 Unless a particular method has been specified in the question, full marks may be awarded for any correct method. However, if a calculation is required then no marks will be awarded for a scale drawing.
- 2 Unless specified in the question, non-integer answers may be given as fractions, decimals or in standard form. Ignore superfluous zeros, provided that the degree of accuracy is not affected.
- 3 Allow alternative conventions for notation if used consistently throughout the paper, e.g. commas being used as decimal points.
- 4 Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored (isw).
- 5 Where a candidate has misread a number or sign in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 A or B mark for the misread.
- 6 Recovery within working is allowed, e.g. a notation error in the working where the following line of working makes the candidate's intent clear.

Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

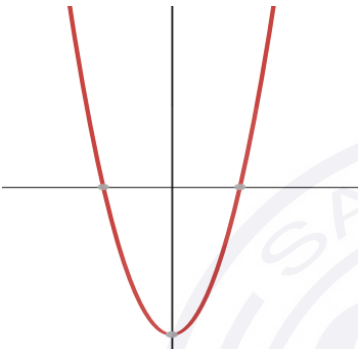
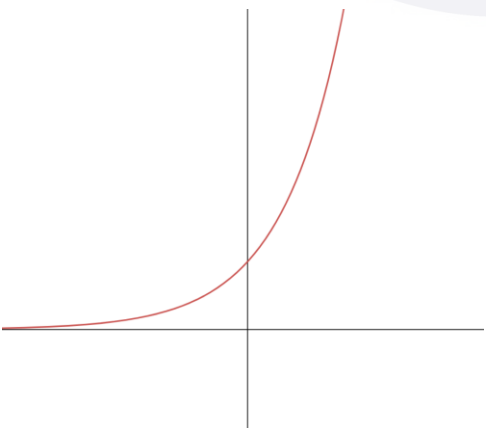
Question	Answer	Marks	Partial Marks
1(a)(i)	$2 \times 5 \times 7 [=70]$	2	B1 for 2, 5, 7
1(a)(ii)	14	2	M1 for $[112 =] 2^4 \times 7$ oe or for answer 2×7
1(a)(iii)	$560x^4y^5$	2	B1 for answer kx^4y^5 or for answer $560x^ay^b$ or for correct answer seen then spoiled
1(b)(i)	a^8	1	
1(b)(ii)	$\frac{c}{8}$ final answer	2	M1 for $\frac{5bc}{40b}$ or better
1(c)	5.5 or $\frac{11}{2}$ or $5\frac{1}{2}$	2	M1 for $2x = 15 - 4$ oe or $2 + x = \frac{15}{2}$ oe
1(d)	-2	3	M1 for $34 + 2x = 5(4 - x)$ oe or better M1 dep for reaching $ax = b$ FT <i>their</i> first step
1(e)(i)	11	2	M1 for $7 + \sqrt[3]{(-8)^2}$ oe
1(e)(ii)	$[\pm]\sqrt{(P-d)^3}$ oe final answer	3	B1 for $P - d = \sqrt[3]{m^2}$ oe M1 for cube both sides M1 for square root leading to final answer
2(a)(i)	Triangle at (1, -1) (1, -3) (-3, -3)	2	B1 for reflection in $x = k$ or for reflection in $y = 1$
2(a)(ii)	Triangle at (3, -1) (5, -1) (3, 0)	2	B1 for correct size and orientation but wrong position
2(b)	Rotation 90 clockwise oe [centre] (2, 4) oe	3	B1 for each
2(c)	$(a, 2k - b)$ oe isw	2	B1 for each coordinate
3(a)	30.875	4	M1 for 5, 15, 30, 45, 65 soi M1 for Σfx M1 dep for <i>their</i> $\Sigma fx \div 120$ dep on 2 nd M1

Question	Answer	Marks	Partial Marks
3(b)	Draws correct bar to height 1.75	4	<p>B3 for [height =] 1.75</p> <p>OR</p> <p>M2 for $[90 -](10 \times 1.3 + 20 \times 1.5 + 30 \times 0.4)$ oe</p> <p>or M1 for 10×1.3 or 20×1.5 or 30×0.4</p> <p>M1dep for <i>their</i> frequency $\div 20$ dep on at least M1</p> <p>After 0 scored SC1 for bar of correct width and height between 1.7 and 1.8</p>
4(a)(i)	22.5	2	M1 for $\frac{11.25}{11.25 + 18.75 + 20} [\times 100]$ oe
4(a)(ii)	9 : 15 : 16	2	M1 for 1125 : 1850 : 2000 or better
4(a)(iii)(a)	$\frac{5}{9}$ or 0.556 or 0.5555 to 0.5556	3	<p>M2 for $\frac{20 \times 25}{15[\times 60]}$ oe</p> <p>or M1 for 20×25</p> <p>or for <i>their</i> distance $\div (15 [\times 60])$ oe</p>

Question	Answer	Marks	Partial Marks
4(a)(iii)(b)	2 h 40 mins	4	<p>Approach 1</p> <p>B3 for $\frac{8}{3}$ [h]oe or 160 [mins] or 9600[s]</p> <p>Or</p> <p>M3 for $5000 \div (18.75 \times 25 \times 4)$[h] oe or $5000 \div (18.75 \times 25 \div 15)$[mins] oe or $5000 \div ((18.75 \times 25 \times 4) \div (60 \times 60))$[secs] oe</p> <p>Or</p> <p>M2 for $(18.75 \times 25 \times 4)$[m/h] oe or $(18.75 \times 25 \div 15)$[m/min] oe or $(18.75 \times 25 \times 4) \div (60 \times 60)$[m/sec] oe</p> <p>Or</p> <p>B1 for 200 or 1 km =1000m soi</p> <p>After 0 scored SC1 for time <i>Figs</i> 267 or <i>figs</i> 2666 to 2667 or <i>figs</i> 16 or <i>figs</i> 96</p> <p>Approach 2</p> <p>B3 for 160 [mins]</p> <p>Or</p> <p>M3 for $15 \times 5000 \div (18.75 \times 25)$ [mins] oe</p> <p>Or</p> <p>M2 for $5000 \div (18.75 \times 25)$ oe</p> <p>Or</p> <p>B1 for 200 or 1 km =1000m soi</p> <p>After 0 scored SC1 for time <i>figs</i> 16</p>
4(a)(iv)	17.1 or 17.14 to 17.15	3	<p>M2 for $20 \times \left(\frac{100-5}{100}\right)^3$ oe</p> <p>or M1 for $20 \times \left(\frac{100-5}{100}\right)^k$ where k is 2, or 4</p> <p>or for $20 \times \left(\frac{100-5}{100}\right)^3$ oe seen and spoiled</p>
4(b)	2500	3	<p>M2 for $\frac{425 \text{ to } 450}{10 + 0.5}$ or $\frac{450 - 12.5}{10 \text{ to } 11}$ or</p> <p>$\frac{425 \text{ to } 450}{630}$ or $\frac{450 - 12.5}{600 \text{ to } 660}$</p> <p>or M1 for 10.5 or 9.5 or 437.5 or 462.5 or 630[s] or 570[s]</p>

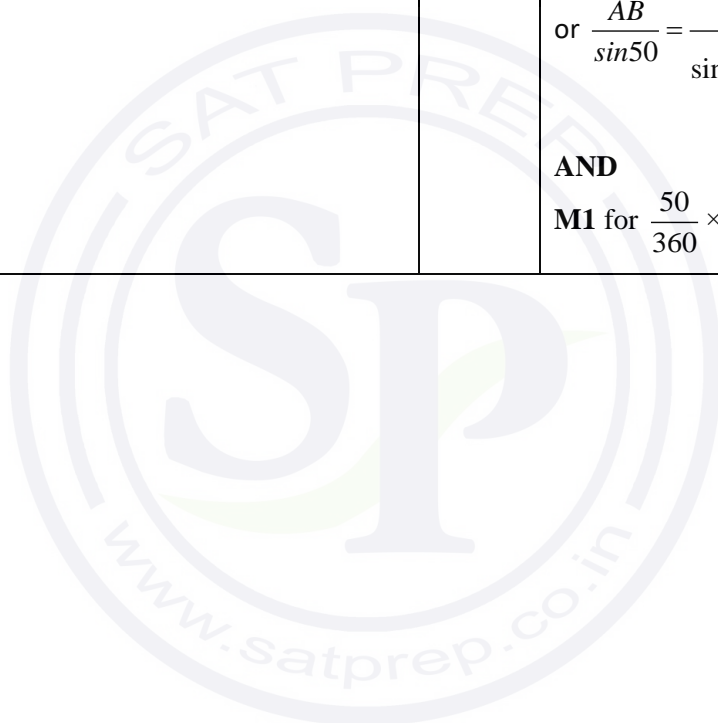
Question	Answer	Marks	Partial Marks
5(a)	$\frac{5}{8}$ oe	1	
5(b)(i)	Tree diagram correct probabilities on 3 pairs of branches $\frac{3}{8}$ $\frac{5}{8}$	2	B1FT for one pair of branches of first stage or second stage correct
5(b)(ii)	$\frac{17}{32}$ oe	3	M2FT for <i>their</i> $\left(\frac{3}{8} \times \frac{3}{8}\right) + \left(\frac{5}{8} \times \frac{5}{8}\right)$ oe or M1FT for one correct product seen
5(c)	$\frac{15}{56}$ oe	3	M2 FT for $\frac{3}{8} \times \frac{2}{7} \times \frac{5}{6} \times k$ where k is 1, 2 or 3 or M1FT for $\frac{3}{8}$ and $\frac{2}{7}$ and $\frac{5}{6}$ seen oe or for showing the 3 possible combinations If 0 scored, SC1 for answer $\frac{135}{512}$ oe
6(a)	$\sqrt{420^2 + 830^2 - 2 \times 420 \times 830 \times \cos 106}$ oe	M2	or M1 for $420^2 + 830^2 - 2 \times 420 \times 830 \times \cos 106$ oe A1 for 1 057 474
	1028.3...	A1	
6(b)	99[.0] or 98.98 to 99.1[0...]	4	B3 for 80.89 to 81.02 or M2 for $\sin[ACB] = \frac{1150 \sin 62}{1028}$ oe or M1 for $\frac{1028}{\sin 62} = \frac{1150}{\sin ACB}$ oe

Question	Answer	Marks	Partial Marks
6(c)	2477 cao nfw	4	B3 for answer 2476.9... or M2 for $\frac{1}{2} \times 420 \times 830 \times \sin 106 \times \frac{P}{10000} = 41\,500$ oe or M1 for $\frac{1}{2} \times 420 \times 830 \times \sin 106$ oe
7(a)	180 and 240	2	B1 for 180 or for 240
7(b)	$12x + 18y \geq 2700$ and completion to $2x + 3y \geq 450$	1	with no errors seen
7(c)	$x = 180$ broken straight line and $y = 90$ solid ruled line and $x + y = 240$ solid ruled line and $2x + 3y = 450$ solid ruled line	B5	B1 for $x = 180$ broken straight line B1 for $y = 90$ solid ruled line B1 for $x + y = 240$ solid ruled line B2 for $2x + 3y = 450$ solid ruled line or B1 for line with a negative gradient passing through (0, 150) or (225, 0)
	<p>Correct region indicated</p>	B2	B1 for region satisfying 3 of the inequalities
7(d)	4200	2	B1 for 150 and 90 or M1 for <i>their</i> $150 \times 10 + \textit{their}$ 90×30
8(a)(i)	6 and -6	2	M1 for $x^2 = 20 + 16$ or better Or B1 for 6 or -6

Question	Answer	Marks	Partial Marks
8(a)(ii)	$\frac{7-x}{3}$ oe final answer	2	M1 for $x = 7 - 3y$ or $\frac{y}{3} = \frac{7}{3} - x$ or $y - 7 = -3x$ oe or better
8(a)(iii)	$9x^2 - 42x + 34$ final answer	3	M1 for $(7 - 3x)^2 - 16$ [+ 1] oe B1 for $49 - 21x - 21x + 9x^2 + k$
8(a)(iv)	Correct sketch with roots marked at -4 and 4 and y – intercept and turning point at $y = -16$ 	4	B1 for correct parabola shape B2 for roots at -4 and 4 on graph and no extras or B1 for $(x - 4)(x + 4) [= 0]$ or for one correct root on graph or for -4 and 4 seen B1 for turning point at $(0, -16)$
8(a)(v)	$[y =] -6x - 25$	5	M1 for derivative $= 2x$ M1 for $x = -3$ substituted into <i>their</i> derivative B1 for $(-3, -7)$ soi M1 substitution of $(-3, \text{their } -7)$ into $y = \text{their } -6x + c$ oe dep on 2 nd M1
8(b)(i)	Correct sketch with y – intercept above x – axis 	2	B1 for correct shape
8(b)(ii)	$y = 0$	1	
9(a)	1360	1	

Question	Answer	Marks	Partial Marks
9(b)	772	3	M2 for $[2 \times] (10 \times 8 + 10 \times 17 + 8 \times 17)$ oe or M1 for 10×8 oe or 10×17 oe or 8×17 oe
9(c)	53 or 53.0 to 53.01	4	M3 for $\tan [GAC] = \frac{17}{\sqrt{10^2 + 8^2}}$ oe or M2 for $10^2 + 8^2$ oe or for $10^2 + 8^2 + 17^2$ oe or M1 for recognising angle GAC is required
9(d)	19[.0] or 19.02 to 19.03	4	M3 for $3^2 + 8^2 + 17^2$ oe OR B1 for $QG = 2$ soi or $HQ = 8$ M1 for $(5 - 2)^2 + 8^2$ or $(5 - 2)^2 + 17^2$
10(a)(i)	$2x^2 + 5x - 187 [= 0]$	M2	M1 for $(2x + 3)(x + 1) = 190$
	$(2x - 17)(x + 11) [= 0]$ oe	M1	
	Leading to $x = 8.5$ with no errors	A1	
10(a)(ii)	59	2	M1 for $6 \times 8.5 + 8$ oe or $6x + 8$ oe or B1 for 9.5 and 20
10(b)(i)	$\frac{50}{360} \pi \times r^2 - \frac{1}{2} r^2 \times \sin 50 = 30$ oe	M3	M1 for $\frac{50}{360} \pi \times r^2$ M1 for $\frac{1}{2} r^2 \times \sin 50$ oe
	23.70[9] to 23.72...	A1	must see at least 4 sig figs

Question	Answer	Marks	Partial Marks
10(b)(ii)	40.7 or 40.8 or 40.71 to 40.75...	4	<p>M2 for $2 \times 23.7 \times \sin 25$ oe or $\sqrt{23.7^2 + 23.7^2 - 2 \times 23.7 \times 23.7 \cos 50}$ oe or $\frac{23.7 \sin 50}{\sin\left(\frac{180-50}{2}\right)}$ oe or M1 for $\frac{x}{23.7} = \sin 25$ oe or for $23.7^2 + 23.7^2 - 2 \times 23.7 \times 23.7 \cos 50$ oe or $\frac{AB}{\sin 50} = \frac{23.7}{\sin\left(\frac{180-50}{2}\right)}$ oe AND M1 for $\frac{50}{360} \times 2 \times \pi \times 23.7$ oe</p>





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Mathematics-Specific Marking Principles

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Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	26 122 cao	2	M1 for $28\,240 \times \left(1 - \frac{7.5}{100}\right)$ oe or B1 for answer 21 18
1(a)(ii)	62.5	2	M1 for $C \times \frac{72}{100} = 45$ oe or better
1(b)	17.5	4	M3 for $\frac{31900 - 11490 - (47 \times 330)}{28000} [\times 100]$ or M2 for $31\,900 - 11\,490 - (47 \times 330)$ or M1 for 47×330 or for $31\,900 - 11\,490$
1(c)	4.43 or 4.427...	2	M1 for $\frac{2.5 + 6}{64 + 128} [\times 100]$ oe
1(d)	31 620	2	M1 for $46\,500 \times \left(1 - \frac{20}{100}\right) \left[\times \left(1 - \frac{15}{100}\right)\right]$ or $46\,500 \times \left(1 - \frac{15}{100}\right) \left[\times \left(1 - \frac{20}{100}\right)\right]$ or for $\left(1 - \frac{20}{100}\right) \times \left(1 - \frac{15}{100}\right)$
2(a)	-4, -1	2	B1 for each correct value
2(b)	Correct graph	4	B3FT for 7 or 8 correct points or B2FT for 5 or 6 correct points or B1FT for 3 or 4 correct points
2(c)(i)	Ruled tangent at $x = 1$	1	
2(c)(ii)	6 to 14 nfww	2	dep on correct tangent or a close attempt at the tangent at $x = 1$ M1 for rise/run for <i>their</i> tangent, or close attempt at tangent at any point. Must see correct or implied calculation from a drawn tangent.
2(d)	$y = x + 2$ ruled	M2	M1 for $[y =] x + 2$ soi or $y = x + k$ ruled or $y = kx + 2$ ruled, but not $y = 2$
	$x = -3.95$ to -3.75 $x = -1.4$ to -1.25 $x = 1.1$ to 1.25	A2	A1 for any two values If A0, SC1 for three correct values

Question	Answer	Marks	Partial Marks
3(a)(i)	$-m + 3n$ final answer	2	B1 for $-m$ or $[+]$ $3n$ in final answer or for $-m + 3n$ seen and then spoiled
3(a)(ii)	$81a^8c^{12}$ final answer	2	B1 for final answer in correct form with any two of $81, a^8, c^{12}$ correct or for $81a^8c^{12}$ seen and then spoiled
3(a)(iii)	$\frac{19x}{30}$ final answer	2	M1 for $\frac{6 \times 4x - 3 \times 3x + 2 \times 2x}{30}$ oe
3(b)	4.5 oe	3	M1 for $a + 2(3a + 2) = 35.5$ oe M1 for correct $ka = b$ for <i>their</i> linear equation
3(c)	$\frac{-(-4) \pm \sqrt{(-4)^2 - 4 \times 5 \times (-3)}}{2 \times 5}$ oe	M2	M1 for $\sqrt{(-4)^2 - 4 \times 5 \times (-3)}$ or better or for $\frac{-(-4) + \sqrt{q}}{2 \times 5}$ or $\frac{-(-4) - \sqrt{q}}{2 \times 5}$ or better
	-0.472 or -0.4718 to -0.4717 and 1.27 or 1.271 to 1.272	B1	
3(d)	$x^2 - 6x + 8 [= 0]$ or $y^2 - 6y + 5 [= 0]$	M2	M1 for $x^2 - 4x + 5 = 2x - 3$ or $y = \left(\frac{y+3}{2}\right)^2 - 4\left(\frac{y+3}{2}\right) + 5$
	$(x-4)(x-2) [= 0]$ or $(y-1)(y-5) [= 0]$ OR $[x =] \frac{-(-6) \pm \sqrt{(-6)^2 - 4[\times 1] \times 8}}{2[\times 1]}$ or $[y =] \frac{-(-6) \pm \sqrt{(-6)^2 - 4[\times 1] \times 5}}{2[\times 1]}$ OR $[x =] 3 \pm \sqrt{-8+9}$ or $[y =] 3 \pm \sqrt{-5+9}$	M1	FT <i>their</i> 3-term quadratic but not if $x^2 - 4x + 5 [= 0]$

Question	Answer	Marks	Partial Marks
	$[x =] 2, [y =] 1$ $[x =] 4, [y =] 5$	B2	B1 for one correct pair or two correct x -values or two correct y -values If B0 scored and at least 2 method marks scored, SC1 for correct substitution of both of <i>their</i> x values or <i>their</i> y values into $y = x^2 - 4x + 5$ or $y = 2x - 3$
4(a)	135	2	M1 for $\frac{360}{5+3} \times k$, where $k = 1, 3$ or 5 oe
4(b)(i)	26	2	B1 for $\angle ABD = 49$
4(b)(ii)(a)	86	2	B1 for $\angle QAD = 49$ or for $\angle BDA = 45$ or for $\angle BCA = 45$
4(b)(ii)(b)	Angle in a semicircle = 90	1	
4(c)(i)	$[2 \times] \cos^{-1} \left(\frac{6.75}{11.5} \right)$ oe	M2	M1 for $\cos(\dots) = \frac{6.75}{11.5}$ oe
	108.117...	A1	
4(c)(ii)	12.7 or 12.73 to 12.74	2	M1 for $\frac{108.12}{360} \times 2 \times \pi \times 6.75$
4(c)(iii)	100 or 100.1 to 100.2	3	M2 for $\frac{360-108.12}{360} \times \pi \times 6.75^2$ oe or M1 for $\frac{108.12}{360} \times \pi \times 6.75^2$ If 0 scored, SC1 for $\frac{360-108.12}{360} \times \pi \times k$
5(a)(i)(a)	1480	1	
5(a)(i)(b)	440	2	M1 for $[UQ =] 1600$ soi or $[LQ =] 1160$ soi
5(a)(ii)	$\frac{8}{80}$ oe	2	M1 for 72 or 8 written
5(b)	236 or 235.5 to 235.6	3	M2 for $\frac{5.104}{1.3} \times 60$ oe or M1 for $\frac{5.104}{\text{their time}}$

Question	Answer	Marks	Partial Marks
5(c)(i)	$(160 - 120) \times 0.2 [= 8]$	1	with no errors seen
5(c)(ii)	22, 36, 64, 30 seen	B2	B1 for 2 or 3 correct frequencies or M1 for three of $1.1 \times (180 - 160)$, $1.8 \times (200 - 180)$, $1.6 \times (240 - 200)$ and $0.5 \times (300 - 240)$ oe
	$(8 \times 140 + \text{their } 22 \times 170 + \text{their } 36 \times 190 + \text{their } 64 \times 220 + \text{their } 30 \times 270) \div 160$	M3	M1 for midpoints soi M1 for Σfx , x in interval or boundary of interval M1 dep on second M1 for $\Sigma fx \div 160$
	211.75	B1	
6(a)	$\begin{pmatrix} 4 \\ -3 \end{pmatrix}$	2	B1 for $\begin{pmatrix} 6 \\ -10 \end{pmatrix}$ or answer $\begin{pmatrix} 4 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ -3 \end{pmatrix}$
6(b)(i)	$(-4, -1)$	1	
6(b)(ii)	7.21 or 7.211...	2	M1 for $(-6)^2 + 4^2$
6(c)(i)(a)	$2\mathbf{c} - \mathbf{a}$	1	
6(c)(i)(b)	$\mathbf{c} - \mathbf{a}$	1	
6(c)(i)(c)	$\frac{1}{5}(\mathbf{a} + 8\mathbf{c})$ final answer	2	M1 for $[\overrightarrow{AP} =] \frac{4}{5} \times \text{their}(2\mathbf{c} - \mathbf{a})$ or $[\overrightarrow{BP} =] \frac{1}{5} \times -\text{their}(2\mathbf{c} - \mathbf{a})$ or for a correct vector route using the lines on the diagram
6(c)(i)(d)	$\frac{4}{5}(-\mathbf{a} + \mathbf{c})$ final answer	2	M1 for $[\overrightarrow{QP} =] -\frac{4}{5}\mathbf{c} + \frac{4}{5} \times \text{their}(2\mathbf{c} - \mathbf{a})$ or for a correct vector route
6(c)(ii)	$[QP \text{ is}] \text{ parallel } [\text{to } CB]$ $QP = \frac{4}{5}CB$ oe	2	Dep both statements consistent with <i>their (c)(i)(b)</i> and <i>their (c)(i)(d)</i> and both vectors in terms of \mathbf{a} and \mathbf{c} B1 for each dep on statement consistent with <i>their (c)(i)(b)</i> and <i>their (c)(i)(d)</i> and both vectors in terms of \mathbf{a} and \mathbf{c}
7(a)(i)	$180 - 60 - 39 [= 81]$	1	
7(a)(ii)	147 or 147.1...	3	M2 for $\frac{129 \sin(81)}{\sin 60}$ oe or M1 for $\frac{\sin(81)}{CD} = \frac{\sin 60}{129}$ oe

Question	Answer	Marks	Partial Marks
7(a)(iii)	$[\cos =] \frac{85^2 + 129^2 - 72^2}{2 \times 85 \times 129}$	M2	M1 for $72^2 = 85^2 + 129^2 - 2 \times 85 \times 129 \cos ABD$
	31.58...	A2	A1 for 0.851 to 0.852 or $\frac{9341}{10965}$ or equivalent fraction
7(a)(iv)	44.5 or 44.51 to 44.54	3	M2 for implicit correct method e.g. $\frac{d}{85} = \sin 31.6$ oe or M1 for recognition that the line from A is perpendicular to BD
7(a)(v)	247 or 247.4...	2	M1 for $180 + (180 - 81 - 31.6)$ oe or for $\angle NBC = 180 - 81 - 31.6$ oe or for $\angle NCB = 81 + 31.6$ oe
7(a)(vi)	972 or 973	4	M1 for $[\triangle ABD] \frac{1}{2} \times 85 \times 129 \sin 31.6$ oe or $\frac{1}{2} \times 129 \times \text{their } 44.5$ oe M1 for $[\triangle BCD] \frac{1}{2} \times 129 \times \text{their } 147 \times \sin 39$ oe M1 for $\frac{\text{their total area}}{10000} \times 1100$
7(b)	126 nfw	3	M2 for $\frac{9400 + 50}{70 \text{ to } 80}$ or $\frac{9400 \text{ to } 9500}{80 - 5}$ or M1 for 9350 or 9450 or 75 or 85 seen
8(a)(i)	$\frac{5}{12}$ oe	1	
8(a)(ii)	$\frac{7}{12}$ oe	1	FT 1 – <i>their (a)(i)</i>
8(b)(i)	$\frac{4}{35}$ oe	2	M1 for $\frac{4}{15} \times \frac{6}{14}$

Question	Answer	Marks	Partial Marks
8(b)(ii)	$\frac{74}{105}$ oe	4	<p>M3 for $1 - \left(\frac{5}{15} \times \frac{4}{14} + \frac{6}{15} \times \frac{5}{14} + \frac{4}{15} \times \frac{3}{14} \right)$ oe</p> <p>or M2 for $\frac{5}{15} \times \frac{4}{14} + \frac{6}{15} \times \frac{5}{14} + \frac{4}{15} \times \frac{3}{14}$ oe</p> <p>or M1 for $\frac{k}{15} \times \frac{k-1}{14}$ where k is 4, 5 or 6 oe</p> <p>If 0 scored, SC1 for $\frac{148}{225}$</p> <p>ALTERNATIVE 1</p> <p>M3 for $\frac{5}{15} \times \frac{10}{14} + \frac{6}{15} \times \frac{9}{14} + \frac{4}{15} \times \frac{11}{14}$ oe</p> <p>or M2 for two of these products added oe</p> <p>or M1 for $\frac{k}{15} \times \frac{15-k}{14}$ where k is 4, 5 or 6 oe</p> <p>If 0 scored, SC1 for $\frac{148}{225}$</p> <p>ALTERNATIVE 2</p> <p>M3 for $\frac{5}{15} \times \frac{6}{14} \times 2 + \frac{5}{15} \times \frac{4}{14} \times 2 + \frac{6}{15} \times \frac{4}{14} \times 2$ oe</p> <p>or M2 for at least two of these different products added oe</p> <p>or M1 for one correct product</p> <p>If 0 scored, SC1 for $\frac{148}{225}$</p>
9(a)(i)	9	1	
9(a)(ii)	63	1	FT $(\text{their (a)(i)})^2 - 2 \times \text{their (a)(i)}$
9(a)(iii)	$\frac{x+5}{2}$ oe final answer	2	M1 for $x = 2y - 5$ or $y + 5 = 2x$ or $\frac{y}{2} = x - \frac{5}{2}$
9(b)	$x^2 - 18x + 35$ final answer	4	<p>M1 for $(2x - 5)^2 - 2(2x - 5) - 3(x^2 - 2x)$</p> <p>B1 for $4x^2 - 10x - 10x + 25$</p> <p>B1 for $-4x + 10 - 3x^2 + 6x$</p>
10(a)	$3x^2 - 18x - 48$ final answer	2	<p>B1 for two correct terms</p> <p>or for correct answer seen then spoiled</p>

Question	Answer	Marks	Partial Marks
10(b)	<i>their</i> $\frac{dy}{dx} = 0$ soi	M1	
	$[3](x - 8)(x + 2)$ oe or $\frac{-(-18) \pm \sqrt{(-18)^2 - 4(3)(-48)}}{2 \times 3}$ oe or $3 \pm \sqrt{16 + 3^2}$	M1	oe $\frac{18 \pm \sqrt{900}}{6}$
	(-2, 52) (8, -448)	B2	B1 for one correct pair of coordinates or for two correct values of x
10(c)	(-2, 52) maximum with reason and (8, -448) minimum with reason and no incorrect statement	3	Reasons could be e.g. 1. A reasonable sketch of a positive cubic 2. Correct evaluation and use of 2nd derivative $6x - 18 = -30$, $-30 < 0$, so (-2, 52) is a maximum oe. $6x - 18 = 30$, $30 > 0$, so (8, -448) is a minimum oe. 3. Evaluates correctly values of y on both sides of both correct stationary points 4. Finds gradient on each side of both correct stationary points. Any incorrect statement MAX B2 B2 for 1 correct with correct reason for that stationary point or for both x -values correct and reasonable sketch of a positive cubic or for correct substitution and evaluation of both of <i>their</i> x -values into <i>their</i> second derivative or substitution and evaluation for one x -value on both sides of both of <i>their</i> stationary points to find the gradients soi or M1 for showing [2nd derivative =] $6x - 18$ or correct FT <i>their</i> 2nd derivative from part (a) or substitution and evaluation shown for one x -value on both sides of one of <i>their</i> stationary points to find the gradients soi or for sketch of any positive cubic.

Cambridge IGCSE™

MATHEMATICS**0580/43**

Paper 4 (Extended)

October/November 2024**MARK SCHEME**Maximum Mark: 130

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the October/November 2024 series for most Cambridge IGCSE, Cambridge International A and AS Level components, and some Cambridge O Level components.

This document consists of **10** printed pages.

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptions for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

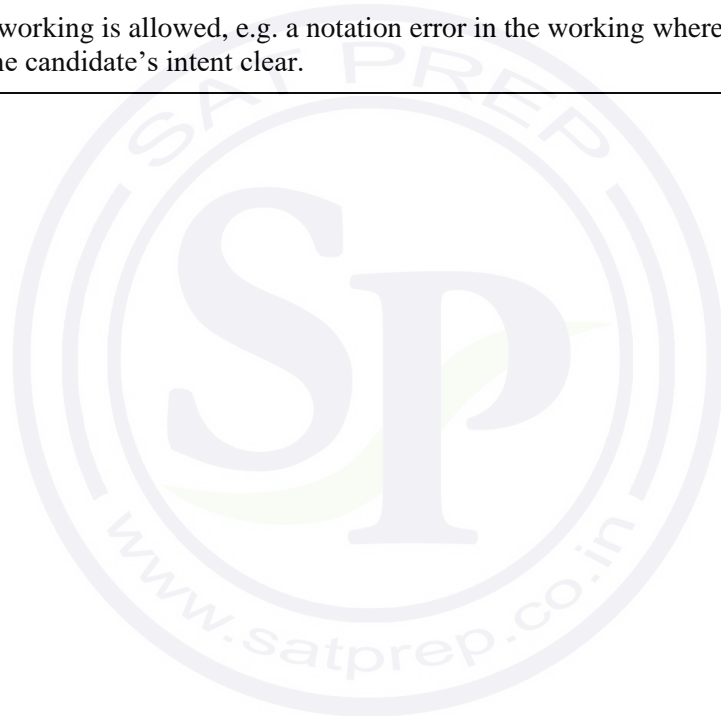
Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Mathematics-Specific Marking Principles

- 1 Unless a particular method has been specified in the question, full marks may be awarded for any correct method. However, if a calculation is required then no marks will be awarded for a scale drawing.
- 2 Unless specified in the question, non-integer answers may be given as fractions, decimals or in standard form. Ignore superfluous zeros, provided that the degree of accuracy is not affected.
- 3 Allow alternative conventions for notation if used consistently throughout the paper, e.g. commas being used as decimal points.
- 4 Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored (isw).
- 5 Where a candidate has misread a number or sign in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 A or B mark for the misread.
- 6 Recovery within working is allowed, e.g. a notation error in the working where the following line of working makes the candidate's intent clear.



Abbreviations

awrt	answers which round to
cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
nfww	not from wrong working
oe	or equivalent
rot	rounded or truncated
SC	Special Case
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)	54	2	M1 for $\frac{48}{8}$
1(b)	142	3	B2 for $2c = 278$ or better or M1 for $c + 3 + c - 1 = 280$ OR B2 for $2x = 276$ or better or M1 for $c + 3 - (c - 1) = 4$
1(c)	8.02 or 8.024 to 8.025	2	M1 for $\frac{1750 - 1620}{1620} [\times 100]$ or for $\frac{1750}{1620} \times 100 [-100]$
1(d)	1580	2	M1 for $[...] \times \frac{100 + 10}{100} = 1738$ oe or better
2(a)(i)	(1, 6)	2	B1 for each
2(a)(ii)	$\begin{pmatrix} -4 \\ -2 \end{pmatrix}$	1	
2(a)(iii)	(15, 13)	2	FT <i>their</i> (a)(ii) M1 for $\begin{pmatrix} 12 \\ 6 \end{pmatrix}$ or $\begin{pmatrix} -12 \\ -6 \end{pmatrix}$ seen or for $-1 + 16$ and $5 + 8$ seen
2(b)(i)	Image at (4, 1), (5, -1), (7, -1), (7, 1)	2	B1 for rotation 180° but incorrect position
2(b)(ii)	Image at (1, 3), (-1, 3), (-1, 6), (1, 5)	2	B1 for correct orientation but incorrect position or for drawing line $y = x + 2$

Question	Answer	Marks	Partial Marks
2(b)(iii)	Enlargement [centre] (3, 3) [factor] $-\frac{1}{2}$	3	B1 for each
3(a)	2.5	3	M2 for $\frac{500 \times r \times 14}{100} = 675 - 500$ oe or M1 for $\frac{500 \times r \times 14}{100}$ or for $675 - 500$
3(b)	108.18	3	B2 for 508.18... or 508.2 or 508 or M1 for $400 \times \left(\frac{100 + 2.2}{100}\right)^{11}$ oe or better
3(c)	0.17[0] or 0.1700...	3	M2 for either $^{(12 \times 21)}\sqrt{\frac{1074}{700}}$ or $^{252}\sqrt{\frac{1074}{700}}$ or better or M1 for $700 \times [\dots]^{(12 \times 21)} = 1074$ oe If 0 scored SC1 answer 2.06 or 2.059...
4(a)	250	2	B1 for 6750 or M1 for $7000 - 50 \times 135$ or for $7 - 50 \times 0.135$
4(b)	80	2	M1 for $6 \times 6 \times 4$ or for 4^3 oe OR M1 for $(6 \times 6) - (4 \times 4)$ oe
4(c)	118 or 117.7 to 117.8	4	M3 for $\frac{1}{2} \times 4 \times 4 \times \sin 60 \times 20 \times 0.85$ oe OR M1 for $\frac{1}{2} \times 4 \times 4 \times \sin 60$ or $\frac{1}{2} \times 4 \times \sqrt{4^2 - 2^2}$ oe M1 for $20 \times \text{their area of triangle}$ M1 dep for $0.85 \times \text{their volume}$, dependent on previous M1 If 0 scored SC1 for height = 3.46...

Question	Answer	Marks	Partial Marks
4(d)(i)	$\pi \times \sqrt{24^2 + 10^2} \times 10 + \pi \times 10^2$ or $\pi \times \left(\sqrt{24^2 + 10^2} \right)^2 \times \frac{2 \times \pi \times 10}{2 \times \pi \times 26} + \pi \times 10^2$	M3	M2 for $\pi \times \sqrt{24^2 + 10^2} \times 10$ or $\pi \times \left(\sqrt{24^2 + 10^2} \right)^2 \times \frac{2 \times \pi \times 10}{2 \times \pi \times 26}$ or M1 for $24^2 + 10^2$ or $\pi \times 10^2$
	1130.9 to 1131.1...	A1	Must see at least 5 sf
4(d)(ii)(a)	0.151 or 0.1511 to 0.1512...	1	
4(d)(ii)(b)	22	2	B1 for figs 22[1...] or M1 for $\frac{2.5 \times 100^2}{1131}$
5(a)	24	2	M1 for $\frac{100 \text{ or } 0.1}{\text{time}}$ or B1 for figs 24
5(b)	8.32 or 8.319 to 8.320	3	M1 for $9.5 \times \frac{45}{60}$ oe M1 for $\frac{8.1}{7.5}$
5(c)	$\frac{18(p+q)}{5v}$ oe final answer	3	M1 for $[k \times] \frac{(p+q)}{v}$ for some $k \neq 0$ M1 for $v \times \frac{1000}{3600}$ oe soi
6(a)	$\frac{16}{y}$ final answer	2	M1 for $\frac{240u}{15uy}$ or better
6(b)	$x^3 + 4x^2 + x - 6$ final answer	3	B2 for correct unsimplified expansion of three brackets or for simplified four-term expression of correct form with 3 terms correct in final answer or B1 for correct expansion of two given brackets with at least 3 terms out of 4 correct

Question	Answer	Marks	Partial Marks
6(c)	$\frac{-1 \pm \sqrt{1^2 - 4(2)(-5)}}{2(2)}$	M2	M1 for $\sqrt{1^2 - 4(2)(-5)}$ or better or for $\frac{-1 + \sqrt{p}}{2(2)}$ or $\frac{-1 - \sqrt{p}}{2(2)}$
	-1.85, 1.35	A2	A1 for each or -1.851 to -1.850 and 1.350 to 1.351 or -1.9 and 1.4 or -1.35 and 1.85
7(a)(i)	88	2	M1 for $\frac{1}{2}(9+13) \times 8$ oe
7(a)(ii)(a)	$\frac{1}{2}(y+4+y+1) \times (y+2) [=264]$ or $\frac{1}{2} \times 3 \times (y+2) + (y+1) \times (y+2) [=264]$	M1	
	$2y^2 + 5y + 4y + 10$	B1	
	Leading to $2y^2 + 9y - 518 = 0$	A1	No errors or omissions
7(a)(ii)(b)	$(2y+37)(y-14)$	B2	B1 for $(2y+a)(y+b)$ where $ab = -518$ or $a+2b = 9$ or $2y(y-14) + 37(y-14)$ or $y(2y+37) - 14(2y+37)$
	14	B1	
7(b)	26.5 or 26.47...	3	B2 for 10.5 or 10.47... or $\frac{10\pi}{3}$ OR M2 for $8 + 8 + \frac{75}{360} \times 2\pi 8$ or M1 for $\frac{75}{360} \times 2\pi 8$
7(c)	$25 + \frac{25}{2}\pi$	4	M2 for $\frac{90}{360} \times \pi \times (\sqrt{5^2 + 5^2})^2$ or M1 for [radius $^2 = $] $5^2 + 5^2$ M1 for [triangle area =] $[2 \times] \frac{1}{2} \times 5 \times 5$ oe

Question	Answer	Marks	Partial Marks
8(a)	126	2	M1 for $\frac{35}{100} \times 360$
8(b)	48.375	4	M1 for mid-values 35, 42.5, 47.5, 60 soi M1 for $15 \times 35 + 20 \times 42.5 + 35 \times 47.5 + 30 \times 60$ M1 dep $\frac{\Sigma fx}{100}$ dep on second M1
8(c)	Correct histogram with correct widths and heights 1.5, 7, 1.5	3	B1 for each column If 0 scored, SC1 for freq. densities 1.5, ...7, 1.5 seen or $\frac{15}{10}, \frac{35}{5}, \frac{30}{20}$
9(a)(i)	$\frac{5}{8}$ oe	1	
9(a)(ii)	75	1	FT <i>their (a)(i)</i>
9(b)(i)	$\frac{17}{32}$ oe	3	M2 for $\frac{5}{8} \times \frac{5}{8} + \frac{3}{8} \times \frac{3}{8}$ or M1 for $\frac{5}{8} \times \frac{5}{8}$ or $\frac{3}{8} \times \frac{3}{8}$
9(b)(ii)	$\frac{15}{32}$ oe	1	FT <i>their (b)(i)</i>
9(c)	$\frac{15}{28}$ oe	3	M2 for $\frac{5}{8} \times \frac{4}{7} \times \frac{3}{6} \times k, k = 1 \text{ or } 2 \text{ or } 3$ oe M1 for $\frac{5}{8}$ and $\frac{4}{7}$ and $\frac{3}{6}$ or showing the three possible combinations oe If 0 scored SC1 for $\frac{225}{512}$ oe
10(a)	$2 - 2x$	2	B1 for $k - 2x$ or $2 - kx$ or $3 + 2 - 2x$
10(b)(i)	Gradient (m) = correct substitution of -1 into <i>their</i> (a) $2 - 2(-1)$	M1	
	$0 = \text{their } m \times -1 + c$ or $y [-0] = \text{their } m(x - -1)$ oe	M1	Dep on previous M1
	$c = 4$ and leading to $y = 4x + 4$	A1	

Question	Answer	Marks	Partial Marks
10(b)(ii)	$-\frac{1}{4}x + \frac{7}{2}$ oe	3	M1 for $-\frac{1}{4}$ M1 for $3 = \text{their } m \times 2 + c$ or better or $y - 3 = \text{their } m(x - 2)$ or better
10(c)	(1, 4)	3	B2 for $x = 1$ or M1 for $\text{their } (a) = 0$ M1 for substituting $\text{their } 1$ into $y = 3 + 2x - x^2$ OR B2 for $x = 1$ or M2 for $4 - (x - 1)^2$ or M1 for $(x - 1)^2$
11(a)	7	1	
11(b)	$-4x^2 - 12x + 13$ final answer	4	B1 for $(2x + 5)(1 - 2x)$ B1 for $2x - 4x^2 + 5 - 10x$ oe B1 for $2(1 - 2x) + 5$
11(c)	$\frac{1-x}{2}$ oe final answer	2	M1 for $x = 1 - 2y$ or $2x = 1 - y$ or $\frac{y}{2} = \frac{1}{2} - x$
11(d)	$\frac{2}{3}$ oe	2	M1 for $h\left(\frac{1}{2}\right)$ or $\frac{1}{\frac{1}{x+1} + 1}$ oe
11(e)	$\frac{-x-4}{(2x+5)(x+1)}$ or $\frac{-x-4}{2x^2+7x+5}$ or $-\frac{x+4}{2x^2+7x+5}$ final answer	3	M1 for $x+1 - (2x+5)$ oe M1 for common denominator $(2x+5)(x+1)$ seen
11(f)	-5	1	
11(g)	1	1	
12(a)	$\sqrt{8.7^2 + 11.4^2 - 2 \times 8.7 \times 11.4 \cos 119}$	M2	M1 for $8.7^2 + 11.4^2 - 2 \times 8.7 \times 11.4 \cos 119$ A1 for 301.8...
	17.372 to 17.373	A1	

Question	Answer	Marks	Partial Marks
12(b)	13.[0] or 13.02 to 13.03	4	<p>M2 for $\sin E = \frac{17.37 \sin 20}{10.9}$</p> <p>or M1 for $\frac{10.9}{\sin 20} = \frac{17.37}{\sin E}$ oe</p> <p>M1 for $\angle ACE = 180 - 20 - \text{their obtuse } AEC$ oe</p>
12(c)	40.9 or 40.91 to 40.94	3	<p>M1 for a correct implicit trig statement for AD</p> <p>e.g. $\sin(\text{their acute } ACE) = \frac{AD}{17.37}$ oe</p> <p>M1 for a correct implicit statement for CD</p> <p>e.g. $\cos(\text{their acute } ACE) = \frac{CD}{17.37}$ oe</p> <p>or $CD^2 = 17.37^2 - (\text{their } AD)^2$</p> <p>or for a correct statement for ED</p> <p>eg $\tan(180 - \text{their obtuse } \angle AEC) = \frac{\text{their } AD}{ED}$</p>

Cambridge IGCSE™

MATHEMATICS**0580/41**

Paper 4 (Extended)

May/June 2024

MARK SCHEME

Maximum Mark: 130

Published

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- 6 Recovery within working is allowed, e.g. a notation error in the working where the following line of working makes the candidate's intent clear.

Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	4.55 or 4.545...	1	
1(a)(ii)	50 : 263 : 400 cao	2	M1 for a correct simplification from 250 000 : 1 315 000 : 2 000 000
1(a)(iii)	83 cao	3	M2 for $43\frac{1}{3} \times (100 - 60 - 10)$ oe or M1 for 100 – 60 – 10 seen
1(a)(iv)	10 200 000 cao	3	B2 for 10 185 185 to 10 185 200 or M1 for $5\,500\,000 \div 27 [\times 50]$
1(a)(v)	3.19×10^7 or $3.190... \times 10^7$	3	B2 for 31903920 or M1 for $60.7 \times 60 \times 24 \times 365$ If B0 scored SC1 for correctly converting <i>their</i> number seen to standard form to 3sf or better
1(b)	2095 nfw	3	M2 for $6445 - C$ where $4300 \leq C < 4400$ oe or $A - 4350$ where $6440 < A \leq 6450$ oe or M1 for 6440 + 5 or 6440 – 5 or 4400 + 50 or 4400 – 50 seen oe
2(a)(i)	Triangle at (2, 1) (1, 3) (5, 3)	1	
2(a)(ii)	Triangle at (–4, –5) (–3, –3) (0, –5)	2	B1 for translation by $\begin{pmatrix} -5 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ -2 \end{pmatrix}$
2(a)(iii)	Triangle at (–2.5, 2) (–4, 3) (–2, 3)	2	B1 for enlargement by sf $-\frac{1}{2}$ with any centre
2(b)	14.4	3	M2 for $[10 \times] 3^2 \times \left(\frac{2}{5}\right)^2$ oe or M1 for 3^2 or $\left(\frac{2}{5}\right)^2$ soi
3(a)(i)	80	2	M1 for $\frac{1}{4} \times 5 \times 8^2$
3(a)(ii)	5	2	M1 for $[y^2 =] \frac{15 \times 4}{2.4}$ oe

Question	Answer	Marks	Partial Marks
3(b)	$\frac{5x+23}{(x-1)(2x+5)}$ or $\frac{5x+23}{2x^2+3x-5}$ final answer	3	B1 for $4(2x+5) - 3(x-1)$ oe isw B1 for common denominator = $(x-1)(2x+5)$ oe isw
3(c)	$2x^3 - 13x^2 + 8x + 48$ final answer	3	B2 for correct expansion of 3 brackets but unsimplified or for simplified four-term expression of correct form with 3 terms correct or B1 for correct expansion of two brackets with at least 3 terms out of 4 correct
3(d)	$\frac{8x^{12}}{y^6}$ or $8x^{12}y^{-6}$ final answer	3	B2 for two elements correct in final answer or for correct answer seen then spoiled or for correct expression where all parts of the power have been dealt with or for $()^{-1}$ or $\left(\frac{2x^4}{y^2}\right)^3$ or B1 for 8 or y^6 or y^{-6} or x^{12} correct in final answer or for $\left(\frac{16x^{16}}{y^8}\right)^{\frac{3}{4}}$ or $\left(\frac{y^2}{2x^4}\right)^{-3}$
4(a)(i)	9.3	1	
4(a)(ii)	3.4	1	
4(a)(iii)	63	5	M4 for $\frac{195}{6} \times \frac{3600}{1000} - \frac{195}{13} \times \frac{3600}{1000}$ oe or M3 for $\frac{195}{6} \times \frac{3600}{1000}$ oe or $\frac{195}{13} \times \frac{3600}{1000}$ oe or for $\left(\frac{195}{6} - \frac{195}{13}\right)[\times k]$ oe OR M1 for $\frac{195}{6}$ or $\frac{195}{13}$ or <i>their</i> speed $\times \frac{3600}{1000}$ seen M1 for selecting 6 and 13

Question	Answer	Marks	Partial Marks
4(b)(i)	$420 < d \leq 450$	1	
4(b)(ii)	411.25	4	M1 for 275, 350, 410, 435, 475 soi M1 for Σfx M1 dep for <i>their</i> $\Sigma fx \div 80$
4(b)(iii)	2.6 19 14	3	B1 for each If 0 scored, SC1 for 3 of 0.14, 0.13, 0.95 or 0.7 oe
4(b)(iv)	$\frac{7}{158}$ oe	3	M2 for $[2 \times] \frac{20}{80} \times \frac{7}{79}$ oe or M1 for $\frac{20}{80}$ or $\frac{7}{79}$ or $\frac{7}{80}$ or $\frac{20}{79}$ oe seen After 0 scored, SC1 for $\frac{7}{160}$ oe
5(a)(i)	$\begin{pmatrix} 4 \\ -12 \end{pmatrix}$	2	B1 for each
5(a)(ii)	$1^2 + 7^2$	M1	
	$5^2 + ([-]5)^2$	M1	
	Both $\sqrt{50}$ oe	A1	With no errors seen If M0M0A0 scored SC1 for $\sqrt{50}$ oe for each
5(a)(iii)	44.4 or 44.42[8...] to 44.435	2	FT <i>their (a)(ii)</i> correct to 3sf or better M1 for $2 \times \pi \times \text{their } \sqrt{50}$ oe
5(a)(iv)	(3, 1)	2	B1 for each

Question	Answer	Marks	Partial Marks
5(a)(v)	$[y =] \frac{1}{3}x$	4	<p>B3 for a correct equation in the wrong form as final answer Or B2 for $1/3$ stated or used as perpendicular gradient</p> <p>OR</p> <p>M1 for $[\text{grad } PQ] = \frac{7 - -5}{1 - 5}$ oe</p> <p>M1 for $\frac{-1}{\text{their grad } PQ}$</p> <p>M1dep for substituting <i>their(a)(iv)</i> or (0,0) into $y = \text{their } mx + c$ oe dep on the 2nd M1 or B2</p>
5(b)	$\frac{3}{5}a + \frac{2}{5}b$ final answer	4	<p>B3 for an unsimplified correct answer</p> <p>or B2 for $AM = \frac{2}{5}(b - a)$ soi</p> <p>or $BM = \frac{3}{5}(a - b)$ soi</p> <p>or B1 for $AB = b - a$ or $BA = a - b$</p> <p>or for a correct route for OM</p> <p>or for correct diagram</p>
6(a)	245	1	
6(b)(i)	$180 - (55 + 25) [=100]$	M1	
6(b)(ii)	$\frac{32 \times \sin 25}{\sin 100}$ oe	M2	M1 for $\frac{\sin 25}{BH} = \frac{\sin 100}{32}$ oe
	13.73...	A1	

Question	Answer	Marks	Partial Marks
6(c)	258 or 257.9 to 258.0...	5	B4 for 67.9 to 68.0... OR M2 for $[\cos =] \left(\frac{11^2 + 13.7^2 - 14^2}{2 \times 13.7 \times 11} \right)$ A1 for 0.3738 to 0.376 or M1 for $14^2 = 11^2 + 13.7^2 - 2 \times 11 \times 13.7 \times \cos B$ M1dep on at least M1 for 190 + <i>their</i> angle <i>B</i>
6(d)(i)	2 44 pm or 14 44 cao	4	B3 for 1 hour 44 or 1 hour 43.6 to 1 hour 43.8 or 104 or 103.6 to 103.8 or B2 for 1.727 to 1.73 or M2 for $\frac{32}{10 \times 1.852} \times 60$ or M1 for $32 \div (10 \times 1.852)$
6(d)(ii)	7.857 to 7.88	3	M2 for $\frac{x}{13.7} = \cos 55^\circ$ oe or M1 for dist to <i>H</i> occurs when perpendicular from <i>B</i> meets <i>CH</i> soi
7(a)(i)	10 100	3	M2 for $30 \times 70 + 2 \times 30 \times 40 + 2 \times 40 \times 70$ or M1 for 30×40 or 30×70 or 40×70
7(a)(ii)	16	3	M2 for 2 fit width, 2 fit height and 4 fit length soi or M1 for 70, 30 or $40 \div 15$ or 20
7(b)(i)	$\frac{1}{3} \pi r^2 \times 3r = \text{their } (750 \div 8.9) \text{ oe}$	M2	M1 for using 750 and 8.9 correctly in $v = m / d$ oe or $750 \div 8.9$
	$r^3 = \frac{\text{their}(750 \div 8.9)}{\pi} \text{ oe}$	M1dep	
	$r = 2.993...$	A1	

Question	Answer	Marks	Partial Marks
7(b)(ii)	117 or 116.9 to 117.2	5	M4 for $\pi \times 2.99^2 + \pi \times 2.99 \times \sqrt{2.99^2 + (3 \times 2.99)^2}$ oe or M3 for $\pi \times 2.99 \times \sqrt{2.99^2 + (3 \times 2.99)^2}$ or M2 for $\sqrt{2.99^2 + (3 \times 2.99)^2}$ or M1 for $2.99^2 + (3 \times 2.99)^2$ or for $\pi \times 2.99^2$
8(a)	Correct sketch with roots indicated at $x = -9$ and $x = 2$ and y intercept $= -18$ Minimum should be in 3rd quadrant	4	B1 for U shaped parabola B2 for roots at -9 and 2 on diagram or M1 for $(x + 9)(x - 2) [= 0]$ B1 for y – intercept at -18 on diagram Maximum 3 marks if sketch not fully correct
8(b)(i)	$2x - 3$	2	B1 for $2x + k$ or $kx^{[p]} - 3$
8(b)(ii)	$(1.5, -30.25)$ oe	3	B2 for $x = 1.5$ or M1 for <i>their</i> (b)(i) $= 0$ or for $(x - 1.5)^2$
8(c)	$x^2 - x - 33 [= 0]$ seen	B1	
	$\frac{[-]1 \pm \sqrt{([-]1)^2 - 4(1)(-33)}}{2 \times 1}$ oe	B2FT	FT <i>their</i> quadratic dep on no factors B1 for $\sqrt{([-]1)^2 - 4(1)(-33)}$ or better or B1 for $\frac{[-]1 + \sqrt{q}}{2(1)}$ oe or $\frac{[-]1 - \sqrt{q}}{2(1)}$ oe
	-5.27 or -5.267 to -5.266 and 6.27 or 6.266 to 6.267	B2	B1 for each If 0 scored, SC1 for -6.27 and 5.27
	$(-5.27, 15.53$ or $15.54)$ and $(6.27, -7.53$ or $-7.54)$	B1	
9(a)(i)	13	1	
9(a)(ii)	-20	1	FT $6 - 2(\text{their } (a)(i))$

Question	Answer	Marks	Partial Marks
9(b)	$\frac{6-x}{2}$ oe final answer	2	M1 for correct first step $x = 6 - 2y, y - 6 = -2x, \frac{y}{2} = 3 - x$
9(c)	2.375 oe	4	B1 for $6 - 2(2x - 7)$ oe B1 for $4x + 1 = 6 - 4x + 14$ M1 for $8x = 19$ FT <i>their</i> linear equation rearranged correctly from $ax + b = cx + d$ to form $ex = f$
9(d)	$\frac{1}{3}$ or 0.333...	2	M1 for $h(1)$ or $3^{3^{x-2} - 2}$ or $3^{(3^{2-2} - 2)}$ or better
9(e)	6561	2	M1 for 3^{10-2} or $x = h(10)$



Cambridge IGCSE™

MATHEMATICS**0580/42**

Paper 4 (Extended)

May/June 2024

MARK SCHEME

Maximum Mark: 130

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the May/June 2024 series for most Cambridge IGCSE, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

This document consists of **10** printed pages.

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptions for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

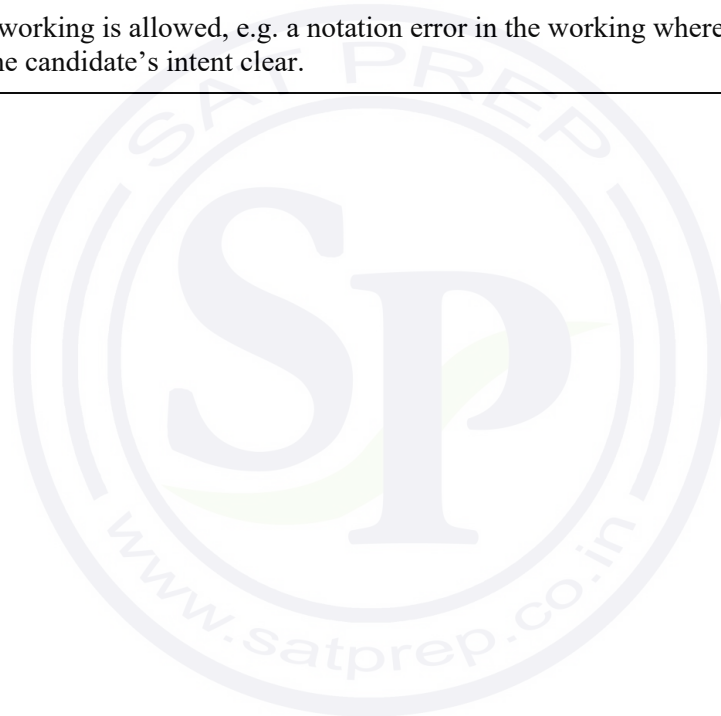
Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Mathematics-Specific Marking Principles

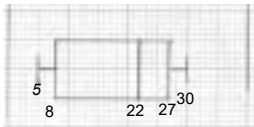
- 1 Unless a particular method has been specified in the question, full marks may be awarded for any correct method. However, if a calculation is required then no marks will be awarded for a scale drawing.
- 2 Unless specified in the question, non-integer answers may be given as fractions, decimals or in standard form. Ignore superfluous zeros, provided that the degree of accuracy is not affected.
- 3 Allow alternative conventions for notation if used consistently throughout the paper, e.g. commas being used as decimal points.
- 4 Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored (isw).
- 5 Where a candidate has misread a number or sign in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 A or B mark for the misread.
- 6 Recovery within working is allowed, e.g. a notation error in the working where the following line of working makes the candidate's intent clear.

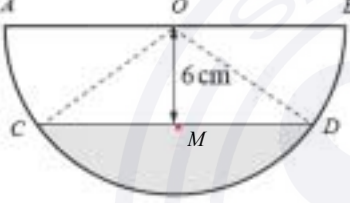


Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

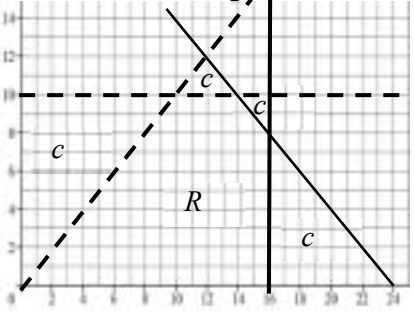
Question	Answer	Marks	Partial Marks
1(a)	10 : 3 final answer	2	M1 for 1500 : 450 oe in ratio form If 0 scored SC1 for answer 3 : 10
1(b)	360 240 400	3	B2 for answer 0.36 0.24 0.4 or for answer two of 360 240 400 or M1 for $\frac{1000}{9+6+10}[\times k]$ where $k = 1, 9,$ 6 or 10 If 0 scored, SC1 for answer with 3 values in ratio 9 : 6 : 10 in that order
1(c)	3.68 cao	2	M1 for $\left(1 + \frac{15}{100}\right) \times 3.2$ oe or B1 for answer 0.48
1(d)	18 804[.0...]	2	1 for $16620 \times \left(1 + \frac{2.5}{100}\right)^5$ oe
1(e)	3.95	3	M2 for $22.5 - (18.5 \text{ to } 18.6)$ or $(22 \text{ to } 23) - 18.55$ or M1 for $23 - 0.5$ oe seen or $23 + 0.5$ oe seen or $18.5 - 0.05$ oe seen or $18.5 + 0.05$ oe seen
2(a)	142 142	2	B1 for each FT angle $b = \textit{their angle } a$
2(b)	150	2	M1 for $\frac{360}{12}$ oe isw or $180 \times (12 - 2)$ oe isw

Question	Answer	Marks	Partial Marks
2(c)	56	B1	
	34	B2	M1 for angle at centre = $2 \times$ <i>their</i> 56 oe soi or for angle $OMB = 90$ oe soi
2(d)	51	2	B1 for opp angle = 129 soi
3(a)(i)	25.4375	4	M1 for mid-points soi (5, 17.5, 32.5, 50) M1 for use of Σfm with m in correct interval including both boundaries M1 for (dep on 2 nd M1) for $\Sigma fm \div 40$
3(a)(ii)	correct histogram	3	B2 for 3 correct blocks or B1 for 2 correct blocks If 0 scored SC1 for 4 correct frequency densities 0.3, 1.2, 1, 0.2 oe soi
3(a)(iii)	$\frac{19}{260}$ oe	3	M2 for $\frac{19}{40} \times \frac{3}{39} [\times 2]$ oe or M1 for any of $\frac{19}{40}, \frac{3}{40}, \frac{19}{39}, \frac{3}{39}$ oe seen If 0 scored, SC1 for $\frac{57}{800}$ oe
3(b)(i)	5	1	
3(b)(ii)	 <p>Correct box plot</p>	3	B2 for with LQ at 8 and median at 22 and UQ at 27 and boxed or M1 for LQ at 8 and median at 22 or for UQ at 27 B1 for lowest = 5 and highest = 30 Max B1 if not box and whisker diagram

Question	Answer	Marks	Partial Marks
3(b)(iii)	Correct explanation which states the median is 22 and correct reference to 100 or 101 e.g. <ul style="list-style-type: none"> Median is 22 which is 50% of the people and 101 is more than 50% oe The median is 22 which is the 100th number (accept 100.5th number) 	1	
4(a)(i)	22 620 cao	3	B2 for 7200π or 22 608 to 22 629 or M1 for $\frac{1}{2} \times \pi \times 12^2 [\times \text{figs 1}]$ oe
4(a)(ii)	8840 or 8850 or 8836 to 8850. 	5	M1 for $\cos COM = \frac{6}{12}$ oe or $\sin AOC = \frac{6}{12}$ oe M1 for $\left(\frac{\text{their } COD}{360} \times \pi \times 12^2 \right)$ oe M1 for $\left(\frac{1}{2} \times 12^2 \times \sin(\text{their } COD) \right)$ oe M1dep for (their area of sector COD – their area of triangle COD) $\times 100$ dep on at least M1M1 oe
4(b)	647 or 646.8	3	M2 for $2.2 = \frac{m}{42 \times 35 \times 0.2}$ oe or M1 for [vol of stone =] $42 \times 35 \times 0.2$ oe If 0 scored SC1 for answer figs 647 or figs 6468
4(c)	46.1 or 46.12 to 46.14	4	M3 for $\tan = \frac{15}{\sqrt{8^2 + 12^2}}$ oe or M2 for $8^2 + 12^2$ oe or $8^2 + 12^2 + 15^2$ oe or M1 for identifying the angle GAC
5(a)	$125x^9$ final answer	2	B1 for answer $125x^k$ or mx^9 or for correct answer seen then spoilt

Question	Answer	Marks	Partial Marks
5(b)	6^{n-2} oe final answer	2	B1 for answer of form 6^k oe or answer of the form $\left(\frac{1}{6}\right)^{-k}$ oe or for correct answer seen
5(c)	$3x^3 + 2x^2 - 37x + 12$ final answer	3	B2 for correct expansion of three brackets unsimplified or for simplified four-term expression of correct form with 3 terms correct or B1 for correct expansion of two brackets with at least 3 terms out of 4 correct
5(d)(i)	eliminates the fraction correctly eg $(3x + 5)(x - 2) + 7 = x(x - 2)$	M1	
	$3x^2 + 5x - 6x - 10 + 7 = x^2 - 2x$ oe	B2	B1 for $3x^2 + 5x - 6x - 10 [+ 7]$ oe seen with at least 3 terms correct
	leading to $2x^2 + x - 3 = 0$	A1	dep on M1 B2 with no errors or omissions
5(d)(ii)	$(2x + 3)(x - 1)$	M2	or M1 for $(2x + a)(x + b)$ where $ab = -3$ or $2b + a = [+]1$ or for partial factors $2x(x - 1) + 3(x - 1)$ or $x(2x + 3) - [1](2x + 3)$
	-1.5 oe and $+1$	B1	
5(e)	[TSA cylinder =] $2\pi x^2 + 2\pi x \times 3x$	M1	
	[TSA hemisphere =] $\pi(5y)^2 + \frac{4\pi(5y)^2}{2}$	M1	
	Leading to $2\pi x^2 + 6\pi x^2 = 50\pi y^2 + 25\pi y^2$ oe	M1	dep M1M1
	$x^2 = \frac{75y^2}{8}$	A1	dep on M1M1M1
6(a)	$\sqrt{10.4^2 + 6.5^2 - 2 \times 10.4 \times 6.5 \times \cos 64}$	M2	M1 for $10.4^2 + 6.5^2 - 2 \times 10.4 \times 6.5 \times \cos 64$ A1 for 91.1 to 91.2
	9.546 to 9.547	A1	

Question	Answer	Marks	Partial Marks
6(b)(i)	$180 - (26 + 42)$	B1	
6(b)(ii)	6.89 or 6.888 to 6.892...	3	M2 for $\frac{9.55}{\sin 112} \times \sin 42$ oe or M1 for $\frac{\sin 112}{9.55} = \frac{\sin 42}{CD}$ oe
6(c)	5.84[2...]	3	M2 for $\frac{x}{6.5} = \sin 64$ oe or M1 for identifying shortest distance from D is perpendicular to AB
7(a)	2	2	M1 for $3x + 4x = 6 + 8$ or better
7(b)	$5a(2a + 1)$ final answer	2	B1 for $a(10a + 5)$ or $5(2a^2 + a)$ or $5a(2a + 1)$ then spoilt
7(c)	$4x(x - 3)$ final answer	2	M1 for $((2x - 3) - 3)((2x - 3) + 3)$ or better or for $4x^2 - 6x - 6x + 9 [-9]$ oe or better
7(d)(i)	$\frac{1}{15}$ oe	1	
7(d)(ii)	19 683	2	B1 for $g(9)$, 3^9 or 3^{3^x} seen
7(d)(iii)	-3	2	M1 for $3^k = \frac{1}{27}$ or $3^k = 3^{-3}$ or answer $g(-3)$
8(a)	$y < 10$ $y < x$ oe $x + y \leq 24$ oe	3	B1 for each If 0 scored, SC1 for $y \leq 10$ and $y \leq x$ and $x + y < 24$

Question	Answer	Marks	Partial Marks
8(b)	<p>Correct lines and region indicated</p> 	6	<p>B1 for each correct line and</p> <p>B2 for R in correct region for all 4 correct lines</p> <p>or B1 for R in any one of the regions marked <i>c</i></p> <p>or B1 for R that satisfies 3 of the correct inequalities</p>
8(c)	228 nfw	2	<p>M1 for $8x + 12y$ for any (x, y) in <i>their</i> R, x, y both integer or $x = 15, y = 9$</p>
9(a)	<p>$[a =] 9$ $[b =] 14$</p>	3	<p>B2 for $a = 9$ OR M2 for $\frac{60}{360} \times 2 \times \pi \times 17 + \frac{60}{360} \times 2 \times \pi \times 10 + 7 + 7$ oe or M1 for $\frac{60}{360} \times 2 \times \pi \times 17$ oe or $\frac{60}{360} \times 2 \times \pi \times 10$ oe If 0 scored SC1 for $b = 14$</p>
9(b)(i)	<p>60° at centre or interior angle = 120°</p>	B1	
	<p>$[6 \times] \frac{1}{2} \times d^2 \times \sin 60$ oe</p>	M1	
	<p>$[d^2 =] \frac{127.3}{6 \times \frac{1}{2} \times \sin 60}$</p>	M1	
	<p>6.99[9...] to 7.00[...]</p>	A1	Dep on M1M1
9(b)(ii)(a)	1273	1	
9(b)(ii)(b)	675 or 674.5 to 674.6	2	M1 for 2×127.3 oe or $6 \times 7 \times 10$ oe
10(a)(i)	(4.5, -1)	2	B1 for each

Question	Answer	Marks	Partial Marks
10(a)(ii)	6.71 or 6.708...	3	M2 for $(6 - 3)^2 + (2 - -4)^2$ oe or better or M1 for $[-](6 - 3)$ and $[-](2 - -4)$ oe or for $([-]3)^2$ and $([-]6)^2$ oe
10(b)(i)	$-\frac{4}{3}$	2	M1 for $3y = -4x + 12$ or $\frac{4}{3}x + y - \frac{12}{3} [= 0]$ or better seen
10(b)(ii)	(0, 4)	2	B1 for each or for $y = 4$ not in coordinate form
10(b)(iii)	$[y =] \frac{3}{4}x + \frac{1}{2}$ final answer	3	M1 for gradient $\frac{3}{4}$ or $\frac{-1}{\text{their(b)(i)}}$ oe or better M1 for (6, 5) substituted into $y = \frac{3}{4}x + c$ or $y = \text{their } mx + c$ oe
11(a)	$-4(-1)^3 - 9(-1)^2 + 5$ or better	M1	
	$= 0$ [so stationary point]	A1	with no errors
11(b)(i)	18	3	B2 for $6x^2 - 6$ isw OR B1 for $6x^2 + k$ (any k) isw or $px^2 - 6$ isw ($p \neq 0$) or $6x^2 - 6 + 8$ M1 dep on B1 for $x = -2$ substituted into $\text{their } \frac{dy}{dx}$
11(b)(ii)	1 and -1	2	M1 for $6x^2 - 6 = 0$ oe seen or for $\text{their } \frac{dy}{dx} = 0$ if B1 scored in part (b)(i)

Cambridge IGCSE™

MATHEMATICS**0580/43**

Paper 4 (Extended)

May/June 2024

MARK SCHEME

Maximum Mark: 130

Published

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Cambridge International is publishing the mark schemes for the May/June 2024 series for most Cambridge IGCSE, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

This document consists of **10** printed pages.

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- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

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- marks are not deducted for omissions
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GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Mathematics-Specific Marking Principles

- 1 Unless a particular method has been specified in the question, full marks may be awarded for any correct method. However, if a calculation is required then no marks will be awarded for a scale drawing.
- 2 Unless specified in the question, non-integer answers may be given as fractions, decimals or in standard form. Ignore superfluous zeros, provided that the degree of accuracy is not affected.
- 3 Allow alternative conventions for notation if used consistently throughout the paper, e.g. commas being used as decimal points.
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- 5 Where a candidate has misread a number or sign in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 A or B mark for the misread.
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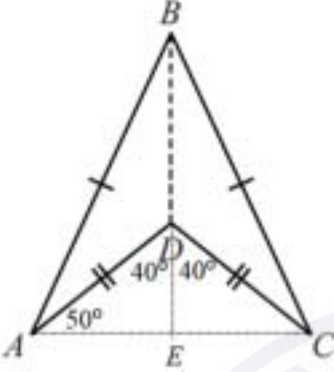
Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	3050	2	M1 for $50 \times 40 + 70 \times 15$ or better
1(a)(ii)	91.1 or 91.14 to 91.15	1	FT $\frac{2780}{\text{their } 3050} \times 100$
1(a)(iii)	125 nfw	2	M1 for $[\dots] \times \frac{100-4}{100} = 120$ oe
1(a)(iv)(a)	132	2	B1 for increase of 6 in adult or junior or M1 for $56 : 76$ or for multiples of 33 seen 33, 66, 99, 132, ... or $50 + x : 70 + x = 14 : 19$ oe or $(70 - 50) \times \frac{19+14}{19-14}$ oe or $50 + x = (120 + 2x) \times \frac{14}{19+14}$ oe
1(a)(iv)(b)	10	2	FT $\frac{\text{their(a)} - 120}{120} \times 100$ dep on <i>their (a)</i> > 120 M1 for $\frac{\text{their(a)} - 120}{120} [\times 100]$ or $\frac{\text{their(a)}}{120} \times 100 [-100]$
1(b)(i)	2280 or 2281 to 2282 nfw	2	M1 for $2500 \times \left(1 - \frac{3}{100}\right)^3$ oe
1(b)(ii)	8	2	M1 for $2500 \times \left(1 - \frac{3}{100}\right)^n$ or 0.97^n evaluated with $n > 3$
2(a)(i)	56	1	
2(a)(ii)	11	2	M1 for $120 - n^3 = -1211$ or $120 - 11^3 = -1211$
2(b)	0.0048 or $\frac{3}{625}$ oe	1	

Question	Answer	Marks	Partial Marks												
2(c)	<table border="1"> <tr> <td>A</td><td>-5</td><td></td><td>$10 - 3n$</td></tr> <tr> <td>B</td><td>$\frac{5}{8}$</td><td></td><td>$\frac{n}{n+3}$</td></tr> <tr> <td>C</td><td>20</td><td></td><td>$n^2 - n$</td></tr> </table>	A	-5		$10 - 3n$	B	$\frac{5}{8}$		$\frac{n}{n+3}$	C	20		$n^2 - n$	8	<p>B1 for -5</p> <p>B2 for $10 - 3n$ oe or B1 for $k - 3n$ or for $10 - kn$</p> <p>B1 for $\frac{5}{8}$</p> <p>B1 for $\frac{n}{n+3}$ oe</p> <p>B1 for 20</p> <p>B2 for $n^2 - n$ oe or B1 for any quadratic or for at least two second differences of 2</p>
A	-5		$10 - 3n$												
B	$\frac{5}{8}$		$\frac{n}{n+3}$												
C	20		$n^2 - n$												
3(a)	5	B1													
	4	B1													
	3.55	3	<p>M2 for $(10 \times 1 + 6 \times 2 + 11 \times 3 + 13 \times 4 + 14 \times 5 + 6 \times 6) \div 60$ oe</p> <p>or M1 for $10 \times 1 + 6 \times 2 + 11 \times 3 + 13 \times 4 + 14 \times 5 + 6 \times 6$ oe</p>												
3(b)(i)	42.55 or 42.6	4	<p>M1 for 25, 40, 62.5 soi</p> <p>M1 for Σfx with x values in correct intervals, including boundaries</p> <p>M1 dep on second M1 for $\frac{\Sigma fx}{100}$</p>												
3(b)(ii)	10.8 2.16	2	B1 for each or for frequency densities 3.6 and 0.72 seen												
4(a)	$\frac{1}{2}(r+5)(r+2)\sin 30 = (r+1)^2$	M2	M1 for $\frac{1}{2}(r+5)(r+2)\sin 30$ oe												
	$r^2 + 5r + 2r + 10$ or $r^2 + r + r + 1$ soi	B1													
	Leading to $3r^2 + r - 6 = 0$ with no errors or omissions	A1	Dependent on both expansions seen												

Question	Answer	Marks	Partial Marks
4(b)	$\frac{-1 \pm \sqrt{1^2 - 4(3)(-6)}}{2(3)}$ <p>Or</p> $-\frac{1}{6} \pm \sqrt{2 + \left(\frac{1}{6}\right)^2} \text{ oe}$ <p>or</p> $\frac{1}{3} \left(-\frac{1}{2} \pm \sqrt{18 + \left(\frac{1}{2}\right)^2} \right) \text{ oe}$	B2	B1 for $\sqrt{1^2 - 4(3)(-6)}$ or for $\frac{-1 + \sqrt{p}}{2(3)}$ or $\frac{-1 - \sqrt{p}}{2(3)}$ or $\left(r + \frac{1}{6}\right)^2$ or $\left(3r + \frac{1}{2}\right)^2$
	-1.59 and 1.26	B1	
4(c)	9.028 to 9.040	2	M1 for (<i>their</i> root (greater than -1) + 1) × 4
5(a)(i)	3 cao	1	
5(a)(ii)	-2, -0.45 to -0.4, 2.40 to 2.45	3	B1 each
5(a)(iii)	3 cao	1	
5(a)(iv)	Asymptote	1	
5(b)(i)	Correct ruled line	2	B1 for ruled line through (0, -2) but not $y = -2$ or for ruled line with gradient 1
5(b)(ii)	1 cao	1	
5(c)	Substituting values of x and y into $y = x^2 - \frac{c}{x}$ for an exact point on graph of $y = f(x)$ or substituting <i>their</i> value of x from 5b(ii) into $x^2 - \frac{c}{x} = x - 2$	M1	
	leading to $c = 2$ with no errors	A1	
5(d)	$[p =] -1$ and $[q =] 2$ nfw	2	M1 for $x^3 - x^2 + 2x = 2$ seen or B1 for each nfw
6(a)	4.27 or 4.272...	2	M1 for $4^2 + 1.5^2$ oe

Question	Answer	Marks	Partial Marks
6(b)	203 or 202.6...	3	B2 for [angle at W =] 22.6... or for [angle at V =] 67.4 or 67.38... or M1 for $\tan = \frac{5}{12}$ or $\frac{12}{5}$ oe
6(c)	25.2 or 25.20 to 25.21[0] 	5	B4 for [BC or AB =] 7.6[0] or 7.604 to 7.605 OR M3 for a complete explicit method leading to AB or BC, e.g. $\frac{5 \sin 140}{\sin 25}$ OR M2 for a complete implicit method leading to AB or BC, e.g. $\frac{\sin 25}{5} = \frac{\sin 140}{BC \text{ or } AB}$ oe and M1 (dep on AB from trig) for $2 \times \text{their } AB + 10$ OR B1 for any relevant angle E.g. $\angle BDA$ or $\angle BDC = 140$, $\angle DAE$ or $\angle DCE = 50$ or $\angle ADE$ or $\angle CDE = 40$ or $\angle ADC = 80$
6(d)	79.5 or 79.6 or 79.54 to 79.55...	5	B2 for [$PR^2 =$] 245 or 245.1 to 245.2 or [$PR =$] 15.65 to 15.66 or 15.7 or M1 for [$PR^2 =$] $11^2 + 8^2 - 2 \times 11 \times 8 \times \cos 110$ M2 for [$\cos PQR =$] $\frac{10^2 + 14^2 - (\text{their } PR)^2}{2 \times 10 \times 14}$ oe or M1 for $(\text{their } PR)^2 = 10^2 + 14^2 - 2 \times 10 \times 14 \cos PQR$ oe
7(a)(i)	40	2	M1 for $\frac{50}{75}$ [$\times 60$] oe
7(a)(ii)	36 nfw	3	M2 for $\frac{47 - 0.5}{75 \text{ to } 80}$ [$\times 60$] or $\frac{46 \text{ to } 47}{75 + 2.5}$ [$\times 60$] or M1 for $47 + 0.5$ or $47 - 0.5$ or $75 + 2.5$ or $75 - 2.5$

Question	Answer	Marks	Partial Marks
7(b)	107 or 107.2...	6	<p>M5 for [speed =] $\frac{240}{(2 \times \frac{260}{7} + 60)} \times 60$ oe</p> <p>OR</p> <p>B5 for [total time =] 134 or 134.2 to 134.3 or 2.24 or 2.238...</p> <p>or B4 for ($t =$) 37.1 or 37.14...</p> <p>OR</p> <p>M2 for $\frac{t}{60} \times 100 + \frac{t+60}{60} \times 110 = 240$ oe</p> <p>or M1 for $\frac{t}{60} \times 100$ or $\frac{t+60}{60} \times 110$ oe</p> <p>M1 for correct equation of form $at = b$ from <i>their</i> equation containing two terms in t and involving the speeds.</p> <p>M1 for $\frac{240}{2 \times \text{their } t + 60} [\times 60]$</p>
8(a)(i)	37.3 or 37.26 to 37.27	5	<p>M2 for $\pi \times 0.35 \times \sqrt{0.35^2 + 1.5^2}$ oe</p> <p>or M1 for $0.35^2 + 1.5^2$ or better</p> <p>M1 for $\pi \times 0.35^2$</p> <p>M1 for $2 \times \pi \times 0.35 \times 16$</p>
8(a)(ii)	6.35 or 6.349 to 6.351	3	<p>M1 for $\pi \times 0.35^2 \times 16$</p> <p>M1 for $\frac{1}{3} \times \pi \times 0.35^2 \times 1.5$</p>
8(a)(iii)	22.2 or 22.3 or 22.24 to 22.26	3	<p>M2 for $17.5 \times 3.5 \times 1.4 - 10 \times$ <i>their(a)(ii)</i></p> <p>or M1 for $17.5 \times 3.5 \times 1.4$</p>

Question	Answer	Marks	Partial Marks
8(b)	154 or 154.3 to 154.4	3	M2 for $450 \times \left(\sqrt{\frac{98}{200}}\right)^3$ oe or M1 for $\left(\sqrt{\frac{98}{200}}\right)^3$ or $\left(\sqrt{\frac{200}{98}}\right)^3$ oe or for $\left(\frac{450}{V}\right)^2 = \left(\frac{200}{98}\right)^3$ oe
9(a)(i)	0	1	
9(a)(ii)	$\frac{1}{7}$ oe	1	
9(b)	$\frac{4}{49}$ oe	2	M1 for $\frac{2}{7} \times \frac{2}{7}$
9(c)(i)	$\frac{2}{21}$ oe	3	M2 for $\frac{2}{7} \times \frac{1}{6} + \frac{1}{7} \times \frac{2}{6}$ oe or M1 for $\frac{2}{7} \times \frac{1}{6}$ or $\frac{1}{7} \times \frac{2}{6}$ oe seen If 0 scored SC1 for $\frac{4}{49}$
9(c)(ii)	$\frac{19}{21}$ oe	3	M2 for $1 - \left(\frac{2}{7} \times \frac{1}{6}\right) - \left(\frac{2}{7} \times \frac{1}{6}\right)$ oe or M1 for $\left(\frac{2}{7} \times \frac{1}{6}\right) + \left(\frac{2}{7} \times \frac{1}{6}\right)$ oe ALTERNATIVE M2 for $\frac{1}{7} [\times 1] \times 3 + \frac{2}{7} \times \frac{5}{6} \times 2$ or M1 for $\frac{2}{7} \times \frac{5}{6}$ or $\frac{1}{7} [\times 1] \times 3$ If 0 scored SC1 for $\frac{38}{49}$
9(d)	3	2	M1 for $\frac{5}{7} \times \frac{4}{6} \times \frac{2 \text{ or } 3}{5}$
10(a)	$7x^6 - 42x^5$ final answer	2	B1 for one correct term $7x^6$ or $42x^5$ or for $7x^6 - 42x^5$ seen and spoiled

Question	Answer	Marks	Partial Marks
10(b)	$49x + 41$	4	M1 for substituting $x = -1$ into $[y =] x^7 - 7x^6$ M1 for $x = -1$ substituted in <i>their</i> (a) or the correct derivative to give <i>their</i> m M1 for <i>their</i> $-8 = (their\ m)(-1) + c$ oe
10(c)	$(0, 0)$ $(6, -46\ 656)$	5	B4 for $(6, -46\ 656)$ or B3 for $x = 0$ and 6 OR M1 for <i>their</i> $\frac{dy}{dx} = 0$ or stating $\frac{dy}{dx} = 0$ and M1 for a correct method to solve <i>their</i> $7x^6 - 42x^5$
11(a)	$\frac{3}{10} \times 360$ oe	M2	M1 for $\frac{3}{3+7} = \frac{x}{360}$ or for $\frac{x}{360} [\times 2\pi r] = \frac{3}{7} \times \frac{360-x}{360} [\times 2\pi r]$ oe or better or $1 [\times 2\pi r] = \frac{10}{7} \times \frac{360-x}{360} [\times 2\pi r]$ oe or better or $\frac{360}{7+3} \times k$ ($k = 1$ or 7)
	108	A1	
11(b)(i)	$\frac{1}{2} r^2 \sin y = \frac{1}{2} \times \frac{y}{360} \times \pi r^2$ or $\frac{y}{360} \times \pi r^2 = [2 \times \frac{1}{2}] r^2 \sin y$ and one further step leading to $360 \sin y = \pi y$ with no errors	2	M1 for $\frac{y}{360} \times \pi r^2$ or for $\frac{1}{2} r^2 \sin y$
11(b)(ii)	341.18 or 341.22 341.00 341.49 or 341.54	3	B1 for each
11(b)(iii)	108.6 cao	1	

Cambridge IGCSE™

MATHEMATICS**0580/42**

Paper 4 (Extended)

February/March 2024**MARK SCHEME**Maximum Mark: 130

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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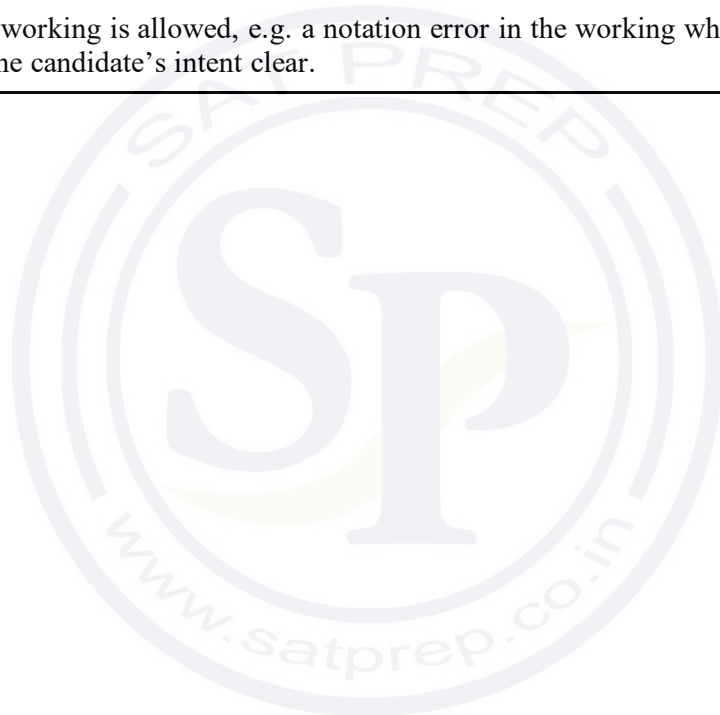
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Mathematics-Specific Marking Principles

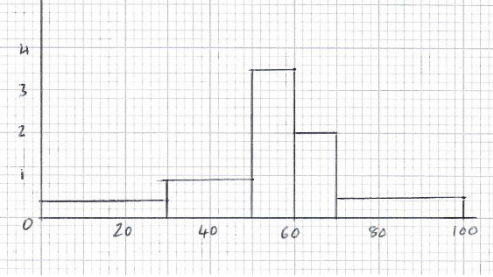
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Abbreviations

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FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)	8.24 cao	2	M1 for $3 \times 1.04 + 4 \times 1.28$
1(b)(i)	32	2	M1 for $\frac{8}{11+8+6} [\times 100]$ oe
1(b)(ii)	360	2	M1 for $\frac{1500}{11+8+6} \times k$ where $k = 1, 11, 8$ or 6
1(b)(iii)	270	1	FT $0.75 \times \text{their } 360$
1(b)(iv)	1.25 cao	2	M1 for $x \times \left(1 - \frac{8}{100}\right) = 1.15$ oe or better
1(c)	140 nfw	3	M2 for $\frac{620 \text{ to } 640}{5 - 0.5}$ or $\frac{620 + 10}{4 \text{ to } 5}$ oe or M1 for $620 + 10$ oe or $620 - 10$ oe or $5 + 0.5$ oe or $5 - 0.5$ oe seen
2(a)	$y + \text{angle } BCD = 180$ oe AND angles on a straight line AND $x + \text{angle } BCD = 180$ oe AND opposite angles of a cyclic quadrilateral are supplementary OR angles in opposite segments are supplementary leading to $x = y$ with no errors	B2	B1 for angles on a straight line OR opposite angles of a cyclic quadrilateral are supplementary OR angles in opposite segments are supplementary

Question	Answer	Marks	Partial Marks
2(b)	Allow any two statements from: CXD is common angle or angle $AXB = \text{angle } CXD$ $x = y$ or angle $BAX = \text{angle } DCX$ angle $ABX = \text{angle } CDX$	M1	
	States all three equal pairs of angles OR 2/all angles equal so triangles similar	A1	
2(c)(i)	6 nfw	3	B2 for $BX = 18$ nfw or M2 for $\frac{24}{12} = \frac{BC+12}{9}$ oe or M1 for $\frac{24}{12} = \frac{BX}{9}$ oe If 0 scored, SC1 for answer 18
2(c)(ii)	4	1	
3(a)(i)	5	1	
3(a)(ii)	16.8	3	M1 for $15 \times 4 + 16 [\times 1] + 17 \times 2 + 18 [\times 1] + 19 \times 0 + 20 \times 2$ oe M1 dep on previous M1 for <i>their</i> $\Sigma fx \div 10$
3(a)(iii)	16.5	1	
3(a)(iv)	15	1	
3(b)	21	3	M2 for 8×17.5 and 7×17 oe or M1 for 7×17 or 8×17.5 oe seen
3(c)	5 correct blocks, with correct widths, heights 	4	B3 for 4 correct blocks or B2 for 3 correct blocks or B1 for 2 correct blocks If 0 scored SC1 for correct frequency densities (0.4 0.9 3.5 2 0.5) soi
4(a)(i)	432	2	M1 for $12 \times 12 \times 9 \div 3$ oe

Question	Answer	Marks	Partial Marks
4(a)(ii)	404 or 403.5 to 403.7	5	M4 for $12^2 + 4 \times \frac{1}{2} \times 12 \times \sqrt{6^2 + 9^2}$ oe or M3 for $\frac{1}{2} \times 12 \times \sqrt{6^2 + 9^2}$ oe or M2 for explicit method to find height of triangular face e.g. $\sqrt{6^2 + 9^2}$ oe or M1 for implicit method to find height of triangular face or for $6^2 + 9^2$ oe seen or B1 for slant height of triangle FC $\sqrt{153}$ or $3\sqrt{17}$ or 12.4 or 12.36 to 12.37 soi
4(b)	4.4[0] or 4.398 to 4.399... nfwv	4	M3 for $\sqrt{\frac{304}{(2+3) \times \pi}}$ oe or M2 for $\frac{4\pi r^2}{2} + \pi r \times 3r = 304$ oe or M1 for $\frac{4\pi r^2}{2}$ oe seen or $\pi r \times 3r$ oe seen
5(a)(i)	$(x-4)(x+3)$ final answer	2	M1 for $(x+a)(x+b)$ where $ab = -12$ or $a + b = -1$ or for $x(x+3) - 4(x+3)$ or $x(x-4) + 3(x-4)$
5(a)(ii)	$\frac{x+4}{x+3}$ final answer	2	M1 for $(x-4)(x+4)$ seen
5(b)	$3x^2 - 14x + 8$ or $(x-4)(3x-2)$ final answer	3	M2 for $((2x-3)-(x+1))((2x-3)+(x+1))$ or $(4x^2 - 6x - 6x + 9) - (x^2 + x + x + 1)$ or better or correct answer seen or M1 for $(x-4)(ax+b)$ or $(3x-2)(x+c)$ or $(4x^2 - 6x - 6x + 9)$ or $\pm(x^2 + x + x + 1)$ oe
5(c)	$\frac{x^2 - 3x - 12}{(x+1)(x-3)}$ or $\frac{x^2 - 3x - 12}{x^2 - 2x - 3}$ final answer	4	B1 for common denominator $(x+1)(x-3)$ oe isw B1 for $(2x+4)(x-3) - x(x+1)$ or better seen B1 for $2x^2 - 6x + 4x - 12$ or $-x^2 - x$ seen

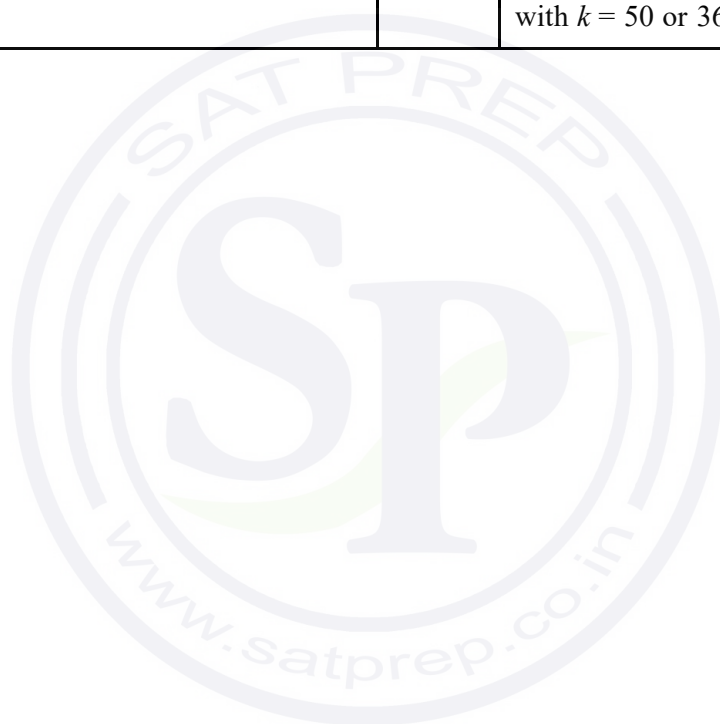
Question	Answer	Marks	Partial Marks
5(d)	$2x^3 - 15x^2 + 22x + 15$ final answer	3	B2 for correct expansion of three brackets unsimplified or for simplified four-term expression of correct form with 3 terms correct in final answer or B1 for correct expansion of two brackets with at least 3 terms out of 4 correct
5(e)	$2x^2 - 3x - 77 [= 0]$ oe $(6x^2 - 9x - 231 [= 0])$ or $18y^2 + 147y + 222 [= 0]$ oe $(6y^2 + 49y + 74 [= 0])$	M2	M1 for correct method to eliminate one variable e.g. $2(13 + 3y)^2 - 9y = 116$ or $2x^2 - 3(x - 13) = 116$ oe
	$(2x + 11)(x - 7) [= 0]$ oe or $\frac{[- -]3 \pm \sqrt{([- -]3)^2 - 4 \times 2 \times -77}}{2 \times 2}$ oe or $(6y + 37)(3y + 6) [= 0]$ or $\frac{-147 \pm \sqrt{147^2 - 4 \times 18 \times 222}}{2 \times 18}$ oe	M2	FT <i>their</i> 3-term quadratic in x or y , correct factors, correct substitution into formula or for correctly completing square M1 for a pair of factors giving 2 correct terms when expanded <i>their</i> quadratic or for e.g. $\sqrt{([- -]3)^2 - 4 \times 2 \times -77}$ oe or $\frac{[- -]3 \pm \sqrt{p}}{2 \times 2}$ oe
	$x = 7$ and $y = -2$ $x = -5\frac{1}{2}$ oe and $y = -6\frac{1}{6}$ oe	B2	B1 for both x -values or both y -values or for 1 correct pair
6(a)	15[.0] or 15.00 to 15.01	3	M2 for $\frac{17.2}{\sin 68} \times \sin 54$ oe or M1 for $\frac{\sin 54}{AC} = \frac{\sin 68}{17.2}$ oe
6(b)	15.7 or 15.65 to 15.66	3	M2 for $\sqrt{\text{their}15^2 + 12.8^2 - 2 \times \text{their}15 \times 12.8 \times \cos 68}$ OR M1 for $\text{their}15^2 + 12.8^2 - 2 \times \text{their}15 \times 12.8 \times \cos 68$ A1 for 244.9 to 245.2

Question	Answer	Marks	Partial Marks
6(c)	13.9 or 13.90 to 13.92	3	M2 for $\frac{x}{17.2} = \sin 54^\circ$ oe or $\frac{x}{\text{their } 15} = \sin 68^\circ$ oe or M1 for distance required is the perpendicular from A to BC soi
7(a)(i)	$\begin{pmatrix} -12 \\ 15 \end{pmatrix}$	1	
7(a)(ii)(a)	$\begin{pmatrix} 12 \\ -10 \end{pmatrix}$	1	
7(a)(ii)(b)	15.6 or 15.62...	2	M1dep for $\text{their } 12^2 + (\text{their } [-]10)^2$ oe, dep $\text{their } 12 \neq 0$ and $\text{their } -10 \neq 0$
7(b)	$\frac{3}{8}a + \frac{5}{8}b$ final answer	3	B2 for an unsimplified correct answer or $MS = \frac{5}{8}(b - a)$ soi or $NS = \frac{3}{8}(-b + a)$ soi or B1 for correct route for \overline{OS} or for $MN = b - a$ or $NM = a - b$
8(a)	Ruled line with negative gradient and positive y-intercept	2	B1 for ruled line with negative gradient or for ruled line with positive y-intercept or straight line with negative gradient and positive y-intercept
8(b)	Negative quadratic, with vertex at origin	2	B1 for negative quadratic in other position or for sketch in 3rd and 4th quadrants only with single maximum at (0, 0) and no other turning point or for positive quadratic, with vertex at origin
8(c)(i)	$18x - 6x^2$ isw	B2	B1 for one correct term $18x$ or $-6x^2$ seen
	setting <i>their</i> derivative = 0 or $\frac{dy}{dx} = 0$	M1	Dep on at least B1 earned or <i>their</i> derivative = $\pm 18x \pm 6x^2$
	(0, 10) and (3, 37)	B2	B1 for $x = 0$ and $x = 3$ or for (0, 10) or (3, 37)

Question	Answer	Marks	Partial Marks
8(c)(ii)	(0, 10) minimum with correct reason AND (3, 37) maximum with correct reason	3	<p>Reasons could be e.g.</p> <p>1 A reasonable sketch of a negative cubic</p> <p>2 Correct use of 2nd derivative = $-12(0) + 18 = 18$, $18 > 0$, so (0, 10) is a minimum oe. 2nd derivative = $-12(3) + 18 = -18$, $-18 < 0$ so (3, 37) is a maximum oe.</p> <p>3 Evaluates correctly values of y on both sides of both correct stationary points</p> <p>4 Finds gradient on each side of both correct stationary points.</p> <p>B2 for 1 correct with correct reason for that stationary point</p> <p>or for both x-values correct and reasonable sketch of a negative cubic,</p> <p>or for correct substitution and evaluation of both of <i>their</i> x-values into <i>their</i> second derivative</p> <p>or substitution and evaluation for one x-value on both sides of both of <i>their</i> stationary points to find the gradients soi</p> <p>or M1 for showing [2nd derivative =] $-12x + 18$ or correct FT <i>their</i> 2nd derivative</p> <p>or substitution and evaluation shown for one x-value on both sides of one of <i>their</i> stationary points to find the gradients soi</p> <p>or for sketch of any negative cubic.</p>
9(a)(i)	5	3	<p>M2 for $\frac{(12800 - 8000) \times 100}{8000 \times 12}$</p> <p>or M1 for $[12800 - 8000 =] \frac{8000 \times 12 \times r}{100}$</p> <p>or 400 seen</p> <p>If 0 scored, SC1 for answer 13.3 or 13.33...</p>
9(a)(ii)	4[.0] or 3.99...	3	<p>M2 for $\sqrt[12]{\frac{12800}{8000}}$</p> <p>or M1 for $12800 = 8000 \times k^{12}$ for any k</p>

Question	Answer	Marks	Partial Marks
9(b)	9 nfww	3	M2 for $260\,000 \times \left(1 + \frac{1.8}{100}\right)^8$ oe evaluated to 4 sf or better or $260\,000 \times \left(1 + \frac{1.8}{100}\right)^9$ oe evaluated to 2 sf or better or M1 for $[300\,000 =] 260\,000 \times \left(1 + \frac{1.8}{100}\right)^n$ oe soi (Accept any inequality sign in $[300\,000 =]$)
10(a)	-2.5 -1.25 5.5	3	B1 for each
10(b)	Correct graph	4	B3FT for 8 or 9 correct points or B2FT for 6 or 7 correct points or B1FT for 4 or 5 correct points
10(c)	$y = 2$ drawn	M1	
	-2.75 to -2.65	A2	A1 for 1 solution
	-1.1 to -1.05		
	0.75 to 0.85		
10(d)	-2.5 5.5	2	B1 for each
11(a)(i)	-3.5 oe	2	M1 for $g\left(\frac{1}{2}\right)$ seen or $3\left(\frac{1}{x}\right) - 5$ or better
11(a)(ii)	$\frac{x+5}{3}$ oe final answer	2	M1 for correct first step $y + 5 = 3x$, $\frac{y}{3} = x - \frac{5}{3}$ or $x = 3y - 5$
11(b)	$3x - 11$ final answer	2	M1 for $3(x - 2) - 5$
11(c)(i)	5	2	M1 for $\frac{1}{3x-5} [= 0.1]$
11(c)(ii)	4 nfww	2	M1 for $2^x - (3 \times 7 - 5) [= 0]$ or better

Question	Answer	Marks	Partial Marks
12(a)	88.9 or 88.92 to 88.93...	4	M3 for $2 \times 12 + \frac{360 - 50}{360} \times 2 \times \pi \times 12$ oe or M2 for $\frac{(360 - 50)}{360} \times 2 \times \pi \times 12$ oe isw or M1 for $\frac{50}{360} \times 2 \times \pi \times 12$ oe isw
12(b)	9.01 or 9.009 to 9.010...	3	M2 for $\frac{(360 - 50)}{360} \times \pi \times 12^2 \times h = 3510$ or M1 for $\frac{k}{360} \times \pi \times 12^2 \times h$ oe seen with $k = 50$ or $360 - 50$





Cambridge IGCSE™

MATHEMATICS

0580/41

Paper 4 (Extended)

October/November 2023

MARK SCHEME

Maximum Mark: 130

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

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- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

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- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Mathematics-Specific Marking Principles

- 1 Unless a particular method has been specified in the question, full marks may be awarded for any correct method. However, if a calculation is required then no marks will be awarded for a scale drawing.
- 2 Unless specified in the question, non-integer answers may be given as fractions, decimals or in standard form. Ignore superfluous zeros, provided that the degree of accuracy is not affected.
- 3 Allow alternative conventions for notation if used consistently throughout the paper, e.g. commas being used as decimal points.
- 4 Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored (isw).
- 5 Where a candidate has misread a number or sign in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 A or B mark for the misread.
- 6 Recovery within working is allowed, e.g. a notation error in the working where the following line of working makes the candidate's intent clear.

Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	Translation $\begin{pmatrix} -7 \\ -1 \end{pmatrix}$ oe	2	B1 for each
1(a)(ii)	Rotation 90° clockwise oe (5, 1)	3	B1 for each
1(b)(i)	Image at (2, 6) (3, 6) (3, 8)	2	B1 for reflection in $y = k$, $k \neq 2$ or for reflection in $x = 2$
1(b)(ii)	Image at (-4, 4) (-6, 4) (-6, 8)	2	B1 for an enlargement, sf -2 in the wrong position
2(a)	1960	2	M1 for $\frac{1}{2} \times 9.8 \times 20^2$ oe
2(b)	1.5 or 1½ or $\frac{3}{2}$	3	M1 for a first correct step, e.g. $20y - 15 = 15$ or $4y - 3 = 3$ M1FTdep for a second correct step, e.g. $20y = 30$ or $4y = 6$ or $y - \frac{15}{20} = \frac{15}{20}$ oe
2(c)	$9x - 10$ final answer	2	B1 for $kx - 10$ or $9x + c$ or M1 for $15x - 24$ or $-6x + 14$ or B1 for correct answer seen and then spoiled
2(d)	$\sqrt[3]{\frac{2b^2 - A}{3}}$ oe final answer	3	M1 for isolating $3c^3$, $3c^3 = 2b^2 - A$ oe or for $\frac{A}{3} = \frac{2b^2}{3} - c^3$ or $\frac{A}{-3} = \frac{2b^2}{-3} + c^3$ M1FT for isolating c^3 , follow through their first step dep on a 3-term expression with a kc^3 term M1FT taking the cube root to the final answer, follow through their previous step Maximum of two marks if answer incorrect
2(e)	$(2q - 1)(3p - 2)$ or $(1 - 2q)(2 - 3p)$ final answer	2	M1 for $2q(3p - 2) - [1](3p - 2)$ or $3p(2q - 1) - 2(2q - 1)$ or for correct answer seen then spoiled
3(a)(i)	227 900 000	1	

Question	Answer	Marks	Partial Marks
3(a)(ii)	51 200 or 51 190 or 51 194	2	M1 for $\frac{35.8}{100} \times 143\,000$ After 0 scored SC1 for answer figs 512 or figs 5119 or figs 51194
3(a)(iii)	2.43 or 2.434...	1	
3(a)(iv)	3000 or 3004 to 3005	2	M1 for $\frac{4.495 \times 10^9}{1.496 \times 10^8} [\times 100]$ oe After 0 scored SC1 for answer figs 3 or figs 3004.... or figs 3005
3(a)(v)	1.52 or 1.522...	2	B1 for $1\text{AU} = 1.5[0] \times 10^8$ or $1.497... \times 10^8$ [km] or $1\text{km} = 6.68 \times 10^{-9}$ or $6.678... \times 10^{-9}$ [AU] OR M1 for $\frac{5.2 \times 2.279 [\times 10^8]}{7.786 [\times 10^8]}$ oe After 0 scored SC1 for answer figs 152 or figs 1522.....
3(a)(vi)	4890 or 4885...	2	M1 for $d \times \left(1 + \frac{39.2}{100}\right) = 6800$ oe
3(b)(i)	$2.9979 \times 10^5 \times 60^2 \times 24 \times 365.25$	M1	After M0 SC1 for $2.9979 \times 10^5 \times 31557600$ oe
	$= 9.4606... \times 10^{12}$	A1	
3(b)(ii)	2.54 or 2.536 to 2.537	2	M1 for $\frac{2.4 \times 10^{19}}{9.461 \times 10^{12}}$ oe
4(a)(i)	$\frac{2}{5}, \frac{5}{9}, \frac{4}{9}, \frac{5}{9}, \frac{4}{9}$	2	B1 for $\frac{2}{5}$ and a pair of probabilities for spinner B that sum to 1
4a(ii)(a)	$\frac{1}{3}$ oe	2	FT dep <i>their</i> tree diagram M1 for $\frac{3}{5} \times \text{their } \frac{5}{9}$
4a(ii)(b)	$\frac{2}{3}$ oe	1	FT dep $1 - \text{their } \frac{1}{3}$
4(b)	72	1	

Question	Answer	Marks	Partial Marks
4(c)	$\frac{20}{81}$ oe	3	M2 for $\frac{2}{9} \times \frac{4}{9} [\times 2] + \frac{2}{9} \times \frac{2}{9}$ oe or M1 for $\frac{2}{9} \times \frac{4}{9}$ or $\frac{2}{9} \times \frac{2}{9}$ oe
4(d)	$\left(\frac{5}{9}\right)^{n-1} [\times] \frac{4}{9}$ oe final answer	2	M1 for $\left(\frac{5}{9}\right)^{n-1}$ seen
5(a)	27.3 or 27.32 to 27.33	5	M4 for $\tan[\angle ACD] = \frac{83.2}{\frac{83.2}{\tan 38} + 54.5}$ oe or M3 for $[AC =] \frac{83.2}{\tan 38} + 54.5$ oe or for [CD =] $\sqrt{54.5^2 + \left(\frac{83.2}{\sin 38}\right)^2 - 2(54.5)\left(\frac{83.2}{\sin 38}\right)\cos(180-38)}$ oe or M2 for $[AB =] \frac{83.2}{\tan 38}$ oe or for $[BD =] \frac{83.2}{\sin 38}$ oe or M1 for $\tan 38 = \frac{83.2}{AB}$ oe or $\sin 38 = \frac{83.2}{BD}$ oe
5(b)	Centre marked at midpoint of <i>FG</i> . and Angle in a semi-circle is 90	B2	B1 for marking the centre at mid-point of FG

Question	Answer	Marks	Partial Marks
5(c)	10.8 or 10.81 to 10.82	7	<p>B2 for 72 or M1 for $\frac{180}{4+5+6} [\times 6]$ and, for triangle PQR B4 for [angle R=]82.8 or 82.81 to 82.83 or B3 for $[\cos R =] \frac{5}{40}$ oe or better or M2 for $\frac{4^2 + 5^2 - 6^2}{2 \times 4 \times 5}$ or M1 for $6^2 = 4^2 + 5^2 - 2 \times 4 \times 5 \times \cos R$ After 0 scored for triangle PQR, SC1 for [P =] 55.8 or 55.77 to 55.78 or [Q =] 41.4 or 41.40 to 41.41</p>
6(a)	A 9	B1	
	$4n - 11$ oe final answer	B2	B1 for $4n - k$ or $jn - 11$ oe $j \neq 0$
	B 55	B1	
	$2n^2 + 5$ oe final answer	B2	B1 for any quadratic or second differences = 4
	C $\frac{6}{2187}$ oe	B1	
	$\frac{n+1}{3^{n+2}}$ oe final answer	B3	<p>B2 for 3^{n+2} oe OR B1 for 3^{n+k} seen oe B1 for $n + 1$ as the numerator of a fraction</p>
6(b)	331 cao	1	
7(a)	226 nfw or 226.2 to 226.3[0] nfw	4	<p>M1 for mid-points soi (217.5, 221.5, 229, 239, 254) M1 for use of Σfm with m in correct interval including both boundaries M1 (dep on 2nd M1) for $\Sigma fm \div$ (9 + 14 + 14 + 2 + 3)</p>
7(b)	Blocks with heights 2.8, 1.4, 0.2 and with correct widths	3	<p>B1 for each correct block If 0 scored, SC1 for two correct frequency densities soi</p>

Question	Answer	Marks	Partial Marks
8(a)(i)	$\frac{2}{3}\pi(3.6)^3 + \frac{2}{3}\pi(5.4)^3 + \pi(3.6)^2 \times 6.5$	M3	M1 for either $\frac{2}{3}\pi(3.6)^3$ or $\frac{2}{3}\pi(5.4)^3$ M1 for $\pi(3.6)^2 \times 6.5$
	692.1 to 692.2...	A1	
8(a)(ii)	33.6 or 33.60 to 33.62	4	M3 for $\left(\frac{0.6}{3.6}\right)^3 \times 692 \times 10.49$ oe or M2 for $\left(\frac{0.6}{3.6}\right)^3 \times 692$ oe or M1 for $\left(\frac{0.6}{3.6}\right)^3$ or $\left(\frac{3.6}{0.6}\right)^3$ oe If 0 scored, SC1 for <i>their</i> volume $\times 10.49$
8(b)(i)	12π final answer	2	M1 for $\frac{216}{360} \times 2\pi \times 10$ oe After 0 scored SC1 for final answer 8π or $12\pi + 20$
8(b)(ii)	302 or 301.5 to 301.6...	4	M1 for $2\pi r = \text{their (b)(i)}$ oe or for $\frac{216}{360} \times \pi \times 10^2 = \pi \times r \times 10$ oe and M1 for $[h =] \sqrt{10^2 - \text{their } 6^2}$ oe and M1 for $[V =] \frac{1}{3}\pi(\text{their } 6)^2 \times (\text{their } 8)$
9(a)(i)	-20	1	
9(a)(ii)	$\frac{x+3}{2}$ oe final answer	2	M1 for $x = 2y - 3$ or better or $y + 3 = 2x$ or better or $\frac{y}{2} = x - \frac{3}{2}$ or better
9(a)(iii)	125	2	M1 for $g(64)$ or $2(4^{2x-1}) - 3$
9(b)	2.5 oe	2	M1 for $2(2x) - 3 = 7$ or better
9(c)	$2x^2 + 4x - 11$ final answer	3	B2 for $2x^2$ and either $+4x$ or -11 in final 3 term answer or for correct answer seen then spoiled or M1 for $2x^2 - 3 + 2(2x - 3) - 3 [+ 1]$

Question	Answer	Marks	Partial Marks
9(d)	1.5 oe	2	M1 for $4^{2x-1} = 4^2$ or better
9(e)	$a = 3$ $b = 4$ $c = -59$ $d = -20$	3	B2 for 3 correct values or for correct unsimplified expanded expression or for simplified four-term expression of correct form with 3 terms correct or B1 for 2 correct values or for correct expansion of one pair of brackets with at least 3 out of 4 terms correct.
10(a)(i)	(15, 6)	2	B1 for each
10(a)(ii)	$\begin{pmatrix} 3 \\ 24 \end{pmatrix}$	1	
10(a)(iii)	13.6 or 13.60...	2	M1 for $(-11)^2 + 8^2$ oe
10(b)(i)	$\mathbf{a} + \frac{3}{5}(\mathbf{b} - \mathbf{a})$ or $\mathbf{b} + \frac{2}{5}(\mathbf{a} - \mathbf{b})$ leading to $\frac{2}{5}\mathbf{a} + \frac{3}{5}\mathbf{b}$ with no errors	M3	M2 for $[\overrightarrow{MR}] = \frac{3}{5}(\mathbf{b} - \mathbf{a})$ oe or $[\overrightarrow{NR}] = \frac{2}{5}(\mathbf{a} - \mathbf{b})$ oe or M1 for $\overrightarrow{MN} = \mathbf{b} - \mathbf{a}$ or $\overrightarrow{NM} = \mathbf{a} - \mathbf{b}$ or a correct route for \overrightarrow{OR}
10(b)(ii)(a)	$k = 5, c = 10$	4	B2 for $c = 10$ or M1 for $c(\frac{2}{5}\mathbf{a} + \frac{3}{5}\mathbf{b}) = \mathbf{b} + 4\mathbf{a} + k\mathbf{b}$ oe or for $\frac{2}{5}c = 4$ and M1 for $\frac{3}{5} \times \text{their } c = k + 1$
10(b)(ii)(b)	$3\mathbf{a} + 6\mathbf{b}$ final answer	1	FT $3\mathbf{a} + (\text{their } k + 1)\mathbf{b}$
11(a)	$3x^2 - 8x - 3$	2	B1 for two terms correct or correct answer seen

Question	Answer	Marks	Partial Marks
11(b)	$3x^2 - 8x - 3 = 0$	M1	FT their part (a)
	Correct method to solve their 3-term quadratic $(3x + 1)(x - 3) [=0]$ $\frac{-(-8) \pm \sqrt{(-8)^2 - 4(3)(-3)}}{2(3)}$	M2	M1 for $(3x + a)(x + b) [=0]$ where $ab = -3$ or $3b + a = -8$ or for $\sqrt{(-8)^2 - 4(3)(-3)}$ or for $\frac{p \pm \sqrt{q}}{r}$ where $p = -(-8)$ and $r = 2(3)$ seen or for a correct method for solving a 2-term quadratic
	$(3, -18)$ $\left(-\frac{1}{3}, \frac{14}{27}\right)$	B2	B1 for one correct point or for two correct x -values, or M1 for substitution of <i>their</i> x -values into $y = x^3 - 4x^2 - 3x$ shown

Question	Answer	Marks	Partial Marks
11(c)	<p>$(3, -18)$ minimum with reason</p> <p>$\left(-\frac{1}{3}, \frac{14}{27}\right)$ maximum with reason</p>	3	<p>Reasons could be e.g.</p> <ol style="list-style-type: none"> 1. A reasonable sketch of a positive cubic 2. Correct use of 2nd derivative = $6x - 8 = 10$, $10 > 0$, so $(3, -18)$ is a minimum oe. 2nd derivative = $6x - 8 = -10$, $-10 < 0$ so $\left(-\frac{1}{3}, \frac{14}{27}\right)$ is a maximum oe. 3. Evaluates correctly values of y on both sides of both correct stationary points 4. Finds gradient on each side of both correct stationary points. <p>B2 for 1 correct with a reason for that stationary point</p> <p>or for both x-values correct with correct conclusions and reasonable sketch of a positive cubic, or for correct substitution of both of <i>their</i> x-values into <i>their</i> second derivative shown,</p> <p>or substitution shown for one x-value either side of both of <i>their</i> stationary points to find the gradients. Or M1 for showing [2nd derivative =] $6x - 8$</p> <p>or substitution shown for one x-value either side of one of <i>their</i> stationary points to find the gradients.</p> <p>or for reasonable sketch of positive cubic.</p>



Cambridge IGCSE™

MATHEMATICS

0580/42

Paper 4 (Extended)

October/November 2023

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Maximum Mark: 130

Published

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GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Mathematics-Specific Marking Principles

- 1 Unless a particular method has been specified in the question, full marks may be awarded for any correct method. However, if a calculation is required then no marks will be awarded for a scale drawing.
- 2 Unless specified in the question, non-integer answers may be given as fractions, decimals or in standard form. Ignore superfluous zeros, provided that the degree of accuracy is not affected.
- 3 Allow alternative conventions for notation if used consistently throughout the paper, e.g. commas being used as decimal points.
- 4 Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored (isw).
- 5 Where a candidate has misread a number or sign in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 A or B mark for the misread.
- 6 Recovery within working is allowed, e.g. a notation error in the working where the following line of working makes the candidate's intent clear.

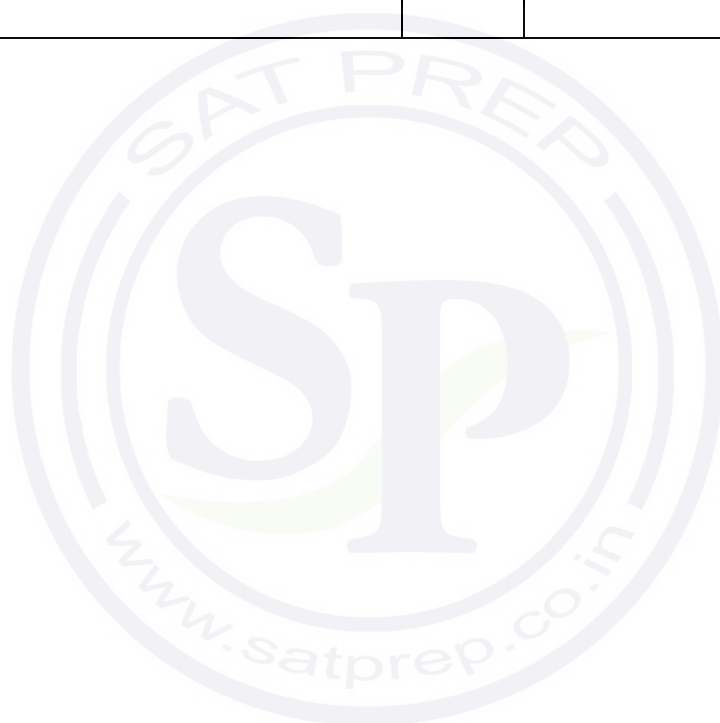
Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks						
1(a)(i)	Image at (−5, 3), (−1, 3), (−1, 5)	2	B1 for translation $\begin{pmatrix} -7 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 1 \end{pmatrix}$						
1(a)(ii)	Translation $\begin{pmatrix} 7 \\ -1 \end{pmatrix}$ cao	1							
1(b)	Image at (6, 4), (6, 6), (2, 6)	2	B1 for reflection in line $x = 4$ or for reflection in line $y = k$						
1(c)	Image at (2, −2), (2, −6), (4, −6)	2	B1 for correct size and orientation or for rotation 90° anticlockwise about (0, 0)						
1(d)(i)	Image at (−1, −1), (−3, −1), (−3, −2)	2	B1 for correct size and orientation or for enlargement SF $\frac{1}{2}$, centre (0, 0)						
1(d)(ii)	Enlargement and [centre] (0, 0) [factor] −2	2	B1 for Enlargement and [centre] (0, 0) B1 for [factor] −2						
2(a)(i)	5	1							
2(a)(ii)	17	1							
2(a)(iii)	18	1							
2(a)(iv)	17.88	3	M2 for (1×15 + 3×16 + 19×17 + 11×18 + 10×19 + 6×20) ÷ 50 oe or M1 for 1×15 + 3×16 + 19×17 + 11×18 + 10×19 + 6×20 oe						
2(b)(i)	<table><tr><td>1</td><td>8</td></tr><tr><td>2</td><td>0 0 1 1 1 2 5</td></tr><tr><td>3</td><td>0 3 4</td></tr></table>	1	8	2	0 0 1 1 1 2 5	3	0 3 4	2	B1 for two rows correct or for fully correct unordered stem-and-leaf diagram
1	8								
2	0 0 1 1 1 2 5								
3	0 3 4								
2(b)(ii)	21	1							
2(b)(iii)	10 nfw	2	B1 for [upper qtile] = 30 or [lower qtile] = 20 soi						
3(a)(i)	6925.5[0] cao	2	M1 for $7695 \times \frac{100-10}{100}$ oe or B1 for answer 769.5						
3(a)(ii)	8550	2	M1 for $X \times \frac{100-10}{100} = 7695$ oe						

Question	Answer	Marks	Partial Marks
3(b)	660	3	B2 for 60 or M2 for $600 + \frac{600 \times 2 \times 5}{100}$ oe or M1 for $\frac{600 \times 2 \times 5}{100}$ oe
3(c)	1.55 or 1.549 to 1.550	3	M2 for $\sqrt[12]{\frac{601.35}{500}}$ or M1 for $500 \times (\dots)^{12} = 601.35$
3(d)(i)	26.3 or 26.25 to 26.26	2	M1 for $[k] \left(\frac{100-3}{100} \right)^{10}$ oe
3(d)(ii)	23	3	M2 for a correct trial evaluated with $n = 22$ or $n = 23$ or M1 for $[k] (0.97)^n < 0.5[k]$ oe soi or for $[k](0.97)^n = 0.5[k]$ oe soi, implied by one correct trial $n > 10$ or for $[k](0.97)^{23}$ oe seen If 0 scored SC1 for answer 22
4(a)	72 or 72.0 cao nfw	3	M2 for $\frac{x}{360} \times 2 \times \pi \times 7.5 = 2 \times \pi \times 1.5$ oe or M1 for $\frac{x}{360} \times 2 \times \pi \times 7.5$ or for $2 \times \pi \times 1.5$ oe OR M2 for $\frac{x}{360} \times \pi \times 7.5^2 = \pi \times 1.5 \times 7.5$ oe or M1 for $\frac{x}{360} \times \pi \times 7.5^2$ or for $\pi \times 1.5 \times 7.5$ oe
4(b)(i)	$2 \times \sqrt{17^2 - 8^2}$ or $\sqrt{34^2 - 16^2}$ oe	M2	M1 for $17^2 = 8^2 + d^2$ or $34^2 = 16^2 + k^2$
4(b)(ii)	29.3 or 29.30 to 29.31	4	M3 for $([\pi] \times 8^2 \times 30) \div \frac{4}{3} \times [\pi] \times 17^3 [\times 100]$ oe OR M1 for $\pi \times 8^2 \times 30$ oe M1 for $\frac{4}{3} \times \pi \times 17^3$ oe

Question	Answer	Marks	Partial Marks
4(c)	12.7 or 12.73 to 12.74	3	B2 for 2.26 or 2.261 to 2.262.... soi or M2 for $\left(20^2 \times 15 - \frac{4}{3} \times \pi \times 6^3\right) \div 20^2$ oe or for $15 - \left(\frac{4}{3} \times \pi \times 6^3 \div 20^2\right)$ oe or M1 for $20^2 \times 15 - \frac{4}{3} \times \pi \times 6^3$ oe or $20^2 \times D = \frac{4}{3} \times \pi \times 6^3$ oe If 0 scored, SC1 for answer 11[.0] or 10.97 to 10.98
5(a)	20	2	M1 for $11x = 10(x + 2)$ oe



Question	Answer	Marks	Partial Marks
5(b)(i)	$\frac{95}{y} + \frac{147}{y+2} = 12$	M2	M1 for $\frac{95}{y}$ or $\frac{147}{y+2}$
	$95(y+2) + 147y = 12y(y+2)$ oe	M1	Allow correct or for clearing <i>their</i> equation with algebraic fractions in y and $y+2$ Allow $95y + 190 + 147y = 12y^2 + 24y$ oe
	leading to $6y^2 - 109y - 95 = 0$	A1	With all brackets shown expanded and no errors or omissions
5(b)(ii)	$(6y+5)(y-19)$	2	B1 for $(6y+a)(y+b)$ with $ab = -95$ or $a+6b = -109$ or $(3y+a)(2y+b)$ with $ab = -95$ or $2a+3b = -109$ or for partial factorisation $y(6y+5) - 19(6y+5)$ or $6y(y-19) + 5(y-19)$
5(b)(iii)	19	1	Correct or FT <i>their</i> positive answer from factors dep on B1 earned
6	11.9 or 11.91 to 11.92	7	B5 for $t = 1.055$ or $1.0550...$ M1 for $\tan w = \frac{\text{their } t}{5}$ oe OR M1 for $(2t+3)^2 = t^2 + 5^2$ oe seen isw M2 for $3t^2 + 12t - 16 [= 0]$ oe seen isw or B1 for $4t^2 + 6t + 6t + 9$ M1FT for $\frac{-12 \pm \sqrt{12^2 - 4(3)(-16)}}{2(3)}$ oe M1 for $\tan w = \frac{\text{their } t}{5}$ oe
7(a)(i)	21.5 or 21.52...	2	M1 for $\tan(\dots) = \frac{2.8}{7.1}$ oe
7(a)(ii)	10.2 or 10.17 to 10.18	3	M2 for $\left(\frac{2.8}{\tan 21}\right)^2 + 7.1^2$ oe or M1 for $\frac{2.8}{PR} = \tan 21$ oe

Question	Answer	Marks	Partial Marks
7(b)	76.5 or 76.52 to 76.53	3	M2 for $[\sin =] \frac{16.7 \sin 32}{9.1}$ oe or M1 for $\frac{9.1}{\sin 32} = \frac{16.7}{\sin M}$ oe
7(c)(i)	$\frac{1}{2} \times 12.3 \times 21.5 \sin(\dots) = 62.89$ or better	M1	
	28.40 to 28.41...	A1	
7(c)(ii)	12.2 or 12.17 to 12.18	3	M2 for $\sqrt{12.3^2 + 21.5^2 - 2 \times 12.3 \times 21.5 \times \cos 28.4}$ OR M1 for $12.3^2 + 21.5^2 - 2 \times 12.3 \times 21.5 \times \cos 28.4$ A1 for 148 or 148.2 to 148.3
7(c)(iii)	6.6[0] to 6.62	3	M2 for $21.5 \cos 28.4 - 12.3$ or M1 for $21.5 \cos 28.4$
8(a)(i)	$\frac{1}{6}$ oe	1	
8(a)(ii)	25	1	FT their (a)(i) dep on $0 < (a) < 1$
8(b)(i)	$\frac{11}{36}$ oe	3	M2 for $\frac{1}{6} \times \frac{2}{6} + \frac{3}{6} \times \frac{3}{6}$ oe or correct possibility diagram with 11 outcomes identified or M1 for $\frac{1}{6} \times \frac{2}{6}$ or $\frac{3}{6} \times \frac{3}{6}$ oe or lists the 11 required outcomes or for possibility diagram but required outcomes not indicated
8(b)(ii)	$\frac{2}{11}$ oe	2	M1 for $\frac{2}{k}$ or $\frac{p}{\text{their } 11}$ seen oe leading to answer
8(c)	6	2	M1 for $\left(\frac{4}{6}\right)^k \times \frac{2}{6} = \frac{32}{729}$ written oe soi by one trial with $k > 1$ or $2^{n-1} = 32$ or better or $3^n = 729$ or better
9(a)	$12x^2 - 4x^3$ oe final answer	2	B1 for $12x^2$ or $-4x^3$ in final answer or for correct answer seen

Question	Answer	Marks	Partial Marks
9(b)	(3, 27)	3	B2 for $x = 3$ OR M1 for <i>their</i> $12x^2 - 4x^3 = 0$ or better or states $\frac{dy}{dx} = 0$ M1dep for substituting <i>their</i> x into $y = 4x^3 - x^4$ shown
9(c)	-64	3	M1 for $4x^3 - x^4 = 0$ B1 for $x = 4$
10(a)	[DEF], BCD ADF, ADB	2	B1 for each pair
10(b)	OQ OQT Tangent perpendicular to radius RHS equal	5	B1 for each
11(a)	4	1	
11(b)	$7 - 3x$ final answer	2	M1 for $1 - 3(x - 2)$
11(c)	$\frac{1-x}{3}$ oe final answer	2	M1 for $x = 1 - 3y$ or $y - 1 = -3x$ or $1 - y = 3x$ or $\frac{y}{3} = \frac{1}{3} - x$
11(d)	$a = 2, b = 5, c = -1$	5	B4 for two correct values <u>only</u> after correct substitution seen i.e. $(1 - 3x - 1)^2 - (x - 1)^2(1 - 3x)$ or for correct unsimplified expansion or a correct simplified expansion. OR M1 for $(1 - 3x - 1)^2 - (x - 1)^2(1 - 3x)$ B2 for correct expansion of $[-](x - 1)^2(1 - 3x)$ $[-](x^2 - x - x + 1 - 3x^3 + 3x^2 + 3x^2 - 3x)$ or better or B1 for expansion of one pair of brackets $[(x - 1)^2 =]x^2 - x - x + 1$ or better or $[(x - 1)(1 - 3x) =] - 3x^2 + x + 3x - 1$

Question	Answer	Marks	Partial Marks
11(e)	$\frac{3-x+3x^2}{x}$ final answer	3	B1 for $3-x(1-3x)$ or better B1 for common denominator x isw
11(f)	-7	1	
12(a)(i)	$\begin{pmatrix} 2 \\ 5 \end{pmatrix}$	1	
12(a)(ii)	$\begin{pmatrix} -6 \\ 4 \end{pmatrix}$	1	
12(b)	$[y =] -\frac{2}{3}x + \frac{19}{3}$ oe	3	M1 for gradient = $\frac{1-5}{8-2}$ oe M1 for substituting (8, 1) or (2, 5) into $y = \text{their } mx + c$
12(c)	$[y =] \frac{3}{2}x - \frac{9}{2}$ oe	4	B1 for (5, 3) oe M1 for gradient = $-\frac{1}{\text{their gradient of } AB}$ M1 substituting <i>their</i> midpoint into $y = \text{their } mx + c$
12(d)	$\frac{65}{6}$ oe	2	M1 for <i>their</i> $\frac{19}{3} - \text{their } -\frac{9}{2}$ oe



Cambridge IGCSE™

MATHEMATICS

0580/43

Paper 4 (Extended)

October/November 2023

MARK SCHEME

Maximum Mark: 130

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the October/November 2023 series for most Cambridge IGCSE, Cambridge International A and AS Level components, and some Cambridge O Level components.

This document consists of **9** printed pages.

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Mathematics-Specific Marking Principles

- 1 Unless a particular method has been specified in the question, full marks may be awarded for any correct method. However, if a calculation is required then no marks will be awarded for a scale drawing.
- 2 Unless specified in the question, non-integer answers may be given as fractions, decimals or in standard form. Ignore superfluous zeros, provided that the degree of accuracy is not affected.
- 3 Allow alternative conventions for notation if used consistently throughout the paper, e.g. commas being used as decimal points.
- 4 Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored (isw).
- 5 Where a candidate has misread a number or sign in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 A or B mark for the misread.
- 6 Recovery within working is allowed, e.g. a notation error in the working where the following line of working makes the candidate's intent clear.

Abbreviations

awrt	answers which round to
cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
nfww	not from wrong working
oe	or equivalent
rot	rounded or truncated
SC	Special Case
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)	18593 cao	2	M1 for $7437.05 \times 250 \div 100$ oe
1(b)	804.53 cao	2	M1 for $5400 \div 671.20 [\times 100]$ oe
1(c)(i)	2000	2	M1 for $3500 \div (4 + 3) [\times k]$ oe
1(c)(ii)	1354.13 ...	3	M2 for $(3500 - \text{their (c)(i)}) \times \frac{77.05}{85.35}$ oe or M1 for $(3500 - \text{their (c)(i)}) \div \text{figs } 85.35$ oe or for $\frac{77.05}{85.35}$ oe or for $(3500 - \text{their (c)(i)}) \times \text{figs } 77.05$
1(c)(iii)	2 [h] 52 [min] nfww	3	M2 for $\frac{2100 \text{ to } 2200}{740 + 10}$ or $\frac{2200 - 50}{740 \text{ to } 760}$ or M1 for $2200 + 50$ or $2200 - 50$ or $740 + 10$ or $740 - 10$
2(a)	36.7 or 36.66 to 36.67 or $36\frac{2}{3}$	2	M1 for $\frac{11}{8 + 6 + 11 + 5} [\times 100]$ oe
2(b)(i)	72, 132 and 60	2	M1 for $360 \div (8 + 6 + 11 + 5)$ oe or $96 \div 8$
2(b)(ii)	Correct pie chart drawn	2	For 2 marks, strict FT <i>their</i> angles for correct pie chart only if angles add up to 360. B1FT for one correct sector
2(c)	29	2	M1 for $8 \times \left(1 + \frac{262.5}{100}\right)$ oe or B1 for 21
2(d)(i)	1.5×10^9	1	
2(d)(ii)	70.8 or 70.75...	2	M1 for $1500 [\text{million}] \div 21.2 [\text{million}]$
3(a)	Rotation 90° [anticlockwise] oe (2, 7)	3	B1 for each
3(b)(i)	Image at (−4, −1), (−3, −1), (−4, −4)	2	B1 for reflection in $y = k$ or $x = 1$
3(b)(ii)	Image at (2, −4), (1, −4), (1, −1)	2	B1 for translation by $\begin{pmatrix} 5 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ -7 \end{pmatrix}$
3(b)(iii)	Image at (−4, 7), (−4, 1), (−2, 1)	2	B1 for enlargement, factor 2 with other centre

Question	Answer	Marks	Partial Marks
4(a)	144	2	M1 for $180 - \frac{360}{10}$ or $\frac{180(10-2)}{10}$ oe
4(b)	$w = 20$ $x = 20$ $y = 60$ $z = 45$	5	B1 for w B1FT for $x = \text{their } w$ B2FT for $y = 80 - \text{their } w$ or B1 for angle $BDC = 20$ FT $\text{their } w$ or angle $ADE = 55$ or angle $CAD = 25$ B1FT for $z = 25 + \text{their } w$ or $105 - \text{their } y$
5(a)	28 and 45 on table	B2	B1 for each
	Histogram correctly completed	B3	B1 for each correct bar If 0 scored, SC1 for two of FD's 3.8, 1.9 or 0.6 oe soi
5(b)	30.7 or 30.66 to 30.67	4	M1 for midpoints soi M1 for use of $\sum fh$ with h in correct interval including both boundaries M1 (dep on 2 nd M1) for $\sum fh \div (\text{their } 28 + \text{their } 45 + 57 + 38 + 12)$
5(c)	Exact values are not known oe	1	
5(d)	$\frac{1254}{39\ 697}$ oe	4	M3 for $N \left(\frac{38+57}{57+38+12} \times \frac{12}{56+38+12} \times \frac{11}{56+38+11} \right)$ oe where $N = 1, 2$ or 3 or M2 for $\frac{38+57}{57+38+12}$ and $\frac{12}{56+38+12}$ or $\frac{12}{57+38+12}$ and $\frac{11}{57+38+11}$ oe seen or M1 for $\frac{38+57}{57+38+12}$ or $\frac{12}{57+38+12}$ oe seen If 0 scored SC1 for answer $\frac{41040}{1225043}$ or 0.0335...
6(a)(i)	7	1	
6(a)(ii)	$\frac{1}{8}$ oe	2	M1 for $g(-0.5)$ or for $64^{5(x)-3}$ or better

Question	Answer	Marks	Partial Marks
6(b)	$\frac{2-x}{x}$ or $\frac{2}{x}-1$ final answer	3	M1 for $y(x+1) = 2$ or $x = \frac{2}{y+1}$ or better M1 for $\frac{2-y}{y}$ or $xy = 2-x$ oe
6c	$-\frac{5}{6}$ -0.833 or better	2	M1 for $[64^x =] 2^{6x}$ or $(2^6)^x$ or $6x = -5$
6(d)	$\frac{7-9x}{(5x-3)(x+1)}$ or $\frac{7-9x}{5x^2+2x-3}$ or $-\frac{9x-7}{5x^2+2x-3}$ final answer	4	B1 for $\frac{1}{5x-3} - \frac{2}{x+1}$ M1 for $x+1-2(5x-3)$ seen isw M1 for $(5x-3)(x+1)$ seen isw
7(a)	0, -1.5 oe, -2.8	3	B1 for each
7(b)	Correct graph	4	B3 FT for 10 or 11 correct points FT <i>their</i> table or B2 FT for 8 or 9 correct points FT <i>their</i> table or B1 FT for 6 or 7 correct points FT <i>their</i> table
7(c)	65 to 67	1	FT intersection of <i>their</i> graph with $y = -2$
7(d)	$y = 2 - \frac{x}{40}$ oe ruled	M2	M1 for $[y =] 2 - \frac{x}{40}$ oe soi or for $3 \cos 2x = 2 - \frac{x}{40}$ oe soi
	32 to 36	B1	
8(a)(i)	$\sin[BOC] = \frac{2}{6}$ or better oe	M1	
	19.47...	A1	
8(a)(ii)	64.6 or 64.55 to 64.58	3	M2 for $\frac{360-135-19.5}{360} \times \pi \times 6^2$ oe or M1 for $\frac{k}{360} \times \pi \times 6^2$ oe

Question	Answer	Marks	Partial Marks
8(a)(iii)	16.1 or 16.10 to 16.13	5	<p>M2 for $2 \times \sqrt{6^2 - 2^2}$ oe or $2 \times 6 \cos 19.5$ oe or M1 for $OC^2 + 2^2 = 6^2$ oe or $6 \cos 19.5$ or better</p> <p>AND</p> <p>M2 for $\sqrt{6^2 + \text{their } OD^2} - 2 \times 6 \times \text{their } OD \times \cos 135$ OR M1 for $6^2 + \text{their } OD^2 - 2 \times 6 \times \text{their } OD \times \cos 135$ A1 for 25.9 to 26.0</p>
8(a)(iv)	94.2 or 94.3 or 94.15 to 94.27... nfww	4	<p>M1 for $\frac{1}{2} \times 6 \times \text{their } OD \times \sin 135$ oe</p> <p>M1 for $\frac{1}{2} \times 6 \times 2 \times \sin(90 - 19.5)$ oe or for $\frac{1}{2} \times \text{their } OC \times 2$</p> <p>M1dep for <i>their (a)(ii)</i> + <i>their</i> two triangle areas</p>
8(b)	1000 cao	3	<p>M2 for $160 \times \left(\frac{20}{8}\right)^2$ or $160 \div \left(\frac{8}{20}\right)^2$ oe or M1 for $\left(\frac{20}{8}\right)^2$ or $\left(\frac{8}{20}\right)^2$ oe</p> <p>OR</p> <p>M2 for $\frac{\text{sector angle}}{360} \times \pi 20^2$ or M1 for $\frac{160}{\pi 8^2} \times 360$ oe or better</p> <p>OR</p> <p>M2 for $\frac{\text{percentage}}{100} \times \pi 20^2$ oe or better or M1 for $\frac{160}{\pi 8^2} [\times 100]$ oe or better</p>
9(a)	$[AB^2 =] (3 - 0)^2 + (3 - 2)^2$ oe or better	M1	or $\begin{pmatrix} 3 \\ 1 \end{pmatrix}$ oe
	$[AC^2 =] (0 - 2)^2 + (4 - 0)^2$ oe or better	M1	or $\begin{pmatrix} 4 \\ -2 \end{pmatrix}$ oe
	$[BC^2 =] (0 - 3)^2 + (4 - 3)^2$ oe or better	M1	or $\begin{pmatrix} 1 \\ -3 \end{pmatrix}$ oe

Question	Answer	Marks	Partial Marks
	Triangle is isosceles [with 10, 20 and 10 or better shown]	A1	or Triangle is isosceles and only vector AB and BC have the same magnitude [because they have the same components]
9(b)(i)	$[y =] -\frac{1}{2}x + 2$ oe	3	M1 for $\frac{0-2}{4-0}$ oe M1 for substituting (0, 2) or (4, 0) into $y = \text{their } mx + c$ oe or B1 for answer $y = kx + 2$
9(b)(ii)	$[y =] 2x - 3$	4	M1 for $\frac{-1}{\text{their grad (b)(i)}}$ B1 for (2, 1) M1 for substituting <i>their</i> (2, 1) into $y = \text{their } px + d$ oe
9(b)(iii)	$(-2, -7)$	3	B2 for $w = -2$ or M1 for $4w + 1 = 2w - 3$ FT <i>their (b)(ii)</i> or for $2 = \frac{4w+1-3}{w-3}$
10(a)	$14x - 22$ or $2(7x - 11)$ final answer	2	B1 for answer $kx - 22$ or $14x + c$ or for $8x - 4$ or $-18 + 6x$ or for correct answer seen in working
10(b)(i)	$3xy(2x + 3)$ final answer	2	M1 for answer $3(2x^2y + 3xy)$ or $3x(2xy + 3y)$ or $3y(2x^2 + 3x)$ or $xy(6x + 9)$ B1 for correct answer seen and spoilt
10(b)(ii)	$(2x + y)(2x - y + 4)$ final answer	3	M1 for $(2x + y)(2x - y)$ M1 for $4(2x + y)$ If 0 scored, SC1 for answer $4x(x + 2) + y(4 - y)$ oe
10(c)(i)	$\frac{100}{x} + \frac{150}{x+10} = 4\frac{1}{3}$ oe or $150 = \left(\frac{13}{3} - \frac{100}{x}\right)(x+10)$	M1	
	$\frac{100(x+10)+150x}{x(x+10)} [= \text{their } 4\frac{1}{3}]$ or better	M1	
	$300x + 3000 + 450x = 13x^2 + 130x$ oe or better	B1	Allow correct multiples
	$13x^2 - 620x - 3000 = 0$	A1	With no errors or omissions

Question	Answer	Marks	Partial Marks
10(c)(ii)	$\frac{[- -]620 \pm \sqrt{(-620)^2 - 4(13)(-3000)}}{2(13)}$ or $-\frac{(-620)}{2 \times 13} \pm \sqrt{\frac{620^2}{4 \times 13^2} - \frac{(-3000)}{13}}$ both oe or better	M2	M1 for $\sqrt{(-620)^2 - 4 \times 13 \times -3000}$ oe or for $\frac{- - 620 + \sqrt{p}}{2(13)}$ or $\frac{- - 620 - \sqrt{p}}{2(13)}$ oe
	52.1 final answer	B1	
11(a)	(-2, 0) (0, 18) (4.5, 0) oe	4	B1 for $B = (0, 18)$ B3 for $A = (-2, 0)$ and $C = (4.5, 0)$ oe or B2 for $x = -2$ and $x = 4.5$ oe or B1 for $(9 - 2x)(2 + x)$ oe or either A or C correct
11(b)	$5 - 4x$ final answer	2	B1 for one correct term when simplified
11(c)	$(-3, -15)$	3	B2FT for $x = -3$ OR M1 for <i>their</i> (b) = 17 M1 dep for correct substitution of <i>their</i> x into $18 + 5x - 2x^2$ shown



Cambridge IGCSE™

MATHEMATICS

0580/41

Paper 4 (Extended)

May/June 2023

MARK SCHEME

Maximum Mark: 130

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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GENERIC MARKING PRINCIPLE 1:

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- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

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Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Maths-Specific Marking Principles	
1	Unless a particular method has been specified in the question, full marks may be awarded for any correct method. However, if a calculation is required then no marks will be awarded for a scale drawing.
2	Unless specified in the question, answers may be given as fractions, decimals or in standard form. Ignore superfluous zeros, provided that the degree of accuracy is not affected.
3	Allow alternative conventions for notation if used consistently throughout the paper, e.g. commas being used as decimal points.
4	Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored (isw).
5	Where a candidate has misread a number in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 mark for the misread.
6	Recovery within working is allowed, e.g. a notation error in the working where the following line of working makes the candidate's intent clear.

Abbreviations

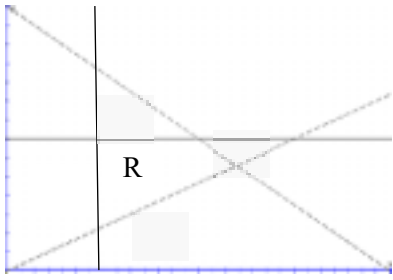
cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

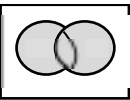
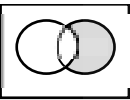
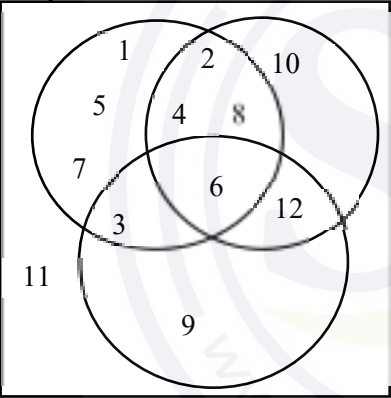
Question	Answer	Marks	Partial Marks
1(a)(i)	600	2	M1 for $\frac{1250}{12+9+4} \times k$ where $k = 1, 4, 9, 12$ oe
1(a)(ii)	80	2	M1 for $1250 \times 64 [\div 1000]$
1(a)(iii)	60	2	M1 for $x \times \left(1 - \frac{10}{100}\right) = 54$ oe
1(a)(iv)	1000	2	M1 for $1250 - (1250 \div 5)$ oe or B1 for 250
1(b)(i)	3.52	2	M1 for $[10 -] 12 \times 0.54$ or B1 for 6.48
1(b)(ii)	0.08	3	B2 for 0.077[4...] or M1 for $0.51 \div 0.826$ If 0 or 1 scored award instead SC2 for 0.93 final answer OR If 0 scored SC1 for 0.06 as answer
2(a)	$[\sin =] \frac{145}{\frac{1}{2} \times 6.4 \times 5.7 \times 15}$	M2	M1 for $145 = \frac{1}{2} \times 6.4 \times 5.7 \times \sin x \times 15$ oe or for $\frac{1}{2} \times 6.4 \times h \times 15 = 145$ and $\sin x = \frac{h}{5.7}$
	32.0[0]	A1	If M0, SC1 for $145 = 0.5 \times 6.4 \times 5.7 \times \sin 32 \times 15$ oe
2(b)	3.4[0] or 3.402 to 3.403 nfw	3	M2 for $\sqrt{6.4^2 + 5.7^2 - 2 \times 6.4 \times 5.7 \times \cos(32)}$ OR M1 for $6.4^2 + 5.7^2 - 2 \times 6.4 \times 5.7 \times \cos(32)$ A1 for 11.6 or 11.57 to 11.58
2(c)	3.02 or 3.020 to 3.021	3	M2 for $\sin(32) = \frac{x}{5.7}$ $\sqrt{80^2 + 50^2 - 2 \times 80 \times 50 \times \cos 75}$ or M1 for recognition that the line from <i>E</i> is perpendicular to <i>AB</i> e.g. right angle seen or $\frac{1}{2} \times 6.4 \times h$

Question	Answer	Marks	Partial Marks
2(d)	10.8 or 10.9 or 10.84 to 10.85...	4	M3 for $[\sin =] \frac{\text{their (c)}}{\sqrt{15^2 + 5.7^2}}$ or $[\tan =] \frac{\text{their (c)}}{\sqrt{(5.7 \times \cos 32)^2 + 15^2}}$ or M2 for $15^2 + 5.7^2$ or $(5.7 \times \cos 32)^2 + 15^2$ oe or M1 for recognition of correct angle
2(e)	136 or 136.0...	3	M2 for $938 \times 145 \times \frac{1000}{1000000}$ oe or M1 for figs 136 or 13601
3(a)(i)	55.87	4	M1 for midpoints soi M1 for use of $\sum fm$ where m is in the correct interval including boundaries M1 (dep on 2nd M1) for $\sum fm \div 1000$
3(a)(ii)	$\frac{177}{500}$ cao	2	M1 for $\frac{154 + 200}{1000}$ oe
3(b)(i)	25000	1	
3(b)(ii)	2.473×10^4	1	
3(c)(i)	166 650 or 165816 nfw	3	M2 for $(500 + 5) \times '320 \text{ to } 340'$ or $'500 \text{ to } 510' \times (320 + 10)$ or M1 for $500 - 5$ or $500 + 5$ or $320 - 10$ or $320 + 10$ Alternative method M2 for $504 \times '320 \text{ to } 340'$ or $'500 \text{ to } 510' \times 329$ or M1 for 504 or 329
3(c)(ii)	285 or 286 nfw	2	M1 for $800 - 10$
4(a)(i)	96	2	M1 for $\frac{1}{2} \times 24 \times 8$
4(a)(ii)	18.4 or 18.43...	2	M1 for $\tan[x] = \frac{8}{24}$ oe

Question	Answer	Marks	Partial Marks
4(b)	622 or 622.0 to 622.1....	2	M1 for $[\frac{1}{2} \times] \pi \times 6^2 \times 11$ or $\frac{1}{2} \times \pi \times 6^2 [\times 11]$
4(c)(i)	246 or 246.2 to 246.3...	5	M4 for $15 \times 20 - 4 \times 4 - \frac{270}{360} \times \pi \times 4^2$ oe OR M2 for $\frac{270}{360} \times \pi \times 4^2$ oe or M1 for $k \times \pi \times 4^2$, where $k \leq 1$ M1 for 15×20 or 4×4 oe
4(c)(ii)	80.8 or 80.9 or 80.84 to 80.85...	3	M1 for $15 + 20 + 11 + 16$ oe M1 for $\frac{3}{4} \times 2 \times \pi \times 4$ oe
5(a)(i)(a)	25	1	
5(a)(i)(b)	17 to 18	1	
5(a)(i)(c)	12	2	B1 for 148 seen
5(a)(i)(d)	30	2	B1 for 104 seen
5(a)(ii)(a)	correct diagram or correct for <i>their</i> median and LQ	3	B1 for whiskers at 1 and at 70 B1 for with median and LQ at <i>their</i> (a)(i)(a) and (a)(i)(b) B1 for UQ at 34 Maximum 2 marks if diagram incorrect If 0 scored SC1 for <i>their</i> 5 correct ages plotted
5(a)(ii)(b)	50	1	
5(b)	correct histogram	3	B1 for each correct block width 10 height 3.7 width 20 height 1.2 width 30 height 2 If 0 scored SC1 for correct frequency densities 3.7, 1.2, 2 oe

Question	Answer	Marks	Partial Marks
6(a)	(5, 2) (2, - 2)	4	B3 for 3 correct values or answers for <i>C</i> and <i>D</i> reversed or correct coordinates given on diagram wrongly labelled or B2 for one correct coordinate pair correctly labelled or M2 for <i>A, B, C</i> and <i>D</i> correctly plotted or M1 for <i>A</i> and <i>B</i> correctly plotted If 0 or 1 scored instead award SC2 for answers (-3, 8) and (-6, 4) or answers (1.5, 1.5) and (-2.5, 4.5)
6(b)(i)	(2.5, 3.5) oe	2	B1 for each
6(b)(ii)	7.07 or 7.071...	3	M2 for $(6 - 1)^2 + (4 - 3)^2$ oe or M1 for $(6 - 1)$ or $(4 - 3)$ oe
6(b)(iii)	$\frac{1}{7}$	2	M1 for $\frac{4 - 3}{6 - 1}$ oe
6(b)(iv)	$y = \frac{1}{7}x - \frac{2}{7}$ or $7y = x - 2$ oe final answer	3	M1 for gradient = <i>their</i> (iii) M1dep for substituting (2, 0) in a linear equation with their <i>m</i> allow if (2, 0) satisfies $y = (\text{their}(\mathbf{b})(\mathbf{iii}) \text{ gradient})x + c$
7(a)(i)	$3(3y - 1)(3y + 1)$ final answer	3	B2 for $(9y - 3)(3y + 1)$ or $(3y - 1)(9y + 3)$ or or M1 for $3(9y^2 - 1)$ or [...] $(3y - 1)(3y + 1)$ if 0 scored SC1 for an otherwise correctly completely factorised expression but with fractions within the brackets
7(a)(ii)	$(2 - p)(m + k)$ final answer	2	M1 for $2(m + k) - p(m + k)$ or $m(2 - p) + k(2 - p)$
7(b)	$-\frac{1}{2}$ oe nfw	5	B4 $-8x = +4$ oe nfw or B3 for $\frac{x^2 - 8x - 5}{(x - 1)(x + 1)} = 1$ or better OR B2 $x^2 - 8x - 5$ or M1 for $(x - 1)(x - 1) - 6(x + 1)$ or better B1 $(x - 1)(x + 1)$ as full denominator or on the right hand side

Question	Answer	Marks	Partial Marks
7(c)	$\frac{-(-3) \pm \sqrt{(-3)^2 - 4(4)(-2)}}{2 \times 4} \text{ oe}$ or $\frac{3}{8} \pm \sqrt{\left(\frac{3}{8}\right)^2 + \frac{2}{4}} \text{ oe}$	M2	M1 for $\sqrt{(-3)^2 - 4(4)(-2)}$ or for $\frac{-(-3) + \sqrt{q}}{2(4)}$ or $\frac{-(-3) - \sqrt{q}}{2(4)}$ or for $[4] \left(x - \frac{3}{8}\right)^2$
	-0.43 and 1.18 final ans cao	A2	B1 for each SC1 for -0.4, -0.42 or -0.425.... and 1.2 or 1.17 or 1.175.... or answers 0.43 and -1.18 or -0.43 and 1.18 seen in working
7(d)	$k = \frac{4m}{1 - pm}$ or $k = \frac{-4m}{pm - 1}$ final answer	4	M1 for clearing fractions M1 for collecting terms in k M1 for factorising M1 for dividing by bracket Maximum 3 marks if answer incorrect
8(a)	$y \leq 7$ oe $x + y < 14$ oe $y > \frac{2}{3}x$ oe	3	B1 for each
8(b)	$x = 4$ solid $y = 7$ solid $x + y = 14$ dashed $y = \frac{2}{3}x$ dashed	M4	B1 for each
	correct shading everywhere but region R 	A2	M1dep (dependent on M4 or B1B1B1B0 where the only error is wrong use of solid/dashed lines) for shading the correct side of 3 of the 4 lines.

Question	Answer	Marks	Partial Marks
8(c)	4 dresses and 3 shirts	1	
8(d)	106	2	M1 for $10x + 6y$ evaluated for (x, y) in <i>their</i> region R or B1 for (7, 6) After 0 scored, SC1 for answer 112 or 116
9(a)(i)	<i>r, l, t, e, a</i>	1	
9(a)(ii)	2	1	
9(b)		1	
		1	
9(c)(i)	Fully correct 	3	B2 for 7, 6, or 5 sections correct or B1 for 4, 3 or 2 sections correct
9(c)(ii)	5	1FT	strict FT from their diagram
10(a)(i)	-7	1	
10(a)(ii)	$\frac{x-5}{2}$ oe final answer	2	M1 for correct first step e.g. $x = 2y + 5$ or $2x = y - 5$ or $\frac{y}{2} = x + \frac{5}{2}$
10(a)(iii)	$2x^3 - 11x^2 - 8x + 80$ final answer	4	M1 for $(x-4)(2x+5)(x-4)$ oe B2 for $2x^3 - 8x^2 - 8x^2 + 5x^2 - 20x - 20x + 32x + 80$ or for simplified 4 term expression of the correct form with 3 terms correct in final answer or B1 for 3 terms correct out of 4 from $x^2 - 4x - 4x + 16$ or $2x^2 - 8x + 5x - 20$

Question	Answer	Marks	Partial Marks
10(b)	0	2	M1 for $g(-2)$ or $2(x-4)+5$ oe or $3^x = 1$ or $g(f(2)) = 1$





Cambridge IGCSE™

MATHEMATICS

0580/42

Paper 4 (Extended)

May/June 2023

MARK SCHEME

Maximum Mark: 130

Published

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Abbreviations

cao	correct answer only
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FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

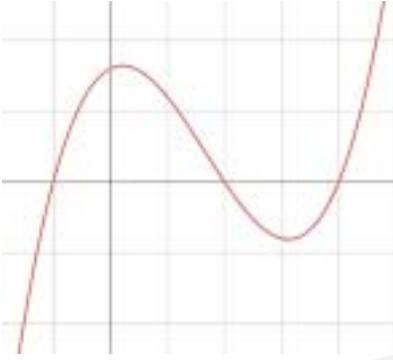
Question	Answer	Marks	Partial Marks
1(a)	111	3	M2 for $180 - \frac{180 - 42}{2}$ oe or $42 + \frac{180 - 42}{2}$ oe or M1 for $\frac{180 - 42}{2}$ oe
1(b)	150	3	M1 for $k \div (3 + 4 + 5) [\times p]$ where $p = 1, 3, 4$ or 5 or $\frac{5}{12}$ oe B1 for 360 used
1(c)	$\frac{3}{5}$ cao nfww	4	B3 for $\frac{72}{120}$ or B2 for $[d =] 72$ or $[h =] 120$ or M1 for $360 \div 5$ oe isw or $180 - (360 \div 6)$ isw or for $(6 - 2) \times 180 [\div 6]$
1(d)	$x + 2x - 5 + x + 20 + 3x - 40 = 360$	M1	Accept equivalent equation e.g. $7x - 25 = 360$
	$7x = 360 + 5 - 20 + 40$ or better	M1	FT <i>their</i> equation, accept e.g. $7x = 385$
	$x = 55$	B1	
	55 and 125 or 105 and 75	B1dep	Dep on M1M1B1 Accept $55 + 3 \times 55 - 40 = 180$ or $2 \times 55 - 5 + 55 + 20 = 180$ If B0 scored, SC1 for 55, 75, 105 and 125
	Opposite angles sum to 180 oe [so PQRS is a cyclic quadrilateral]	A1	Dep on M1M1B1B1
1(e)	48.7 or 48.69 to 48.70...	3	M2 for $\frac{360 - 50}{360} \times 2 \times \pi \times 9$ oe or M1 for $\frac{50}{360} \times 2 \times \pi \times 9$ oe
2(a)	249.98 to 250[.0...]	3	M2 for $830 - 500 \times 1.16$ or M1 for 500×1.16 OR M1 for $830 \div 1.16$ M1 for $(\text{their } 715.5... - 500) \times 1.16$

Question	Answer	Marks	Partial Marks
2(b)(i)	33.5 or 33.51...	2	M1 for $\frac{12400}{37000} [\times 100]$ oe If 0 scored, SC1 for answer 66.5 or 66.48 to 66.49
2(b)(ii)	38 184 cao	2	M1 for $37\,000 \times \left(1 + \frac{3.2}{100}\right)$ oe or B1 for 1184
2(c)(i)	441 or 440.6 or 440.64 to 440.65	3	B2 for answer 3941 or 3940.6 or 3940.64 to 3940.65 or M2 for $3500 \times \left(1 + \frac{2.4}{100}\right)^5 - 3500$ or M1 for $3500 \times \left(1 + \frac{2.4}{100}\right)^5$ oe isw
2(c)(ii)	16	3	B2 for 15[.0] nfw to 15.1 or M2 for $3500 \times \left(1 + \frac{2.4}{100}\right)^{15}$ oe seen or $3500 \times \left(1 + \frac{2.4}{100}\right)^{16}$ oe seen or M1 for $(3500 \text{ or } \textit{their} 3941) \times \left(1 + \frac{2.4}{100}\right)^n$ associated with 5000 oe
3(a)(i)	$\frac{(x+3)(2x+5)}{2} = 60$	M1	Accept $(x+3)(2x+5) = 2 \times 60$ or 120 Accept e.g. $(x+3)(x+2.5) = 60$ without division by 2 shown for M1 (but not A1)
	$2x^2 + 6x + 5x + 15$ seen	B1	Accept $2x^2 + 11x + 15$ seen
	$2x^2 + 11x - 105 = 0$	A1	Correct completion after M1B1 with the fraction seen removed with no errors or omissions seen
3(a)(ii)	$(2x+21)(x-5) [= 0]$	M2	M1 for partial factors $2x(x-5) + 21(x-5) [= 0]$ or $x(2x+21) - 5(2x+21) [= 0]$ OR $(2x+a)(x+b) [= 0]$ where $ab = -105$ or $2b+a = 11$
	-10.5 and 5	B1	

Question	Answer	Marks	Partial Marks
3(a)(iii)	61.9 or 61.92 to 61.93	3	M2 for $\tan = \frac{2 \times \text{their } 5 + 5}{\text{their } 5 + 3}$ oe or B1FT for $2 \times \text{their } 5 + 5$ and $\text{their } 5 + 3$
3(b)(i)	28.1 or 28.07 to 28.08	1	FT $\text{their } 90 - \text{their (a)(iii)}$ unless $\text{their (a)(iii)} < 45$, in which case FT their (a)(iii)
3(b)(ii)	10	3	M2 for $(\text{their } 5 + 3) \times \sqrt{\frac{93.75}{60}}$ oe or M1 for $\sqrt{\frac{93.75}{60}}$ or $\sqrt{\frac{60}{93.75}}$ oe seen or $\left(\frac{\text{their } 5 + 3}{x}\right)^2 = \frac{60}{93.75}$ oe
4(a)(i)	$1.65 < h \leq 1.8$	1	
4(a)(ii)	1.63875	4	M1 for midpoints soi M1 for use of $\sum fh$ with h in correct interval including both boundaries M1dep on 2nd M1 for $\sum fh \div 80$
4(b)(i)	$\frac{1}{40}$ oe	1	
4(b)(ii)	$\frac{63}{395}$ oe	3	M2 for $\frac{56}{80} \times \frac{9}{79} [\times 2]$ oe or B1 for $\frac{56}{80}$ or $\frac{9}{79}$ or $\frac{9}{80}$ or $\frac{56}{79}$ oe seen If 0 or B1 scored, instead award SC2 for answer $\frac{117}{632}$ oe or SC1 for answer $\frac{63}{400}$ oe
4(c)(i)	15, 39, 71, 80	2	B1 for 3 correct or M1 for 1 error in addition with other values then consistent

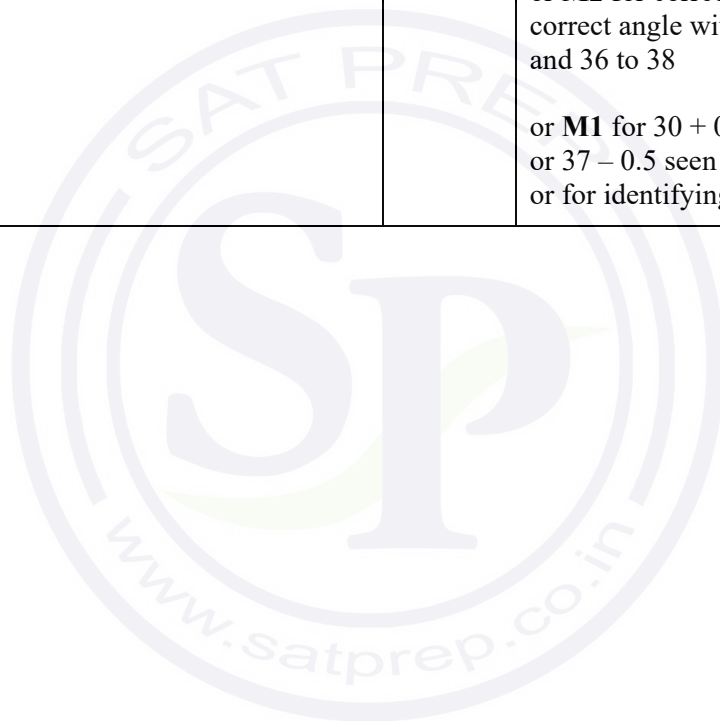
Question	Answer	Marks	Partial Marks
4(c)(ii)	Correct curve	3	B1 for correct horizontal placement for 5 plots B1FT for correct vertical placement for 5 plots B1FT dep on at least B1 for reasonable increasing curve or polygon through <i>their</i> 5 points If 0 scored SC1 FT for 4 out of 5 points correctly plotted
4(d)(i)	Strict FT <i>their</i> UQ – <i>their</i> LQ	2dep	B1dep for <i>their</i> UQ or <i>their</i> LQ seen Dep on increasing curve/polygon for 2 marks or B1
4(d)(ii)	Strict FT <i>their</i> reading at 48	2dep	B1 for 48 written
5(a)(i)	251 or 251.3 to 251.4	2	M1 for $\frac{1}{3} \times \pi \times 4^2 \times 15$ oe
5(a)(ii)	79.5 or 79.51...	5	M3 for $\pi \times 4 \times \sqrt{4^2 + 15^2}$ oe or M2 for $\sqrt{15^2 + 4^2}$ oe or M1 for $[l^2 =] 4^2 + 15^2$ oe or $\pi \times 4 \times \text{their } l$ M1 for $\frac{\text{their curved surface area}}{\text{their curved surface area} + \pi \times 4^2} [\times 100]$ oe
5(b)(i)	13 min 20 sec	3	B2 for 800 or $\frac{40}{3}$ oe seen or M1 for figs 3 ÷ figs 375 or figs 3 ÷ 22 500
5(b)(ii)	0.472 or 0.4715 to 0.4716...	3	M2 for $\pi \times 0.45^2 \times h = 0.3$ or $\pi \times 45^2 \times h = 300\,000$ oe or M1 for $\pi \times \text{figs } 45^2 \times h = \text{figs } 3$ oe
6(a)(i)	$\frac{1}{5}, \frac{2}{7}, \frac{3}{9}$ final answer	2	B1 for 2 correct terms isw or for 0.2 and (0.286 or 0.2857...) and 0.333...
6(a)(ii)	36	2	M1 for $k = \frac{12(2k+3)}{25}$ or better

Question	Answer	Marks	Partial Marks
6(b)(i)	$n^3 + 5$ oe final answer	2	B1 for any cubic or common third differences of 6 (at least 2) or for correct answer seen and spoilt
6(b)(ii)	$100 \times 2^{1-n}$ oe final answer	2	B1 for 2^{-n} oe or $\left(\frac{1}{2}\right)^{n[+k]}$ oe in answer or for correct answer seen and spoilt
7(a)	Angle $CAB = 52$	B1	
	$180 - 52 - \sin^{-1}\left(\frac{60 \sin their 52}{87}\right)$	M3	M2 for $[\sin[...]] = \frac{60 \sin their 52}{87}$ oe or M1 for $\frac{60}{\sin B} = \frac{87}{\sin their 52}$ oe
	95.08...	A1	
7(b)	77.1 or 77.08 to 77.11	6	B4 for dist travelled = 256.9 to 257[.0...] or B3 for $[AB =]$ 109.9 to 110[.0...] or M3 for $60 + 87 +$ $\sqrt{60^2 + 87^2 - 2 \times 60 \times 87 \times \cos 95.1}$ oe or M2 for $\sqrt{60^2 + 87^2 - 2 \times 60 \times 87 \times \cos 95.1}$ oe or $AB^2 = 12093. \dots$ to 12097. ... or $\frac{87 \sin 95.1}{\sin their 52}$ oe or M1 for $AB^2 = 60^2 + 87^2 - 2 \times 60 \times 87 \times \cos 95.1$ oe or $\frac{\sin 95.1}{AB} = \frac{\sin their 52}{87}$ oe M1 for <i>their</i> total distance $\div 3 \frac{20}{60}$ oe
8(a)(i)	Correct expansion of a pair of brackets $x^2 - 4x + [1]x - 4$ or $x^2 - 4x - 2x + 8$ or $x^2 + [1]x - 2x - 2$	M1	accept $x^2 - 3x - 4$ or $x^2 - 6x + 8$ or $x^2 - [1]x - 2$
	$x^3 - 4x^2 + x^2 - 4x - 2x^2 + 8x - 2x + 8$ leading to and stating $[y =] x^3 - 5x^2 + 2x + 8$	A1	Accept $x^3 - 3x^2 - 4x - 2x^2 + 6x + 8$ or $x^3 - 6x^2 + [1] x^2 + 8x - 6x + 8$ or $x^3 - [1] x^2 - 2x - 4x^2 + 4x + 8$ leading to and stating $[y =] x^3 - 5x^2 + 2x + 8$

Question	Answer	Marks	Partial Marks
8(a)(ii)	<p>Correct labelled sketch positive cubic Crossing x-axis at -1, 2 and 4 only Crossing y – axis at 8 only</p> 	4	<p>B1 for positive cubic B2 for three intercepts only with x -axis labelled at -1, 2 and 4</p> <p>or B1 for 1 or 2 correctly labelled x – intercepts B1 for a single intercept on y-axis labelled at 8 but not if line $y = 8$</p>
8(b)	$3x^2 - 10x - 8 [= 0]$	M3	<p>B2 for derivative $= 3x^2 - 10x + 2$ isw OR B1 for derivative with $3x^2$ or $-10x$ given in expression isw M1dep on B1 for <i>their</i> first derivative $= 10$</p>
	$x = 4$ and $x = -\frac{2}{3}$	B1	
	$(4, 0)$ and $\left(-\frac{2}{3}, \frac{112}{27}\right)$ oe	B1	
	<p>$[y =] 10x - 40$ and $[y =] 10x + \frac{292}{27}$</p>	B2	<p>B1 for each or for two different equations of the form $[y =] 10x + c$ (c must be numeric) or for $c = -40$ and $\frac{292}{27}$</p>
9(a)(i)	$27x^6y^{12}$ final answer	2	<p>B1 for two terms correct in answer e.g. $27x^6y^k$ or $27x^ky^{12}$ or kx^6y^{12} or for correct answer seen then spoilt</p>

Question	Answer	Marks	Partial Marks
9(a)(ii)	$\frac{x^{24}y^{12}}{64}$ final answer	3	<p>B2 for final answer with two correct elements</p> <p>or final answer $\frac{64}{x^{24}y^{12}}$ or $\frac{64^{-1}}{x^{-24}y^{-12}}$ or better</p> <p>or for correct answer seen</p> <p>or B1 for 64 or x^{24} or y^{12} seen in final answer</p> <p>or final answer $\frac{k}{x^{-24}y^{-12}}$</p> <p>or M1 for first correct step seen</p> <p>eg $\left(\frac{x^{16}y^8}{16}\right)^{\left[\frac{3}{2}\right]}$ or $\left(\frac{4}{x^8y^4}\right)^{[-3]}$ or</p> <p>$\left(\frac{4096}{x^{48}y^{24}}\right)^{\left[\frac{-1}{2}\right]}$</p>
9(b)(i)	$(x+3)(x-3)$ final answer	1	
9(b)(ii)	$\frac{x+3}{2y+5}$ final answer	3	<p>M2 for $(x-3)(2y+5)$</p> <p>or M1 for $2y(x-3) + 5(x-3)$</p> <p>or $x(2y+5) - 3(2y+5)$</p>
9(c)	$5x^2 + 4x - 20 [= 0]$ oe or $5y^2 - 78y + 221 [= 0]$ oe	M2	<p>M1 for $7 - 2x = 5x^2 + 2x - 13$ oe seen</p> <p>or $y = 5\left(\frac{7-y}{2}\right)^2 + 2\left(\frac{7-y}{2}\right) - 13$ oe seen</p>
	$\frac{-4 \pm \sqrt{(4)^2 - 4(5)(-20)}}{2(5)}$ oe or $-\frac{4}{10} \pm \sqrt{4 + \left(\frac{4}{10}\right)^2}$ oe	M2	<p>FT <i>their</i> 3-term quadratic</p> <p>or M1 for $\sqrt{(4)^2 - 4(5)(-20)}$ or better</p> <p>or for $\frac{-4 + \sqrt{q}}{2 \times 5}$ or $\frac{-4 - \sqrt{q}}{2 \times 5}$</p> <p>or for $\left(x + \frac{4}{10}\right)^2$ oe</p>
	$x = 1.64$ $y = 3.72$ and $x = -2.44$ $y = 11.88$	B2	<p>B1 for one correct pair or both x-values correct or both y-values correct</p>

Question	Answer	Marks	Partial Marks
10(a)	13.9 or 13.85 to 13.86	4	<p>M3 for $2x^2 = 28^2 - 20^2$ or better or $x = \left(\sqrt{28^2 - 20^2} \right) \sin 45$ oe or M2 for $x^2 + x^2 + 20^2 = 28^2$ oe or $\sin 45 = \frac{x}{\sqrt{28^2 - 20^2}}$</p> <p>or M1 for any correct Pythag in 2D or <i>their</i> $AC \times \sin 45$ oe dep on trig/Pythagoras attempt for AC</p>
10(b)	51.9 or 51.87 to 51.88	4	<p>M3 for $\sin = \frac{29 \text{ to } 30}{37 + 0.5}$ or $\frac{30 - 0.5}{37 \text{ to } 38}$ oe or M2 for correct trig statement for correct angle with values in range 29 to 31 and 36 to 38</p> <p>or M1 for $30 + 0.5$ or $30 - 0.5$ or $37 + 0.5$ or $37 - 0.5$ seen or for identifying correct angle RKM</p>





Cambridge IGCSE™

MATHEMATICS

0580/43

Paper 4 (Extended)

May/June 2023

MARK SCHEME

Maximum Mark: 130

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the May/June 2023 series for most Cambridge IGCSE, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Maths-Specific Marking Principles	
1	Unless a particular method has been specified in the question, full marks may be awarded for any correct method. However, if a calculation is required then no marks will be awarded for a scale drawing.
2	Unless specified in the question, answers may be given as fractions, decimals or in standard form. Ignore superfluous zeros, provided that the degree of accuracy is not affected.
3	Allow alternative conventions for notation if used consistently throughout the paper, e.g. commas being used as decimal points.
4	Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored (isw).
5	Where a candidate has misread a number in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 mark for the misread.
6	Recovery within working is allowed, e.g. a notation error in the working where the following line of working makes the candidate's intent clear.

Abbreviations

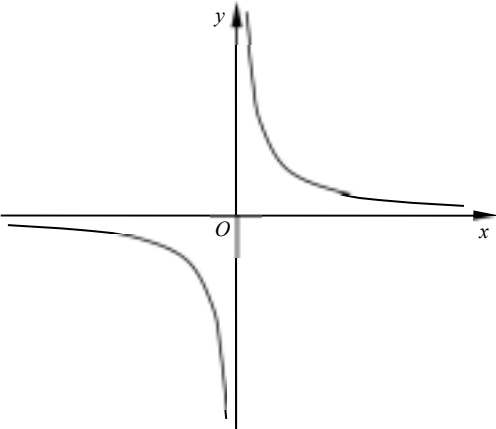
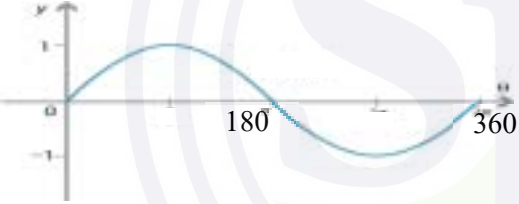
cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	22.5	2	M1 for $\frac{9}{14+17+9} [\times 100]$
1(a)(ii)	238	2	FT <i>their</i> $14 + 17 + 9 = N$ seen in (a)(i) M1 for $\frac{560}{\text{their } (14+17+9)} \times k$, where $k = 1, 9, 14$ or 17
1(a)(iii)	<u>METHOD 1</u> 1.25×195 oe	M2	M1 for $\frac{25}{100} \times 195$
	243[.75] and No oe	A1	Strict FT yes if <i>their</i> (a)(ii) > 243.75 If M0 scored, then SC1 for 243.75 and a correct conclusion.
	<u>METHOD 2</u> $\frac{\text{their } 238}{195} - 1 = 0.22\ldots$ oe	(M2)	M1 for $\frac{\text{their } 238}{195} = 1.22\ldots$ oe
	22[%] (or better) and No oe	(A1)	Strict FT yes if <i>their</i> (a)(ii) gives answer > 25 If M0 scored, then SC1 for 22.05 and a correct conclusion.
	<u>METHOD 3</u> $195 \times 0.25 = 48.75$ oe and <i>their</i> $238 - 195 = 43$	(M2)	M1 for 0.25×195
	43 and 48.75 and NO	(A1)	Strict FT yes if <i>their</i> (a)(ii) gives profit > 48.75 If M0 scored, then SC1 for 43 and 48.75 and a correct conclusion.
	<u>METHOD 4</u> $\frac{\text{their } 238}{125} \times 100$	(M2)	M1 for $x \times \left(1 + \frac{25}{100}\right) = \text{their } 238$
1(b)	190.4 and NO	(A1)	Strict FT yes if <i>their</i> (a)(ii) gives answer > 195 If M0 scored then SC1 for 190.4 and a correct conclusion.
	56.55	2	M1 for $\frac{725 \times 1.3 [\times 6]}{100}$ oe

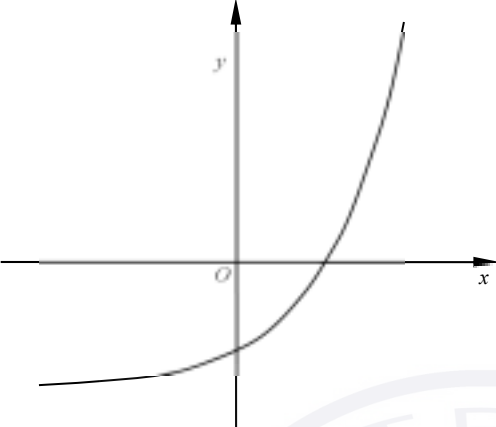
Question	Answer	Marks	Partial Marks						
1(c)	48.5[0]	2	M1 for $x \times \left(1 - \frac{24}{100}\right) = 36.86$ oe						
2(a)(i)	<table><tr><td>1</td><td>3 5 7 8</td></tr><tr><td>2</td><td>1 1 2 7 8 9</td></tr><tr><td>3</td><td>1 1 1 8</td></tr></table> 1 7 represents 17 [messages]	1	3 5 7 8	2	1 1 2 7 8 9	3	1 1 1 8	3	B2 for fully correct stem-and-leaf diagram OR B1 for two rows correct or for fully correct unordered stem-and-leaf diagram or for a correct diagram with one error or omission B1 for correct key
1	3 5 7 8								
2	1 1 2 7 8 9								
3	1 1 1 8								
2(a)(ii)	24.5	1							
2(a)(iii)	31	1							
2(a)(iv)	25	1							
2(b)	$\frac{14}{33}$ oe	2	M1 for $\frac{8}{12} \times \frac{7}{11}$						
3(a)(i)	118	1							
3(a)(ii)	X is 8.3 cm from B	2	M1 for $(332 \div 200) \times 5$ oe						
3(a)(iii)	1 : 4000	2	M1 for $200 \div 5$ or 200×100 , both soi						
3(b)	1.13 or 1.128 to 1.129	5	M4 for $4.5 \times \sqrt[3]{\frac{0.385 \times 8000}{195200}}$ oe or $\sqrt[3]{\frac{4.5^3 \times 0.385 \times 8000}{195200}}$ oe or M3 for $\sqrt[3]{\frac{0.385}{\text{their}24.4}}$ or $\sqrt[3]{\frac{\text{their}3080}{195200}}$ or $\frac{0.385}{\text{their}24.4} = \frac{l^3}{4.5^3}$ oe or M2 for $\frac{\text{their}24.4}{0.385}$ or $\frac{0.385}{\text{their}24.4}$ oe or B2 for 24.4 or 3080 seen or M1 for $195\,200 \div 8000$ or for 0.385×8000						

Question	Answer	Marks	Partial Marks
4(a)	246	3	B2 for $BCS(\text{outh}) = 66$ or $BCA = 48$ and $ACN(\text{orth}) = 66$ or $BCW(\text{est}) = 24$ or $ACS(\text{outh}) = 114$ or B1 for $ABC = 66$ or $BAC = 66$ or $BCA = 48$ or $ACN(\text{orth}) = 66$
4(b)(i)	58	1	
4(b)(ii)	106	1	
4(b)(iii)	47	2	B1 for $PRQ = 27$ or B1FT for SPR , either = 48 or = $106 - \text{their (b)(i)}$ or B1FT for $RPQ = \text{their (b)(i)} - 11$
4(c)	Radius perpendicular to tangent	1	
	Tangents to circle from a/same point oe	1	
	RHS	1	
	68 angles on a [straight] line add up/sum to 180 oe	1	
	56 [base angles of] isosceles triangle	1	
	$OBC = BOT$ Alternate angles	1	Angles and reason required and dependent on OBC and BOT correct
5(a)(i)	2[.00] or 2.002 to 2.003 nfw	3	M2 for $\sqrt{4.8^2 + 5.6^2 - 2 \times 4.8 \times 5.6 \times \cos 20.4}$ OR M1 for $4.8^2 + 5.6^2 - 2 \times 4.8 \times 5.6 \times \cos 20.4$ A1 for 4.01[17...] or 4.012
5(a)(ii)	4.1[0] or 4.11 or 4.100 to 4.107 cao	2	M1 for $\tan 64 = \frac{AX}{\text{their (a)(i)}}$ or for $\frac{AX}{\sin 64} = \frac{\text{their (a)(i)}}{\sin(90 - 64)}$ oe
5(a)(iii)	6.96	2	M1 for $\frac{1}{2} \times 4.8 \times 2.9$ oe

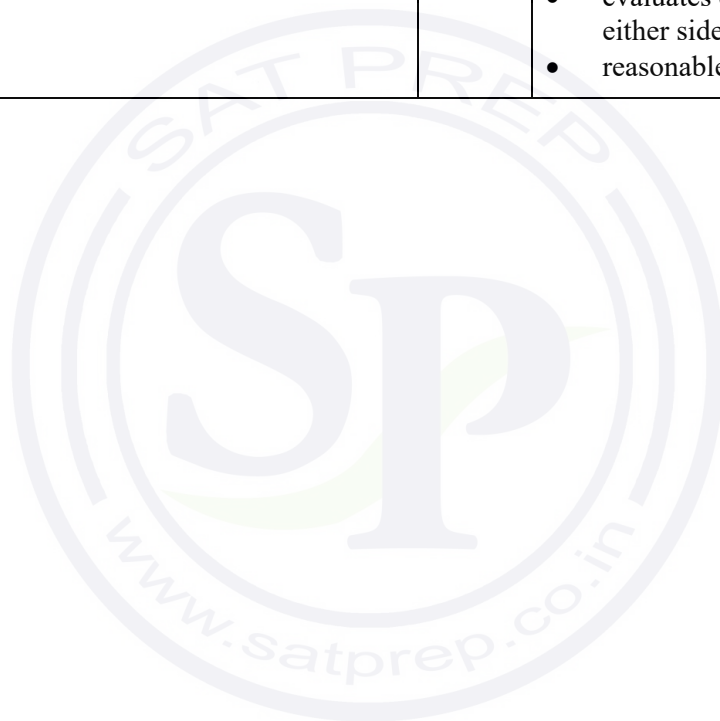
Question	Answer	Marks	Partial Marks
5(b)	11.3 or 11.31..	5	<p>M4 for $2 \times \frac{8}{\sin(45)} \times \sin 30$ or B4 for $PM = 5.65[685\dots]$ or 5.66 or better</p> <p>OR</p> <p>B1 for <i>angle RPM</i> = 45°</p> <p>M2 for $\frac{8}{\sin(\text{their } 45)} \times \sin 30$ or M1 for implicit form</p>
6(a)(i)	Correct curve	3	<p>B1 for correct horizontal placement for 6 plots B1 for correct vertical placement for 6 plots B1 dep on at least B1 for reasonable increasing curve through <i>their</i> 6 points</p> <p>If 0 scored, SC1 for 4 out of 6 points correctly plotted</p>
6(a)(ii)(a)	87 to 89.5	1	
6(a)(ii)(b)	12.5 to 14	2	B1 for [LQ =] 80.5 to 81.5 or [UQ =] 94 to 94.5
6(a)(ii)(c)	Strict FT, 200 – <i>their</i> cumul freq reading from <i>their</i> graph at 110 given to nearest integer	2	B1FT for correct cumul freq at 110 seen or for non-integer answer
6(b)(i)	3576	4	<p>M1 for midpoints soi M1 for use of $\sum fx$ where x is in the correct interval including boundaries M1 (dep on 2nd M1) for $\sum fx \div 50$</p>
6(b)(ii)	5 3.2 3	3	<p>B1 for each</p> <p>If 0 scored, SC1 for 3 frequency densities $\frac{12}{600}, \frac{15}{900}, \frac{16}{1500}, \frac{7}{700}$ seen oe to 3sf or better or multiplier 3 or 300</p>
7(a)	Cubic	1	

Question	Answer	Marks	Partial Marks
7(b)(i)	Correct sketch 	2	B1 for one branch correct or an attempt at the correct shape Maximum 1 mark if sketch crosses x -axis or y -axis
7(b)(ii)	$\pm \frac{1}{2}$ nfww	2	M1 for $4x^2 = 1$ oe or B1 for $\frac{1}{2}$ or $-\frac{1}{2}$ nfww
7(c)(i)	Correct sketch through (0, 0) (180, 0) and (360, 0) with max and min at 1 and -1 resp. 	2	B1 for correct sine curve shape, starting at the origin, with minimum of 1 cycle.
7(c)(ii)	199.5 or 199.47... and 340.5...	3	B2 for one correct or M1 for $\sin x = -\frac{1}{3}$ oe If 0 scored, SC1 for two reflex angles with a sum of 540 or 2 non-reflex angles with a sum of 180
8(a)	$4x + 3(x + 27) = 194.75$ or $4x + 3x + 81 = 194.75$	M1	
	16.25 cao	B2	M1 for $7x = k$ where $k < 194.75$ or B1 for answer 16.3
8(b)	$x^2 - 20x - 69 [= 0]$ oe or $y^2 + 116y - 861 [= 0]$ oe	M2	M1 for $x^2 + 4(-8 - 5x) = 37$ oe or for $37 - 4y = \left(\frac{-8 - y}{5}\right)^2$ oe or for $x^2 + 4y = 37$ and $20x + 4y = -32$ subtracted with no more than one error

Question	Answer	Marks	Partial Marks
	$(x + 3)(x - 23) [= 0]$ oe or $(y - 7)(y + 123) [= 0]$ oe	M1	correct method to solve <i>their</i> quadratic e.g. $x = \frac{-(-20) \pm \sqrt{(-20)^2 - 4 \times 1 \times (-69)}}{2 \times 1}$ or $x - 10 = \pm 13$ or $x - 10 = \pm \sqrt{169}$
	$x = -3$ $y = 7$ $x = 23$ $y = -123$ final answer	B2	B1 for one correct pair or two correct x values or two correct y values
8(c)	$2\pi x \times 6x + 2\pi x^2$ or $2\pi x(6x + x)$	M2	or M1 for $2\pi x \times 6x$ or $2\pi x^2$
	<i>Their</i> $(2\pi x \times 6x + 2\pi x^2) = 4\pi r^2$	M1	Dep on at least on M1 earned <i>Their</i> LHS must be an area in terms of x only
	At least one further stage of working leading to $r^2 = \frac{7}{2}x^2$	A1	with no error seen
9(a)(i)	311 or 311.0 to 311.1	3	M2 for $11 \times 11 + 2 \times \frac{1}{4} \times \pi \times 11^2$ oe or M1 for $[2 \times] \frac{1}{4} \times \pi \times 11^2$ or 11×11 oe
9(a)(ii)	78.6 or 78.55 to 78.56...	3	M2 for $4 \times 11 + 2 \times \frac{1}{4} \times 2 \times \pi \times 11$ oe or M1 for $[2 \times] \frac{1}{4} \times 2 \times \pi \times 11$ or 4×11 oe
9(b)	35.2 or 35.3 or 35.239... to 35.28	4	M3 for $[\tan =] \frac{7}{\sqrt{7^2 + 7^2}}$ or $[\sin =] \frac{7}{\sqrt{7^2 + 7^2 + 7^2}}$ or $[\cos =] \frac{\sqrt{7^2 + 7^2}}{\sqrt{7^2 + 7^2 + 7^2}}$ OR M2 for $AG = \sqrt{7^2 + 7^2 + 7^2}$ or for $\sqrt{7^2 + \left(\frac{7}{\sin 45}\right)^2}$ oe or for $AC = \sqrt{7^2 + 7^2}$ or $\frac{7}{\sin 45}$ oe OR M1 for $7^2 + 7^2$ or for implicit trigonometry or identifying correct angle

Question	Answer	Marks	Partial Marks
10(a)	-2.5 -2 -1	3	B1 for each
10(b)	Correct curve 	4	B3 FT for 8 or 7 correct plots B2 FT for 6 or 5 correct plots B1 FT for 4 or 3 correct plots
10(c)	2.3 to 2.4	1	
10(d)	ruled line $y = x - 1.5$	M2	M1 for $y = x - 1.5$ soi or for $2^x - 3 = x - 1.5$ seen. or $y = x + k$ or $y = kx - 1.5$ drawn Do not accept $y = -1.5$
	-1 and 1.55 to 1.7	A2	A1 for each
11(a)	10	3	M2 for $(1 - -7)^2 + (4 - -2)^2$ oe or M1 for $(1 - -7)$ or $(4 - -2)$ oe
11(b)	$\frac{4}{3}$ or $\frac{8}{6}$	2	M1 for $\frac{1 - -7}{4 - -2}$ oe
11(c)	$y = -\frac{3}{4}x - \frac{9}{4}$ or $4y + 3x + 9 = 0$ oe final answers	4	B3 for $-\frac{3}{4}x - \frac{9}{4}$ OR B1 for midpoint $(1, -3)$ M1 for gradient $-\frac{3}{4}$ or $-\frac{1}{\text{their } (b)}}$ M1 for substituting <i>their</i> $(1, -3)$ into $y = (\text{their } m)x + c$ or for $\text{their } m = \frac{y - -3}{x - 1}$ oe
12(a)	$4x^3 - 16x$ cao	2	M1 for $4x^3 + kx$ or $kx^3 - 16x$ or $4x^3 - 16x + k$ or $4x^3 - 16$ as final answers

Question	Answer	Marks	Partial Marks
12b	<i>Their</i> $\frac{dy}{dx} = 0$ or stating $\frac{dy}{dx} = 0$	B1	
	Correct method to solve <i>their</i> $4x^3 - 16x = 0$	M1	e.g. $4x(x^2 - 4)$ or $4x(x - 2)(x + 2)$ oe
	$[x =] 0, -2, 2$	A1	Or B1 for $(-2, -11)$ and $(2, -11)$
	$(0, 5) (-2, -11) (2, -11)$	A1	
12(c)	$(0, 5)$ with correct reasoning	2	M1 for any of <ul style="list-style-type: none"> correct use of 2nd derivative $12x^2 - 16$ evaluates correctly both values of y on either side evaluates correctly the gradient on either side reasonable correct sketch





Cambridge IGCSE™

MATHEMATICS

0580/42

Paper 4 (Extended)

February/March 2023

MARK SCHEME

Maximum Mark: 130

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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This document consists of **15** printed pages.

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These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

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- marks are not deducted for errors
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Maths-Specific Marking Principles	
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3	Allow alternative conventions for notation if used consistently throughout the paper, e.g. commas being used as decimal points.
4	Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored (isw).
5	Where a candidate has misread a number in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 mark for the misread.
6	Recovery within working is allowed, e.g. a notation error in the working where the following line of working makes the candidate's intent clear.

Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	$\frac{750}{8+7} \times 8$ [= 400]	M1	
1(a)(ii)(a)	37.5	1	
1(a)(ii)(b)	275	3	M2 for $250 + \frac{250 \times 2 \times 5}{100}$ oe or M1 for $\frac{250 \times 2 \times 5}{100}$ oe
1(a)(iii)	407[.00] cao nfww	3	B2 for 406.5 to 406.7 or M1 for $350 \times \left(1 + \frac{0.25}{100}\right)^{60}$ oe isw If 0 scored SC1 for answer 354 or answer 406
1(b)	24	2	M1 for [C : D =] 6 : 10 oe and [C : E =] 6 : 9 oe or for $\frac{6}{6+10+9} [\times 100]$ oe

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Question	Answer	Marks	Partial Marks
1(c)	56 000 nfw	3	M2 for $60564 \div \left(1 + \frac{3}{100}\right) \div \left(1 + \frac{5}{100}\right)$ oe or M1 for $[x \times] \left(1 + \frac{3}{100}\right) \times \left(1 + \frac{5}{100}\right)$ or for $60564 \div \left(1 + \frac{3}{100}\right)$ oe or $60564 \div \left(1 + \frac{5}{100}\right)$ If 0 scored, SC1 for answer 65499 to 65500
1(d)	2.5[0] or 2.499...	3	M2 for $\sqrt[8]{\frac{609.20}{500}}$ oe or M1 for $500 \times (\dots)^8 = 609.2[0]$ oe
2(a)(i)	7	1	
2(a)(ii)	8	1	
2(a)(iii)	8.31	3	M1 for $3 \times 6 + 32 \times 7 + 19 \times 8 + 29 \times 9 + 11 \times 10 + 6 \times 11$ oe M1dep on M1 for $\frac{\sum fx}{100}$
2(a)(iv)	$\frac{23}{110}$ oe	2	M1 for $\frac{k}{100} \times \frac{k-1}{99}$ oe, $k < 100$ or B1 for $\frac{46}{100}$ and $\frac{45}{99}$
2(b)(i)	53	1	
2(b)(ii)	20	1	

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Question	Answer	Marks	Partial Marks
2(c)(i)	151.975	4	M1 for 80, 155, 250 soi M1 for $\sum fx$ where x is in correct interval including boundaries M1 dep for $\frac{\sum fx}{200}$ dep on second M1
2(c)(ii)	Correct histogram completed with widths 110 to 200 and 200 to 300 and heights 1.1 and 0.41	2	B1 for one correct block If 0 scored, SC1 for 1.1 and 0.41 seen
3(a)	$[h =] \frac{\frac{1}{2} \times \frac{4}{3} \times \pi \times 3^3}{\pi \times 12^2} \text{ oe}$ leading to 0.125 or $3 - \frac{\pi \times 12^2 \times 3 - \frac{1}{2} \times \frac{4}{3} \times \pi \times 3^3}{\pi \times 12^2} \text{ oe}$ leading to 0.125	M3	M2 for $\pi \times 12^2 \times h = \frac{1}{2} \times \frac{4}{3} \times \pi \times 3^3 \text{ oe}$ or for $\pi \times 12^2 \times 3 = \pi \times 12^2 \times x + \frac{2}{3} \times \pi \times 3^3 \text{ oe}$ or for $\frac{\frac{1}{2} \times \frac{4}{3} \times \pi \times 3^3}{\pi \times 12^2 \times 3} = \frac{h}{3} \text{ oe}$ or M1 for $\pi \times 12^2 \times h$ or $\frac{1}{2} \times \frac{4}{3} \times \pi \times 3^3 \text{ oe}$ or $\pi \times 12^2 \times 3$

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Question	Answer	Marks	Partial Marks
3(b)	4.8[0] or 4.795 to 4.796	3	M2 for $\pi \times 12^2 \times (3 - 0.125) = \pi \times R^2 \times 18$ oe or $\pi \times 12^2 \times 3 - \frac{2}{3} \times \pi \times 3^3 = \pi \times R^2 \times 18$ or B1 for $3 - 0.125$ or for 414π oe
3(c)	10.5 or 10.47 to 10.49	3	M2 for $\frac{\frac{4}{3} \times \pi \times 3^3 - 30 \times 1.5^3}{\frac{4}{3} \times \pi \times 3^3}$ or $\frac{30 \times 1.5^3}{\frac{4}{3} \times \pi \times 3^3} \times 100$ oe or M1 for $\frac{4}{3} \times \pi \times 3^3 - 30 \times 1.5^3$ or $\frac{30 \times 1.5^3}{\frac{4}{3} \times \pi \times 3^3}$ oe
4(a)(i)	Triangle at (3, -1), (9, -1), (9, 2)	2	B1 for correct shape, size and orientation or for correct plots but no triangle
4(a)(ii)(a)	Triangle at (3, 3), (4, 3), (3, 5)	2	B1 for correct shape size and orientation or for rotation about (4, 2) 90° anticlockwise or for correct plots but no triangle
4(a)(ii)(b)	Triangle at (4, 3), (5, 3), (5, 5)	3	B2 for correct shape size and orientation or for correct plots but no triangle or M1 for $x + y = 6$ drawn
4(a)(ii)(c)	Reflection $x = 4$	2	B1 for each

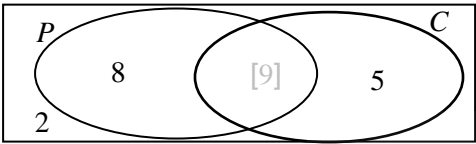
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Question	Answer	Marks	Partial Marks
4(b)	$\frac{5}{7}\mathbf{a} + \frac{2}{7}\mathbf{b}$ final answer	3	B2 for correct unsimplified answer OR M2 for $\overrightarrow{HZ} = \frac{2}{7}(\mathbf{b} - \mathbf{a})$ or $\overrightarrow{KZ} = \frac{5}{7}(\mathbf{a} - \mathbf{b})$ oe or M1 for $\overrightarrow{HK} = -\mathbf{a} + \mathbf{b}$ or $\overrightarrow{KH} = -\mathbf{b} + \mathbf{a}$ or for a correct route
5(a)	$6p^4 - 13p^2 + 6$ final answer	2	B1 for three of $6p^4 - 9p^2 - 4p^2 + 6$ seen
5(b)(i)	175	2	M1 for $\frac{1}{2}(20 + 30) \times 7$ oe
5(b)(ii)	$\frac{2s - ut}{t}$ or $\frac{2s}{t} - u$ final answer	3	B2 for correct answer but unsimplified e.g. $\frac{s \div t}{0.5} - u$, $\frac{s}{\frac{1}{2}t} - u$, $\frac{s}{0.5t} - u$ OR M1 for correct multiplication by 2 or division by 0.5 M1 for correctly rearranging terms to isolate term in v M1 for correct division by t Max 2 marks if final answer incorrect
5(c)(i)	$(2q - 3)(t + 2)$ final answer	2	B1 for $t(2q - 3) + 2(2q - 3)$ or $2q(t + 2) - 3(t + 2)$

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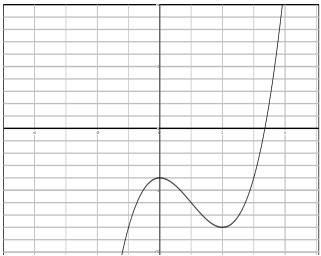
Question	Answer	Marks	Partial Marks
5(c)(ii)	$x(x+5)(x-5)$ final answer	3	B2 for $(x^2 - 5x)(x+5)$ or $(x^2 + 5x)(x-5)$ or for correct answer seen then spoiled or B1 for $x(x^2 - 25)$
6(a)	$y = 4$ oe	1	
6(b)	$[y =] -\frac{1}{2}x + 4$ final answer	2	B1 for $\text{grad} = -\frac{4}{8}$ oe soi or $[y =] kx + 4$
6(c)(i)	Gradient = $\frac{-1}{\text{their gradient in}(b)}$	M1	Accept e.g. $2 \times -\frac{1}{2} = -1$ oe or states negative reciprocal of $-\frac{1}{2} = 2$
	Substituting (2, 3) in <i>their</i> equation.	M1	$3 = 2 \times \text{their } m + c$
	leading to $y = 2x - 1$	A1	No errors or omissions
6(c)(ii)	3.35 or 3.354...	5	B2 for $\left(\frac{1}{2}, 0\right)$ soi or x -coordinate of $D = \frac{1}{2}$ or M1 for $2x - 1 = 0$ M2 for $(2 - \text{their } \frac{1}{2})^2 + (3 - \text{their } 0)^2$ oe or M1 for $(2 - \text{their } \frac{1}{2})$ and $(3 - \text{their } 0)$ oe

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Question	Answer	Marks	Partial Marks
7(a)	Completed Venn diagram. 	2	B1 for two correct values
7(b)(i)	8	1	FT <i>their (a)</i> <i>their</i> 8 dep < 24
7(b)(ii)	19	1	FT <i>their (a)</i> 24 – <i>their</i> 5 dep on positive answer
7(c)	$\frac{15}{92}$ oe	3	<p>M2 for $[2\times] \frac{9}{24} \times \frac{\text{their } 5}{23}$ oe</p> <p>or M1 for $\frac{9}{24}$ and $\frac{\text{their } 5}{23}$ or $\frac{\text{their } 5}{24}$ and $\frac{9}{23}$</p> <p>If 0 scored SC1 for answer $\frac{5}{32}$ oe</p>
7(d)	$\frac{9}{34}$ oe	2	B1 for $\frac{9}{17}$ seen
8(a)	54	2	M1 for $\frac{1}{2} \times 12 \times 9$

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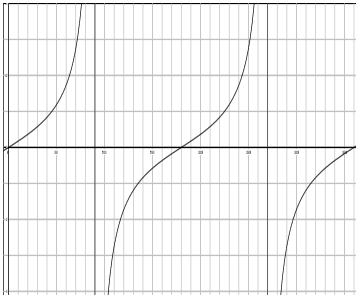
Question	Answer	Marks	Partial Marks
8(b)	$2x^2 + 13x - 85 [= 0]$	B3	M1 for $\frac{1}{2}(2x+3)(x+5) [= 50]$ oe B1 for $2x^2 + 10x + 3x + 15$
	$\frac{-13 \pm \sqrt{13^2 - 4(2)(-85)}}{2(2)}$ oe or $-\frac{13}{4} \pm \sqrt{\frac{85}{2} + \left(\frac{13}{4}\right)^2}$ oe	M2	M1 for $\sqrt{13^2 - 4 \times 2 \times -85}$ oe or for $\frac{-13 + \text{or } -\sqrt{p}}{2(2)}$ oe or for $[2]\left(x + \frac{13}{4}\right)^2$
	4.03 cao	B1	
9(a)	-3	3	B2 for $3x^2 - 6x$ or B1 for $3x^2 - kx$ or for $kx^2 - 6x$ or for $3x^2 - 6x + c$
9(b)	(0, -4) and (2, -8)	4	B3 for $x = 0$ and 2 or for (2, -8) OR M1 for <i>their</i> $3x^2 - 6x = 0$ or stating $\frac{dy}{dx} = 0$ oe M1 for correct method to solve <i>their</i> $3x^2 - 6x = 0$

Question	Answer	Marks	Partial Marks
9(c)	Correct sketch 	2	Max on negative y-axis and min in correct quadrant and extends into first quadrant B1 for positive cubic graph and two turning points
10(a)	$\cos 31 = \frac{AB}{12.3}$ oe	M1	
	10.543...	A1	
10(b)	$\cos = \frac{12.3}{16.5}$ oe	M1	
	41.801 to 41.802	A1	
10(c)	16.7 or 16.8 or 16.74 to 16.75...	3	M2 for $\sqrt{10.54^2 + 16.5^2 - 2 \times 10.54 \times 16.5 \times \cos(31 + 41.8)}$ or for $\sqrt{6.33^2 + 11^2 - 2 \times 6.33 \times 11 \times \cos(180 - 31)}$ OR M1 for $10.54^2 + 16.5^2 - 2 \times 10.54 \times 16.5 \times \cos(31 + 41.8)$ or for $6.33^2 + 11^2 - 2 \times 6.33 \times 11 \times \cos(90 + 90 - 31)$ oe A1 for 280 or 281 or 280.4 to 280.6

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Question	Answer	Marks	Partial Marks
10(d)	18.9 to 20.7... nfw	4	<p>M1 for $\sin 31 = \frac{BC}{12.3}$ oe or better and</p> <p>$\sin 41.8[0] = \frac{CD}{16.5}$ oe</p> <p>M2dep on M1 for</p> <p>$\cos [DBC] = \frac{their(c)^2 + 6.34^2 - 10.998^2}{2 \times their(c) \times 6.34}$</p> <p>or M1dep on M1 for</p> <p>$10.998^2 = their(c)^2 + 6.34^2 - 2 \times their(c) \times 6.34 \times \cos DBC$</p>
10(e)	2.05 to 2.24... nfw	4	<p>M1 for $\sin 31 = \frac{BC}{12.3}$ oe or better</p> <p>or $\sin 41.8[0] = \frac{CD}{16.5}$ oe</p> <p>M2dep on M1 for $\frac{\text{dist}}{theirBC} = \sin(\text{their angle } CBD)$</p> <p>or $\frac{\text{dist}}{theirCD} = \sin(\text{their angle } CDB)$</p> <p>or M1 for recognition of shortest distance</p>
11(a)	1	1	
11(b)	$-\frac{1}{5}$ or -0.2	2	M1 for $2x - 1 + 3x + 2 = 0$ oe isw
11(c)	$9x + 8$ final answer	2	M1 for $3(3x + 2) + 2$

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Question	Answer	Marks	Partial Marks
11(d)	$\frac{4x^2 + 5x - 3}{x(2x - 1)}$ final answer	4	<p>M1 for $\frac{1}{2x-1}$ and $3\left(\frac{1}{x}\right) + 2$ oe</p> <p>B1 for $x + 3(2x-1) + 2x(2x-1)$ oe or better isw</p> <p>B1 for common denominator = $x(2x-1)$ isw</p> <p>If 0 scored, SC1 for answer $\frac{4x^2 + 9x + 3}{x(2x+1)}$</p>
11(e)	h(x) indicated	1	
12(a)	<p>Correct sketch</p> 	2	<p>Condone curve touching asymptotes but not crossing</p> <p>B1 for one section correct</p> <p>or for 3 sections in correct part of graph but with incorrect curvature and no other sections in incorrect part of graph</p>
12(b)	30 and 210 final answer	2	<p>B1 for each</p> <p>If 0 scored SC1 for two answers (one acute and one reflex) with a difference of 180</p>



Cambridge IGCSE™

MATHEMATICS

0580/41

Paper 4 Extended

October/November 2022

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<p>Published</p>

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oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	1580 or 1583 to 1584	2	M1 for $\pi \times 6^2 \times 14$
1(a)(ii)	452 or 452.3 to 452.4...	2	M1 for $\left[\frac{1}{2}\right] \times \frac{4}{3} \times \pi \times 6^3$
1(b)(i)	$7.85 \div 1000 [= 0.00785]$	M1	
1(b)(ii)	16[.0] or 15.95 to 15.99	2	FT { <i>their (a)(i) + their (a)(ii)</i> } $\times 0.00785$ evaluated to 3 sig fig or better M1 for (<i>their (a)(i) + their (a)(ii)</i>) $\times 0.00785$
1(c)(i)	16.2 or 16.21 to 16.23	3	M2 for $\frac{2000 - 50 \times \frac{4}{3} \times \pi \times 2^3}{2000} [\times 100]$ or for $\frac{50 \times \frac{4}{3} \times \pi \times 2^3}{2000} \times 100$ or M1 for $\frac{50 \times \frac{4}{3} \times \pi \times 2^3}{2000}$
1(c)(ii)	6.87 or 6.870 to 6.872	1	FT $\sqrt[3]{2000 - \text{their} \left(50 \times \frac{4}{3} \times \pi \times 2^3 \right)}$ evaluated to 3sf or better
1(d)	$\frac{2}{3}$ oe	4	M1 for $[\pi](3R)^2 + [\pi]3R \times 9R$ oe M1 for $2[\pi]x^2 + 2[\pi]x \times 7x$ oe M1 for <i>their</i> area of cone = <i>their</i> area of cylinder seen
2(a)(i)	2990 cao	1	
2(a)(ii)	1.0 cao	1	
2(a)(iii)	2100 cao	1	
2(b)	97	1	
2(c)	$\frac{1}{64}$ final answer	1	
2(d)	$7.01[0] \times 10^{-3}$	1	
2(e)	1.65×10^x	2	M1 for final answer figs 165 or for $15 \times 10^{x-1}$ seen or for 0.15×10^x seen

Question	Answer	Marks	Partial Marks
2(f)	$37.7... - 3.7... [= 34]$ oe	M1	
	$\frac{34}{90}$ oe fraction	B1	
3(a)	$-2 < x \leq 4$ oe	1	
3(b)(i)	$-3 \leq x < 3$ final answer	3	M2 for $-3 \leq x < k$ or for $k \leq x < 3$ or for $-6 \leq 2x < 6$ or for $-\frac{3}{2} - \frac{3}{2} \leq x < \frac{9}{2} - \frac{3}{2}$ or M1 for $-3 - 3 \leq 2x < 9 - 3$ or for $-\frac{3}{2} \leq x + \frac{3}{2} < \frac{9}{2}$ After 0 scored SC1 for $-3 \leq x$ or for $x < 3$
3(b)(ii)	$-3, -2, -1, 0, 1, 2$ final answer	2	FT their (i) as long as negative and positive values B1FT for one error or omission
3(c)(i)	$\frac{36}{17}$ oe	4	B3 for $-15x - 2x = 5 + 4 - 45$ or better OR B2 for $45 - 15x - 2x - 4 = 5$ oe OR M1 for correct removal of fraction or M1 for correct removal of brackets
3(c)(ii)	-8	3	B2 for $5x - 3x = 9 - 25$ or better or M1 for $5(x + 5) = 3(x + 3)$ oe or better
4(a)(i)	550 nfww	3	M2 for $\frac{500 \times 2 \times 5}{100} + 500$ oe or M1 for $\frac{500 \times 2 \times 5}{100}$ oe
4(a)(ii)	546.65	2	M1 for $500 \times \left(1 + \frac{1.8}{100}\right)^5$ oe
4(a)(iii)	8 nfww	3	B2 for final answer 13 OR M2 for trials correctly comparing both investments to 7 and 8 more years or M1 for at least two trials correctly comparing both investments

Question	Answer	Marks	Partial Marks
4(b)	1476 cao	3	B2 for 1480 or 1476.2 ... OR M1 for $2500 \times \left(1 - \frac{10}{100}\right)^5$ oe B1 for their more accurate answer seen correctly rounded to the nearest dollar.
4(c)	3.2[0] or 3.200 to 3.201	3	M2 for $(...) = \sqrt[22]{2}$ oe isw or M1 for $[N] \times (...)^{22} = 2[N]$
5(a)(i)	9.4	1	
5(a)(ii)	2.4	2	B1 for [uq =] 10.4 or [lq =] 8 but not as final answer
5(a)(iii)	18	2	B1 for 82 seen
5(b)(i)	34.65 or $34\frac{13}{20}$	4	M1 for midpoints 10, 25, 32.5, 40, 52.5 soi M1 for Σfx where values of x are in interval or on boundary M1 dep on second M for $\frac{\Sigma fx}{150}$
5(b)(ii)	0.3, 5.7, ..., 7.95, 1.5	3	B2 for any two correct or B1 for one correct or for at least three frequency densities seen 0.2, 3.8, 8, 5.3, 1 oe or M1 for [factor] 1.5
5(b)(iii)	$\frac{7}{745}$ oe	2	M1 for $\frac{15}{150} \times \frac{14}{149}$
6(a)(i)	$\begin{pmatrix} -3 \\ 3 \end{pmatrix}$	1	
6(a)(ii)	$\begin{pmatrix} 3 \\ 2 \end{pmatrix}$	1	
6(a)(iii)	3.61 or 3.605 to 3.606	2	M1 for $2^2 + 3^2$ oe
6(b)	(6, 1)	2	B1 for each

Question	Answer	Marks	Partial Marks
6(c)	$\frac{2}{7}\mathbf{g} + \frac{3}{14}\mathbf{h}$	4	B3 for correct unsimplified expression for \overrightarrow{MK} or B2 for $[\overrightarrow{MK} =] \frac{2}{7}\mathbf{g} + k\mathbf{h}$ or $[\overrightarrow{MK} =] k\mathbf{g} + \frac{3}{14}\mathbf{h}$ or $\overrightarrow{HK} = \frac{2}{7}(\mathbf{g} - \mathbf{h})$ oe or $\overrightarrow{GK} = \frac{5}{7}(\mathbf{h} - \mathbf{g})$ oe or M1 for correct route for \overrightarrow{MK}
7(a)(i)	4	1	
7(a)(ii)	16	1	FT $2^{their 4}$
7(b)	3	1	
7(c)	$\frac{1}{4}$ oe	2	M1 for $\frac{2}{x} = 2^3$ or better
7(d)	$\frac{5-x}{2}$ oe final answer	2	M1 for $x = 5 - 2y$ or $y + 2x = 5$ oe or $\frac{y}{2} = \frac{5}{2} - x$ oe
7(e)	$\frac{11x - x^2 + 2}{x}$ final answer	3	B2 for $\frac{x(10-x) + 2 + x}{x}$ oe single fraction or B1 for $x(10-x) + 2 + x$ oe or M1 for $10 - x + \frac{2}{x} + 1$
7(f)	$[a =] 1$ $[b =] -21$ $[c =] 100$	4	B3 for $x^2 - 21x + 100$ OR M1 for $(10-x)^2 - (10 - (10-x))$ oe or better B2 for $[(10-x)^2] = 100 - 10x - 10x + x^2$ or B1 for three out of four terms of $[(10-x)^2] = 100 - 10x - 10x + x^2$ correct
7(g)	1024	2	M1 for $[x =] h(10)$ oe or better
8(a)	$[\cos =] \frac{15^2 + 8^2 - 20^2}{2 \cdot 15 \cdot 8}$	M2	M1 for $20^2 = 15^2 + 8^2 - 2 \cdot 15 \cdot 8 \cos(\quad)$
	117.54 to 117.55	A2	A1 for $-\frac{37}{80}$ or $-\frac{111}{240}$ or $-[0].4625$

Question	Answer	Marks	Partial Marks
8(b)	53.2 or 53.19 to 53.23	2	M1 for $0.5 \times 8 \times 15 \times \sin(117.5)$ oe
8(c)	15.5 or 15.52 to 15.53	2	M1 for $15^2 + 4^2$ oe
8(d)	7.1 or 7.13 or 7.125 to 7.126	3	M2 for $\tan [P] = \frac{4-3}{8}$ oe or for 7.1 or 7.13 or 7.125 to 7.126 seen or M1 for vertical line = $4 - 3$ soi After 0 scored SC1 for correct angle identified
8(e)	11.5 nfww or 11.48 to 11.49...	5	B1 for height of 3.5 soi M2 for $15^2 + 4^2 - 2.15.4 \cos(117.5)$ or M1 for $\cos 117.5 = \frac{15^2 + 4^2 - (...)^2}{2.15.4}$ M1 for $\tan = \frac{3.5}{\text{their } 17.216...}$ oe After M0 scored SC1 for correct angle identified
9(a)(i)	$x(3x + 4) + 2(x - 1)[= 20]$	M1	Correct expression with brackets unexpanded
	Leading to $3x^2 + 6x - 22 = 0$ with no errors or omissions	A1	Must see equated to 20 and brackets expanded first to award A1
9(a)(ii)	$\frac{-6 \pm \sqrt{6^2 - 4(3)(-22)}}{2.3}$ oe or for $= -1 \pm \sqrt{1 + \frac{22}{3}}$ oe	B2	B1 for $\sqrt{6^2 - 4(3)(-22)}$ or $\frac{-6 + \text{or} - \sqrt{k}}{2.3}$ or $(x+1)^2 = k$ oe
	-3.887 and 1.887 cao	B2	B1 for one correct answer or for answers -3.89 or -3.88 or -3.886 or -3.8868 to -3.8867 and 1.88 or 1.89 or 1.886 or 1.8867 to 1.8868 or correct answers seen in working or -1.887 and 3.887 answers
9(a)(iii)	5.77 or 5.773 to 5.774	1	FTdep 2 (positive $x + 1$) evaluated to 3 sig. fig. or more, dep on $x > 1$

Question	Answer	Marks	Partial Marks
9(b)	$y^2 + 3y - 40 [= 0]$ oe	B4	Oe 3 term quadratic M3 for $15y - 20(y - 2) = y(y - 2)$ oe Or M2 for $\frac{15}{y-2} - \frac{20}{y} = 1$ oe Or M1 for $H(y - 2) = 15$ or $hy = 20$ soi
	$(y + 8)(y - 5) [= 0]$ oe	B2	Strict FT a three term quadratic B1FT for $(y + a)(y + b)$ where $ab = -40$ or $a + b = 3$ or $y(y - 5) + 8(y - 5)$ or $y(y + 8) - 5(y + 8)$
	5	B1	
10(a)(i)	4 or 5 or 7 or 8 or 9	1	
10(a)(ii)	$[a =] 3, [b =] 10$	2	B1 for each or for a and b transposed
10(b)	$6x^5 - 30x^4$	B2	B1 for $6x^5$ or $-30x^4$
	<i>their</i> derivative = 0.	M1	
	(0, 0) and (5, -3125)	B2	B1 for (5, -3125) or for $x = 0$ and $x = 5$



Cambridge IGCSE™

MATHEMATICS

0580/42

Paper 4 (Extended)

October/November 2022

MARK SCHEME

Maximum Mark: 130

<p>Published</p>

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the October/November 2022 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

This document consists of **14** printed pages.

PUBLISHED**Generic Marking Principles**

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

PUBLISHED**GENERIC MARKING PRINCIPLE 6:**

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Maths-Specific Marking Principles

1	Unless a particular method has been specified in the question, full marks may be awarded for any correct method. However, if a calculation is required then no marks will be awarded for a scale drawing.
2	Unless specified in the question, answers may be given as fractions, decimals or in standard form. Ignore superfluous zeros, provided that the degree of accuracy is not affected.
3	Allow alternative conventions for notation if used consistently throughout the paper, e.g. commas being used as decimal points.
4	Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored (isw).
5	Where a candidate has misread a number in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 mark for the misread.
6	Recovery within working is allowed, e.g. a notation error in the working where the following line of working makes the candidate's intent clear.

Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

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Question	Answer	Marks	Partial Marks
1(a)(i)	75	2	M1 for $\frac{45}{3}[\times k]$ where k is 1, 5 or 8
1(a)(ii)	2.332 oe	2	M1 for $2.65 [\text{million}] \times \left(1 - \frac{12}{100}\right)$ oe or B1 for 0.318[million] seen
1(a)(iii)	23 280 cao	2	M1 for $\frac{6.25}{100} \times x = 1455$ or better
1(a)(iv)	1450 or 1449 to 1450	3	M2 for $1631 = k \left(1 + \frac{4}{100}\right)^3$ oe or better or B1 for $\left(1 + \frac{4}{100}\right)^3$ oe seen or M1 for $1631 = k \left(1 + \frac{4}{100}\right)^n, n > 0$ oe
1(b)(i)	$\frac{7x}{2}$ oe	1	
1(b)(ii)	$x + 12 \quad \frac{7x}{2} - 26$ oe final answer	2	FT <i>their (b)(i)</i> B1 for $x + 12$ B1 for <i>their</i> $\frac{7x}{2} - 26$

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Question	Answer	Marks	Partial Marks
1(b)(iii)	$\frac{7x}{2} - 26 = 3(x + 12)$ oe leading to 124	4	M1dep for $their \left(\frac{7x}{2} - 26 \right) = 3 \times their (x + 12)$ oe M2dep for isolating x terms, dep on eqn with term in x and constant on each side and with a bracket or fraction. or M1dep for correctly removing brackets or dealing with fractions, dep on eqn with term in x and constant on each side and with a bracket or fraction.
2(a)(i)	28	1	
2(a)(ii)	Correct curve	4	B3FT for 9 or 10 correct points or B2FT for 7 or 8 correct points or B1FT for 5 or 6 correct points
2(a)(iii)	2.5 to 2.8 8.2 to 8.5	2	B1 for each value
2(b)(i)	$2x^2 + 4x(9 - x)$ oe	M1	Accept the sum of individual areas if done in smaller parts
	$2x^2 + 36x - 4x^2$ oe Leading to $36x - 2x^2$	A1	With intermediate step shown and brackets removed with no errors or omissions
2(b)(ii)	144	3	B1 for $x = 6$ identified from graph or using calculus M1 for $36 \times their 6 - 2 \times (their 6)^2$

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Question	Answer	Marks	Partial Marks
3(a)(i)	211.275	4	M1 for mid-points soi (90, 125, 175, 250, 350) M1 for use of Σfm with m in correct interval including both boundaries M1 for (dep on 2nd M1) for $\Sigma fm \div 200$
3(a)(ii)	$32 \times 350 - 32 \times 330$ oe or better, or the reverse of this	M1	
	3.2 or – 3.2 final answer	B1	
3(a)(iii)	1.75 7.6 1.6	3	B2 for two correct heights or B1 for one correct height or 3 correct frequency densities or M1 for scale factor of 5 or 0.2
3(b)	$\frac{4}{25}$ oe	1	
3(c)(i)	$\frac{39}{995}$ oe	2	M1 for $\frac{40}{200} \times \frac{39}{199}$ oe
3(c)(ii)	$\frac{147}{4975}$ oe	3	M2 for $[2 \times] \frac{84}{200} \times \frac{7}{199}$ oe or B1 for $\frac{84}{200}$ and $\frac{7}{199}$ or $\frac{84}{199}$ and $\frac{7}{200}$ oe If 0 scored, SC1 for answer $\frac{147}{5000}$ oe

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Question	Answer	Marks	Partial Marks
4(a)(i)	Translation $\begin{pmatrix} 7 \\ -8 \end{pmatrix}$ oe	2	B1 for each
4(a)(ii)	Rotation 90° [anticlockwise] oe (0, 8)	3	B1 for each
4(a)(iii)	Enlargement [sf] $\frac{1}{2}$ oe [centre] (–1, –4)	3	B1 for each
4(b)	Image at (–4, 4) (–3, 4) (–2, 5) (–2, 3) (–4, 3)	2	B1 for the line $y = x + 8$ drawn so long enough to be fit for purpose or correct size and orientation but wrong position

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Question	Answer	Marks	Partial Marks
5(a)(i)	$\frac{14}{18}$ oe	1	
5(a)(ii)	17.5	4	M3 for $\frac{1}{2}(10+24)18+22\times 24 - 134 = 40v$ oe or M2 for $\frac{1}{2}(10+24)18+22\times 24$ oe or B2 for [distance covered by bus =] 700 or M1 for correct method for any partial area for the car or for 40v
5(b)	92.8 or $92\frac{4}{5}$	3	M1 for $\frac{\text{figs}162[4]}{\text{their}10\text{ min }30\text{sec}}$ oe M1 for correct conversion to km/h, e.g. $\times \frac{60}{1000}$

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Question	Answer	Marks	Partial Marks
6(a)	-1.5 or $-1\frac{1}{2}$ or $-\frac{3}{2}$	2	M1 for $4x = 9 - 15$ or $x + \frac{15}{4} = \frac{9}{4}$
6(b)	$(a - 3)(a + 3)$ final answer	1	
6(c)	$\frac{8c}{3d}$ final answer	3	B2 for $\frac{8ac}{3ad}$ or $\frac{40c}{15d}$ or $\frac{4}{1} \times \frac{2c}{3d}$ seen or for correct answer seen then spoiled or M1 for $\frac{4a}{5} \times \frac{10c}{3ad}$ or $\frac{8ac}{10c} \div \frac{3ad}{10c}$ oe
6(d)	$n + 1$ final answer	2	M1 for 5×5^n or 5^{n+1} seen
6(e)	$(2x - 1)(2x + 5) [= 0]$ oe	B2	M1 for $2x(2x + 5) - [1](2x + 5) [= 0]$ or $2x(2x - 1) + 5(2x - 1) [= 0]$ or for $(2x + m)(2x + n) [= 0]$ with and $mn = -5$ or $n + m = 4$
	$\frac{1}{2}$ or 0.5 and -2.5 or $-2\frac{1}{2}$ or $-\frac{5}{2}$	B1	
6(f)(i)	7	3	M1 for $y = k(x + 3)^3$ or better M1 for $108 = \text{their } k(x + 3)^3$
6(f)(ii)	4	2	M1 for $\left(\frac{1}{2}\right)^2$ oe or $\frac{k}{\frac{1}{4}d^2}$ oe seen or better

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Question	Answer	Marks	Partial Marks
6(g)	$2x^3 + 7x^2 - 9$ final answer	3	B2 for correct expansion unsimplified or for simplified 4 term expression of correct form with 3 terms correct or B1 for one pair of brackets expanded with at least 3 terms out of 4 correct
6(h)	$6x + 4$	2	B1 for $6x$ or 4 or $6x + 4$ with one extra term seen

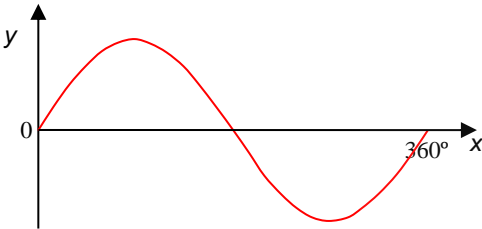
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Question	Answer	Marks	Partial Marks
7(a)(i)	52.[0] or 52.01...	4	M2 for $[\cos P =] \frac{39.4^2 + 46.5^2 - 38.2^2}{2 \times 39.4 \times 46.5}$ oe or M1 for $38.2^2 = 39.4^2 + 46.5^2 - 2 \times 39.4 \times 46.5 \times \cos P$ oe A1 for 0.616 or 0.6155...
7(a)(ii)	36.6 or 36.64 to 36.65	3	M2 for $\frac{d}{46.5} = \sin(\text{their } 52.01)$ oe or M1 for recognition that the line from Q is perpendicular to PR
7(b)(i)	41.[0] or 41.01... nfw	3	M2 for $29^2 + 21^2 + 20^2$ oe or better or M1 for $29^2 + 21^2$ oe or $29^2 + 20^2$ oe or $21^2 + 20^2$ oe or better
7(b)(ii)	29.2 or 29.18 to 29.2	3	M2 for $\sin[GAC] = \frac{20}{\text{their } AG}$ oe or M1 for angle GAC identified
7(c)	bearing 286	B2	B1 for angle $MLK = 49$ or for angle $MKL = 35$ correctly identified or angle from North to $ML = 106$
	distance 64.6 or 64.59...	B3	M2 for $\frac{112 \times \sin(\text{their } 35)}{\sin(96)}$ oe or M1 for the implicit form

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Question	Answer	Marks	Partial Marks
8(a)	(22, 11)	2	B1 for each value
8(b)	$\frac{\text{their } 11 - 3}{\text{their } 22 - 2}$ oe or better	M1	
	$-\frac{1}{\text{their } m}$	M1	
	Substitution of (12, 7) into $y = (\text{their } m)x + c$	M1	Accept $y - 7 = \text{their } m(x - 12)$ oe
	leading to $2y + 5x = 74$ final answer	A1	Without error or omission
8(c)	32	1	
8(d)	145	2	M1 for $\frac{1}{2} \times (\text{their } 32 - 3) \times 10$ oe or $\frac{1}{2} \times \sqrt{(7 - 3)^2 + (12 - 2)^2} \times \sqrt{(\text{their } 32 - 7)^2 + (2 - 12)^2}$ oe

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Question	Answer	Marks	Partial Marks
9(a)	Correct sketch to go through (0, 0), and (360, 0) 	2	M1 for correct sine curve shape through the origin or for almost correct sketch fitting all tramlines but with an omission at either end or incorrect curvature in one place only
9(b)	233.1 or 233.13... and 306.9 or 306.86 to 306.87	3	B2 for one correct angle or M1 for $\sin x = -0.8$ oe If 0 scored SC1 for 2 reflex angles that add to 540 or two non-reflex angles that add to 180
10(a)	42.05 final answer	2	M1 for $11.4 + 0.05$ oe or $14.8 + 0.05$ oe or $15.7 + 0.05$ oe
10(b)	319 or 318.5 to 318.6	2	M1 for $\frac{150}{360} \times \pi \times 15.6^2$ oe
10(c)	$\frac{360-x}{360} \times 2\pi r + 2r = 3 \left(\frac{x}{360} \times 2\pi r + 2r \right)$ oe	M2	M1 for $\frac{x}{360} \times 2\pi r$ oe seen or $\frac{360-x}{360} \times 2\pi r$ oe seen
	$\frac{4x}{360} \times 2\pi[r] = 2\pi[r] - 4[r]$ oe	M1	i.e. M mark for isolating and collecting terms in x
	Leading to $\frac{90(\pi-2)}{\pi}$	A1	With no errors or omissions

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Question	Answer	Marks	Partial Marks
11(a)	2.5 and -2.5 oe	3	M2 for $1681m^2 = \frac{42025}{4}$ oe or M1 for $(9m)^2 + (40m)^2$ oe
11(b)(i)(a)	c – a final answer	1	
11(b)(i)(b)	$\frac{3}{4}$ a final answer	1	
11(b)(i)(c)	c + $\frac{3}{4}$ a final answer	1	FT c + <i>their (b)(i)(b)</i> , must be a vector in terms of a and/or c in its simplest form
11(b)(ii)	a + $\frac{4}{3}$ c oe	2	B1 for $[\overrightarrow{BQ} =] \frac{1}{3} \mathbf{c}$ or $[\overrightarrow{AQ} =] \frac{4}{3} \mathbf{c}$ or M1 for a correct route or for answer a + $k\mathbf{c}$ oe, where $k > 1$



Cambridge IGCSE™

MATHEMATICS

0580/43

Paper 4 (Extended)

October/November 2022

MARK SCHEME

Maximum Mark: 130

<p>Published</p>

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- the standard of response required by a candidate as exemplified by the standardisation scripts.

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- marks are not deducted for omissions
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Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

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Maths-Specific Marking Principles

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5	Where a candidate has misread a number in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 mark for the misread.
6	Recovery within working is allowed, e.g. a notation error in the working where the following line of working makes the candidate's intent clear.

Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	60.9 or 60.86 to 60.87	1	
1(a)(ii)	375	2	M1 for $\frac{250}{12} [\times 18]$ oe
1(a)(iii)	30 nfw	3	M1 for $2200 \div 800 [\times 12]$ oe M1 for $1500 \div 600 [\times 12]$ oe
1(b)(i)	1.92	2	M1 for $k \times \left(1 + \frac{25}{100}\right) = 2.4[0]$ oe or better
1(b)(ii)	43.75 or $43\frac{3}{4}$	3	M2 for $\left(\left(1 + \frac{25}{100}\right) \times \left(1 + \frac{15}{100}\right) [-1]\right) [\times 100]$ oe or $\left(1 + \frac{25}{100}\right) \times \left(1 + \frac{15}{100}\right) \times 100 [-100]$ or for $\frac{2.40 \times \left(1 + \frac{15}{100}\right)}{\text{their(b)(i)}} \times 100 [-100]$ oe or M1 for $2.40 \times \left(1 + \frac{15}{100}\right)$ or $\left(1 + \frac{25}{100}\right) \times \left(1 + \frac{15}{100}\right)$ oe
1(c)	18 nfw	3	M2 for $\frac{200 \text{ to } 210}{11.5 - 0.25}$ or $\frac{200 + 5}{11 \text{ to } 11.5}$ oe or M1 for $200 + 5$, $200 - 5$, $11.5 + 0.25$ or $11.5 - 0.25$

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Question	Answer	Marks	Partial Marks
2(a)(i)	p^{14} final answer	1	
2(a)(ii)	$6m^4$ final answer	2	B1 for $6m^k$ or km^4 in final answer or correct answer seen and spoilt
2(a)(iii)	$\frac{4}{3x^3y^9}$ or $\frac{4x^{-3}y^{-9}}{3}$ final answer	3	B2 for correct answer seen and spoilt or 2 correct elements in final answer or B1 for one of $\frac{4}{3}$ or $\frac{3}{4}$ oe or x^3 or y^9 seen
2(b)	3, 12, 27	2	B1 for 12 or 27
2(c)(i)	$3n + 10$ oe final answer	2	B1 for $3n + k$ oe or $jn + 10$ oe ($j \neq 0$) or for correct expression shown in working and then spoilt
2(c)(ii)	$2n^3 + 1$ oe final answer	2	B1 for 3rd diff = 12 (both needed) or for cubic answer or for correct expression shown in working and then spoilt
2(d)	38	3	M2 for $3x = 4 \times 23 + 22$ or M1 for $3x - 22 = 4 \times 23$ or for $\frac{3x}{4} = 23 + \frac{22}{4}$ oe
2(e)	$\frac{-8 \pm \sqrt{8^2 - 4(3)(-20)}}{2 \times 3}$ or $\frac{-8}{2 \times 3} \pm \sqrt{\frac{8^2}{4 \times 3^2} - \frac{(-20)}{3}}$ or better	B2	B1 for $\sqrt{8^2 - 4(3)(-20)}$ oe or $\frac{-8 + \sqrt{q}}{2 \times 3}$ oe or $\frac{-8 - \sqrt{q}}{2 \times 3}$ oe or both
	– 4.24, 1.57 final answers	B2	B1 for each If B0 , SC1 for answers – 4.2 or –4.23 or –4.240 to – 4.239 and 1.6 or 1.572 to 1.573 or – 4.24 and 1.57 seen in working or for –1.57 and 4.24 as final answer

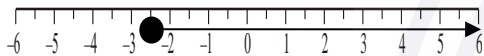
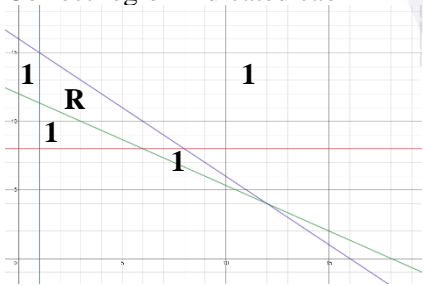
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Question	Answer	Marks	Partial Marks
3(a)	Correct histogram	3	B1 for each correct block If 0 scored, SC1 for two of $\frac{28}{15}$, $\frac{33}{20}$, $\frac{13}{10}$ or 1.87 or 1.866 to 1.867, 1.65, 1.3
3(b)	38.65	4	M1 for 12.5, 20, 32.5, 50, 65 soi M1 for $\sum fx$ where x is in the correct interval including boundaries M1dep for $\sum fx \div 100$
4(a)	Triangle drawn at (1, – 5), (1, – 7), (5, – 5)	2	B1 for reflection in any horizontal line If 0 scored, SC1 for reflection in $x = -2$
4(b)	Triangle drawn at (– 2, 0), (– 2, – 1), (0, – 1)	2	B1 for correct size and orientation but wrong position
4(c)	Rotation 90 [anticlockwise] oe [centre] (– 1, 0)	3	B1 for each

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Question	Answer	Marks	Partial Marks
5(a)	$\left(\frac{(36+50) \times 40}{2}\right) \times 120$ oe or $\left(\frac{(0.36+0.5) \times 0.4}{2}\right) \times 1.2$ oe	M2	M1 for $\frac{(36+50) \times 40}{2}$ oe or $\frac{(0.36+0.5) \times 0.4}{2}$ oe
	206400 ÷ 1000 = 206.4 or 0.2064 × 1000 = 206.4 nfw	A1	Must see an explicit conversion
5(b)	5 [minutes] 44 seconds	3	B2 for 344 [seconds] oe 5.73...[mins] or M1 for figs 206.4 ÷ figs 6 oe
5(c)(i)	28[.0] or 27.96 to 27.97	3	M2 for $[r^2 =] \frac{\text{figs } 2064}{(\text{figs } 84)\pi}$ or M1 for $\pi r^2 \times \text{figs } 84 = \text{figs } 2064$
5(c)(ii)	140 cao	2	M1 for $0.6h = 84$ oe ALT method M1 for $\pi \times (\text{their (c)(i)})^2 \times h = \text{figs } 206400 \div 0.6$ oe
5(d)	128 or 127.7 to 127.8	4	B3 for $40^2 + 120^2 + 18^2$ oe OR B1 for horizontal length 18 soi M1 for any correct attempt at 2-dimensional Pythagoras' $18^2 + 120^2$, $120^2 + 40^2$, $18^2 + 40^2$

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Question	Answer	Marks	Partial Marks
6(a)(i)	38	2	M1 for $5 \times 3^2 - 7$ oe
6(a)(ii)	$[\pm]\sqrt{\frac{P+7}{5}}$ oe final answer	3	M1 for $P + 7 = 5k^2$ or $\frac{P}{5} = k^2 - \frac{7}{5}$ M1 for $k^2 = \dots\dots$ FT <i>their</i> first step M1 for square root to final answer Max M2 for incorrect answer
6(b)(i)	$x \geq -2.5$ final answer	2	M1 for $-4x \leq 7 + 3$ or better
6(b)(ii)		1	FT <i>their</i> inequality in (b)(i)
6(c)(i)	$x = 2$ broken line	B1	
	$y = 32 - x$ solid line	B1	
	$2x + 3y = 72$ solid line	B2	B1 for line passing through (0, 24) or (36, 0)
	Correct region indicated cao 	B2	B1 for region satisfying 3 of the inequalities
6(c)(ii)	(16, 16)	2	M1 for substitution into $2x + y$ for any integer point in <i>their</i> region

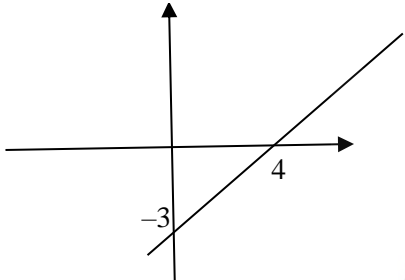
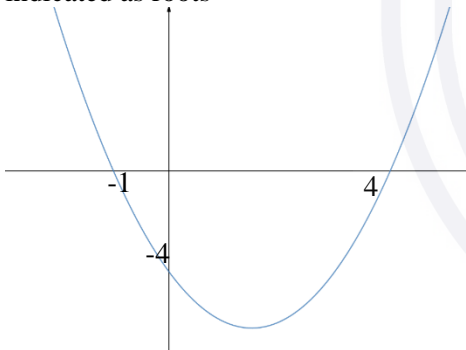
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Question	Answer	Marks	Partial Marks
7(a)(i)	$\frac{1}{15}$ oe	3	<p>M2 for $2 \times \frac{1}{6} \times \frac{1}{5}$ oe</p> <p>or M1 for $\frac{1}{6} \times \frac{1}{5}$ oe</p> <p>or list or indication of 2 correct pairs</p> <p>If 0 scored, SC1 for answer $\frac{1}{18}$ oe</p>
7(a)(ii)	$\frac{7}{15}$ oe	3	<p>M2 for $\left(\frac{4}{6} \times \frac{3}{5}\right) + 2\left(\frac{1}{6} \times \frac{1}{5}\right)$ oe or $14\left(\frac{1}{6} \times \frac{1}{5}\right)$ oe</p> <p>or $1 - 2\left(\frac{2}{6} \times \frac{4}{5}\right)$</p> <p>or M1 for $\left(\frac{4}{6} \times \frac{3}{5}\right)$ or $2\left(\frac{1}{6} \times \frac{1}{5}\right)$ oe or $2\left(\frac{2}{6} \times \frac{4}{5}\right)$</p> <p>or correct identification of 14 pairs</p> <p>If 0 scored, SC1 for answer $\frac{5}{9}$</p>
7(b)	$\frac{1}{10}$ oe nfw	4	<p>M3 for $6\left(\frac{1}{6} \times \frac{1}{5} \times \frac{1}{4}\right) + 6\left(\frac{1}{6} \times \frac{1}{5} \times \frac{1}{4}\right)$ oe</p> <p>or M2 for $6\left(\frac{1}{6} \times \frac{1}{5} \times \frac{1}{4}\right)$ oe or $2\left(\frac{1}{6} \times \frac{1}{5} \times \frac{1}{4}\right)$ oe</p> <p>or M1 for $k\left(\frac{1}{6} \times \frac{1}{5} \times \frac{1}{4}\right)$ where k is an integer and $1 \leq k \leq 12$ but not $k = 2$ or $k = 6$</p> <p>or identifies $-2, 2$ and 5 or $-3, 3$ and 5 as the 3 cards needed</p> <p>If 0 scored, SC1 for answer $\frac{1}{18}$</p>

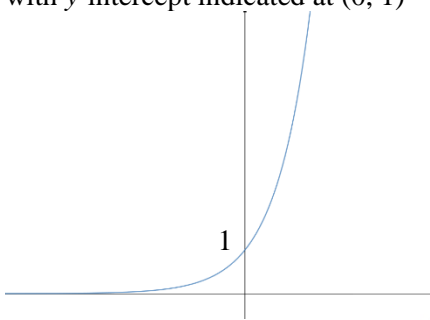
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Question	Answer	Marks	Partial Marks
8(a)	$[\cos B =] \frac{9.5^2 + 7.7^2 - 10^2}{2 \times 9.5 \times 7.7}$ oe	M2	M1 for $10^2 = 9.5^2 + 7.7^2 - 2 \times 9.5 \times 7.7 \cos B$ oe or better
	70.206 to 70.207 or 70.21 to 70.22	A2	A1 for $\frac{2477}{7315}$ oe or 0.339 or 0.3386....
8(b)(i)	140.4	1	
8(b)(ii)	19.8	1	FT $(180 - \text{their (b)(i)}) \div 2$
8(b)(iii)	70.2	1	FT $90 - \text{their (b)(ii)}$
8(c)	5.31 or 5.314 to 5.315	3	M2 for $\frac{5}{\cos \text{their (b)(ii)}}$ oe or M1 for $\frac{5}{r} = \cos(\text{their (b)(ii)})$ oe
8(d)	38.8 or 38.9 or 38.78 to 38.85	4	M3 for $\frac{0.5 \times 9.5 \times 7.7 \times \sin 70.2}{\pi \times (\text{their (c)})^2} [\times 100]$ OR M1 for $0.5 \times 9.5 \times 7.7 \times \sin 70.2$ M1 for $\pi \times (\text{their (c)})^2$

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Question	Answer	Marks	Partial Marks
9(a)(i)	<p>Correct sketch of $3x - 4y = 12$ with $y = -3$ and $x = 4$ indicated on axes</p> 	2	B1 for line with positive gradient
9(a)(ii)	<p>Correct sketch of $y = x^2 - 3x - 4$ with $(0, -4)$ indicated as y – intercept and $x = -1$ and $x = 4$ indicated as roots</p>  <p>Minimum in fourth quadrant, not at $x = 0$</p>	4	<p>B3 for correct sketch with one value omitted or incorrect or for a poor sketch with all 3 intercepts correct.</p> <p>or B2 for roots $x = -1$ and $x = 4$ soi with no extra roots or for correct shape with $y = -4$ indicated or B1 for correct shape or for $(x - 4)(x + 1)$ shown or for incorrect sketch with $(0, -4)$ indicated as y – intercept</p>

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Question	Answer	Marks	Partial Marks
9(a)(iii)	Correct sketch of $y = 6^x$ with y-intercept indicated at (0, 1) 	2	B1 for increasing exponential graph seen on both sides of the y-axis.
9(b)(i)	$8 - 4x^2$ [+ 0]	2	B1 for two terms correct and one extra incorrect term or for one of two terms correct or for correct answer seen and spoilt
9(b)(ii)	4	2	M1 for substitution of $x = -1$ into <i>their</i> (b)(i)
9(b)(iii)	(3, -7) and (-3, 17)	5	B4 for (3, -7) or (-3, 17) or B3 for $x = \pm 3$ or M2 for $x^2 = 9$ or $k(x - 3)(x + 3) = 0$ oe or for correct method for solving <i>their</i> (b)(i) = - 28 or M1 for <i>their</i> (b)(i) = - 28

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Question	Answer	Marks	Partial Marks
10(a)(i)	2a drawn correctly with direction arrow	1	
10(a)(ii)	a – b drawn correctly with direction arrow	2	B1 for $\begin{pmatrix} 4 \\ -3 \end{pmatrix}$ seen or implied or M1 for correctly drawing <i>their</i> a – b with an arrow
10(b)(i)(a)	$q + \frac{3}{4}p$ final answer	1	
10(b)(i)(b)	$q - \frac{1}{4}p$ final answer	2	M1 for a correct route
10(b)(i)(c)	$\frac{13}{24}p - \frac{2}{3}q$ final answer	3	M2 for $\frac{3}{8}p - \frac{2}{3}$ (<i>their (b)(i)(b)</i>) oe or for $-\frac{3}{8}p - q + p + \frac{1}{3}$ (<i>their (b)(i)(b)</i>) oe or M1 for a correct route or for $\overrightarrow{BN} = -\frac{2}{3}$ (<i>their (b)(i)(b)</i>) or $\overrightarrow{AN} = \frac{1}{3}$ (<i>their (b)(i)(b)</i>) or final answer $kp - \frac{2}{3}q$ oe or $\frac{13}{24}p - kq$ oe
10(b)(ii)	$\frac{19}{16}p$ oe final answer	2	$\overrightarrow{AG} = \frac{3}{8}p \div 2$ soi M1 for $\overrightarrow{AG} = \frac{3}{8}p \div 2$ soi or for answer kp oe



Cambridge IGCSE™

MATHEMATICS

0580/41

Paper 4 (Extended)

May/June 2022

MARK SCHEME

Maximum Mark: 130

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the May/June 2022 series for most Cambridge IGCSE, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

This document consists of **13** printed pages.

PUBLISHED**Generic Marking Principles**

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Maths-Specific Marking Principles

1	Unless a particular method has been specified in the question, full marks may be awarded for any correct method. However, if a calculation is required then no marks will be awarded for a scale drawing.
2	Unless specified in the question, answers may be given as fractions, decimals or in standard form. Ignore superfluous zeros, provided that the degree of accuracy is not affected.
3	Allow alternative conventions for notation if used consistently throughout the paper, e.g. commas being used as decimal points.
4	Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored (isw).
5	Where a candidate has misread a number in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 mark for the misread.
6	Recovery within working is allowed, e.g. a notation error in the working where the following line of working makes the candidate's intent clear.

PUBLISHED**ABBREVIATIONS IN MARK SCHEME**

Abbreviation	Meaning
M	Method marks - for a correct method applied to appropriate numbers.
A	Accuracy marks – depend on M marks. Hence M0 A1 is not possible.
B	Independent of method marks – for a correct final answer, a partially correct answer or a correct intermediate stage.
SC	Marks given in special cases only when indicated in mark scheme.
FT	Work can be followed through after an error.
isw	Ignore subsequent working (after correct answer obtained)
cao	Correct answer only
nfw	Not from wrong working
oe	Or equivalent
soi	Seen or implied
eeo	Each error or omission
dep	Dependent on the previous mark(s)

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Question	Answer										Marks	Partial Marks
1(a)(i)	1	7	7	8	8	9	9				2	B1 for one row correctly ordered or for fully correct unordered stem-and-leaf diagram or for a correct diagram with one error or omission
	2	1	1	1	1	2	3	3	4	5		
1(a)(ii)	21										1	
1(a)(iii)	23										1	
1(a)(iv)	48										2	M1 for $\frac{2}{15}[\times 360]$ or $\frac{360}{15}[\times 2]$
1(b)(i)	120										1	
1(b)(ii)	130										1	
1(b)(iii)	60										1	
1(c)(i)	93.4										4	M1 for mid-values soi M1 for Σfx M1 dep on second M for $\Sigma fx \div 200$
1(c)(ii)	19										2	M1 for $\frac{86}{50}$ or $\frac{114}{60}$

Question	Answer	Marks	Partial Marks
2(a)	42	2	M1 for $12 \div 2$ or better
2(b)(i)	5.72	2	M1 for $\frac{100-12}{100} \times 6.50$ oe or B1 for 0.88 oe
2(b)(ii)	12.5[0]	2	M1 for $\frac{100-12}{100} \times x = 11$ or better oe

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Question	Answer	Marks	Partial Marks
2(c)	4	2	M1 for $\frac{100+2.5}{100} \times [\dots] = \frac{100+6.6}{100}$ oe
2(d)(i)	72.3 or 72.31...	2	M1 for $80 \times \left(\frac{100-2}{100}\right)^5$ oe
2(d)(ii)	4 nfw	3	B2 for answer 9 nfw or M2 for correct trials with values giving either side of 67 or M1 for $80 \times \left(\frac{100-2}{100}\right)^n = 67$ or <i>their</i> $(i) \times \left(\frac{100-2}{100}\right)^k = 67$ or an evaluated trial with $n \geq 6$ or $k \geq 1$

Question	Answer	Marks	Partial Marks
3(a)(i)	6	3	B2 for $4x + 6 = 30$ or better or M1 for $x + x + 7 + 2x - 1 [= 30]$
3(a)(ii)	21	3	M2 for $(555 - \text{their } x \times 15 - \text{their } (x + 7) \times 18) \div \text{their } (2x - 1)$ or M1 for $\text{their } x \times 15$ or $\text{their } (x + 7) \times 18$
3(b)(i)	8	2	M1 for isolating the term in w or correctly removing all fractions e.g. $\frac{3w}{16} = 1 + \frac{1}{2}$ or better or $3w - 16 = 8$
3(b)(ii)	-3	2	M1 for $2^{-y} = 8$ or $2^y = \frac{1}{8}$ or $2^{-y} = \text{their } w$ or better

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Question	Answer	Marks	Partial Marks
3(c)(i)	$[p =] \frac{1}{2}$ oe $[q =] 1$	2	B1 for each If zero scored, SC1 for 2 values satisfying one of the original equations
3(c)(ii)	$[u =] 30$ and 150 $[v =] 0$ and 360	4	B1 for each OR SC1 for $\sin u = \text{their } p$ and $\cos v = \text{their } q$ SC1 if their two different angles for u sum to 180 or if their different two angles for v sum to 360

Question	Answer	Marks	Partial Marks
4(a)(i)	3	1	
4(a)(ii)	7	1	FT <i>their</i> (i) $3 \times \text{their (i)} - 2$
4(b)	$\frac{x+2}{3}$ oe final answer	2	M1 for $y + 2 = 3x$ or $\frac{y}{3} = x - \frac{2}{3}$ or $x = 3y - 2$
4(c)	25	2	M1 for $\frac{1}{x} = 5^{-2}$ oe
4(d)	$\frac{2x^2 - x - 1}{x}$ final answer	2	M1 for $2x - 1 - \frac{1}{x}$
4(e)	2.98×10^{17} or $2.980... \times 10^{17}$	1	
4(f)	625	2	M1 for $x = j(4)$

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Question	Answer	Marks	Partial Marks
5(a)(i)(a)	$\frac{(8-2) \times 180}{8 \times 2}$ oe	M2	M1 for $\frac{(8-2) \times 180}{8}$ or $\frac{360}{8}$ or $\frac{(2 \times 8 - 4) \times 90}{8}$
5(a)(i)(b)	174 or 173.8....	4	<p>M3 for $\frac{1}{2} \times 6 \times OM$ oe</p> <p>or $\frac{1}{2} \times (OA)^2 \times \sin 45$ oe</p> <p>or $\frac{1}{2} \times 6 \times OA \times \sin 67.5$ oe</p> <p>where OA and OM are as in the M2</p> <p>or M2 for $OM = 3 \times \tan 67.5$ oe</p> <p>or for $OA = \left(\frac{3}{\cos 67.5} \right)$ or $\frac{6 \times \sin 67.5}{\sin 45}$ oe</p> <p>or M1 for $\frac{OM}{3} = \tan 67.5$ oe</p> <p>or for $\frac{3}{OA} = \cos 67.5$ oe</p> <p>or for $\frac{\sin 45}{6} = \frac{\sin 67.5}{OA}$ oe</p>
5(a)(ii)	193 or 193.0 to 193.1	3	<p>M2 for $\pi \times \left(\frac{3}{\cos 67.5} \right)^2$ oe</p> <p>or M1 for $\frac{3}{r} = \cos 67.5$ or $\frac{\sin 45}{6} = \frac{\sin 67.5}{r}$</p>

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Question	Answer	Marks	Partial Marks
5(b)(i)	1.27 or 1.272 to 1.273	2	M1 for $\left[\frac{1}{2} \times \pi \times 0.45^2 \times 4\right]$ or $\frac{1}{2} \times \pi \times 0.45^2 [\times 4]$
5(b)(ii)	742 or 743	6	M5 for a method leading to the volume of water e.g. $4 \times \left\{ 2 \times \frac{\operatorname{invcos}\left(\frac{0.15}{0.45}\right)}{360} \times \pi \times 0.45^2 \right.$ $\left. - \frac{1}{2} \times 0.45^2 \times \sin\left(2 \operatorname{invcos}\left(\frac{0.15}{0.45}\right)\right) \right\}$ oe OR M2 $\left[2 \times \frac{\operatorname{invcos}\left(\frac{0.15}{0.45}\right)}{360} \times \pi \times 0.45^2 \right]$ oe or $\left[2 \times \frac{90 - \operatorname{invcos}\left(\frac{0.15}{0.45}\right)}{360} \times \pi \times 0.45^2 \right]$ oe or M1 for use of $\frac{\theta}{360} \times \pi \times 0.45^2$ oe M2 for $\frac{1}{2} \times 0.45^2 \times \sin\left(2 \operatorname{invcos}\left(\frac{0.15}{0.45}\right)\right)$ oe or $\frac{1}{2} \times 0.15 \times 0.45 \times \sin\left(\operatorname{invcos}\left(\frac{0.15}{0.45}\right)\right) [\times 2]$ oe

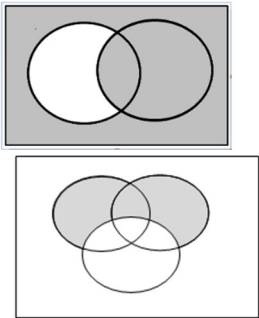
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Question	Answer	Marks	Partial Marks
5(b)(ii)			$\frac{1}{2} \times 0.45^2 \times \sin \theta$ oe or M1 for use of $[2 \times] \frac{1}{2} \times 0.15 \times 0.45 \times \sin \beta$ oe or If 0 scored, SC1 for $\cos^{-1} \left(\frac{0.15}{0.45} \right)$ or $\sin^{-1} \left(\frac{0.15}{0.45} \right)$ or $\sqrt{0.45^2 - 0.15^2}$ soi
6(a)(i)	−3	1	
6(a)(ii)	−1 1.55 to 1.6 4.4 to 4.45	3	B1 for each
6(a)(iii)	−8	1	
6(a)(iv)	Ruled line through origin intersecting curve once	2	B1 for ruled line through origin
6(b)(i)	18	3	B2 for $6x - 12$ or B1 for $6x$ or -12
6(b)(ii)	(2, −5)	2	B1 for each. If 0 scored, M1 for <i>their</i> $6x - 12 = 0$ or states $\frac{dy}{dx} = 0$
6(c)	$[p =] 7$ $[q =] 3$	2	B1 for each

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Question	Answer	Marks	Partial Marks
7(a)	39.6 or 39.57....	4	M2 for $[\cos =] \frac{14^2 + 12^2 - 9^2}{2 \times 14 \times 12}$ or M1 for $9^2 = 14^2 + 12^2 - 2 \times 14 \times 12 \times \cos ACD$ A1 for 0.7708... or 0.771 or $\frac{37}{48}$ oe
7(b)	$\frac{14 \sin 25}{\sin 123}$	M2	M1 for $\frac{\sin 123}{14} = \frac{\sin 25}{BC}$ oe
	7.054...	A1	
7(c)	3.74 or 3.735 to 3.739	3	M2 for $7.05 \times \sin 32$ or M1 for recognition that the line from B is perpendicular to AC
7(d)	11.8 or 11.83 to 11.85	4	M1 for $32 + \text{their}(a)$ soi M2 for $12^2 + 7.05^2 - 2 \times 12 \times 7.05 \times \cos(\text{their}(a) + 32)$ or M1 for $\cos(\text{their}(a) + 32) = \frac{12^2 + 7.05^2 - BD^2}{2 \times 12 \times 7.05}$
7(e)	309.6 or 309.57...	2	FT 270 + $\text{their}(a)$ M1 for $270 + \text{their}(a)$ oe

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Question	Answer	Marks	Partial Marks
8(a)(i)	$A \cap B$	1	
8(a)(ii)		2	B1 for each
8(b)(i)	$\frac{9}{11}$	1	
8(b)(ii)	$\frac{36}{121}$ oe	3	M2 for $2 \times \frac{2}{11} \times \frac{9}{11}$ oe or M1 for $\frac{2}{11} \times \frac{9}{11}$ oe If 0 scored SC1 for $\frac{36}{110}$
8(c)(i)	3, 5, 28, 14 correctly placed	2	B1 for 28 in the intersection
8(c)(ii)	$\frac{28}{50}$ oe	1	FT <i>their</i> 28 where <i>their</i> 28 < 50
8(c)(iii)	$\frac{123}{175}$ oe	2	M1 for $\frac{42}{50} \times \frac{41}{49}$
8(c)(iv)	$\frac{63}{88}$ oe	2	FT <i>their</i> 28 M1 for $\frac{\text{their}28}{33} \times \frac{\text{their}28-1}{32}$

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Question	Answer	Marks	Partial Marks
9(a)	$x^2 - x - 30 [= 0]$	B3	M1 for $(2x+1)(x-1) - x^2 = 29$ oe B1 for $(2x+1)(x-1) = 2x^2 - 2x + x - 1$ oe soi
	$(x-6)(x+5)$ oe	M1	or correct factors for <i>their</i> 3 term quadratic equation or for correct substitution into quadratic formula or correctly completing the square for <i>their</i> 3 term quadratic equation
	$x = 6$ cao	B1	
	12 or $2 \times$ <i>their</i> x evaluated or $k = 2x$ stated	B1 FT	
9(b)(i)	$(y+1)^3 - y^3 = 5$ oe	M1	
	$(y+1)^3 = y^3 + 3y^2 + 3y + 1$ soi	B2	B1 for $(y+1)^2 = y^2 + y + y + 1$ oe soi
	Completion to $3y^2 + 3y - 4 = 0$	A1	With no errors or omissions
9(b)(ii)	$\frac{-3 \pm \sqrt{3^2 - 4(3)(-4)}}{2 \times 3}$	B2	or B1 for $\sqrt{3^2 - 4(3)(-4)}$ or for $\frac{-3 + \sqrt{\dots}}{2 \times 3}$ or $\frac{-3 - \sqrt{\dots}}{2 \times 3}$
	0.44	B2	B1 for 0.758 or 0.7583...



Cambridge IGCSE™

MATHEMATICS

0580/42

Paper 4 (Extended)

May/June 2022

MARK SCHEME

Maximum Mark: 130

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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Cambridge International is publishing the mark schemes for the May/June 2022 series for most Cambridge IGCSE, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

This document consists of **9** printed pages.

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Maths-Specific Marking Principles	
1	Unless a particular method has been specified in the question, full marks may be awarded for any correct method. However, if a calculation is required then no marks will be awarded for a scale drawing.
2	Unless specified in the question, answers may be given as fractions, decimals or in standard form. Ignore superfluous zeros, provided that the degree of accuracy is not affected.
3	Allow alternative conventions for notation if used consistently throughout the paper, e.g. commas being used as decimal points.
4	Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored (isw).
5	Where a candidate has misread a number in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 mark for the misread.
6	Recovery within working is allowed, e.g. a notation error in the working where the following line of working makes the candidate's intent clear.

Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

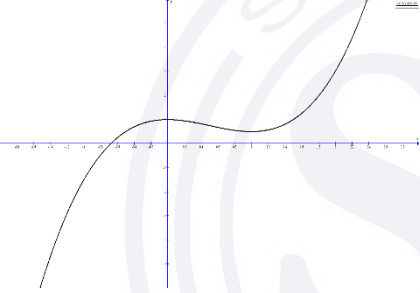
Question	Answer	Marks	Partial Marks
1(a)	150	2	B1 for answer $150k$ or M1 for prime factors of 30 or 75 seen or a list of multiples of both 30 and 75 with at least 3 of each or for $\frac{30 \times 75}{15}$ oe or for answer $2 \times 3 \times 5^2$
1(b)	152 190 266	3	Accept in any order B2 for two correct answers or M1 for $\frac{608}{4+5+7} \times k$ oe where $k=1, 4, 5, 7$
1(c)	2.61×10^{-2} 2.61×10^{-2} or $2.608... \times 10^{-2}$	2	B1 for figs 2608 or 261 seen If 0 scored, SC1 for answer $2.6[0] \times 10^{-2}$ without more accurate value in standard form seen
1(d)	$\frac{27}{99}$ oe fraction	1	
1(e)	2.8	1	
	g/cm^3 or g cm^{-3}	1	
2(a)	$PQR = 90$ angle in semi-circle	B1	
	$PRQ = 61$ angle sum of triangle [= 180]	B1	
	$PSQ = 61$ angle in same segment	B1	If 0 scored SC1 for $PSQ = PRQ [= 61]$ soi
2(b)	57	4	B1 for $ABT = 98$ B1 for TAB or $ATB = 41$ B1 for $BTC = 41$ or $TBC = 82$ or $ATC = 82$ soi
3(a)	8.25 or 8.246...	3	M2 for $(3 - -5)^2 + (2 - 4)^2$ oe or better or M1 for $(3 - -5)$ and $(2 - 4)$ oe seen
3(b)	$[y =] 4x + 7$	5	B1 for [midpoint] $(-1, 3)$ soi M1 for [gradient of $l =$] $\frac{4-2}{-5-3}$ oe M1 for gradient -1 / <i>their</i> $\left(-\frac{1}{4}\right)$ M1dep on at least M1 for <i>their</i> $(-1, 3)$ substituted into $y = \text{their } m \times x + c$ oe

Question	Answer	Marks	Partial Marks
3(c)	(0, – 8) and (0, 16)	4	<p>B3 for (0, –8) or (0, 16) or for –8 and 16 OR B2 for distance = $[\pm]12$ soi or M1 for $13^2 - (5[-0])^2$ oe B1 for both answers (0, k), $k \neq 0$ or 4</p> <p>ALT METHOD B3 for (0, –8) or (0, 16) or for –8 and 16 OR M2 for $y^2 - 8y - 128 [= 0]$ or for $(y - 4)^2 = 144$ or better or M1 for $13^2 = (-5 - 0)^2 + (4 - y)^2$ oe B1 for both answers (0, k), $k \neq 0$ or 4</p>
4(a)	7.06 or 7.058... or 7.059	3	<p>M2 for $\sqrt{6.4^2 + 10.9^2 - 2 \times 6.4 \times 10.9 \times \cos 38}$ oe OR M1 for $6.4^2 + 10.9^2 - 2 \times 6.4 \times 10.9 \times \cos 38$ oe A1 = 49.8...</p>
4(b)(i)	97	1	
4(b)(ii)	15.3[0...]	3	<p>M2 for $[AB =] \frac{10.9 \times \sin \text{their } 97}{\sin 45}$ or M1 for $\frac{\sin \text{their } 97}{AB} = \frac{\sin 45}{10.9}$ oe</p>
4(c)	72.8 to 72.81...	3	<p>M2 for $\frac{1}{2}(6.4) \times 10.9 \times \sin 38 + \frac{1}{2} \text{their } 15.3 \times 10.9 \times \sin 38$ oe or M1 for $\frac{1}{2} \times 6.4 \times 10.9 \times \sin 38$ oe or $\frac{1}{2} \times \text{their } 15.3 \times 10.9 \times \sin 38$ oe or M1 for height = $10.9 \times \sin 38$ oe</p>
5(a)	Correct lines drawn	2	B1 for one correct with no incorrect lines
5(b)(i)(a)	Translation or translate $\begin{pmatrix} -1 \\ 4 \end{pmatrix}$ oe	2	B1 for each
5(b)(i)(b)	Rotation or rotate 90 [anticlockwise] oe [centre] (2, 1)	3	B1 for each
5(b)(ii)(a)	Triangle at (– 5, 6) (– 2, 6) (– 2, 5)	2	B1 for reflection in $y = k$

Question	Answer	Marks	Partial Marks
5(b)(ii)(b)	Triangle at (1, 5) (1, 7) (7, 7)	2	B1 for correct size and orientation, wrong position
6(a)	42 028	2	M1 for $\frac{380}{500}$ oe soi isw
6(b)	$\frac{47}{66}$ oe	4	0.712[1...] M3 for $2\left(\frac{5}{12} \times \frac{4}{11}\right) + 2\left(\frac{4}{12} \times \frac{3}{11}\right) + 2\left(\frac{5}{12} \times \frac{3}{11}\right)$ oe or $1 - \left(\frac{5}{12} \times \frac{4}{11} + \frac{4}{12} \times \frac{3}{11} + \frac{3}{12} \times \frac{2}{11}\right)$ oe or M2 for sum of 3 or more correct product pairs and no incorrect pairs or for $\frac{5}{12} \times \frac{4}{11} + \frac{4}{12} \times \frac{3}{11} + \frac{3}{12} \times \frac{2}{11}$ and no other pairs or M1 for $\frac{k}{12} \times \frac{j}{11}$ seen If 0 scored SC1 for answer $\frac{94}{144}$ oe
6(c)	52	2	M1 for $x \times \frac{100-16}{100} = 43.68$ oe or better
6(d)(i)	70 or 70.16[5...] or 70.17 or 70.2	3	M2 for $\frac{29750 \text{ to } 29800}{400+25}$ or $\frac{29750 \text{ to } 29800}{400+24}$ or $\frac{29800-50}{400 \text{ to } 425}$ or B1 for 29 750 or 29 850 or 29 849 or 375 or 425 or 424 seen
6(d)(ii)	2399 or 2400 nfw	2	B1 for 27 450 or 27 550 or 27 549 or 29 850 or 29 849 seen
7(a)	25.2 or 25.23...	4	M1 for midpoints soi M1 for use of $\sum fx$ with x in correct interval including both boundaries M1 (dep on 2 nd M1) for $\sum fx \div 150$
7(b)	5 correct blocks	4	B3 for 4 correct blocks or B2 for 3 correct blocks or B1 for 2 correct blocks or block widths 10, 10, 5, 15, 10 If 0 scored SC1 for 4 correct frequency densities from 1.2, 3.8, 6.4, 3.33[3...] and 1.8 oe soi
7(c)(i)	12, 50, 82, 132, 150	2	B1 for 3 or 4 correct

Question	Answer	Marks	Partial Marks
7(c)(ii)	92	2	M1 for $150 - 12$ oe seen If 0 scored, SC1 for answer 8[%]
8(a)	$\frac{1}{2}$ or 0.5 oe	2	M1 for $10 - 3 = 11p + 3p$ oe or better
8(b)	$[m =] \frac{2k}{c^2 - g}$ oe final answer	3	M1 for correctly isolating m terms M1 for correctly factorising M1 for dividing by a bracket with two terms to the final answer Maximum mark M2 if final answer incorrect
8(c)	0 4.5 oe	5	B4 for $2x^2 - 9x [= 0]$ or $9x - 2x^2 [= 0]$ or better OR M2 for $(2x + 3) + 4(x - 3) = (x - 3)(2x + 3)$ or better or M1 for $(2x + 3) + 4(x - 3)$ seen oe or common denominator $(x - 3)(2x + 3)$ oe B1 for $2x^2 - 6x + 3x - 9$ or better seen
8(d)	$y^2 - 10y + 21 [= 0]$ or $x^2 - 4x - 12 [= 0]$	M2	M1 for $y^2 + 5(12 - 2y) = 39$ oe or $5x + \frac{(12 - x)^2}{2^2} = 39$ seen oe
	$(y - 3)(y - 7) [= 0]$ or $(x + 2)(x - 6) [= 0]$	M1	or for correct factors for <i>their</i> 3-term quadratic equation or for correct substitution into quadratic formula or correctly completing the square for <i>their</i> 3-term quadratic equation
	$x = -2$ $y = 7$ $x = 6$ $y = 3$	B2	B1 for $x = -2, x = 6$ or for $y = 7, y = 3$ or for one correct pair of x and y values
8(e)	$2x^3 + x^2 - 54x + 72$ final answer	3	B2 correct expansion of three brackets unsimplified or for final answer of correct form with 3 out of 4 terms correct or B1 correct expansion of two brackets with at least three terms out of four correct
9(a)	$PMR = MSR = \text{right angle[s]} \text{ or } 90^\circ$	B1	
	$PRM = MRS$ same angle	B1	
	AAA oe OR $MPR = SMR$ 3rd angle of triangle	B1	Dep on B1B1 and no errors seen

Question	Answer	Marks	Partial Marks
9(b)(i)	5.5	2	M1 for $\frac{x}{4.5} = \frac{9.9}{8.1}$ oe
9(b)(ii)	16.7 or 16.73 to 16.74	2	M1 for $25 \times \left(\frac{8.1}{9.9}\right)^2$ oe or $25 \times \left(\frac{4.5}{\text{their } 5.5}\right)^2$ oe
10(a)	1, 2, 3	2	M1 for $15 - 8 > 5n - 3n$ oe If 0 scored, B1 for 2 correct answers and no others or 3 correct answers with one extra value
10(b)(i)	$10y + 8x \leq 80$ oe final answer $x > 4$ oe final answer $2y > x - 4$ oe final answer	3	B1 for each If 0 scored, SC1 for $10y + 8x < 80$ oe final answer and $x \geq 4$ oe final answer and $2y \geq x - 4$ oe final answer
10(b)(ii)	23 final answer	2	M1 for 7 and 2 selected soi
11(a)(i)	4.455 to 4.456... [= 4.46]	2	M1 for $[r =] \frac{28}{2\pi}$ oe
11(a)(ii)	1250 or 1247 to 1249.9...	2	M1 for $20 \times \pi \times 4.46^2$ oe
11(a)(iii)	66[.0] or 65.95 to 66.02	3	M2 for $[\tan] = \frac{20}{2 \times 4.46}$ oe or B1 for identifying angle ANB on cylinder not on rectangle
11(b)	11.8 or 11.82 to 11.83	5	M2 for $[r =] \sqrt[3]{\frac{310 \times 3}{2\pi}}$ oe or $[h =] \sqrt[3]{\frac{310 \times 3 \times 4}{\pi}}$ oe or M1 for $310 = \frac{1}{3}\pi \times r^2 \times 2r$ or $310 = \frac{1}{3}\pi \left(\frac{h}{2}\right)^2 h$ M2 for $\sqrt{(\text{their } r)^2 + (2 \times \text{their } r)^2}$ oe or M1 for $[l^2 =](\text{their } r)^2 + (2 \times \text{their } r)^2$ oe

Question	Answer	Marks	Partial Marks
12(a)	$3x^2 - 2kx$	M2	M1 for $3x^2$ or $-2kx$
	<i>their</i> $\frac{dy}{dx} = 6$	M1	Dep on at least M1 for derivative
	$x = 2$ substituted in <i>their</i> $\frac{dy}{dx}$	M1	Dep on at least M1 for derivative
	Correct working leading to 1.5 oe	A1	A0 if any errors in working leading to 1.5
12(b)	(0, 1) (1, 0.5)	4	B3 for $x = 0$ and $x = 1$ or for (1, 0.5) OR M1 for <i>their</i> $\frac{dy}{dx} = 0$ B1 for $3x^2 - 3x$ oe or better
12(c)	correct sketch 	2	with max on positive y-axis and min in 1st quadrant B1 for positive cubic or for graph with one max which is on pos y-axis and one min which is in 1st quadrant



Cambridge IGCSE™

MATHEMATICS

0580/43

Paper 4 (Extended)

May/June 2022

MARK SCHEME

Maximum Mark: 130

Published

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Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

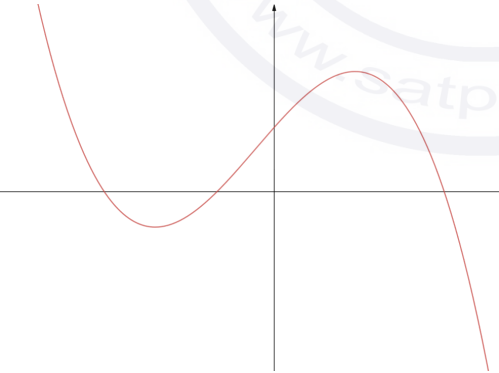
Question	Answer	Marks	Partial Marks
1(a)	10 07	1	
1(b)	123	2	M1 for $10\ 30 - 8\ 27$ soi or $10\ 30 - 8\ 52 + 25$ soi or $25 + 50 + 48$
1(c)	$25.2, 25\frac{1}{5}$	2	M1 for figs $29.4 \div 70$ [$\times 60$] oe
1(d)	\$142.1[0] cao	4	M2 for [adults =] $56 \div 8 \times 5$ and [child =] $56 \div 8 \times 3$ or better or M1 for $56 \div (5 + 3) \times k$ where $k = 1, 3$ or 5 M1 for <i>their</i> $35 \times 2.80 + \text{their } 21 \times 2.80 \times \frac{3}{4}$ oe
2(a)(i)	Triangle drawn at (2, -1), (2, -4), (3, -4)	2	B1 for two correct points If 0 scored, SC1 for reflection of triangle <i>T</i> in $y = -x$
2(a)(ii)	Triangle drawn at (-5, 6), (-2, 5), (-5, 5)	2	B1 for translation by $\begin{pmatrix} -1 \\ k \end{pmatrix}$ or by $\begin{pmatrix} k \\ 3 \end{pmatrix}$ If 0 scored SC1 for triangle drawn at (-4.5, 3.5), (-4.5, 4.5) and (-1.5, 3.5)
2(a)(iii)	Enlargement [SF] - 1.5 oe [centre] (0, 3)	3	B1 for each
2(b)	$28.8, 28\frac{8}{10}, 28\frac{4}{5}$	2	M1 for 1.2^2 oe
3(a)(i)(a)	187 or 186.7 to 186.8 or $186\frac{42}{53}$	1	
3(a)(i)(b)	2 : 7 : 42 cao	2	B1 for 106 : 371 : 2226 or any equivalent ratio If 0 scored, SC1 for 2 : 7 : 42 in the wrong order
3(a)(ii)	33.3 or 33.28 to 33.29	2	M1 for $\frac{2967 - 2226}{2226} [\times 100]$ oe or $\frac{2967}{2226} \times 100 [-100]$ oe

Question	Answer	Marks	Partial Marks
3(a)(iii)	1706 cao nfw	3	B2 for 1705 to 1706.0... or 1710 or M1 for $\left(1 + \frac{30.48}{100}\right)x = 2226$ oe or better If 0 or M1 scored, SC1 for rounding <i>their</i> decimal answer seen to nearest integer
3(b)	3897	5	B1 for $a = 2000$ M2 for $[b =] \sqrt[3]{\frac{2662}{2000}}$ or M1 for $2662 = 2000b^3$ M1 for <i>their</i> $2000 \times \left(\sqrt[3]{\frac{2662}{\text{their } 2000}}\right)^7$ or for <i>their</i> $a \times (\text{their } b)^7$ provided <i>their a</i> and <i>their b</i> are clearly identified in the working If 0 or M1 scored, SC1 for rounding <i>their</i> decimal answer seen to nearest integer.
4(a)	$\frac{(12-2) \times 180}{12} [= 150]$ oe or $180 - \frac{360}{12} [= 150]$	1	Accept $\frac{(2 \times 12 - 4) \times 90}{12} [= 150]$
4(b)(i)	$\frac{3}{\cos 75}$ oe or $\frac{6 \sin 75}{\sin 30}$	M2	M1 for $\frac{3}{AO} = \cos 75$ oe or $\frac{r}{\sin 75} = \frac{6}{\sin 30}$
	11.59...	A1	
4(b)(ii)(a)	72.8 or 72.9 or 72.82 to 72.89...	2	M1 for $2 \times \pi \times 11.6$
4(b)(ii)(b)	12.1 or 12.06 to 12.08	2	M1 for $[6 +] \text{their (b)(ii)(a)} \div 12$ oe
4(c)	806 or 807 or 805.9 to 807.4	3	B2 for 402.9... to 403.7 OR M2 for $\frac{1}{2} \times 6 \times 11.6 \times \sin 75 \times 12 \times 2$ oe or M1 for $\frac{1}{2} \times 6 \times 11.6 \times \sin 75 [\times k]$ oe
5(a)(i)	$20 < t \leq 35$	1	

Question	Answer	Marks	Partial Marks
5(a)(ii)	28 nfw	4	M1 for midpoints soi M1 for use of $\sum fm$ with m in correct interval including both boundaries M1 (dep on 2 nd M1) for $\sum fm \div 80$
5(b)(i)	$\frac{7}{8}$ cao	2	M1 for $\frac{18+28+24}{80}$ oe
5(b)(ii)	$\frac{25}{126}$ oe	3	M2 for $[2 \times] \left(\frac{3}{28} \times \frac{25}{27} \right)$ or $[2 \times] \left(\frac{25}{28} \times \frac{3}{27} \right)$ oe or M1 for either $\frac{3}{28}$ or $\frac{25}{27}$ or $\frac{25}{28}$ or $\frac{3}{27}$ If 0 scored, SC1 for answer $\frac{75}{392}$ oe
5(c)(i)	28 and 56	1	
5(c)(ii)	Correct diagram	3	B1FT <i>their</i> (c)(i) for plots at 5 correct heights B1 for 5 plots at upper ends of intervals on correct vertical line B1FT (dep on at least B1) for increasing curve or polygon through 5 points After 0 scored, SC1FT for 4 correct points plotted
5(c)(iii)	Strict FT <i>their</i> reading at 80 th percentile for an increasing curve/polygon	2	B1 for 64 written or a mark at cf = 64 on graph or a mark on curve at $(t, 64)$
5(c)(iv)	Correct integer reading at $t = 45$	M1	FT <i>their</i> cf graph for all three marks
	$\frac{80 - (\text{their reading at } t = 45)}{80} [\times 100]$ or $\frac{(\text{their reading at } t = 45)}{80} \times 100$	M1	
	Percentage consistent with <i>their</i> reading	A1	If no working shown then SC1 for a correct percentage that follows from a correct reading from <i>their</i> graph.
6(a)	$5b - 2a$ final answer	2	B1 for $5b$ or $-2a$ in final answer or for $5b - 2a$ seen
6(b)	$6x - 23$ final answer nfw	2	M1 for $4x - 20$ or $-3 + 2x$

Question	Answer	Marks	Partial Marks
6(c)	$\frac{35-x}{2x(x-5)}$ or $\frac{35-x}{2x^2-10x}$ oe final answer nfw	3	B1 for $3(2x) - 7(x-5)$ or better isw B1 for $2x(x-5)$ as common denominator isw, allow expanded
6(d)	-5	3	M1 for $13 - 4x = 18 - 3x$ oe or $\frac{-4x}{3} + x = 6 - \frac{13}{3}$ oe M1FT for $-4x + 3x = 18 - 13$ oe or for $\frac{-x}{3} = \frac{5}{3}$
6(e)	$[x =] \frac{5p}{y+10}$ oe final answer	4	M1 for correctly clearing the x from the denominator M1 for correctly expanding the brackets or (dealing with the 5 correctly throughout) M1 for correctly isolating terms in x M1 for correctly factorising and dividing by the bracket Max 3 marks if answer is incorrect
7(a)	87.[0] or 86.98 to 86.99	3	M2 for $\sqrt{82^2 + 55^2 - 2 \times 82 \times 55 \times \cos 76}$ oe OR M1 for $82^2 + 55^2 - 2 \times 82 \times 55 \times \cos 76$ oe A1 for 7570 or 7566 to 7567
7(b)	66.1 or 66.2 or 66.13 to 66.17	3	M2 for $\frac{82 \times \sin 76}{\text{their (a)}}$ oe or M1 for $\frac{82}{\sin C} = \frac{\text{their (a)}}{\sin 76}$ oe
7(c)	13.3 or 13.30 to 13.31	3	M2 for $AG = 55 \cos 76$ oe or M1 for recognition that CG is perpendicular to AB

Question	Answer	Marks	Partial Marks
7(d)	54.1 or 54.13... and 125.9 or 125.86 to 125.87	5	B4 for 54.1 or 54.13... or 125.9 or 125.86 to 125.87 M3 for $[\sin Q =] \frac{0.5 \times 82 \times 55 \times \sin 76}{0.5 \times 90 \times 60}$ oe or M2 for $0.5 \times 82 \times 55 \times \sin 76 = 0.5 \times 60 \times 90 \times \sin Q$ oe or M1 for $0.5 \times 82 \times 55 \times \sin 76$ oe or for $0.5 \times 60 \times 90 \sin Q = \text{their area of } ABC$ If B4 not scored then SC1 for two angles seen that sum to 180 (from use of sine ratio) but not 0 and 180.
8(a)(i)	(-0.5, 1)	2	B1 for each
8(a)(ii)	$\begin{pmatrix} 7 \\ -3 \end{pmatrix}$	2	B1 for each
8(a)(iii)	7.62 or 7.615 to 7.616	2	FT <i>their (a)(ii)</i> M1 for $(\text{their } 7)^2 + (\text{their } -3)^2$ oe
8(a)(iv)	$[y =] -4x - 1$ final answer	3	B2 for answer $-4x + c$ [oe] or for correct equation in different form or for $-4x + -1$ or for $-4m - 1$ OR M1 for $\frac{-5-7}{1-2}$ oe M1 for correct substitution shown of $(-2, 7)$ or $(1, -5)$ or <i>their</i> $(-0.5, 1)$ into $y = (\text{their } m)x + c$ oe OR M1 for $7 = -2m + c$ and $-5 = m + c$ A1 for $m = -4$ and $c = -1$
8(a)(v)	$[y =] \frac{1}{4}x + \frac{11}{4}$ final answer	3	M1 for $\text{grad} = \frac{1}{4}$ oe nfwf soi, FT negative reciprocal of <i>their</i> gradient from (iv) M1 for correct substitution shown of $(5, 4)$ into $y = (\text{their } m)x + c$ oe or, if no substitution shown, $(5, 4)$ satisfies <i>their</i> final linear equation.

Question	Answer	Marks	Partial Marks
8(b)	$2x^2 + 11x - 21 [= 0]$	M2	or M1 for $8 - 5x = 2x^2 + 6x - 13$ oe or better
	$(2x - 3)(x + 7) [= 0]$ oe or $\frac{-11 \pm \sqrt{11^2 - 4 \times 2 \times (-21)}}{2 \times 2}$ or $-\frac{11}{4} \pm \sqrt{\frac{21}{2} + \left(\frac{11}{4}\right)^2}$ oe	M2	Allow correct method to solve <i>their</i> quadratic equation e.g. formula, complete the square but not for $2x^2 + 6x - 13$ M1 FT <i>their</i> equation for $2x(x + 7) - 3(x + 7) [= 0]$ or $x(2x - 3) + 7(2x - 3) [= 0]$ or $(2x + a)(x + b) [= 0]$ where $ab = -21$ or $2b + a = 11$ OR M1 for $\sqrt{11^2 - 4 \times 2 \times -21}$ or for $\frac{-11 + \sqrt{k}}{2 \times 2}$ or $\frac{-11 - \sqrt{k}}{2 \times 2}$ OR M1 for $\left(x + \frac{11}{4}\right)^2$
	$\left(\frac{3}{2}, \frac{1}{2}\right)$ and $(-7, 43)$	B2	B1 for one correct pair or for 2 correct x -values or 2 correct y -values
9(a)	Correct sketch of negative cubic crossing the x -axis at $-3, -1$ and 3 and crossing the y -axis at 9 	4	B1 for any negative cubic shape with two turning points B2 for three intercepts only with x -axis labelled at $-3, -1$ and 3 or B1 for one or two correctly labelled x -intercepts B1 for intercept with y -axis labelled at 9 If no graph drawn, SC1 for all four intercepts labelled on axes.
9(b)(i)	$3 - x + 3x - x^2$ or better or $3 + x + 3x + x^2$ or better or $9[-3x + 3x] - x^2$	M1	At least 3 of the four terms correct or for the correct expansion of all three brackets with all 8 terms correct
	Correct completion to $[y =] 9 + 9x - x^2 - x^3$	A1	with no errors or omissions seen

Question	Answer	Marks	Partial Marks
9(b)(ii)	$9 - 2x - 3x^2 = 0$ oe	B3	B2 for $9 - 2x - 3x^2$ or B1 for two correct terms M1 for <i>their</i> derivative = 0 or stating $\frac{dy}{dx} = 0$
	$\frac{- -2 \pm \sqrt{(-2)^2 - 4 \times -3 \times 9}}{2 \times -3}$ oe OR $-\frac{1}{3} \pm \sqrt{\frac{9}{3} + \left(\frac{1}{3}\right)^2}$ oe	B2	FT <i>their</i> derivative B1FT for $\sqrt{(-2)^2 - 4(-3)(9)}$ or better or for $\frac{-(-2) + \sqrt{q}}{2 \times -3}$ or $\frac{-(-2) - \sqrt{q}}{2 \times -3}$ OR B1 for $\left(x + \frac{1}{3}\right)^2$
	-2.10 and 1.43 final answer	B2	B1 for each or for answers -2.1 or -2.097 ... and 1.4 or 1.430 to 1.431 or SC1 for -2.097... and 1.43[0] to 1.431 seen in working or for -1.43 and 2.10 as final answer
9(b)(iii)	$[a =] -6$ $[b =] 17$	3	B2 for either a correct or b correct or for $[a =] -5.04$ or -5.049 to -5.05 and $[b =] 16.9...$ seen or M1 for substitution of one of <i>their</i> solutions into $9 + 9x - x^2 - x^3$ oe or SC1 for reversed answers, $a = 17$, $b = -6$
10(a)	20.8 or 20.76 to 20.79	4	B3 for $[BC =] 10.4$ or 10.38 to $10.39...$ or $6\sqrt{3}$ oe or M2 for $(2x)^2 + x^2 + 6^2 = 24^2$ oe or M1 for $24^2 - 6^2$ oe or $x^2 + 6^2$ oe or $(2x)^2 + 6^2$ oe, or $x^2 + (2x)^2$ oe or SC2 for final answer of $12\sqrt{5}$ or 26.8 or 26.83... OR M3 for $x^2 + \left(\frac{x}{2}\right)^2 + 6^2 = 24^2$ oe or M2 for $x^2 + \left(\frac{x}{2}\right)^2$ or M1 for $x^2 + 6^2$ oe or $\left(\frac{x}{2}\right)^2 + 6^2$ oe or $24^2 - 6^2$ oe

Question	Answer	Marks	Partial Marks
10(b)	14.5 or 14.47 to 14.48	3	M2 for $\sin [\dots] = \frac{6}{24}$ oe or M1 for recognising the correct angle <i>GAC</i>





Cambridge IGCSE™

MATHEMATICS

0580/42

Paper 4 (Extended)

February/March 2022

MARK SCHEME

Maximum Mark: 130

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the February/March 2022 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

This document consists of **10** printed pages.

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- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

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GENERIC MARKING PRINCIPLE 3:

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- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
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- marks are not deducted for omissions
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GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

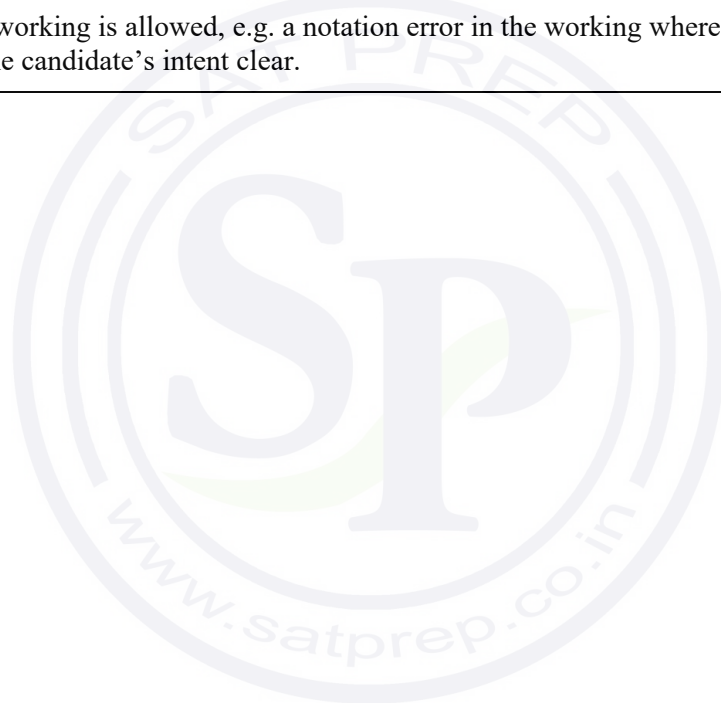
GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:


Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Maths-Specific Marking Principles	
1	Unless a particular method has been specified in the question, full marks may be awarded for any correct method. However, if a calculation is required then no marks will be awarded for a scale drawing.
2	Unless specified in the question, answers may be given as fractions, decimals or in standard form. Ignore superfluous zeros, provided that the degree of accuracy is not affected.
3	Allow alternative conventions for notation if used consistently throughout the paper, e.g. commas being used as decimal points.
4	Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored (isw).
5	Where a candidate has misread a number in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 mark for the misread.
6	Recovery within working is allowed, e.g. a notation error in the working where the following line of working makes the candidate's intent clear.



Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)	184	2	M1 for $\frac{852-300}{300}[\times 100]$ oe or for $\frac{852}{300}\times 100[-100]$ oe
1(b)	497	2	M1 for $\frac{852}{5+7}\times k$ oe where $k = 1, 5$ or 7
1(c)(i)	Forty thousand six hundred	1	
1(c)(ii)	4.06×10^4	1	
1(d)	435	3	M2 for $3000\times\left(1-\frac{48}{100}-\frac{3}{8}\right)$ oe or B2 for 2565, or 1440 and 1125 or 1875 and 1440 or 1560 and 1125 or M1 for $1-\frac{48}{100}-\frac{3}{8}$ or $3000\times\left(\frac{48}{100}+\frac{3}{8}\right)$ oe or B1 for 1440 or 1125 or 1560 or 1875 If 0 scored SC1 for answer 975
1(e)	35.7	3	M2 for $\frac{100+15}{100}\times\frac{100+18}{100}[-1]$ oe or better or M1 for $k\times\frac{100+15}{100}\times\frac{100+18}{100}$ oe
2(a)	1[.0] 0.9	2	B1 for each
2(b)	correct curve 	4	B3 FT for 6 or 7 points B2 FT for 4 or 5 points B1 FT for 2 or 3 points

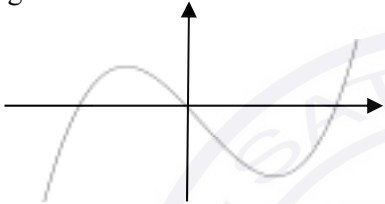
Question	Answer	Marks	Partial Marks
2(c)	ruled line at $y = -1$	B1	
	0.3 to 0.32	B1	
3(a)(i)	169	2	M1 for $g(13)$ or $(1+4x)^2$ or better
3(a)(ii)	$1+4x^2$ final answer	1	
3(a)(iii)	x	1	
3(b)	3.5 or $\frac{7}{2}$	2	M1 for $1+4x=15$
4(a)(i)	40.9 or 40.91...	3	M2 for $[\sin ABC = \frac{29.5 \sin 51.6}{35.3}]$ oe or for $[\cos ABC = \frac{35.3^2 + 45^2 - 29.5^2}{2 \times 35.3 \times 45}]$ or M1 for $\frac{29.5}{\sin ABC} = \frac{35.3}{\sin 51.6}$ oe or for correct implicit cosine rule
4(a)(ii)	520 or 520.0 to 520.2...	2	FT <i>their</i> (a)(i) if used provided working shown M1 for $0.5 \times 29.5 \times 45 \times \sin 51.6$ oe or for $0.5 \times 35.3 \times 45 \times \sin(\text{their(a)(i)})$ or for $0.5 \times 35.3 \times 29.5 \sin(180 - 51.6 - \text{their(a)(i)})$
4(b)(i)	41.2 or 41.21 to 41.23	4	M1 for $SQ = 2 \times 32 \times \sin\left(\frac{1}{2} \times 56\right)$ oe or $\sqrt{32^2 + 32^2 - 2 \times 32 \times 32 \times \cos 56}$ oe or $\frac{32 \sin 56}{\sin((180 - 56) \div 2)}$ oe M2 for $SR^2 = 47^2 + (\text{their } SQ^2) - 2 \times 47 \times \text{their } SQ \times \cos 60$ or M1 for implicit form
4(b)(ii)	28.3 or 28.25 to 28.29...	3	M2 for $32 \times \sin 62$ oe or M1 for recognition that line from P is perpendicular to SQ
5(a)	121 or 120.8... or $120 \frac{5}{6}$	4	M1 for midpoints soi M1 for use of $\sum fx$ with x in correct interval including both boundaries but not if x is 50, 50, 100 and 300 M1 (dep on 2nd M1) for $\sum fx \div 120$

Question	Answer	Marks	Partial Marks
5(b)	12.4 5 1.4	3	B1 for each If 0 scored SC1 for fd's [0.86,] 0.62, 0.25 and 0.07 oe
5(c)	43 74 99 120	2	B1 for 2 or 3 correct
5(d)	Correct diagram	3	B1 for correct horizontal placement for 4 plots B1FT for correct vertical placement for 4 plots B1FT dep on at least B1 for reasonable increasing curve or polygon through <i>their</i> 4 points If 0 scored SC1 FT for 3 out of 4 points correctly plotted
5(e)(i)	Strict FT <i>their</i> median reading	1	
5(e)(ii)	Strict FT <i>their</i> UQ reading	1	
5(e)(iii)	Strict FT <i>their</i> reading at 40th percentile	2	B1 for 48 written or mark at cf = 48 on graph
5(e)(iv)	Strict FT <i>their</i> reading at 400 – <i>their</i> reading at 250	2	B1 for either correct reading at 250 or 400
6(a)	15	2	M1 for $\frac{360}{180-156}$ or for $\frac{180(n-2)}{n} = 156$ oe
6(b)	38	2	B1 for $AOB = 76$
6(c)	68	2	B1 for $RSP = 68$ or $RQP = 112$

Question	Answer	Marks	Partial Marks
6(d)	Two pairs of equal angles identified with fully correct reasons	M3	M2 for one pair of equal angles identified with fully correct reasons $KMG = 90$ angle in semicircle and $OGH = 90$ angle between tangent and radius OR $KMG = OGH$ alternate segment OR $GOH = MGK$ alternate angles OR Angle $FGM =$ angle GHO corresponding and angle $FGM = GKM$ alternate segment and angle $H =$ angle K or M1 for $KMG = 90$, angle in semicircle or $OGH = 90$, angle between tangent and radius
	Two or three pairs of angles equal [so similar] oe	A1	Dep on M3 with no incorrect work seen
7(a)	31.5	3	M2 for $17.5 \times \sqrt{\frac{1134}{350}}$ oe or M1 for $\sqrt{\frac{1134}{350}}$ oe isw or $\sqrt{\frac{350}{1134}}$ oe isw or for $\frac{1134}{350} = \left(\frac{x}{17.5}\right)^2$ oe
7(b)	163.9375 or $163\frac{15}{16}$ final answer	2	B1 for $15 + 0.25$ or $10.5 + 0.25$ or better seen
7(c)	40.5[0]	2	M1 for $x \times \left(1 - \frac{18}{100}\right) = \frac{166.05}{[5]}$ oe
7(d)	\$2.23 final answer	3	B2 for 2.227... or 2.23 seen OR M2 for $57 - \frac{48.2}{0.88}$ oe or M1 for $\frac{48.2}{0.88}$ oe If 0 scored SC1 for 57×0.88 oe seen

Question	Answer	Marks	Partial Marks
8(a)	$\frac{12}{x} + \frac{26}{x+10} = 2.8$ oe isw	3	B2 for $\frac{12}{x} + \frac{26}{x+10}$ oe isw OR B1 for $\frac{26}{x+10}$ seen B1 for time = 2.8 or $\frac{168}{60}$ or $2\frac{48}{60}$ oe
8(b)	$12(x+10) + 26x = 2.8x(x+10)$ or better	M2	FT <i>their</i> time, provided 2 algebraic fractions one in x and other in $\pm x \pm 10$ M1 for $12(x+10) + 26x$ seen or better
	$12x + 120 + 26x = 2.8x^2 + 28x$	M1	FT <i>their</i> equation dep on M2
	$2.8x^2 - 10x - 120 = 0$ oe or $30x + 300 + 65x = 7x^2 + 70x$ or better leading to $7x^2 - 25x - 300 = 0$	A1	with no errors or omissions
8(c)	$\frac{[-]25 \pm \sqrt{([-]25)^2 - 4 \times 7 \times -300}}{2 \times 7}$ oe	B2	B1 for $\sqrt{([-]25)^2 - 4(7)(-300)}$ or better or for $\frac{[-]25 + \sqrt{q}}{2 \times 7}$ or $\frac{[-]25 - \sqrt{q}}{2 \times 7}$
	- 5 and 8.57 or 8.571...	B2	B1 for each or SC1 for final answers 5 and -8.57
8(d)	84 to 84.01...	2	FT $\frac{720}{\text{their positive answer}}$ to 3 sf or better M1 for $\frac{12}{\text{their positive answer}} [\times 60]$ oe
9(a)	54[.0] or 53.99 to 54.03...	6	M2 for $[h =] 95.4 \times 3 \div (\pi \times 2.4^2)$ oe or M1 for $95.4 = \frac{1}{3} \times \pi \times 2.4^2 \times h$ M2 for [slant ht, $l =] \sqrt{(\text{their } h)^2 + 2.4^2}$ or M1 for $(\text{their } h)^2 + 2.4^2$ M1 for $\frac{x}{360} \times 2 \times \pi \times \text{their } l = 2 \times \pi \times 2.4$ oe or $\frac{x}{360} \times \pi \times (\text{their } l)^2 = \pi \times 2.4 \times \text{their } l$

Question	Answer	Marks	Partial Marks
9(b)	14500 or 14470 to 14480	4	M3 for $200 \times 60 \times 24 \times \pi \times 4^2 [\div 1000]$ or $2 \times 60 \times 24 \times \pi \times 0.04^2 [\times 1000]$ or M2 for $200 \times \pi \times 4^2$ or for $2 \times \pi \times 0.04^2$ or M1 for $\pi \times 4^2$ oe or $\pi \times 0.04^2$ seen oe isw or $1000 \text{ cm}^3 = 1 \text{ litre}$ soi or $1 \text{ m}^3 = 1000 \text{ litres}$ soi or for 24×60 seen oe
10(a)	$x^3 + 2x^2 - 5x - 6$ final answer	3	B2 for correct expansion of three brackets unsimplified or for simplified expression of correct form with 3 out of 4 terms correct or B1 for correct expansion of 2 of the 3 given brackets with at least 3 terms out of four correct
10(b)	$\frac{Mc}{M-2f}$ or $\frac{-Mc}{2f-M}$ final answer	4	M1 for clearing $g - c$ from denominator e.g. $M(g - c) = 2fg$ M1 for correctly isolating terms in g in numerator on one side M1 for correctly factorising or simplifying, to single term in g in an equation M1 for correctly dividing by bracket to final answer
10(c)	$\frac{4x}{x+4}$ final answer	3	B1 for $4x(x - 4)$ B1 for $(x + 4)(x - 4)$
11(a)(i)	$\frac{1}{6}$ oe on all late branches $\frac{5}{6}$ oe on all not late branches	2	B1 for one correct vertical pair $\frac{1}{6}$ oe and $\frac{5}{6}$ oe
11(a)(ii)	$\frac{5}{36}$ oe	2	FT <i>their</i> tree M1 for <i>their</i> $\frac{1}{6} \times \text{their } \frac{5}{6}$
11(b)(i)	$(G \cup T \cup M)'$ oe	1	
11(b)(ii)	28	1	
11(b)(iii)	$\frac{17}{50}$ oe	1	

Question	Answer	Marks	Partial Marks
11(b)(iv)	$\frac{4}{7}$ oe	3	M2 for $\frac{16}{21} \times \frac{15}{20}$ or M1 for $\frac{n}{21} \times \frac{n-1}{20}$ or for $\frac{16}{21}$ and $\frac{15}{20}$ seen If 0 scored SC1 for answer $\frac{256}{441}$ oe
12(a)	85[.0], 265[.0] and no others	2	B1 for each If 0 scored SC1 for two values in the range with a difference of 180 but not multiples of 90
12(b)	correct shape and passes through origin 	3	B1 for any positive cubic shape B1 for sketch with one max and one min and with 3 roots including zero If 0 scored, SC1 for $x(x+2)(x-2)$ soi
12(c)	$a = -12$ $b = 5$ $k = -11$	6	B5 for 2 correct OR B2 for $3x^2 + a$ or B1 for $3x^2$ isw M1dep on at least B1 for <i>their</i> $\frac{dy}{dx} = 0$ M1dep on at least B1M1 for $x = 2$ or $x = -2$ substituted in <i>their</i> $\frac{dy}{dx} = 0$ equation M1 for $k = 2^3 + 2 \times \text{their } a + b$ and $10 - k = (-2)^3 + (-2) \times \text{their } a + b$



Cambridge IGCSE™

MATHEMATICS

0580/41

Paper 4 (Extended)

October/November 2021

MARK SCHEME

Maximum Mark: 130

Published

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GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Maths-Specific Marking Principles	
1	Unless a particular method has been specified in the question, full marks may be awarded for any correct method. However, if a calculation is required then no marks will be awarded for a scale drawing.
2	Unless specified in the question, answers may be given as fractions, decimals or in standard form. Ignore superfluous zeros, provided that the degree of accuracy is not affected.
3	Allow alternative conventions for notation if used consistently throughout the paper, e.g. commas being used as decimal points.
4	Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored (isw).
5	Where a candidate has misread a number in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 mark for the misread.
6	Recovery within working is allowed, e.g. a notation error in the working where the following line of working makes the candidate's intent clear.

Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	683	3	M2 for $[2]((19.4 \times 9.2) + (5.7 \times 9.2) + (19.4 \times 5.7))$ oe or M1 for one of 19.4×9.2 or 5.7×9.2 or 19.4×5.7
1(a)(ii)	1.93[0] or 1.932 to 1.933	3	M2 for $19.4 \times 9.2 \times 5.7 \times 1.9$ or M1 for $19.4 \times 9.2 \times 5.7$
1(b)	39 375	3	M2 for $9000 \div 200 \times 175 \times 5$ or M1 for $9000 \div 200$ soi or for $\frac{175}{200}$ soi
1(c)	10 th July	3	B2 for 4.1 to 4.2 or $4\frac{1}{6}$ or 4 days 1.5 hours Or M2 for answer 9 th July or 11 th July or M1 for $1500 \div (9 \times 40)$
1(d)	167 or 166.9 to 167.0...	3	B2 for answer with figs 167 or figs 1669 to 1670.. or M1 for $\pi \times 22.5^2 \times 105$ oe If 0 scored SC1 for answer 668 or 667.9 to 668.1
2(a)(i)	71.4 or 71.42 to 71.43	1	
2(a)(ii)	97 [min] 25 [s]	3	B2 for 13 min 55 sec seen or 97.4 or 97.41 to 97.42 seen or 5845 seen OR M2 for $55.66... \div 4 \times 7$ oe or $3340 \div 4 \times 7$ oe or for $7/4 \times 55 + 7/4 \times 40$ oe or M1 for $55 \text{ min } 40 \text{ sec} \div 4$ oe or M1 for total time $\div 16$ soi
2(b)(i)	60.8[0]	2	M1 for $47.5 \times \left(1 + \frac{28}{100}\right)$ oe or B1 for 13.3[0]
2(b)(ii)	71.25	3	B2 for 118.75 Or M2 for $47.50 \div \left(1 - \frac{60}{100}\right) - 47.50$ or M1 for $x \times \left(1 - \frac{60}{100}\right) = 47.50$ oe or better

Question	Answer	Marks	Partial Marks
2(c)	15 380	4	M3 for $(1\,120\,000 - 5000) \div (70 + 2.5)$ oe or B2 for answer figs 15 379 to figs 15 380 or M2 for $(1\,120\,000 \pm 5000) \div (70 \pm 2.5)$ oe or M1 for one of figs 675, 725, 1115, 1125 seen
2(d)	1.8[0] or 1.801 to 1.802 [million] nfw	2	M1 for figs $16 \times \left(1 + \frac{2.4}{100}\right)^5$ oe
3(a)	Correct box-and-whisker plot	4	B1 for lowest value and highest value at 30 and 90 B1 for LQ and UQ at 50 and 72 B1 for median at 63
3(b)(i)	56	2	M1 for 24 soi
3(b)(ii)	16	2	B1 for 64 written
3(c)(i)	14, 22	1	
3(c)(ii)	61.5	4	M1 for 35, 45, 55, 65, 75, 85 soi M1 for Σfx M1 dep for $their \Sigma fx \div (8 + 12 + their\ 14 + their\ 22 + 14 + 10)$ or $\Sigma fx \div 80$
3(c)(iii)	$\frac{35}{69}$ oe	3	M2 for $[2] \left(\frac{10}{24} \times \frac{14}{23} \right)$ oe or M1 for $\frac{10}{24}$ or $\frac{14}{24}$ oe seen If 0 scored, SC1 for answer $\frac{35}{72}$ oe
4(a)(i)	$\frac{10}{3}$ or $3\frac{1}{3}$ or 3.33[3...]	3	M1 for $42 - 12x = 3x - 8$ oe or for $7 - 2x = \frac{3x}{6} - \frac{8}{6}$ oe M1 for reaching $ax = b$ correctly FT <i>their</i> first step
4(a)(ii)	-2.5 or $-2\frac{1}{2}$ or $-\frac{5}{2}$	3	M1 for $3 \times 2x = 2(x - 5)$ oe M1 for reaching $ax = b$ correctly FT <i>their</i> first step

Question	Answer	Marks	Partial Marks
4(b)(i)	$2(x + 12y)(x - 12y)$ final answer	3	B2 for $(2x + 24y)(x - 12y)$ or $(2x - 24y)(x + 12y)$ or for $2(x + 12y)(x - 12y)$ seen OR M2 for $k(x + 12y)(x - 12y)$ or M1 for $2(x^2 - 144y^2)$
4(b)(ii)	$(5x - 8)(x + 5)$ final answer	2	M1 for $5x(x + 5) - 8(x + 5)$ or $x(5x - 8) + 5(5x - 8)$ or for $(5x + a)(x + b)$ where $ab = -40$ or $a + 5b = 17$
4(c)	$4x^2 - 17x + 9 [= 0]$ oe	B1	
	$\frac{[- -]17 \pm \sqrt{([- -]17)^2 - 4(4)(9)}}{2 \times 4}$	B2	FT their 3 term quadratic B1FT for $\sqrt{([- -]17)^2 - 4(4)(9)}$ or better or $\left(x - \frac{17}{8}\right)^2$ oe or $\sqrt{\frac{([- -]17)^2 - 4(4)(9)}{4}}$ or better and B1FT for $\frac{[- -]17 + \sqrt{q}}{2(4)}$ or $\frac{[- -]17 - \sqrt{q}}{2(4)}$ or better or $\frac{17}{8} + \sqrt{\frac{145}{64}}$ oe or $\frac{17}{8} - \sqrt{\frac{145}{64}}$ oe or $\frac{[- -]17}{2} + \sqrt{q}$ or $\frac{[- -]17}{2} - \sqrt{q}$
	0.62 and 3.63 cao	B2	B1 for each SC1 for 0.6[0] or 0.619 to 0.620 and 3.6[0] or 3.6301 to 3.6302 or 0.62 and 3.63 seen in working or -0.62 and -3.63 as final answers
5(a)(i)	62 and Angle at centre is twice angle at circumference oe	2	B1 for either
5(a)(ii)	117 and Isosceles [triangle] and Opposite angles in a cyclic quadrilateral are supplementary	4	B2 for 117 or B1 for [angle $OCD =$] 28 B1dep for isosceles [triangle] and B1 for opposite angles in a cyclic quadrilateral are supplementary

Question	Answer	Marks	Partial Marks
5(b)	24.9 or 24.94 to 24.95	5	B1 for angle $PQS = 42$ M2 for $QS = 5.9 \div \cos 42$ oe or M1 for $\cos 42 = \frac{5.9}{QS}$ oe M1dep for $their SQ \times \pi$ oe
6(a)(i)	9.5, 4.8 and 8.5	3	B1 for each
6(a)(ii)	correct curve	5	B4 for correct curve, but branches joined or touching y axis or B3FT for 9 or 10 correct plots or B2FT for 7 or 8 correct plots or B1FT for 5 or 6 correct plots AND B1 indep two separate branches not touching or cutting y-axis
6(b)	$y = \frac{24}{5} - 2x$ ruled and – 0.4 to – 0.2 and 1.45 to 1.7	4	B2 for correct ruled line crossing curve twice or B1 for correct freehand or for short ruled line or for line with negative gradient through (0, 4.8) or for line with gradient – 2 B1 for each value
6(c)	$[a =] 10$ $[b =] 20$ $[c =] -48$	4	B3 for $10x^3 - 15 = 48x - 20x^2$ oe or better or B2 for 2 correct values or B1 for 1 correct value or for $5x^2 - \frac{15}{2x} = 24 - 10x$ or better or for $2x^3 - 3 = \frac{48}{5}x - 4x^2$ or better or for $x^3 - \frac{3}{2} = \frac{24}{5}x - 2x^2$ After 0 scored SC1 for correct elimination of a denominator of 5, x or 2x from a four term expression.
7(a)(i)(a)	Shape at (–2, 1) (–4, 1) (–4, 7) (0, 7)	2	B1 for 3 correct points or for enlargement SF2 from any centre
7(a)(i)(b)	Shape at (2, –2) (2, –3) (5, –1) (5, –3)	3	B2 for correct orientation but wrong position or for 3 correct points or B1 for $y = x - 1$ drawn

Question	Answer	Marks	Partial Marks
7(a)(ii)	Rotation 90 [anticlockwise] oe (0, 0) oe	3	B1 for each
7(b)	$\frac{3}{4}\mathbf{p} + \frac{1}{2}\mathbf{q}$ or $\frac{1}{4}(3\mathbf{p} + 2\mathbf{q})$ or $\frac{3\mathbf{p} + 2\mathbf{q}}{4}$ final answer	3	M2 for $AM = \overrightarrow{AM} = \frac{1}{2}\left(-\mathbf{p} + \mathbf{q} + \frac{1}{2}\mathbf{p}\right)$ oe or M1 for correct route for \overrightarrow{AB} oe soi by $-\frac{1}{2}\mathbf{p} + \mathbf{q}$ or for \overrightarrow{OM} soi
8(a)(i)	1.6 oe	2	M1 for $3 - 5x = -5$
8(a)(ii)	$\frac{3-x}{5}$ oe final answer	2	M1 for $x = 3 - 5y$ or $\frac{y}{5} = \frac{3}{5} - x$ or better, or $y - 3 = -5x$ oe
8(b)(i)	$20.25 - (1.5 + x)^2$	3	Method 1 B1 for $(\pm 1.5 \pm x)^2$ seen B1 for [b =] 18 + <i>their</i> 1.5 ² OR Method 2 B1 for $b - a^2 - 2ax - x^2$ or for b = 20.25 B1 for a = 1.5
8(b)(ii)	Correct sketch with max in correct quadrant at (-1.5, 20.25)	3	FT <i>their</i> $20.25 - (\text{their } 1.5 + x)^2$ provided in that form B1 for \cap shape or for \cup shape if in form $c + (d + x)^2$ in part (b)(i) B1 for TP at $(-1.5, k)$ or $(k, 20.25)$ FT <i>their</i> $20.25 \pm (\text{their } 1.5 + x)^2$ or for $(-1.5, 20.25)$ seen
8(b)(iii)	[y =] $34 - 11x$	6	B2 for $-3 - 2x$ or B1 for either $kx - 3$, $k \neq 0$ or $-2x + n$ or for $18 - 3 - 2x$ M1dep for gradient = <i>their</i> $(-3 - 2(4))$ B1 for y-value at $x = 4$, is -10 M1dep for <i>their</i> $-10 = (\text{their } -11)4 + c$ oe

Question	Answer	Marks	Partial Marks
9(a)	3.5 oe	3	M1 for $2(x + x + 3) = 20$ oe M1 for correct $ax = b$ for <i>their</i> linear equation
9(b)	116.8 or 116.83 to 116.85 nfw	5	M2 for $\sin p = \frac{5 \sin 20}{2.5}$ or M1 for $\frac{2.5}{\sin 20} = \frac{5}{\sin p}$ A1 for 43.2 or 43.15 to 43.17 M1dep for $180 - (20 + \text{their } 43.2)$ After 0 scored, SC1 for length of side = 5
9(c)	5.07 or 5.068 to 5.071	6	B3 for 7.41 or 7.412 to 7.413 or M2 for $r + r + \frac{40}{360} \times 2 \times \pi \times r = 20$ oe or M1 for $\frac{40}{360} \times 2 \times \pi \times r$ oe seen M2 for $2 \times 7.41 \times \sin 20$ oe or $7.41^2 + 7.41^2 - 2(7.41^2) \cos 40$ oe or $\frac{7.41 \sin 40}{\sin 70}$ oe or M1 for implicit version



Cambridge IGCSE™

MATHEMATICS

0580/42

Paper 4 (Extended)

October/November 2021

MARK SCHEME

Maximum Mark: 130

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the October/November 2021 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

This document consists of **10** printed pages.

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Maths-Specific Marking Principles	
1	Unless a particular method has been specified in the question, full marks may be awarded for any correct method. However, if a calculation is required then no marks will be awarded for a scale drawing.
2	Unless specified in the question, answers may be given as fractions, decimals or in standard form. Ignore superfluous zeros, provided that the degree of accuracy is not affected.
3	Allow alternative conventions for notation if used consistently throughout the paper, e.g. commas being used as decimal points.
4	Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored (isw).
5	Where a candidate has misread a number in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 mark for the misread.
6	Recovery within working is allowed, e.g. a notation error in the working where the following line of working makes the candidate's intent clear.

Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	$\frac{450}{8+7+3} \times 8$ oe	2	M1 for $\frac{450}{8+7+3}$
1(a)(ii)	75	1	
1(a)(iii)	56	2	M1 for $\frac{32}{100} \times (450 - 200 - \text{their } 75)$ oe or $\frac{32}{100} \times \frac{450}{8+7+3} \times 7$ oe If 0 scored, SC1 for answer 231
1(a)(iv)	59 000 nfw	3	B2 for 58 600 to 58 800 or B1 for 293 to 294 or M1 for $\frac{\text{figs } 485 \times 200}{165}$ oe If 0 scored, SC1 for <i>their</i> more accurate answer seen and rounded to the nearest 1000
1(b)(i)	3 075 000	1	
1(b)(ii)	3.075×10^6	1	FT <i>their</i> (b)(i)
1(c)	32.5	2	M1 for $x \times \left(1 + \frac{16}{100}\right) = 37.7$ or better
1(d)	2460 or 2458. ...	2	M1 for $1800 \left(1 + \frac{2.1}{100}\right)^{15}$ oe
2(a)(i)	90	1	
2(a)(ii)	68	1	
2(a)(iii)	52	1	FT 120 – <i>their</i> (a)(ii)
2(a)(iv)	20	2	B1 for 60 in working or as answer
2(b)(i)	97.5	4	M1 for mid-points soi (50, 70, 90, 115, 145, 180) M1 for use of Σfm with m in correct interval including both boundaries M1 for (dep on 2nd M1) for $\Sigma fm \div 80$
2(b)(ii)	Bars with heights 0.9, 0.5, 0.3, 0.175 and with correct widths	4	B1 for each correct bar If 0 scored, SC1 for 3 or 4 correct frequency densities

Question	Answer	Marks	Partial Marks
2(b)(iii)	$\frac{28}{395}$ oe	3	M2 for $[2 \times] \frac{16}{80} \times \frac{14}{79}$ oe or M1 for $\frac{16}{80}$ or $\frac{16}{79}$ oe or $\frac{14}{80}$ oe or $\frac{14}{79}$ oe seen If 0 scored, SC1 for answer $\frac{7}{100}$ oe
3(a)(i)	$\frac{AD}{46.1} = \tan 64$ oe or better	M1	
	94.51 to 94.52	A1	
3(a)(ii)	46[.0] or 45.96... nfw	3	M2 for $56.5 \times \frac{\sin 94}{78.4}$ oe or M1 for $\frac{56.5}{\sin BAC} = \frac{78.4}{\sin 94}$ oe
3(a)(iii)	102.3 or 102.4 or 102.34 to 102.38	4	M2 for $[\cos C =] \frac{38.6^2 + 78.4^2 - 94.5^2}{2 \times 38.6 \times 78.4}$ or M1 for $94.5^2 = 38.6^2 + 78.4^2 - 2 \times 38.6 \times 78.4 \times \cos C$ and A1 for -0.214 or -0.2144 to -0.2137 If 0 scored, SC2 for $[CAD =] 23.5$ or 23.51 to 23.52 or for $[CDA =] 54.1$ or $54.14...$
3(b)	16.2 or 16.15...	3	M2 for $\frac{1}{2} \times 21.5 \times 27.6 \sin 111 = \frac{1}{2} \times 34.3 \times d$ oe or M1 for $\frac{1}{2} \times 21.5 \times 27.6 \sin 111$ seen or $\frac{1}{2} \times 34.3 \times d$ oe soi
4(a)(i)	Image at $(-5, 6)$ $(-5, 8)$ $(-6, 7)$	2	B1 for translation by $\begin{pmatrix} -4 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 5 \end{pmatrix}$
4(a)(ii)	Image at $(3, 1)$ $(3, 3)$ $(4, 2)$	2	B1 for reflection in $y = 1$ or $x = k$
4(a)(iii)	Image at $(3, 4)$ $(3, 8)$ $(1, 6)$	2	B1 for enlargement, sf 2, in wrong position
4(b)	Rotation 90° [anticlockwise] oe $(-3, 0)$	3	B1 for each

Question	Answer	Marks	Partial Marks
5(a)	$-1, -0.375, 3$	3	B1 for each
5(b)	Correct graph	4	B3FT for 8 or 9 correct points or B2FT for 6 or 7 correct points or B1FT for 4 or 5 correct points
5(c)	$y = 2 - x$ ruled correctly AND -0.45 to -0.35 1 2.35 to 2.45	4	B2 for $y = 2 - x$ ruled or B1 for $[y =] 2 - x$ soi or $y = k - x$ ruled or $y = kx + 2$ ruled, but not $y = 2$ B2 for all three values or B1 for any two values
6(a)(i)	$4.5, 4\frac{1}{2}$ or $\frac{9}{2}$	3	M1 for $8x - 12 = 24$ or $2x - 3 = 6$ M1 for reaching $ax = b$ correctly FT <i>their</i> first step
6(a)(ii)	$x > -\frac{4}{3}$ or $x > -1\frac{1}{3}$ final answer	2	M1 for $6x > 6 - 14$ or $x + \frac{14}{6} > 1$
6(b)	$[y =] \sqrt[3]{\frac{2x^3 - V}{3}}$ oe final answer	3	M1 for isolating term in y M1 for division by 3 or FT <i>their</i> first step M1 for cube root or FT <i>their</i> previous step to the final answer
6(c)	$4n^2 - 20n + 12$	M2	B1 for $4n^2 - 10n - 10n + 25$
	$4(n^2 - 5n + 3)$ or correct explanation linked to expression	A1	with no errors seen e.g. 4, $[-]20$ and 12 are all multiples of 4 or divides each term or each coefficient by 4
6(d)(i)	$p = -3$ and $q = 23$	3	B2 for $23 - 2(x - 3)^2$ OR M1 for $[q] - 2x^2 - 4px - 2p^2$ or $-2(x - 3)^2$ seen B1 for either $p = -3$ or $q = 23$ or FT $q = 5 + 2(\text{their } p)^2$
6(d)(ii)	$(3, 23)$	1	FT <i>their</i> (d)(i)
6(e)	69	2	M1 for figs 13^2 oe
7(a)(i)	$\frac{16\pi}{3}$ or $5\frac{1}{3}\pi$ final answer	2	M1 for $\frac{1}{2} \times \frac{4}{3}\pi \times 2^3$ oe

Question	Answer	Marks	Partial Marks
7(a)(ii)	2.4[0]	4	B3 for answer in range 2.396... to 2.40... OR M3 for <i>their</i> $\frac{16\pi}{3} + \pi \times 2^2 \times 5.2 +$ $\frac{1}{3}\pi \times 2^2 \times h = \frac{88\pi}{3}$ oe or M2 for $\frac{88\pi}{3} - \text{their } \frac{16\pi}{3} - \pi \times 2^2 \times 5.2$ oe or M1 for $\pi \times 2^2 \times 5.2$ oe or $\frac{1}{3}\pi \times 2^2 \times h$ oe soi
7(a)(iii)	1 hour 38 min or 1 hour 37.8 min to 1 hour 37.9... min	3	B2 for 1.63[2...] or 98 [mins] or 97.8 to 97.9...] or M1 for $\frac{88\pi}{3} \times 620$ $\frac{3}{35000}$ [$\times 60$] oe
7(b)	8.5[0] or 8.496 to 8.497	4	M3 for [$r=$] $\sqrt{\frac{65}{\frac{140}{360}\pi - \frac{1}{2}\sin 140}}$ oe or M2 for $\frac{140}{360}\pi \times r^2 - \frac{1}{2}r^2 \times \sin 140$ [=65] oe or M1 for either area expression seen
8(a)(i)	$\frac{12}{x}$ or $12 \div x$ final answer	1	
8(a)(ii)	$\frac{12}{x-4} - \text{their } \frac{12}{x} = 1.5$ oe	M1	Accept 3 or more term equivalents
	$12x - 12(x-4) = 1.5x(x-4)$ or $\frac{12x - 12(x-4)}{x(x-4)} [= 1.5]$	M1	Correctly clearing fractions, or correctly collecting into a 'single fraction' FT <i>their</i> expression dep on two fractions both with algebraic denominators
	$12x - 12x + 48 = 1.5x^2 - 6x$	M1	Correctly multiplying <i>their</i> two sets of brackets FT <i>their</i> expression dep on two fractions both with algebraic denominators or first M1 given
	$[1.5x^2 - 6x - 48 = 0]$ $x^2 - 4x - 32 = 0$	A1	One further step either 3 term equation or division throughout by 1.5 leading to solution With no errors or omissions seen, dep on M3

Question	Answer	Marks	Partial Marks
8(a)(iii)	$(x + 4)(x - 8)$	M2	M1 for $(x + a)(x + b)$ where $ab = -32$ or $a + b = -4$ or for $x(x + 4) - 8(x + 4)$ or $x(x - 8) + 4(x - 8)$
	-4 and 8	B1	
8(a)(iv)	3	2	FT $\frac{12}{\text{their } 8 - 4}$ M1 for $\frac{12}{\text{their } 8 - 4}$ or $\frac{12}{\text{their } 8} + 1.5$ oe or for answer $\frac{12}{\text{their } 8}$
8(b)	69.6	3	M2 for $\frac{430 \text{ to } 440}{6 + 0.25}$ or $\frac{440 - 5}{6 \text{ to } 6.5}$ oe or M1 for $440 + 5$ oe or $440 - 5$ oe or $6 + 0.25$ oe or $6 - 0.25$ oe seen
9(a)(i)	(3, 1)	1	
9(a)(ii)	$\begin{pmatrix} -10 \\ 15 \end{pmatrix}$	1	
9(a)(iii)	3.61 or 3.605 to 3.606	2	M1 for $(-2)^2 + 3^2$ oe
9(b)(i)(a)	$\frac{1}{2} \mathbf{c}$	1	
9(b)(i)(b)	$\mathbf{a} + \frac{1}{2} \mathbf{c}$ oe	1	FT $\mathbf{a} + \text{their (b)(i)(a)}$

Question	Answer	Marks	Partial Marks
9(b)(ii)(a)	$\overrightarrow{OP} = \frac{1}{3}(2\mathbf{a} + \mathbf{c})$ oe and $\overrightarrow{OQ} = \frac{1}{2}(2\mathbf{a} + \mathbf{c})$ oe OR $\overrightarrow{OP} = \frac{2}{3}(\mathbf{a} + \frac{1}{2}\mathbf{c})$ OR $\overrightarrow{PQ} = \frac{1}{3}(\mathbf{a} + \frac{1}{2}\mathbf{c})$ and correct comment e.g. have the same base vector or that they are multiples of one another and they share a common point OR e.g. $\overrightarrow{OQ} = 1.5\overrightarrow{OP}$, $2\overrightarrow{PQ} = \overrightarrow{OP}$	2	B1 for \overrightarrow{OP} or \overrightarrow{PQ} factorised or for correct multiplicative statement on relationship without factorised vectors e.g. $\overrightarrow{OQ} = 1.5\overrightarrow{OP}$, $\frac{2}{3}\overrightarrow{OQ} = \overrightarrow{OP}$, $2\overrightarrow{PQ} = \overrightarrow{OP}$, $1.5\left(\frac{2}{3}\mathbf{a} + \frac{1}{3}\mathbf{c}\right) = \mathbf{a} + \frac{1}{2}\mathbf{c}$
9(b)(ii)(b)	1.5 oe	1	
10(a)	(2, -10) and (-2, 22)	5	B2 for $3x^2 - 12$ isw or B1 for $3x^2 + k$ or $px^2 - 12$ ($p \neq 0$) or for $3x^2 - 12 + 6$ isw M1 for setting <i>their</i> derivative = 0 or $\frac{dy}{dx} = 0$ B1 for $x = \pm 2$ or for one correct coordinate pair
10(b)	(2, -10) minimum with correct reason or sketch (-2, 22) maximum with correct reason or sketch	3	B2 for 1 correct with correct reasoning or B2FT for correct evaluation with correct 2nd derivative for both of <i>their</i> different x values or M1 for showing [2nd derivative =] $6x$ or gradients for one value on either side of one correct stationary point or for reasonable sketch of cubic
11(a)(i)	10.2	2	M1 for $\frac{YZ}{13.6} = \frac{15.3}{20.4}$ oe or better

Question	Answer	Marks	Partial Marks
11(a)(ii)	143.1	3	<p>M2 for $\left(\frac{20.4}{13.6}\right)^2 \times 63.6$ oe</p> <p>or M1 for $\left(\frac{20.4}{13.6}\right)^2$ or $\left(\frac{13.6}{20.4}\right)^2$ oe</p> <p>Alt method</p> <p>M2 for $\frac{1}{2} \times 20.4 \times 15.3 \times \sin R$ where</p> <p>R is $\sin^{-1}\left(\frac{63.6}{0.5 \times 13.6 \times \text{their(a)(i)}}\right)$</p> <p>or M1 for $R = \sin^{-1}\left(\frac{63.6}{0.5 \times 13.6 \times \text{their(a)(i)}}\right)$</p>
11(b)	0.55	3	<p>M2 for [ratio of areas] = $\left(\sqrt[3]{\frac{37.5}{64.8}}\right)^2$ or</p> <p>$\left(\sqrt[3]{\frac{64.8}{37.5}}\right)^2$ oe</p> <p>or M1 for [ratio of lengths] = $\sqrt[3]{\frac{37.5}{64.8}}$ or</p> <p>$\sqrt[3]{\frac{64.8}{37.5}}$ oe</p> <p>or for $\left(\frac{0.792}{x}\right)^3 = \left(\frac{64.8}{37.5}\right)^2$ oe</p>



Cambridge IGCSE™

MATHEMATICS

0580/43

Paper 4 (Extended)

October/November 2021

MARK SCHEME

Maximum Mark: 130

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

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- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Maths-Specific Marking Principles	
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2	Unless specified in the question, answers may be given as fractions, decimals or in standard form. Ignore superfluous zeros, provided that the degree of accuracy is not affected.
3	Allow alternative conventions for notation if used consistently throughout the paper, e.g. commas being used as decimal points.
4	Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored (isw).
5	Where a candidate has misread a number in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 mark for the misread.
6	Recovery within working is allowed, e.g. a notation error in the working where the following line of working makes the candidate's intent clear.


Abbreviations

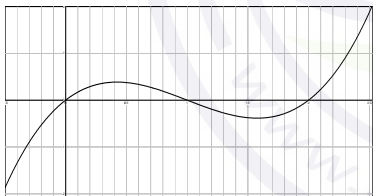
cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)	Rotation 90° clockwise oe [centre] (5, 2)	3	B1 for each
1(b)(i)	Translation $\begin{pmatrix} -1 \\ 4 \end{pmatrix}$	2	B1 for each
1(b)(ii)	4.12 or 4.123...	2	M1 for $(\text{their } (-1))^2 + (\text{their } 4)^2$
2(a)	52°	3	M1 for $180 - 2 \times 38$, implied by 104 M1 for $\text{their } AOB \div 2$
2(b)(i)	80°	2	B1 for $FEC = 50$ or $FCE = 50$
2(b)(ii)	100°	1	FT 180 – <i>their</i> (i)
3(a)(i)	4.095	2	B1 for figs 4095 or M1 for $\frac{525 \times 7.8}{1000}$
3(a)(ii)	15	3	B2 for 35 OR M2 for $\frac{1}{2}(10+4) \times 5 \times L = 525$ oe M1 for $\frac{1}{2}(10+4) \times 5$ oe
3(a)(iii)	455 or 454.9...	6	M3 for <i>their</i> $[BD =] \sqrt{3^2 + 5^2} \times (\text{their } 15)$ [$\times 2$] or B2 for $\sqrt{34}$ or 5.83 or 5.830 to 5.831 or M1 for $5^2 + \left(\frac{1}{2}(10-4)\right)^2$ and M1 for <i>their</i> 35×2 M1 for $(\text{their } 15) \times 10$ and $(\text{their } 15) \times 4$
3(a)(iv)	4200	3	M2 for $525 \times \left(\frac{10}{5}\right)^3$ oe or M1 for $\left(\frac{10}{5}\right)^3$ or $\left(\frac{5}{10}\right)^3$ oe

Question	Answer	Marks	Partial Marks
3(b)	182.875 ... 307.125 final answer	3	B2 for either seen or M1 for 10 ± 0.5 or 6 ± 0.5 or 4 ± 0.5 oe
4(a)	Correctly eliminate one variable	M1	
	$p = 3$ $q = -1$	A2	A1 for each If M0 , SC1 for 2 values satisfying one of original equations If 0 scored SC1 for correct answers with no working
4(b)	$1\frac{1}{11}$ or $\frac{12}{11}$ 1.09 or 1.090 to 1.091	2	M1 for $\frac{3x}{12} + \frac{8x}{12} = 1$ or better
4(c)(i)	$-2 < x \leq 3$	3	B2 for $-2 < x$ or $x \leq 3$ or M1 for $-8 + 2 < 3x$ or $3x \leq 7 + 2$
4(c)(ii)	-1, 0, 1, 2, 3	1	FT dep on -ve and +ve values in <i>their</i> (c)(i)
4(d)	$4a(4 - a)$ final answer	2	B1 for any correct partial factorisation
4(e)(i)	$\frac{2b}{3a}$ final answer	2	M1 for $\frac{1}{2a} \times \frac{4b}{3}$ or better
4(e)(ii)	$\frac{x-2}{x-1}$ final answer nfw	2	B1 for $2(x-1) - x$ oe seen.
5(a)(i)	105	2	M1 for $\frac{3}{100} \times 500 [\times 7]$
5(a)(ii)	115 or 114.9...	3	M2 for $500 \times \left(1 + \frac{3}{100}\right)^7 [-500]$ or M1 for $500 \times \left(1 + \frac{3}{100}\right)^k, k \text{ integer } \geq 2$
5(b)	8600	3	M2 for $\frac{6269.4}{\left(1 - \frac{10}{100}\right)^3}$ oe or M1 for $C \times \left(1 - \frac{10}{100}\right)^3 = 6269.4$ oe
6(a)	9.33 or 9.334...	3	M2 for $\frac{12 \sin 50}{\sin 100}$ or M1 for $\frac{\sin 100}{12} = \frac{\sin 50}{AD}$ oe

Question	Answer	Marks	Partial Marks
6(b)	$[\cos =] \frac{11^2 + 12^2 - 8^2}{2 \times 11 \times 12}$	M2	M1 for $8^2 = 11^2 + 12^2 - 2 \times 11 \times 12 \cos(BAC)$
	40.415...	A2	A1 for 0.761... or $\frac{201}{264}$ or $\frac{67}{88}$
6(c)	70.8 or 70.77 to 70.79...	3	M1 for $\frac{1}{2} \times 12 \times \text{their (a)} \times \sin(180 - 100 - 50)$ M1 for $\frac{1}{2} \times 12 \times 11 \times \sin(40.42)$
6(d)	7.13 or 7.131 to 7.132...	3	M2 for $\frac{\text{dist}}{11} = \sin(40.42)$ or M1 for recognition that shortest distance is perpendicular to AC
7(a)	87	3	M2 for $3c + 4c = 587 + 22$ or better or M1 for $3c + 2(2c - 11) [= 587 \text{ or } 5.87]$
7(b)	1.1[0]	3	M2 for $22w + 22 = 42w$ or better or M1 for $\frac{22}{w} = \frac{42}{w+1}$ oe OR B2 for number of bottles = 20 or M1 for $Nw = 22$ and $N(w+1) = 42$
7(c)(i)	$\frac{9}{x} + \frac{5}{2x+1} = 2.5$ oe	M2	M1 for $\frac{9}{x}$ or $\frac{5}{2x+1}$
	$9(2x+1) + 5x = 2.5x(2x+1)$ oe or $\frac{9(2x+1) + 5x}{x(2x+1)} [= 2.5 \text{ oe}]$	M1	Correctly clearing fractions, or correctly collecting into a single fraction FT <i>their</i> expression dep on two fractions both with algebraic denominators
	All brackets expanded leading to $10x^2 - 41x - 18 = 0$ with no errors or omissions	A1	

Question	Answer	Marks	Partial Marks
7(c)(ii)	$(2x - 9)(5x + 2)$ or $\frac{-(-41) \pm \sqrt{(-41)^2 - 4(10)(-18)}}{2(10)}$	M2	B1 for $(ax + b)(cx + d)$ with $ac = 10$ and $bd = -18$ or $ad + bc = -41$ or $\sqrt{(-41)^2 - 4(10)(-18)}$ or $\frac{-(-41) + \sqrt{q}}{2(10)}$ oe or $\frac{-(-41) - \sqrt{q}}{2(10)}$ oe or both or M1 for $\left(x - \frac{41}{20}\right)^2 - \frac{18}{10} - \left(\frac{41}{20}\right)^2 = 0$ or better
	10	A2	A1 for $[x =] \frac{9}{2}$ oe or M1 for $2 \times \text{their positive root} + 1$
8(a)(i)	$\frac{60}{360} \times 600$ oe	1	
8(a)(ii)	45	2	M1 for $\frac{27}{360} \times 600$ oe
8(a)(iii)	Correct straight line on the pie chart	2	B1 for 75
8(b)	Correct diagram  0.6 3.4 5.2 7.5 8.7	3	B1 for any three of 0.6, 3.4, 5.2, 7.5, 8.7 correctly placed B1 for 7.5 and 8.7 seen
8(c)(i)	5	1	
8(c)(ii)	2	1	
8(c)(iii)	3	1	
8(d)	39.2	4	M1 for mid-values soi M1 for Σfx with x in correct interval including boundaries M1 dep for $\frac{\Sigma fx}{50}$ dep on second M1
9(a)	(0, 0), (1, 0), (2, 0)	2	B1 for any two correct If 0 scored, SC1 for all three x values clearly identified

Question	Answer	Marks	Partial Marks
9(b)	$x(x^2 - x - 2x + 2)$ or $(x^2 - x)(x - 2)$ or $(x - 1)(x^2 - 2x)$ leading to $x^3 - 3x^2 + 2x$ with no errors or omissions	2	B1 for $x(x^2 - x - 2x + 2)$ or $(x^2 - x)(x - 2)$ or $(x - 1)(x^2 - 2x)$
9(c)	$3x^2 - 6x + 2$	B2	B1 for 2 correct terms
	their $\frac{dy}{dx} = 0$	M1	
	their $\frac{-(-6) \pm \sqrt{(-6)^2 - 4(3)(2)}}{2(3)}$	M2	M1 for $\sqrt{(-6)^2 - 4(3)(2)}$ or for $p = -(-6)$ and $r = 2(3)$ if in form $\frac{p \pm \sqrt{q}}{r}$
	(0.4, 0.4) (1.6, -0.4)	B3	B2 for 0.4 or 0.42... and 1.6 or 1.57 to 1.58 or for one correct pair of coordinates or B1 for 0.4 or 0.42... or 1.6 or 1.57 to 1.58 If 0 scored SC1 for $1 + \sqrt{\frac{1}{3}}$ and $1 - \sqrt{\frac{1}{3}}$ or better or for one correct pair of coordinates in any form
9(d)	Correct sketch 	2	FT their (c) but must be cubic i.e. correct shape cubic through origin and max and min in correct quadrants B1 for cubic shape sketch
10(a)(i)	1	1	
10(a)(ii)	$\frac{1}{4}$ oe nfww	2	M1 for $\frac{2}{4} \times \frac{2}{4}$ oe
10(a)(iii)	7	2	M1 for trials with $\left(\frac{3}{4}\right)^k \times \frac{1}{4}$ soi
10(b)(i)	0.72 oe	2	M1 for 0.9×0.8
10(b)(ii)	0.26 oe	3	M2 for $0.9 \times 0.2 + 0.1 \times 0.8$ or $1 - \text{their (b)(i)} - 0.1 \times 0.2$ or M1 for 0.9×0.2 or 0.1×0.8 or $1 - \text{their (b)(i)}$ or $1 - 0.1 \times 0.2$
11(a)(i)	64	1	

Question	Answer	Marks	Partial Marks
11(a)(ii)	127	1	FT $2 \times \text{their (a)(i)} - 1$
11(b)	$\pm \frac{1}{2}$ oe nfw	4	M1 for $(2x-1)^2 + 2(2x-1)$ B1 for $4x^2 - 2x - 2x + 1$ or $(2x-1)(2x-1+2)$ B1 for $4x^2 - 1 [= 0]$ or $(2x-1)(2x+1) [= 0]$ OR M1 for $x(x+2) = 0$ (solving $g(x) = 0$) A1 for $x = 0$ or -2 B1 for $2x - 1 = 0$ or $2x - 1 = -2$
11(c)	$\frac{x+1}{2}$ oe final answer	2	M1 for $y+1=2x$ or $\frac{y}{2}=x-\frac{1}{2}$ or $x=2y-1$
11(d)	$-\frac{1}{6}$ oe nfw	3	B2 for $3x = -\frac{1}{2}$ oe OR M1 for $2^{2x} \times 2^x$ oe or $4^{\frac{1}{2}x} \times 4^x$ oe or 8^x oe M1 for $2^{\frac{1}{2}}$ or $4^{\frac{1}{4}}$ or $8^{\frac{1}{6}}$ soi



Cambridge IGCSE™

MATHEMATICS

0580/41

Paper 4 (Extended)

May/June 2021

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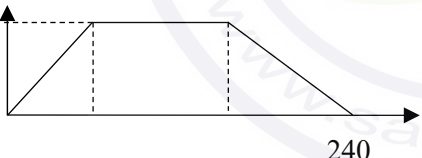
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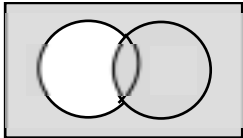
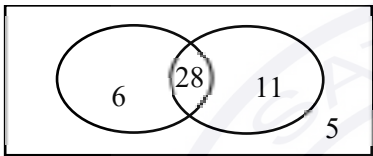
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Abbreviations


cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	28	2	M1 for $32 \times 0.50 + 30 \times 0.40$
1(a)(ii)	$98 - 100 \times 0.5$ $48 \div 0.4 = 120$ [minutes] = 2 [hrs]	M3	M1 for $100 \times 0.50 + x \times 0.40 = 98$ M1 for $50 + 0.4x = 98$ or $0.4x = 48$ M1 for $x = \frac{48}{0.4}$ $x = 120$ [min] = 2 [hr] OR M1 for $100 \times 0.5 [= 50]$ M1 for $98 - 50 [= 48]$ M1 for $48 \div 0.4 = 120$ [min] = 2 [hr]
1(b)	2925 1170 4095	3	B2 for one correct answer or M1 for $8190 \div (5 + 2 + 7)$
1(c)	58	2	M1 for $\left(1 + \frac{45}{100}\right)k = 84.1$ oe
2(a)	0.18 or $\frac{9}{50}$	1	
2(b)	$1944 \times \frac{1000}{3600 \times 3600}$	M1	
	$9 \div 0.15 = 60$	M1	
2(c)		1	ruled line to axis with point of contact at 240
2(d)	6.9375	4	M2 for area = $\frac{1}{2} \times (130 + 240) \times 9$ oe or M1 for one correct partial area M1dep for <i>their</i> total area $\div 240$
3(a)	2.64 or 2.638...	4	M3 for $[R^2 =] \frac{\pi \times 2.4^2 + \pi \times 2.4 \times 6.3}{\pi + 2\pi}$ oe or M2 for $\pi \times 2.4^2 + \pi \times 2.4 \times 6.3 = \pi R^2 + \frac{1}{2} \times 4\pi R^2$ or M1 for $[\pi \times 2.4^2] + \pi \times 2.4 \times 6.3$ oe or $[\pi R^2] + \frac{1}{2} \times 4\pi R^2$ oe

Question	Answer	Marks	Partial Marks
3(b)	953 or 952.6 to 952.8	4	<p>M3 for $\frac{1}{3} \times \pi \times 7.6^2 \times 16 \times \left(1 - \left(\frac{16-12}{16}\right)^3\right)$</p> <p>or $\frac{1}{3} \times \pi \times 7.6^2 \times 16 - \frac{1}{3} \times \pi \times 1.9^2 \times (16-12)$</p> <p>OR</p> <p>B1 for top radius = 1.9 or $\left(\frac{16-12}{16}\right)^3$ oe</p> <p>M2 for</p> <p>$\frac{1}{3} \times \pi \times 7.6^2 \times 16 - \frac{1}{3} \times \pi \times (\text{their } 1.9)^2 \times (16-12)$</p> <p>or $\frac{1}{3} \times \pi \times 7.6^2 \times 16 \times \left(1 - \text{their } \left(\frac{16-12}{16}\right)^3\right)$</p> <p>or M1 for $\frac{1}{3} \times \pi \times 7.6^2 \times 16$</p> <p>or for $\frac{1}{3} \times \pi \times (\text{their } 1.9)^2 \times (16-12)$</p>
4(a)(i)	438 cao	2	M1 for $\frac{500}{1.142}$
4(a)(ii)	14.95	2	M1 for $[329 -] 275 \times 1.142$ oe
4(b)	14	2	M1 for $5.25 \times \frac{8}{3}$ oe
4(c)	1.7[0] or 1.699...	3	<p>M2 for $\sqrt[5]{\frac{6669}{6130}}$</p> <p>or M1 for $6669 = 6130 (k)^5$</p>
5(a)	13.5 or 13.47...	4	<p>B1 for angle 102 seen</p> <p>M2 for</p> <p>$\sqrt{10.6^2 + 6.4^2 - 2 \times 10.6 \times 6.4 \times \cos(180 - 78)}$</p> <p>OR</p> <p>M1 for</p> <p>$10.6^2 + 6.4^2 - 2 \times 10.6 \times 6.4 \times \cos(180 - 78)$</p> <p>A1 for 181.5...</p>
5(b)	8.68 or 8.682 to 8.683 nfw	4	<p>B1 for angle = 44</p> <p>M2 for $\sin(180 - 58 - 78) \times \frac{10.6}{\sin 58}$ oe</p> <p>or M1 for $\frac{\sin(180 - 58 - 78)}{x} = \frac{\sin 58}{10.6}$ oe</p>

Question	Answer	Marks	Partial Marks
5(c)	78.2 or 78.17 to 78.19...	3	M2 for $\frac{1}{2} \times 10.6 \times (6.4 + \text{their } 8.68) \times \sin(78)$ oe OR M1 for $\frac{1}{2} \times 10.6 \times 6.4 \times \sin(180 - 78)$ oe M1 for $\frac{1}{2} \times 10.6 \times \text{their } 8.68 \times \sin 78$ oe
6(a)		1	
6(b)		2	B1 for 2 or 3 correct elements or M1 for $34 - x$, x and $39 - x$ correctly placed on diagram and $x = 28$
6(c)(i)	8	1	
6(c)(ii)	11	1	
6(c)(iii)	2	1	
6(c)(iv)	$C \cap S \cap B'$ oe	1	
6(c)(v)	$\frac{19}{30}$ oe	1	
6(c)(vi)	$\frac{2}{57}$ oe	3	M2 for $\frac{4}{19} \times \frac{3}{18}$ or M1 for $\frac{4}{19}$ seen
6(c)(vii)	Equal numbers 15 or equal probability $\frac{15}{30}$ oe	1	
7(a)	$\frac{x+5}{x+4}$ final answer	3	B1 for $(x-5)(x+5)$ B1 for $(x-5)(x+4)$
7(b)	$\frac{2x^2+12x-5}{x(x-1)}$ or $\frac{2x^2+12x-5}{x^2-x}$ final answer	3	B1 for common denominator $x(x-1)$ oe B1 for $(x-1)(x+5) + x(x+8)$ or better
7(c)(i)	$6x^2 - 8x$ final answer	2	B1 for each term in final answer or M1 for correct answer seen and spoilt

Question	Answer	Marks	Partial Marks
7(c)(ii)	64	2	FT <i>their</i> (c)(i) correctly evaluated provided at least 2 terms but not the original equation M1 for substituting $x = 4$ into <i>their</i> (c)(i)
7(c)(iii)	$(0, 6)$ $\left(\frac{4}{3}, \frac{98}{27}\right)$ oe	4	M1 for <i>their</i> derivative = 0 or $\frac{dy}{dx} = 0$ soi B1 for $x = 0$ and $x = \frac{4}{3}$ M1dep for substituting one of <i>their</i> x values into $y = 2x^3 - 4x^2 + 6$ soi
8(a)(i)	3 22 43 48 50	2	B1 for 4 correct or M1 for one error in adding.
8(a)(ii)	correct diagram	3	B1FT <i>their</i> (a)(i) for 5 correct heights B1 for 5 points at upper ends of intervals on correct vertical line B1FT dep on at least B1 for increasing curve through <i>their</i> 5 points After 0 scored, SC1 for 4 of <i>their</i> points correctly plotted
8(a)(iii)	35 to 38	1	
8(b)	Correct box-and-whisker diagram  1.45 1.57 1.64 1.71 1.83	4	B1 for median 1.64 drawn B1 for LQ 1.57 drawn B1 for UQ 1.71 drawn If 0 scored SC1 for 1.64, 1.57 or 1.71 seen
9(a)	1350 or 1354....	6	M2 for $20^2 - 13^2$ or M1 for $BC^2 + 13^2 = 20^2$ A1 for $\sqrt{231}$ or 15.2 or 15.19 to 15.20 M1 for 20×24 and 13×24 and <i>their</i> 15.2×24 M1 for $[\frac{1}{2} \times]$ <i>their</i> 15.2×13
9(b)	2370 or 2369 to 2371... cao	1	
9(c)	24.6 or 24.58 to 24.59	4	M3 for $\sin [...] = \frac{13}{\sqrt{20^2 + 24^2}}$ oe or M2 for $\sqrt{20^2 + 24^2}$ or $\sqrt{24^2 + 20^2 - 13^2}$ or M1 for $AF^2 = 20^2 + 24^2$ or $24^2 + 20^2 - 13^2$ or M1 for correct angle identified
10(a)	0.75 3 7 3 0.75	3	B2 for 4 or 3 correct or B1 for 2 correct

Question	Answer	Marks	Partial Marks
10(b)	correct curve 	4	B3FT for 8 or 9 correct plots B2FT for 6 or 7 correct plots B1FT for 4 or 5 correct plots
10(c)	Accept any integer ≥ 8	1	
10(d)	line $y = 4 - \frac{1}{2}x$ ruled	B3	B2 for $[y =]4 - \frac{1}{2}x$ identified or B1 for ruled line with gradient $-\frac{1}{2}$ or B1 for ruled line through (0, 4) but not $y = 4$
	0.2 to 0.3 4.2 to 4.3	B1	
11(a)	20	2	M1 for $\frac{360}{18}$ or $180 - \frac{16 \times 180}{18}$
11(b)	4.5	2	M1 for $\frac{BE}{6.75} = \frac{5.2}{5.2 + 2.6}$ oe
11(c)	5.8[0] or 5.798 to 5.799	3	M2 for $2 \times \sqrt[3]{\frac{780}{32}}$ oe or M1 for $\sqrt[3]{\frac{780}{32}}$ or $\sqrt[3]{\frac{32}{780}}$ or $\frac{2^3}{l^3} = \frac{32}{780}$
11(d)	$QN = NR$ [given]	B1	
	Two correct pairs of angles with reasons from angle $PQN =$ angle SRN alternate angle $QPN =$ angle RSN alternate angle $PNQ =$ angle SNR [vertically] opposite	B2	B1 for any correct pair of angles with reason or two correct pairs of angles with no/wrong reasons
	ASA [implies congruent]	B1	dep on B1 B2

Question	Answer	Marks	Partial Marks
12(a)	13	1	
12(b)	$4x - 3$ final answer	2	M1 for $3 - 2(3 - 2x)$
12(c)	-7 5	4	M1 for $x^2 + 2x - 35 [= 0]$ or $x^2 + 2x = 35$ M2 for $(x + 7)(x - 5)$ or $x(x - 5) + 7(x - 5)$ or $x(x + 7) - 5(x + 7)$ or M1 for $(x + a)(x + b)$ where a, b are integers with $ab = -35$ or $a + b = 2$
12(d)	$\frac{3-x}{2}$ oe final answer	2	M1 for a correct first step: $x = 3 - 2y$ or $y - 3 = -2x$, $2x = 3 - y$ or $\frac{y}{2} = \frac{3}{2} - x$
12(e)	$32 - 54x + 37x^2 - 8x^3$ final answer	5	B4 for $27 - 36x - 18x + 24x^2 + 12x^2 - 8x^3 + x^2 + 5$ oe OR B1 for $(3 - 2x)^3 + x^2 + 5$ and B2 for expansion of the 3 brackets, allow one error or B1 for correct expansion of 2 of the brackets with at least 3 terms correct



Cambridge IGCSE™

MATHEMATICS

0580/42

Paper 4 (Extended)

May/June 2021

MARK SCHEME

Maximum Mark: 130

Published

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Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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This document consists of **8** printed pages.

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- marks are not deducted for omissions
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GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Maths-Specific Marking Principles	
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2	Unless specified in the question, answers may be given as fractions, decimals or in standard form. Ignore superfluous zeros, provided that the degree of accuracy is not affected.
3	Allow alternative conventions for notation if used consistently throughout the paper, e.g. commas being used as decimal points.
4	Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored (isw).
5	Where a candidate has misread a number in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 mark for the misread.
6	Recovery within working is allowed, e.g. a notation error in the working where the following line of working makes the candidate's intent clear.

Abbreviations


cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	11.61 final answer	2	M1 for $13.5[0] \times \left(1 - \frac{14}{100}\right)$ oe or B1 for 1.89
1(a)(ii)	197.37 final answer	2	FT $17 \times$ <i>their</i> (a)(i) exact or correct to nearest cent M1 for $42.5 \div 2.5$
1(b)(i)	53.3 or 53.33...	1	
1(b)(ii)	7.5	2	M1 for $22.5 \div (2 + 8 + 5)$ oe soi
1(c)	20.55×2.45 oe	M2	M1 for $20.5 + 0.05$ oe seen or $2.4 + 0.05$ oe seen If 0 scored, SC1 here for 20.45×2.35 oe
	3 nfw	A2	M1 for <i>their</i> area $\div 10 \div 2.5$ oe
2(a)(i)	1, -0.5 oe	2	B1 for each
2(a)(ii)	Correct curve	4	B3FT for 6 or 7 correct plots or B2FT for 4 or 5 correct plots or B1FT for 2 or 3 correct plots
2(b)	$y = 2.5 - 2x$ ruled	B2	B1 for $y = k - 2x$ or $y = px + 2.5$ ruled ($p \neq 0$) or for $[y =] 2.5 - 2x$ oe identified
	1.3 to 1.4	B1	
2(c)	-1	B1	
	$y = -1$	B1	FT <i>their</i> k (must be negative)
3(a)(i)	7^{11} cao	1	
3(a)(ii)	7^{10} cao	1	
3(a)(iii)	7^2 cao	1	If answers 11, 10 and 2 in (a) then allow SC1 in this part
3(b)	$1000x^9y^{12}$ final answer	3	B2 for correct answer seen or answer of the form $1000x^9y^k$ or $1000x^ky^{12}$ or kx^9y^{12} or B1 for answer with one correct element in product or $(10x^3y^4)^{[3]}$ seen
3(c)(i)	108	2	M1 for $[540 =] 2^2 [\times] 3^3 [\times] 5$ or B1 for 108 oe not in prime factor form e.g. $2^2 \times 3 \times 9$

Question	Answer	Marks	Partial Marks
3(c)(ii)	30 240	2	M1 for $(540 \times 2^5 \times 3^3 \times 7) \div \text{their (c)(i)}$ oe or B1 for answer 30 240 oe not in prime factor form e.g. $2^5 \times 3^3 \times 35$
3(c)(iii)	98	2	B1 for 592 704 seen or $2^6 \times 3^3 \times 7^3$ seen or 2×7^2 oe seen
3(d)(i)	$(x - 7)(x + 4)$ final answer	2	M1 for $x(x - 7) + 4(x - 7)$ or $x(x + 4) - 7(x + 4)$ or better or for $(x + a)(x + b)$ where $ab = -28$ or $a + b = -3$
3(d)(ii)	$(a + 2b)(11a + 14b)$ final answer	2	M1 for $(a + 2b)(7(a + 2b) + 4a)$ or $(a + pb)(11a + qb)$ where $pq = 28$ or $11p + q = 36$ If 0 scored, SC1 for $a + 2b(11a + 14b)$
3(e)	$[y =] \frac{5x - 1}{2}$ oe final answer	4	B2 for $2x - 1 = -2x + 2y - x$ oe or B1 for $9^x = 3^{2x}$ or better M1dep for correct rearrangement of <i>their</i> 5 term 'linear' equation in y and x to make y the subject
4(a)(i)	Correct histogram	3	B1 for each correct block If 0 scored, SC1 for any two of fds 7.5, 3.33..., 0.8 oe soi
4(a)(ii)	3.7875 or 3.79 or 3.787 or 3.788	4	M1 for 0.75, 1.5, 3, 5.5, 9.5 soi M1 for Σfx M1 dep for <i>their</i> $\Sigma fx \div 40$
4(a)(iii)	$\frac{11}{40}$ oe	1	
4(a)(iv)	$\frac{30}{203}$ oe	3	M2 for $[2 \times] \frac{4}{29} \times \frac{15}{28}$ oe or M1 for $\frac{4}{29}$ or $\frac{15}{29}$ oe seen After 0 scored, SC1 for $[2 \times] \left(\frac{4}{40} \times \frac{26}{39} \right)$ oe or for answer $\frac{120}{841}$ oe
4(b)(i)	4.6	1	
4(b)(ii)	3.2	1	

Question	Answer	Marks	Partial Marks
4(b)(iii)	[median] remains the same oe and one is below [the median/middle] and one is above oe	2	B1 for each statement
5(a)(i)(a)	$\begin{pmatrix} 5 \\ -13 \end{pmatrix}$ final answer	1	
5(a)(i)(b)	$\begin{pmatrix} -4 \\ 11 \end{pmatrix}$ final answer	2	B1 for answer $\begin{pmatrix} -4 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 11 \end{pmatrix}$ or $\begin{pmatrix} -6 \\ 16 \end{pmatrix}$ seen
5(a)(i)(c)	5.39 or 5.385...	2	M1 for $2^2 + ([-]5)^2$
5(a)(ii)	$[k =] 8$ $[m =] -32$	3	B2 for $k = 8$ or $m = -32$ or M1 for $-3 + 2k = 13$ oe or for $m = -5 \times \text{their } k + 8$ correctly evaluated
5(b)(i)(a)	$\mathbf{p} + \mathbf{q}$ final answer	1	
5(b)(i)(b)	$\frac{1}{2}\mathbf{p} - \frac{1}{2}\mathbf{q}$ or $\frac{1}{2}(\mathbf{p} - \mathbf{q})$ or $\frac{\mathbf{p} - \mathbf{q}}{2}$ final answer	2	M1 for unsimplified answer or any correct vector route for \overrightarrow{CM} , e.g. $-\mathbf{q} + \frac{1}{2}\text{their } (\mathbf{b})(\mathbf{i})(\mathbf{a})$
5(b)(i)(c)	$\frac{1}{2}\mathbf{p} + \frac{1}{10}\mathbf{q}$ or $\frac{5\mathbf{p} + \mathbf{q}}{10}$ final answer	2	M1 for unsimplified answer or any correct vector route for \overrightarrow{MN}
5(b)(ii)	$\frac{5}{3}\mathbf{p} + \mathbf{q}$ or $\frac{5\mathbf{p} + 3\mathbf{q}}{3}$ final answer	3	B2 for unsimplified correct answer OR M1 for $\mathbf{p} + \frac{3}{5}\mathbf{q}$ seen B1 for final answer of form $k\mathbf{p} + \mathbf{q}$ ($k > 1$) or final answer $\frac{5}{3}\mathbf{p} + j\mathbf{q}$ oe (any j)
6(a)	$\sqrt{16^2 + 19^2 - 2 \times 16 \times 19 \cos 57}$ oe	M2	or M1 for $16^2 + 19^2 - 2 \times 16 \times 19 \cos 57$ A1 for 285.8 to 285.9
	16.90 to 16.91	A1	

Question	Answer	Marks	Partial Marks
6(b)	74.3 or 74.30 to 74.33	4	M2 for $[\sin \dots =] \frac{16.9 \times \sin 75}{32}$ oe or M1 for $\frac{16.9}{\sin C} = \frac{32}{\sin 75}$ oe B1 for $[\text{angle } BCD =] 30.7 \text{ or } 30.67 \text{ to } 30.69\dots$ or M1dep for $105 - \text{their angle } BCD$
6(c)	388 or 387.7 to 387.9... nfw	3	M1 for $\frac{1}{2} \times 16 \times 19 \times \sin 57$ oe M1 for $\frac{1}{2} \times 16.9 \times 32 \times \sin \text{their (b)}$ oe
6(d)	13.4 or 13.41 to 13.42 nfw	3	M2 for $\frac{x}{16} = \sin 57$ oe or M1 for distance required is perpendicular to AD soi
7(a)(i)	Triangle at (4, 0) (4, 3) (6, 3)	2	B1 for translation by $\begin{pmatrix} 2 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ -1 \end{pmatrix}$ If 0 scored SC1 for triangle at (3, 0.5) (3, 3.5) (5, 3.5)
7(a)(ii)	Triangle at (1, -2) (4, -4) (4, -2)	2	B1 for rotation 90 clockwise wrong centre or for rotation 90 anticlockwise about the origin
7(a)(iii)	Triangle at (-4, 4) (-4, 2.5) (-5, 2.5)	2	B1 for enlargement SF $-\frac{1}{2}$ with wrong centre or for enlargement SF $\frac{1}{2}$ with centre (-2, 3)
7(b)	Reflection $y = -x$ oe	2	B1 for each
8(a)	$[L =] 11.8$ $[W =] 5.9$ $[H =] 7.1$	5	M1 for $L = 2W$ oe soi M1 for $W + 2H = 20.1$ oe M1 for $2L + 2H = 37.8$ oe B1 for at least one correct answer
8(b)(i)	0.559 to 0.56[0...]	B4	M2 for $\frac{1}{3} \times 18 \times 15 \times \sqrt{24^2 - 18^2}$ isw conversion or M1 for $h^2 + 18^2 = 24^2$ oe or better M1 for figs $800 \div \text{figs their volume}$ isw
	g/cm^3 or g cm^{-3} final answer	B1	

Question	Answer	Marks	Partial Marks
8(b)(ii)	34.1 or 34.11 to 34.12	4	M3 for $\tan [] = \frac{\sqrt{24^2 - 18^2}}{\sqrt{18^2 + 15^2}}$ oe or M2 for $\sqrt{18^2 + 15^2}$ isw or $\sqrt{24^2 + 15^2}$ isw or M1 for $18^2 + 15^2$ isw or $24^2 + 15^2$ isw or M1 for indicating required angle is <i>EBD</i>
9(a)(i)	2	2	M1 for $x(x^2 - 4x + 4)$ or $x(x - 2)^2$ or $(x^2 - 2x)(x - 2)$ or $x^3 - 2ax^2 + a^2x$
9(a)(ii)	Correct sketch with curve passing through <i>O</i> and touching (2, 0) 	4	B1 for any positive cubic B1 for sketch through or touching <i>O</i> B1 for sketch with min or max touching <i>x</i> -axis once only but not at (0, 0) B1FT <i>their (a)(i)</i> for sketch with min or max touching <i>x</i> -axis at (<i>their</i> 2, 0) and <i>their</i> 2 is labelled or clearly indicated
9(b)	$y = 20x - 64$ final answer nfw	7	B6 for equivalent correct equation OR B2 for $3x^2 - 8x + 4$ isw or B1 for $3x^2$ or $-8x$ seen M2dep for [grad =] 20 soi nfw or M1dep for substituting 4 into <i>their</i> derivative isw B1 for (4, 16) soi M1dep for $16 = \text{their } 20 \times 4 + c$ oe
10	125 n^3 oe final ans	B2	B1 for 125 B1 for n^3
	29 $6n - 1$ oe final ans	B3	B1 for 29 B2 for $6n - 1$ oe or B1 for $6n + k$ or $an - 1$ ($a \neq 0$)
	2^{n-3} oe final ans	B2	B1 for $2^{n[+k]}$ oe
	25 $6n - 1 - 2^{n-3}$ oe final ans OR 25.25 $-\frac{1}{24}n^3 + \frac{1}{8}n^2 + \frac{17}{3}n - 1$ oe final ans	B2	FT <i>their</i> 29 – 4 and <i>their</i> $6n - 1 - \text{their } 2^{n-3}$ B1FT for each OR B1 for each



Cambridge IGCSE™

MATHEMATICS

0580/43

Paper 4 (Extended)

May/June 2021

MARK SCHEME

Maximum Mark: 130

Published

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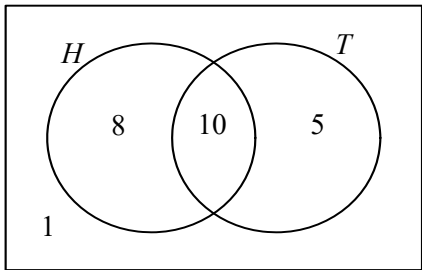
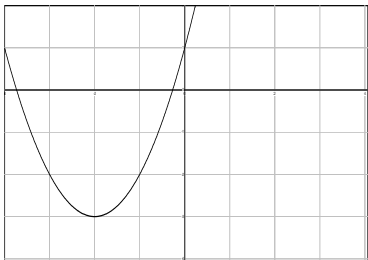
Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	120	2	M1 for $6 \div (21 - 19)$ oe soi or for $\frac{2x}{40} = 6$
1(a)(ii)(a)	34	2	M1 for $40 - \frac{15}{100} \times 40$ oe or better or B1 for 6
1(a)(ii)(b)	35	2	M1 for $\left(1 - \frac{15}{100}\right) \times p = 29.75$ or better
1(b)(i)	44 274 cao	3	B2 for 44273 to 44274 or 44270 or M1 for $40100 \times \left(1 + \frac{2}{100}\right)^5$ oe
1(b)(ii)	2019 nfw	3	M2 for one correct trial of $n = 8$ or $n = 9$ either to find a salary or, if working with 1.02 ⁿ and $47\,500 \div 40\,100 [= 1.1845]$, to find a value of 1.02 ⁿ or B2 for final answer 9 or 4 nfw or M1 for <i>their</i> $44\,274 \times \left(1 + \frac{2}{100}\right)^n = 47\,500$ oe or $40\,100 \times \left(1 + \frac{2}{100}\right)^n = 47\,500$ oe or for at least one trial giving a value greater than <i>their</i> 44 274
1(c)	2.9 [increase]	2	M1 for $\left(1 + \frac{5}{100}\right) \times \left(1 - \frac{2}{100}\right)$ oe implied by 1.029 or 102.9[%]
2(a)(i)	-1	2	M1 for $3 \times 2^2 - 13$ oe
2(a)(ii)	$[\pm] \sqrt{\frac{y-t}{p}}$ oe final answer	3	M1 for correct rearrangement to isolate x^2 term M1 for correct division by p M1 for correct square root Incorrect answer scores a maximum of M2 If 0 scored, SC1 for a correctly rearranged formula with $p = 3$ and $t = -13$ substituted

Question	Answer	Marks	Partial Marks
2(b)(i)	$(5x - 4)(3x + 2)$ oe final answer	2	B1 for $(ax + b)(cx + d)$ where either $ac = 15$ <u>and</u> $bd = -8$ or $ad + bc = -2$ or $5x(3x + 2) - 4(3x + 2)$ or $3x(5x - 4) + 2(5x - 4)$ or correct factors seen and spoiled
2(b)(ii)	$\frac{4}{5}$ oe and $-\frac{2}{3}$ oe	1	FT a factorised quadratic
2(c)	$x(x + 4y)(x - 4y)$ final answer	3	B2 for $(x^2 + 4xy)(x - 4y)$ or $(x + 4y)(x^2 - 4xy)$ or answer in the form $x(a + b)(a - b)$ or correct answer seen and spoiled or B1 for $x(x^2 - 16y^2)$ oe or $(x + 4y)(x - 4y)$
2(d)	$\frac{1 - 2a}{x}$ oe final answer	4	B2 for $(2x - 1)(1 - 2a)$ oe or B1 for $2x - 1 - 2a(2x - 1)$ or $2x(1 - 2a) - (1 - 2a)$ B1 for $x(2x - 1)$
3(a)(i)	4	1	
3(a)(ii)	7	1	
3(a)(iii)	8	1	
3(b)(i)	14	1	
3(b)(ii)	4	2	B1 for [l.q. =] 11 or [u.q. =] 15
3(c)	8.09	3	M1 for $5 \times 3 + 10 \times 6 + 43 \times 7 + 75 \times 8 + 48 \times 9 + 21 \times 10$ M1 dep $\div 200$
3(d)	30, 70, 40, 36, 24 seen	B2	B1 for 3 or 4 correct or M1 for $1 \times (80 - 50)$, $3.5 \times (100 - 80)$, $4 \times (110 - 100)$, $3.6 \times (120 - 110)$ and $0.6 \times (160 - 120)$ oe
	$(\text{their } 30 \times 65 + \text{their } 70 \times 90 + \text{their } 40 \times 105 + \text{their } 36 \times 115 + \text{their } 24 \times 140) \div 200$	M3	M1 for midpoints soi M1 for Σfx , x in interval or boundary of interval M1 dep on second M1 for $\div 200$
	99.75	A1	
4(a)(i)	(2, 7)	2	B1 for each coordinate

Question	Answer	Marks	Partial Marks
4(a)(ii)	$-\frac{1}{2}x + 8$ oe	4	<p>Correct equivalent in different form scores 3 marks.</p> <p>M1 for gradient of $AB = \frac{9-5}{3-1}$ or $\frac{4}{2}$ or 2</p> <p>M1 dep for gradient</p> $p = -\frac{1}{\text{their grad of } AB}$ <p>M1 (dep on previous M1) for substitution of <i>their</i> midpoint into $y = (\text{their } p)x + c$ oe</p> <p>where <i>their</i> $p \neq 0$</p>
4(b)(i)	$\begin{pmatrix} 0 \\ 2 \end{pmatrix}$	2	B1 for $\begin{pmatrix} 0 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 2 \end{pmatrix}$
4(b)(ii)	$\begin{pmatrix} -2 \\ 9 \end{pmatrix}$	2	<p>FT <i>their</i> \overrightarrow{PQ}</p> <p>B1FT for $\begin{pmatrix} 0 \\ 6 \end{pmatrix}$</p>
4(c)(i)	$\frac{2}{3}\mathbf{t} + \frac{1}{3}\mathbf{u}$ or $\frac{1}{3}(2\mathbf{t} + \mathbf{u})$ final answer	2	<p>M1 for $\overrightarrow{UY} = \frac{2}{3}(\mathbf{t} - \mathbf{u})$ oe</p> <p>or $\overrightarrow{TY} = \frac{1}{3}(\mathbf{u} - \mathbf{t})$ oe</p> <p>or correct route soi</p>
4(c)(ii)	$\frac{2}{3}\mathbf{t}$ cao	1	
5(a)	$[x =] 7$ $[y =] 3$	2	B1 for each
5(b)	$[x =] 0, [y =] 2$ $[x =] -3, [y =] 5$	4	<p>B3 for $x = 0$ and $x = -3$ or B2 for $x^2 + 3x = 0$ or M1 for $2 - x = x^2 + 2x + 2$ If 0 scored award B1 for $x = 0, y = 2$ or $x = -3, y = 5$ from no/incorrect working</p> <p>ALTERNATIVE</p> <p>B3 for $y = 2$ and $y = 5$ or B2 for $y^2 - 7y + 10 = 0$ or M1 for $y = (2 - y)^2 + 2(2 - y) + 2$ If 0 scored award B1 for $x = 0, y = 2$ or $x = -3, y = 5$ from no/incorrect working</p>

Question	Answer	Marks	Partial Marks
6(a)		2	i.e. 8, 10 and 5 correctly placed B1 for 10 correctly placed or M1 for $18 - x$, x and $15 - x$ correctly placed on diagram and $x = 10$ seen
6(b)	10	1	FT <i>their</i> Venn diagram
6(c)	5	1	FT <i>their</i> Venn diagram
6(d)	$\frac{5}{24}$ oe	1	FT <i>their</i> 5 on the Venn diagram
6(e)	0	1	
6(f)	$\frac{5}{17}$ oe	3	M2 for $\frac{\text{their}10}{18} \times \frac{\text{their}9}{17}$ or B1FT for $\frac{\text{their}10}{18}$ or $\frac{\text{their}9}{17}$ seen After 0 scored, SC1 for answer $\frac{25}{81}$ oe
7(a)	$-2 < x \leq 1$	2	B1 for $-2 < x$ or $x \leq 1$
7(b)(i)	$(x+2)^2 - 3$	2	M1 for $(x+2)^2 + k$
7(b)(ii)	$(x+2)^2 = 3$	M1	FTdep <i>their</i> (b)(i) for $k < 0$
	-3.73 or -3.732... and -0.268 or -0.2679...	B1	
7(b)(iii)	$(-2, -3)$	2	FT <i>their</i> $(x+2)^2 - 3$ B1 for each coordinate
7(b)(iv)	Correct sketch 	2	Parabola with minimum point in correct quadrant and both x -intercepts negative and positive y -intercept B1 for parabola with minimum point.

Question	Answer	Marks	Partial Marks
8(a)(i)	1200	1	
8(a)(ii)(a)	800	3	M2 for $[2 \times] (20 \times 12 + 20 \times 5 + 12 \times 5)$ or M1 for 20×12 or 20×5 or 12×5
8(a)(ii)(b)	0.19	1	FT $152 \div \text{their } 800$
8(b)	$\frac{3x}{2}$ or $1.5x$	3	B2 for $r^3 = \frac{27x^3[\pi]}{8[\pi]}$ or better or M1 for $\frac{4}{3}\pi r^3 = \pi x^2 \times \frac{9x}{2}$
8(c)	13.6 or 13.59 to 13.61	7	If chord is AB and O is centre of the cross section M2 for $2 \times \cos^{-1}\left(\frac{20-5}{20}\right)$ oe or M1 for $\cos = \frac{20-5}{20}$ oe M1 for $\frac{\text{their } AOB}{360} \times \pi \times 20^2$ or $\frac{1}{2}(20)^2 \left(\frac{82.8\pi}{180}\right)$ M1 for $\frac{1}{2} \times 20^2 \times \sin(\text{their } AOB)$ oe M1 for $\text{their area} \times 150$ M1 for $\text{their volume} \div 1000$
9(a)	42.3 or 42.28 to 42.30...	7	M1 for $\frac{AB}{14} = \cos 35$ oe M1 for $\frac{AD}{14} = \sin 35$ oe B1 for $[C =] 75$ M3 for $[BC =] \frac{14 \sin 60}{\sin \text{their } 75}$ oe and $[DC] \frac{14 \sin 45}{\sin \text{their } 75}$ oe or M2 for $\frac{14 \sin 60}{\sin \text{their } 75}$ or $\frac{14 \sin 45}{\sin \text{their } 75}$ oe or M1 for $\frac{\sin \text{their } 75}{14} = \frac{\sin 60}{BC}$ oe or $\frac{\sin \text{their } 75}{14} = \frac{\sin 45}{CD}$ oe

Question	Answer	Marks	Partial Marks
9(b)(i)	4.91 or 4.907...	3	B2 for $[l^2 =]$ 24.1 or 24.08... or M2 for $\sqrt{3} l = 8.5$ or $[l =] \sqrt{\frac{8.5^2}{3}}$ oe or M1 for $l^2 + l^2 + l^2 = 8.5^2$ oe
9(b)(ii)	35.3 or 35.26 to 35.3 nfw	3	M2dep for $\sin(\text{angle}) = \frac{\text{their (b)(i)}}{8.5}$ oe or M1 for clear recognition of correct angle
10(a)(i)	4	1	
10(a)(ii)	3	1	
10(a)(iii)	13	1	FT $5 \times \text{their (a)(i)} - 7$
10(b)	$\frac{x+2}{3}$ final answer	2	M1 for $y + 2 = 3x$ or for $\frac{y}{3} = x - \frac{2}{3}$ or for $x = 3y - 2$
10(c)	$9x^2 - 9x + 2$ final answer	3	M1 for $(3x-2)^2 + 3x - 2$ B1 for $(3x-2)^2 = 9x^2 - 6x - 6x + 4$
10(d)	$2x + 1$	1	
10(e)(i)	81	1	
10(e)(ii)	x	1	Not $y = x$
11(a)(i)	-5	1	
11(a)(ii)	Subtract 4 oe	1	
11(a)(iii)	$15 - 4n$ oe final answer	2	B1 for $k - 4n$ or $15 - jn$ $j \neq 0$
11(b)(i)	$\frac{1}{21}$ or equivalent fraction	2	B1 for $\frac{12}{7}$ and $\frac{10}{6}$
11(b)(ii)	$n = \frac{3}{5}$ oe or $2n \geq n + 1$ but $3 < 4$.	M2	M1 for $\frac{3}{4} = \frac{2n}{n+1}$ oe or M1 for $2n > n + 1$ but $3 < 4$
	No, n is not an integer oe or No, $\frac{3}{4}$ is less than 1, oe	A1	



Cambridge IGCSE™

MATHEMATICS

0580/42

Paper 4 (Extended)

March 2021

MARK SCHEME

Maximum Mark: 130

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the March 2021 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

This document consists of **10** printed pages.

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

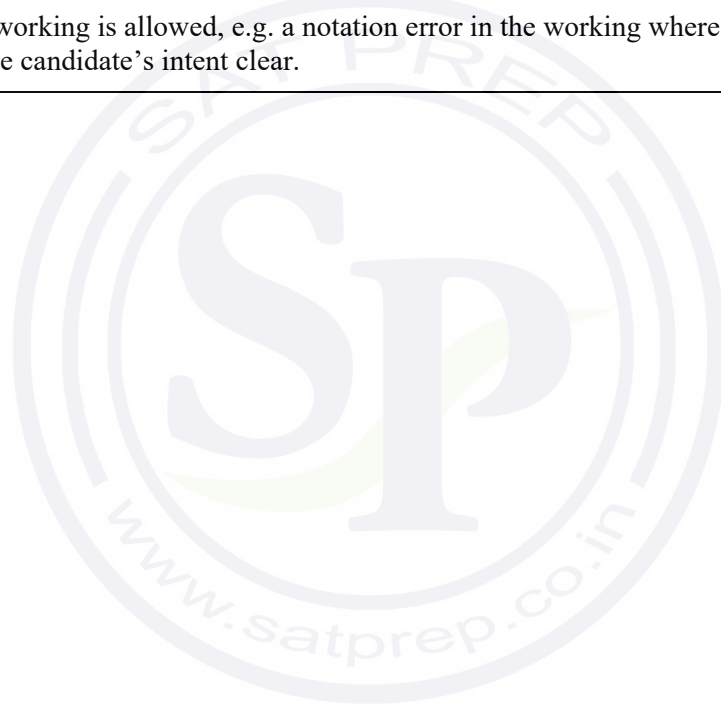
GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Maths-Specific Marking Principles	
1	Unless a particular method has been specified in the question, full marks may be awarded for any correct method. However, if a calculation is required then no marks will be awarded for a scale drawing.
2	Unless specified in the question, answers may be given as fractions, decimals or in standard form. Ignore superfluous zeros, provided that the degree of accuracy is not affected.
3	Allow alternative conventions for notation if used consistently throughout the paper, e.g. commas being used as decimal points.
4	Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored (isw).
5	Where a candidate has misread a number in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 mark for the misread.
6	Recovery within working is allowed, e.g. a notation error in the working where the following line of working makes the candidate's intent clear.

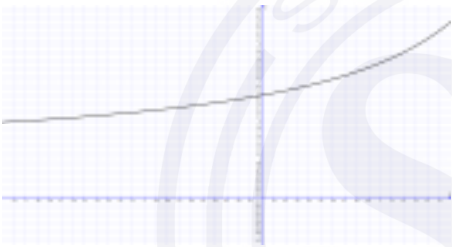


Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)	245	1	
1(b)	8	2	M1 for $40 + 26.5x = 252$ oe or B1 for 212 seen
1(c)	6	2	M1 for $(224 - 2 \times 48) \div 32$ oe or $2 \times 48 + 32(x - 2) = 224$ soi
1(d)	35 : 36 : 32 final answer	2	B1 for <i>their</i> (a) : 252 : 224 or equivalent ratio
2(a)(i)	rotation 90 anticlockwise oe (-3, 2)	3	B1 for each
2(a)(ii)	enlargement $-\frac{1}{2}$ (-2, -1)	3	B1 for each
2(b)	Image at (-3, -5) (1, -5) (1, 3)	2	B1 for translation by $\begin{pmatrix} -5 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ -10 \end{pmatrix}$
2(c)	Image at (2, 3) (6, 3) (6, -5)	2	B1 for reflection in $y = k$ or $x = 4$
3(a)	126 54 117	3	B1 for each
3(b)	angle [in a] semicircle is 90	B1	Do not accept triangle for angle
	Allied, co-interior [add to 180] or Angles in triangle [= 180] and alternate oe	B1	
	32	B1	
3(c)	109	2	B1 for 218 or 71 in correct places or correctly labelled

Question	Answer	Marks	Partial Marks
4(a)	462	1	
4(b)(i)	$\frac{7}{15}$ oe	1	
4(b)(ii)	$\frac{7}{15} \times \frac{6}{14} + \frac{6}{15} \times \frac{5}{14} + \frac{2}{15} \times \frac{1}{14}$ $= \frac{37}{105}$	3	M2 for addition of two of $\frac{7}{15} \times \frac{6}{14} + \frac{6}{15} \times \frac{5}{14} + \frac{2}{15} \times \frac{1}{14}$ or M1 for one of the products seen
4(b)(iii)	$\frac{29}{65}$ oe	4	M3 for $\frac{7}{15} \times \frac{6}{14} \times \frac{5}{13} + 3 \times \frac{7}{15} \times \frac{6}{14} \times \frac{6}{13} + 3 \times \frac{7}{15} \times \frac{6}{14} \times \frac{2}{13}$ oe or $1 - 3 \left(\frac{8}{15} \times \frac{7}{14} \times \frac{7}{13} \right) - \left(\frac{8}{15} \times \frac{7}{14} \times \frac{6}{13} \right)$ oe or M2 for the sum of at least two of $\frac{7}{15} \times \frac{6}{14} \times \frac{5}{13}$, $N \times \frac{7}{15} \times \frac{6}{14} \times \frac{6}{13}$, $N \times \frac{7}{15} \times \frac{6}{14} \times \frac{2}{13}$ seen or for $\frac{7}{15} \times \frac{6}{14} \times \frac{13}{13}$ or $\frac{7}{15} \times \frac{6}{14} + N \times \frac{7}{15} \times \frac{6}{14} \times \frac{k}{13}$ seen or M1 for $\frac{7}{15} \times \frac{6}{14} \times \frac{5}{13}$ or $N \times \frac{7}{15} \times \frac{6}{14} \times \frac{6}{13}$ or $N \times \frac{7}{15} \times \frac{6}{14} \times \frac{2}{13}$ seen If 0 scored SC1 for $\frac{1519}{3375}$ oe
5(a)	27[.0] or 26.97... nfww	3	M2 for $[\cos =] \frac{8.6^2 + 9.7^2 - 4.4^2}{2 \times 8.6 \times 9.7}$ or M1 for implicit form
5(b)	9.19 or 9.192 to 9.193	4	B1 for $[\text{angle } BCD =] 73$ seen M2 for $\frac{9.7 \times \sin 65}{\sin (180 - 65 - 42)}$ oe or M1 for $\frac{\sin (180 - 65 - 42)}{9.7} = \frac{\sin 65}{DC}$ oe

Question	Answer	Marks	Partial Marks
5(c)	6.15 or 6.149 to 6.151...	3	M2 for $\frac{d}{\text{their } 9.19} = \sin 42$ oe or M1 for right angle between line from C to BD and BD soi
6(a)(i)	$[a =] 4$ $[b =] - 3$ nfw	2	B1 for $[a =] 4$ B1 for $[b =] - 3$ nfw
6(a)(ii)	$y = 4$ oe	1	
6(a)(iii)	$y = -6x + 7$ oe final answer	2	B1 for answer $-6x + 7$ or answers $y = -6x + c$ or $y = kx + 7$ ($k < 0$)
6(b)(i)	2.25 2.67 3.5	3	B1 for each
6(b)(ii)	correct curve 	4	B3 FT for 7 or 8 points or B2 FT for 5 or 6 points or B1 FT for 3 or 4 points
6(c)(i)	-0.78 to -0.72 and 0.55 to 0.59	2	B1 for each
6(c)(ii)	$3x^3 - 9x^2 - 3x + 4$ [= 0] final answer	4	B3FT for 3 out of 4 correct terms or for $bx^3 - 3bx^2 + (a - 1)x + 8 - 3a$ [= 0] oe or B2FT for 2 out of 4 correct terms or for 3 out of 4 terms from $bx^3 - 3bx^2 + (a - 1)x + 8 - 3a$ [= 0] or M1 for $1 + \frac{5}{3-x} = \text{their } 4 + (\text{their } (-3))x^2$ oe
7(a)(i)	70	1	
7(a)(ii)	78	1	
7(a)(iii)	Value in range $86 < V \leq 90$	1	

Question	Answer	Marks	Partial Marks
7(a)(iv)	One <u>general</u> comment <u>interpreting</u> the median comparison nfw e.g. Students did better on second test oe OR One <u>general</u> comment <u>interpreting</u> IQR/range comparison nfw e.g. Students marks were more consistent on the 2nd test oe	1	
7(b)	31.2	4	M1 for mid-values soi M1 for Σfm where m is any value in interval including boundaries M1 (dep on second M1) for $their \Sigma fm \div 50$
7(c)(i)	38	1	
7(c)(ii)	Blocks of heights 4.4 and 3.4 with correct widths	2	B1 for each correct block If B0 scored, SC1 for both correct frequency densities soi

Question	Answer	Marks	Partial Marks
8(a)(i)	$\frac{53}{360} \times \pi \times 9.5^2$	M1	
	41.74 to 41.75	A1	
8(a)(ii)	5.9[0] or 5.899 to 5.903..	4	<p>M3 for $[OA^2 =] \frac{\frac{1}{3} \times 41.7}{\frac{1}{2} \sin 53}$ oe</p> <p>M2 for $\frac{1}{2} \times OA^2 \times \sin 53 = \frac{1}{3} \times 41.7$ oe</p> <p>M1 for $\frac{1}{2} \times OA \times OB \times \sin 53 = \frac{1}{3} \times 41.7$ seen or better</p>
8(b)	396 or 397 or 396.4 to 396.6	6	<p>M2 for $[r =] \left(\frac{60}{360} \times 2 \times \pi \times 24 \right) \div 2\pi$ oe or better</p> <p>or M1 for $2\pi r = \frac{60}{360} \times 2 \times \pi \times 24$ oe</p> <p>M2 for $\sqrt{24^2 - a^2}$</p> <p>or M1 for $h^2 + a^2 = 24^2$</p> <p>M1 for $\frac{1}{3} \pi \times \text{their } r^2 \times \text{their } h$</p>
9(a)(i)	$(5a - b)(m + 2p)$ final answer	2	<p>M1 for $5a(m + 2p) - b(m + 2p)$</p> <p>or $m(5a - b) + 2p(5a - b)$</p> <p>or B1 for correct answer seen</p>
9(a)(ii)	$5(k + g)(3k + 3g - 4)$ final answer	2	<p>M1 for correct partial factorisation by 5 or $(k + g)$ isw</p> <p>eg $5(3k^2 + 6kg + 3g^2 - 4k - 4g)$</p> <p>or $5(3(k + g)^2 - 4(k + g))$ or $(k + g)(15(k + g) - 20)$</p> <p>or $(5k + 5g)(3k + 3g - 4)$</p> <p>or B1 for correct answer seen</p>
9(a)(iii)	$(2x - y^2)(2x + y^2)$ final answer	2	<p>M1 for answer in form $(a + b)(a - b)$</p> <p>or B1 for correct answer seen</p>
9(b)	$3x^3 - 10x^2 - x + 12$ final answer	3	<p>B2 for correct unsimplified expansion</p> <p>or simplified expression with 3 terms correct in a 4-term expression of required form</p> <p>or B1 for correct expansion of two of the brackets with at least 3 terms correct</p>
9(c)	$[a =] 11$ $[b =] 121$	2	B1 for each

Question	Answer	Marks	Partial Marks
10(a)	1600	3	B2 for answer figs 16 or M2 for $90.72 \div (\text{figs}45 \times \text{figs}3 \times \text{figs}42)$ or M1 for volume = figs 45 \times figs 3 \times figs 42 isw
10(b)	62.8 or 62.83 to 62.84	3	M2 for $\frac{\pi \times 10^2 \times 30}{15000} \times 100$ or M1 for $\pi \times 10^2 \times 30$
10(c)	12.9[0]	3	B2 for 86 OR M2 for $\frac{98.9}{1 + \frac{15}{100}} \times 0.15$ oe or $98.9 - \frac{98.9}{1 + \frac{15}{100}}$ oe or M1 for $\left(1 + \frac{15}{100}\right)a = 98.9$ oe isw
10(d)	50	2	M1 for $3540 \div 70.8$
11(a)	$\frac{48}{x}$ final answer	1	Accept $48 \div x$
11(b)	$their(a) - \frac{60}{x+2} = 4$ oe	M1	FT <i>their</i> (a) provided expression in x
	$48(x+2) - 60x = 4x(x+2)$ oe	M2	FT <i>their</i> 3 term eqn with algebraic denominators, x and $x+2$, for M2 or M1 M1 for common denominator $x(x+2)$ oe seen or any two terms in a 3 term equation from $\pm 48(x+2)$, $\pm 60x$, $\pm 4x(x+2)$ oe seen
	$48x + 96 - 60x = 4x^2 + 8x$ oe leading to $x^2 + 5x - 24 = 0$	A1	With brackets expanded and no errors or omissions seen
11(c)	$(x-3)(x+8)$	B2	B1 for $x(x+8) - 3(x+8)$ or $x(x-3) + 8(x-3)$ or $(x+a)(x+b) [= 0]$ where $ab = -24$ or $a+b = 5$ [a, b integers]
	3 and -8	B1	
11(d)	12	1	
12(a)	17	3	M2 for $3 \times 2x^2 - 7$ or better isw or M1 for $3 \times 2x^2$ oe or $kx^2 - 7$ seen

Question	Answer	Marks	Partial Marks
12(b)(i)	13.4 or 13.41 to 13.42	3	M2 for $\sqrt{(-5-7)^2 + (8-2)^2}$ oe or M1 for $(-5-7)^2 + (8-2)^2$ oe
12(b)(ii)	$[y =] 2x + 5$ final answer	4	M1 for [gradient of $AB = \frac{8-2}{-5-7}$ oe M1dep for gradient $p = -1 \div \text{their} - \frac{1}{2}$ oe M1dep on previous M1 for substituting $(-1, 3)$ into $y = \text{their } px + c$ oe where $\text{their } p \neq 0$
12(b)(iii)	(5, 0)	4	B3 for $\overrightarrow{AD} = \begin{pmatrix} -2 \\ -2 \end{pmatrix}$ or $\overrightarrow{DA} = \begin{pmatrix} 2 \\ 2 \end{pmatrix}$ or coordinates of C $(-7, 6)$ and $[\overrightarrow{CD} =] \begin{pmatrix} 12 \\ -6 \end{pmatrix}$ oe seen or B2 for $a = b = 2$ soi or coordinates of C $(-7, 6)$ or M1 for $a = b$ oe soi or for $a^2 + b^2 = (\sqrt{8})^2$ oe or $\cos 45 = \frac{a}{\sqrt{8}}$ oe or for $[\overrightarrow{DC} =] \begin{pmatrix} -12 \\ 6 \end{pmatrix}$ or $[\overrightarrow{CD} =] \begin{pmatrix} 12 \\ -6 \end{pmatrix}$ seen or $\frac{y-8}{x-5} = 1$ oe or $\frac{y-2}{x-7} = 1$



Cambridge IGCSE™

MATHEMATICS

0580/41

Paper 4 (Extended)

October/November 2020

MARK SCHEME

Maximum Mark: 130

Published

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GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
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- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Maths-Specific Marking Principles	
1	Unless a particular method has been specified in the question, full marks may be awarded for any correct method. However, if a calculation is required then no marks will be awarded for a scale drawing.
2	Unless specified in the question, answers may be given as fractions, decimals or in standard form. Ignore superfluous zeros, provided that the degree of accuracy is not affected.
3	Allow alternative conventions for notation if used consistently throughout the paper, e.g. commas being used as decimal points.
4	Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored (isw).
5	Where a candidate has misread a number in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 mark for the misread.
6	Recovery within working is allowed, e.g. a notation error in the working where the following line of working makes the candidate's intent clear.

Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)	Image at (4, -1) (4, -4) (5, -4)	2	B1 for translation by $\begin{pmatrix} 8 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ -6 \end{pmatrix}$ or for correct vertices not joined
1(b)	Image at (-4, -4) (-4, -7) (-3, -4)	2	B1 for reflection in $x = -1$ or $y = k$ or for correct vertices not joined
1(c)	Enlargement 3 (-5, 5)	3	B1 for each
1(d)	Rotation 90° clockwise oe (1, 1)	3	B1 for each
2(a)	1 : 5 : 12	2	M1 for 2 : 10 : 24 or 7 : 35 : 84 or $\frac{1}{18} : \frac{5}{18} : \frac{12}{18}$
2(b)(i)	266 and 95	3	B2 for 266 or 95 or 266 and 95 reversed or M1 for $\frac{114}{6}$
2(b)(ii)	15	2	M1 for $\frac{114 - 96.9}{114} [\times 100]$ oe or $\frac{96.9}{114} \times 100$
2(c)(i)	2h 50min	1	
2(c)(ii)	636	2	M1 for $1802 \div \text{their } 2\text{h } 50\text{min}$
3(a)	Disagree: the median for the women is greater (than the median for the men) oe Disagree: the men have a smaller [interquartile] range of times oe	2	B1 for each correct statement oe
3(b)(i)	87.4 nfww	4	M1 for mid-points soi (30, 80, 130, 190, 270) M1 for use of Σfm with m in correct interval including both boundaries M1 (dep on 2 nd M1) for $\Sigma fm \div (41 + 24 + 23 + 8 + 4)$
3(b)(ii)(a)	90	1	
3(b)(ii)(b)	8	2	B1 for 92 seen

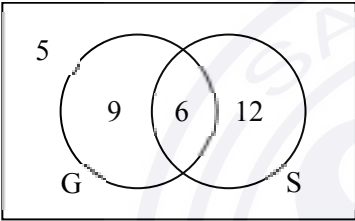
Question	Answer	Marks	Partial Marks
3(b)(iii)	2.4	2	M1 for $\frac{24}{40}$ or $\frac{8}{60}$ Or B1 for [multiplier] 18 or $\frac{1}{18}$
4(a)	38.6	3	M2 for $[2 \times] (8.5 + 0.05 + 10.7 + 0.05)$ or M1 for $8.5 + 0.05$ or $10.7 + 0.05$
4(b)(i)	8.86 or 8.863...	2	M1 for $\frac{h}{9} = \sin 80$ or better oe
4(b)(ii)	$\angle CDF = 100$ leading to $\angle DCF = 40$ Or $\angle EDF = 80$ leading to $\angle DCF = 40$	M1	Implied by $180 - (100 + 40) = 40$ or $80 - 40$
	‘two equal angles’	A1	With no incorrect work seen
4(b)(iii)	66.5 or 66.45 to 66.47...	3	M2 for $0.5(3 + 12) \times \text{their (b)(i)}$ or $12 \times \text{their (b)(i)} - 0.5 \times 9 \times 9 \times \sin 100$ oe or B1 for $DC = 9$ or $BC = 3$

Question	Answer	Marks	Partial Marks
4(c)	130 nfw or 129.6 to 129.8	5	<p>B1 for $\angle ACD = 21^\circ$ or $\angle CAD = 69^\circ$</p> <p>Method 1</p> <p>M2 for $\cos 21 = \frac{12}{AC}$ oe</p> <p>or M1 for $\angle ADC = 90$ soi</p> <p>M1 for $\pi(\text{their } AC/2)^2$</p> <p>OR</p> <p>Method 2</p> <p>M2 for $\frac{12}{\sin 138} = \frac{r}{\sin 21}$ oe</p> <p>or M1 for $\angle COD = 138$ soi</p> <p>M1 for $\pi(\text{their } r)^2$</p> <p>OR</p> <p>Method 3</p> <p>M2 for $\cos 21 = \frac{6}{OC}$ oe</p> <p>or M1 for $\angle CXO = 90$ soi where X is the point where the perpendicular from O meets the chord CD</p> <p>M1 for $\pi(\text{their } OC)^2$</p>
4(d)	78.4 or 78.37 to 78.41	3	<p>M2 for</p> $\frac{x}{360} \times 2 \times \pi \times 9.5 + 2 \times 9.5 = 4 \times 8 \quad \text{oe}$ <p>or M1 for $\frac{x}{360} \times 2 \times \pi \times 9.5$</p> <p>After M0, SC1 for $9.5x + 19 = 32$ oe</p>
5(a)(i)	2.7 to 2.8	1	

Question	Answer	Marks	Partial Marks
5(a)(ii)	tangent ruled at $x = -2$	B1	
	6 to 10	2	<p>dep on B1 or a close attempt at tangent at $x = -2$</p> <p>or M1 for rise/run for <i>their</i> tangent, or close attempt, at any point Must see correct or implied calculation from a drawn tangent</p> <p>After M0, SC1 for gradient of tangent (or close attempt) in range embedded in $y = mx + c$</p>
5(a)(iii)	$y = 2x - 2$ ruled and $x = -2.9$ to -2.8 cao	3	<p>B2 for correct ruled line</p> <p>or B1 for short line or for freehand line or broken line or ruled line with gradient 2 or with y-intercept at -2 (but not $y = -2$)</p>
5(b)	$A(4, 17) B(-1.5, 0.5)$	5	<p>B4 for $(-1.5, 0.5)$ and $(4, 17)$, or for $x = 4$ and $x = -1.5$ OR</p> <p>B3 for $A(4, 17)$ or $B(-1.5, 0.5)$ OR</p> <p>M1 for $2x^2 - 2x - 7 = 3x + 5$ oe</p> <p>AND either M2 for $(2x + 3)(x - 4)$ or M1 for $2x(x - 4) + 3(x - 4)$ or $x(2x + 3) - 4(2x + 3)$ or $(2x + c)(x + d)$ where $cd = -12$ or $c + 2d = -5$ [c and d are integers]</p> <p>OR</p> <p>M2 for $\frac{-\text{their } b \pm \sqrt{(\text{their } b)^2 - 4(\text{their } a)(\text{their } c)}}{2(\text{their } a)}$ or M1 for $\sqrt{(\text{their } b)^2 - 4(\text{their } a)(\text{their } c)}$ or for $p = -\text{their } b$, $r = 2(\text{their } a)$ if in the form $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$</p>

Question	Answer	Marks	Partial Marks
6(a)(i)	106.01 to 106.02	4	M2 for $[\cos[\angle CBD] =] \frac{192^2 + 168^2 - 287.9^2}{2 \times 192 \times 168}$ oe or M1 for the implicit form A1 for -0.276 to -0.275
6(a)(ii)	292.0 or 291.98 to 291.99	1	
6(a)(iii)	310.0 or 310.03 to 310.04	5	M2 for $[\sin A =] \frac{168 \times \sin(90 - 38)}{205.8}$ or M1 for $\frac{\sin A}{168} = \frac{\sin(90 - 38)}{205.8}$ A1 for $[A =] 40.0$ or 40.03 to 40.04 M1 dep for $270 + \text{their angle } DAB$ oe
6(b)(i)	15 500 or 15 501 to 15 503. ...	2	M1 for $0.5 \times 192 \times 168 \times \sin(106)$ oe
6(b)(ii)	55 400	2	FT $3.575 \times \text{their (b)(i)}$ oe rounded to nearest 100 M1 for figs $35\ 75 \times \text{figs their (b)(i)}$ or figs 554 or figs 5541 to figs 5543
7(a)	25 36 10 15 35 51	2	B1 for 3, 4 or 5 correct
7(b)	n^2	1	
7(c)(i)	92	1	
7(c)(ii)	$\frac{1}{2}(n^2 - n)$ oe	2	M1 for $\frac{1}{2}(3n^2 - n) - n^2$ oe or for final quadratic answer with $\frac{1}{2}n^2$ oe or $-\frac{1}{2}n^2$ oe but not both

Question	Answer	Marks	Partial Marks
7(d)	$a = \frac{1}{2}, b = \frac{1}{2}$	5	<p>B2 for 2 correct equations eg $a + b = 1, 8a + 4b = 6$ or B1 for 1 correct equation</p> <p>B2 for one correct value or M1 (dep on at least B1) for correctly eliminating one variable from two linear equations in a and b</p> <p>OR</p> <p>B2 for $a = \frac{1}{2}$ or B1 for $6a = 3$ or for 3rd difference = 3</p> <p>B2 for $b = \frac{1}{2}$ or M1 for substituting <i>their</i> a into a correct equation of first differences</p>
8(a)	$ab(3a - b)$ final answer	2	B1 for $a(3ab - b^2)$ or $b(3a^2 - ab)$ or $ab(3a - b)$ seen
8(b)	$x > 7.5$ final answer	2	B1 for $12 + 3 < 5x - 3x$ oe
8(c)	$27x^6y^{12}$	2	B1 for two of $27, x^6$ and y^{12} correct
8(d)	0.5 or $\frac{1}{2}$	3	<p>M2 for $4 = 6x + 2x$ or better</p> <p>or</p> <p>M1 for $2(2 - x) = 6x$ oe</p>
8(e)	$2x^3 + 5x^2 - 23x + 10$ final answer	3	<p>B2 for correct expansion of three brackets unsimplified</p> <p>B1 for correct expansion of two brackets with at least 3 terms correct</p>
8(f)(i)	$200\left(1 + \frac{r}{100}\right)^2 = 206.46$ oe	M1	
	$1 + \frac{2r}{100} + \frac{r^2}{100^2}$ oe	M1	
	$r^2 + 200r - 323 = 0$	A1	<p>Correct solution reached with no errors or omissions seen</p> <p>If 0 scored, SC1 for $200(n)^2 = 206.46$</p>

Question	Answer	Marks	Partial Marks
8(f)(ii)	$\frac{-200 + \sqrt{200^2 - 4(1)(-323)}}{2 \times 1}$	B2	B1 for $\sqrt{200^2 - 4(1)(-323)}$ or $(r + 100)^2$ B1 for $\frac{-200 + \sqrt{q}}{2 \times 1}$ or $r = \sqrt{323 + 100^2} - 100$ OR B2 for $100 \left(\sqrt{\frac{206.46}{200}} - 1 \right)$ or B1 for $\sqrt{\frac{206.46}{200}}$
	1.60 cao final answer	B1	
9(a)(i)		2	B1 for two correct values Or B1 5 outside and total in G = 15 and total in S = 18
9(a)(ii)	$\frac{3}{8}$ oe	1	FT $\frac{\text{their } 12}{32}$
9(a)(iii)	$\frac{2}{5}$ oe	1	FT $\frac{\text{their } 6}{15}$
9(b)	96	2	M1 for $\frac{36}{64} = \frac{54}{x}$ oe or $36 = \frac{54}{(54+b)} \times 100$ oe If 0 scored SC1 for answer 150
9(c)(i)	$\frac{9}{25}$ oe	2	M1 for $\frac{15}{25} \times \frac{15}{25}$ oe
9(c)(ii)	$\frac{16}{25}$ oe	1	FT 1 – <i>their</i> (c)(i)
9(d)	$\frac{17}{20}$ oe	3	M2 for $1 - \frac{10}{25} \times \frac{9}{24}$ oe or for $\frac{15}{25} \times \frac{14}{24} + \frac{15}{25} \times \frac{8}{24} + \frac{15}{25} \times \frac{2}{24} + \frac{8}{25} \times \frac{15}{24}$ $+ \frac{2}{25} \times \frac{15}{24}$ oe or M1 for one correct relevant product

Question	Answer	Marks	Partial Marks
10(a)(i)	$A(-4, 0)$ $B(1, 0)$ $C(0, -4)$	4	B3 for A and B correct Or B2 for B $(-4, 0)$ and A $(1, 0)$ Or B1 for $(x + 4)(x - 1)$ or for $\frac{-3 \pm \sqrt{3^2 - 4 \times 1 \times -4}}{2}$ oe and B1 for A or B correct B1 for C $(0, -4)$ OR SC2 for -4 , 1 and -4 in correct positions on the graph
10(a)(ii)	$2x + 3$ [± 0] final answer	2	B1 for answer $2x + c$ or for $ax + 3$, $a \neq 0$ or for correct answer seen
10(a)(iii)	$y = 7x - 8$ oe	3	B2 for answer $7x - 8$ OR M1 for [gradient =] $2(2) + 3$ FT <i>their</i> part (a)(ii) of the form $ax + b$ M1dep for substitution of $(2, 6)$ into $y = \text{their } mx + c$ oe
10(b)(i)	Correct sketch 	2	B1 for one correct section out of 4 OR B1 for two properties correct from <ul style="list-style-type: none"> • Crosses x-axis at $(0, 0)$ $(180, 0)$ and $(360, 0)$ only • Correct curvature in each section of 90° • Asymptotes at $x = 90$ and $x = 270$
10(b)(ii)	125.5 or 125.53 to 125.54 and 305.5 or 305.53 to 305.54	3	B2 for one correct angle or B1 for -54.5 or $-54.46\dots$ or for 2 angles with a difference of 180 .



Cambridge IGCSE™

MATHEMATICS

0580/42

Paper 4 (Extended)

October/November 2020

MARK SCHEME

Maximum Mark: 130

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the October/November 2020 series for most Cambridge IGCSE™, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

This document consists of **9** printed pages.

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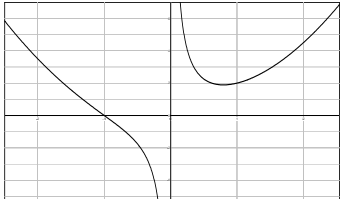
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oe	or equivalent
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nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)	9080 cao	3	B2 for 9078 to 9081... or M1 for $813 \times \text{their } 11\text{h } 10\text{min}$
1(b)(i)	654 or 653.5...	2	M1 for $10260 \div 15\text{ h } 42\text{ min}$ oe
1(b)(ii)(a)	21.8 or 21.82 to 21.83	1	
1(b)(ii)(b)	4.58 or 4.59 cao	2	M1 for $470 \div (10260 \div 100)$ oe or $100 \div \text{their } \mathbf{(b)(ii)(a)}$
1(c)	12.97	1	
2(a)	Translation $\begin{pmatrix} 1 \\ -6 \end{pmatrix}$	2	B1 for each
2(b)(i)	Image at (0, 1), (-3, 1), (-3, 2)	2	B1 for reflection in $x = k$ or $y = 1$
2(b)(ii)	Image at (5, -4), (5, -1), (4, -1)	2	B1 for rotation 90° anticlockwise with other centre or for rotation 90° clockwise about (6, 0)
2(b)(iii)	Image at (-1, -2), (-7, -2), (-7, -4)	2	B1 for enlargement, factor -2 with other centre
3(a)(i)	2210 or 2208 or 2208.2, or 2208.16...	2	M1 for $2000 \times \left(1 + \frac{2}{100}\right)^5$ oe
3(a)(ii)	10.4 or 10.5 or 10.40 to 10.41	2	M1 for $\frac{\text{their } \mathbf{(a)(i)} - 2000}{2000} [\times 100]$ or $\frac{\text{their } \mathbf{(a)(i)}}{2000} \times 100$ or $\left(1 + \frac{2}{100}\right)^5 - 1$ or $\left(1 + \frac{2}{100}\right)^5 \times 100$ oe
3(a)(iii)	12	3	B2 for 11.3 or 11.26 to 11.27 OR M2 for $[2000 \times] \left(1 + \frac{2}{100}\right)^{11}$ oe or $[2000 \times] \left(1 + \frac{2}{100}\right)^{12}$ oe seen or M1 for $[2000 \times] \left(1 + \frac{2}{100}\right)^n$ oe, $n > 5$ oe or for $2000 \times \left(1 + \frac{2}{100}\right)^n =$ or $>$ or ≥ 2500 oe

Question	Answer	Marks	Partial Marks
3(b)	490 cao	3	M2 for $p \times \left(1 - \frac{4}{100}\right)^{16} = 255$ oe soi by 490.0... or M1 for $p \times \left(1 - \frac{4}{100}\right)^n = 255$ oe, $n > 1$ oe
4(a)(i)	25	1	
4(a)(ii)	10 nfww	2	B1 for [lq =] 22 or [uq =] 32
4(a)(iii)	27	1	
4(a)(iv)	6	2	B1 for 114 written
4(b)(i)	27.9 or 27.91 to 27.92 nfww	4	M1 for mid-values M1 for $\sum fx$ where x lies within or on boundary of correct interval M1 dep $\sum fx \div 120$ dep on second M1
4(b)(ii)	7.6	2	M1 for $\frac{18}{10}$ oe or $\frac{38}{20}$ oe or B1 for [multiplier] 4 or $\frac{1}{4}$
5(a)	1.48	3	B2 for $7x + 2 = 12.36$ or better or M1 for $3x + 2(2x + 1) [= 12.36]$ or better
5(b)	1.75 or $1\frac{3}{4}$	3	B2 for $18x - 14x = 7$ or better or M1 for $18x = 7(2x + 1)$
5(c)	[0].8 oe	3	B2 for $4(2x + 1) = 13x$ or M1 for $\frac{4}{x} = \frac{13}{2x+1}$ oe or correct equation to find number of cakes

Question	Answer	Marks	Partial Marks
5(d)	$\frac{20}{x} + \frac{10}{2x+1} = 45$ oe	M2	B1 for $\frac{20}{x}$ seen or $\frac{10}{2x+1}$ seen
	$90x^2 - 5x - 20 [= 0]$ oe	B2	B1 for $\frac{20(2x+1)+10x}{x(2x+1)} = 45$ or better
	$(9x+4)(2x-1) [= 0]$ or for $\frac{- -1 \pm \sqrt{(-1)^2 - 4(18)(-4)}}{2(18)}$ oe	M2	FT <i>their</i> 3-term quadratic M1 for factors that give two correct terms when expanded or for correct discriminant or correct $\frac{-b}{2a}$ provided quadratic formula is in correct form
	$[0].5$ or $\frac{1}{2}$ final answer	B1	
6(a)(i)	$\frac{1}{3}$ oe	1	
6(a)(ii)	0	1	
6(a)(iii)	$\frac{1}{6}$ oe	1	
6(b)(i)	$\frac{1}{15}$ oe	2	M1 for $\frac{2}{6} \times \frac{1}{5}$ or equivalent method
6(b)(ii)	$\frac{4}{15}$ oe	3	M2 for $\frac{2}{6} \times \frac{1}{5} + \frac{3}{6} \times \frac{2}{5}$ or equivalent method or M1 for $\frac{2}{6} \times \frac{1}{5}$ oe seen or $\frac{3}{6} \times \frac{2}{5}$ oe seen
6(c)	$\frac{7}{18}$ oe	3	M2 for $\left(\frac{1}{6}\right)^2 + \left(\frac{2}{6}\right)^2 + \left(\frac{3}{6}\right)^2$ oe or M1 for one correct product seen or sample space with 14 correct pairs identified
7(a)	2, 4.5	2	B1 for each
7(b)	Correct graph 	4	B3 FT for 6 or 7 correct points FT <i>their</i> table or B2 FT for 4 or 5 correct points FT <i>their</i> table or B1 FT for 2 or 3 correct points FT <i>their</i> table

Question	Answer	Marks	Partial Marks
7(c)(i)	−0.5 to −0.4	1	
7(c)(ii)	$y = 1 - x$ ruled and −1.9 to −1.75	2	M1 for $[y =] 1 - x$ or $\left[x^2 + \frac{1}{x} =\right] 1 - x$ soi or B1 for −1.9 to −1.75
7(d)	Any integer ≥ 2	1	
8(a)	$[v =] 40$ $[w =] 80$ $[x =] 40$ $[y =] 100$ $[z =] 60$	5	B1 for each FT angle z as $140 - \text{their } w$
8(b)	24	3	M2 for $360 - 11x = 2 \times 2x$ oe or M1 for $360 - 11x$ seen or obtuse angle $KOL = 2 \times 2x$ oe
8(c)(i)	angle $ADX = \text{angle } BCX$ oe same segment oe angle $DAX = \text{angle } CBX$ oe same segment oe angle $AXD = BXC$ oe [vertically] opposite oe	M2	Accept in any order M1 for one correct pair with reason If 0 scored, SC1 for two correct pairs of equal angles identified with incorrect/no reasons
	corresponding angles are equal oe	A1	
8(c)(ii)(a)	8.75 or $8\frac{3}{4}$	2	M1 for $\frac{8}{10} = \frac{7}{DX}$ oe
8(c)(ii)(b)	81.8 or 81.78 to 81.79	4	M2 for $[\cos[BXC] =] \frac{5^2 + 7^2 - 8^2}{2 \times 5 \times 7}$ oe or M1 for $8^2 = 5^2 + 7^2 - 2 \times 5 \times 7 \times \cos(\dots)$ oe A1 for $\frac{10}{70}$ oe

Question	Answer	Marks	Partial Marks
9(a)	315 or 314.5 to 315.0	6	<p>M1 for $\tan 70 = \frac{\text{height}}{\frac{1}{2}(8-5)}$ oe or better seen</p> <p>M1dep for $\frac{1}{2}(8+5) \times \text{their height}$ or better seen dep on trig attempt for height</p> <p>M2 for $12 \times \frac{\frac{1}{2}(8-5)}{\cos 70}$ oe or better seen</p> <p>or M1 for $\frac{\frac{1}{2}(8-5)}{\cos 70}$ oe or better seen</p> <p>M1 for 8×12 oe isw and 5×12 oe isw</p>
9(b)(i)	$8 - \frac{1}{2}(8-5)$ or $5 + \frac{1}{2}(8-5)$	M1	
9(b)(ii)	13.6 or 13.64 to 13.65	2	M1 for $12^2 + (6.5)^2$ oe
9(b)(iii)	16.8 or 16.9 or 16.79 to 16.91... nfw	2	M1 for identifying angle GAX from a diagram or from working or better
10(a)(i)	10	1	
10(a)(ii)	-19	1	FT 1 – 2 <i>their (a)(i)</i>
10(b)	$\frac{1-x}{2}$ oe final answer	2	<p>M1 for $x = 1 - 2y$ or $y + 2x = 1$ or $\frac{y}{2} = \frac{1}{2} - x$</p> <p>or $y - 1 = -2x$ or better</p>
10(c)	$\frac{1}{2}$ oe	1	
10(d)	$4x^2 - 8x + 2$ final answer	4	<p>M1 for $(1-2x)(1-2x) - (1-2(1-2x))$ or better</p> <p>B1 for $1 - 2x - 2x + 4x^2$</p> <p>B1 for $-(1-2+4x)$ or better or $[+]$ $1 - 4x$</p> <p>or for correct answer seen then spoiled</p>
10(e)	x final answer	1	
10(f)	3125	1	
10(g)	25	1	
10(h)	-2	2	B1 for $\frac{1}{25}$ or 0.04
11(a)	A : -3 $17 - 4n$ oe	3	<p>B1 for -3</p> <p>B2 for $17 - 4n$ oe</p> <p>or B1 for $k - 4n$ oe or $17 - pn$ oe, $p \neq 0$</p>

Question	Answer	Marks	Partial Marks
	B : 124 $n^3 - 1$ oe	3	B1 for 124 B2 for $n^3 - 1$ oe or B1 for any cubic
	C : $\frac{11}{128}$ $\frac{n+6}{2^{n+2}}$ oe	4	B1 for $\frac{11}{128}$ B3 for $\frac{n+6}{2^{n+2}}$ oe or B2 for 2^{n+2} oe seen or B1 for 2^k oe or $n + 6$ seen
11(b)	$\frac{p+1}{2q}$ oe	2	B1 for $p + 1$ or $2q$ oe





Cambridge IGCSE™

MATHEMATICS

0580/43

Paper 4 (Extended)

October/November 2020

MARK SCHEME

Maximum Mark: 130

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the October/November 2020 series for most Cambridge IGCSE™, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

This document consists of **9** printed pages.

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Maths-Specific Marking Principles	
1	Unless a particular method has been specified in the question, full marks may be awarded for any correct method. However, if a calculation is required then no marks will be awarded for a scale drawing.
2	Unless specified in the question, answers may be given as fractions, decimals or in standard form. Ignore superfluous zeros, provided that the degree of accuracy is not affected.
3	Allow alternative conventions for notation if used consistently throughout the paper, e.g. commas being used as decimal points.
4	Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored (isw).
5	Where a candidate has misread a number in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 mark for the misread.
6	Recovery within working is allowed, e.g. a notation error in the working where the following line of working makes the candidate's intent clear.

Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	$5.101[00\dots] \times 10^8$ final answer	1	
1(a)(ii)	361 150 800 oe	2	FT <i>their (a)(i)</i> M1 for $\frac{70.8}{100} \times 510\,100\,000$ or for $\frac{70.8}{100} \times \text{their (a)(i)}$
1(b)(i)	6070 oe	1	
1(b)(ii)	32 000 oe	2	B1 for figs 32
1(b)(iii)	6.68 or 6.677 ...	2	M1 for $\frac{6.41 \times 10^5}{9.6[0] \times 10^6} [\times 100]$ oe
1(b)(iv)	1250 or 1248 to 1249 oe	2	B1 for figs 125 or figs 1248 to figs 1249
1(c)(i)	25.1 or 25.08...	2	M1 for $\frac{7.53[\times 10^9] - 6.02[\times 10^9]}{6.02[\times 10^9]}$ oe or $\frac{7.53[\times 10^9]}{6.02[\times 10^9]} \times 100$
1(c)(ii)	1.33 or 1.325...	3	M2 for $\sqrt[17]{\frac{7.53[\times 10^9]}{6.02[\times 10^9]}}$ or $\sqrt[17]{1 + \frac{\text{their (c)(i)}}{100}}$ or M1 for $6.02[\times 10^9] \times p^{17} = 7.53[\times 10^9]$ or $p^{17} = 1 + \frac{\text{their (c)(i)}}{100}$
2(a)(i)	Triangle at (–3, 2) (–3, 3) (–5, 2)	2	B1 for correct rotation about incorrect point or for rotation 90 clockwise around (0, 0)
2(a)(ii)	Triangle at (5, –2) (6, –2) (5, 0)	2	B1 for translation by $\begin{pmatrix} 3 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ -5 \end{pmatrix}$
2(b)	Enlargement [SF] 3 [Centre] (1, 4)	3	B1 for each
3(a)(i)	43	1	
3(a)(ii)	65	1	
3(a)(iii)	13	1	

Question	Answer	Marks	Partial Marks
3(b)	80	3	M2 for $\frac{400}{18} \times \frac{60 \times 60}{1000}$ oe Or M1 for $\frac{400}{18}$ or for <i>their</i> speed in m/s $\times \frac{60 \times 60}{1000}$ or for $\frac{400}{1000}$ and $\frac{18}{60 \times 60}$ soi
4(a)(i)	$\frac{1}{11}$ oe	1	
4(a)(ii)	$\frac{1}{110}$ oe	2	M1 for $\frac{1}{11} \times \frac{1}{10}$ oe
4(a)(iii)	$\frac{4}{55}$ oe	3	M2 for $\left(\frac{2}{11} \times \frac{1}{10}\right) + \left(\frac{3}{11} \times \frac{2}{10}\right)$ oe or M1 for $\left(\frac{2}{11} \times \frac{1}{10}\right)$ or $\left(\frac{3}{11} \times \frac{2}{10}\right)$ seen oe
4(b)(i)	$\frac{1}{165}$ oe	2	M1 for $\frac{3}{11} \times \frac{2}{10} \times \frac{1}{9}$ oe
4(b)(ii)	$\frac{1}{5}$ oe	5	M4 for $3\left(\frac{2}{11} \times \frac{1}{10} \times \left[\frac{9}{9}\right]\right) + 3\left(\frac{3}{11} \times \frac{2}{10} \times \frac{8}{9}\right)$ oe or M3 for $3\left(\frac{3}{11} \times \frac{2}{10} \times \frac{8}{9}\right)$ or M2 for $3\left(\frac{2}{11} \times \frac{1}{10} \times \left[\frac{9}{9}\right]\right)$ or $\frac{3}{11} \times \frac{2}{10} \times \frac{8}{9}$ oe or M1 for $\frac{2}{11} \times \frac{1}{10} \times \left[\frac{k}{9}\right]$ where k is 3, 6 or 9
4(b)(iii)	$\frac{131}{165}$ oe	2	M1 for $1 - (\text{their (b)(i)} + \text{their (b)(ii)})$ oe
5(a)(i)	81° <u>Angle at centre</u> is <u>twice</u> angle at <u>circumference</u> oe	2	B1 for 81°
5(a)(ii)	81° Alternate segment [theorem] oe	2	FT <i>their (a)(i)</i> B1FT for 81°

Question	Answer	Marks	Partial Marks
5(a)(iii)	123° <u>Angles</u> on a straight <u>line</u> [= 180] Opposite angles in a <u>cyclic quadrilateral</u> are supplementary oe	3	FT <i>their</i> acute (a)(ii) + 42 B1 for each element
5(b)(i)	Angle <i>PTU</i> = angle <i>PRQ</i> corresponding Angle <i>PUT</i> = angle <i>PQR</i> corresponding Angle <i>RPQ</i> is common oe	M2	Accept in any order M1 for one correct pair with reason If 0 scored, SC1 for two correct pairs of equal angles identified with incorrect/no reasons
	Corresponding angles are equal oe	A1	
5(b)(ii)(a)	4 : 7 oe	1	
5(b)(ii)(b)	41.25 oe	3	M2 for $20 \times \left(\frac{7}{4}\right)^2$ oe or $20 \times \frac{7^2 - 4^2}{4^2}$ oe or M1 for $\left(\frac{7}{4}\right)^2$ or $\left(\frac{4}{7}\right)^2$ or $\frac{7^2 - 4^2}{4^2}$ or $\frac{4^2}{7^2 - 4^2}$
6(a)	440	2	M1 for $8 \times 5 \times 11$
6(b)	$\sqrt{8^2 + 5^2 + 11^2}$ oe or $8^2 + 5^2 + 11^2$ and 13^2 <u>ALTERNATIVE</u> $\sqrt{8^2 + 11^2}$ or $8^2 + 11^2$ and 13^2	M3	M2 for $8^2 + 5^2 + 11^2$ or $8^2 + 11^2$ oe or M1 for $8^2 + 5^2$ or $5^2 + 11^2$ oe
	Yes and 14.5 or 14.4 or 14.49... or Yes and 13.6[0...]	A1	Accept equivalent conclusion
6(c)(i)	32.0[...]	2	M1 for $\tan[.] = \frac{5}{8}$ oe
6(c)(ii)	49.4 or 49.38 to 49.39	2	M1 for $\sin[.] = \frac{11}{\text{their } AG}$ oe
7(a)(i)	$(8 - x)(3 + x)$	2	M1 for $8(3 + x) - x(3 + x)$ or $3(8 - x) + x(8 - x)$ or $(a - x)(b + x)$ where $ab = 24$ or $a - b = 5$

Question	Answer	Marks	Partial Marks
7(a)(ii)	$[a =] -3$ $[b =] 8$ $[c =] 24$	3	FT <i>their (a)(i)</i> for a and b B1FT for each of a and b or both correct but reversed B1 for $[c =] 24$
7(a)(iii)	8	3	M2 for $5 - 2x$ or M1 for $-2x$ or $5 - kx$, $k \neq 0$
7(b)(i)	Correct sketch: positive cubic shape and max on the y -axis or to the right of y -axis with one root at $(-1, 0)$ and turning point at $(3, 0)$ and y -intercept at $(0, 9)$ all labelled	4	B1 for positive cubic shape with max on the y -axis or to the right of y -axis B1 for root at $(-1, 0)$ B1 for turning point at $(3, 0)$ B1 for y -intercept $(0, 9)$ If 0 score SC1 for all three intercepts on axes identified
7(b)(ii)	$x^3 - 5x^2 + 3x + 9$ final answer	3	B2 for correct expansion of three brackets unsimplified B1 for correct expansion of two brackets with at least 3 terms correct
8(a)(i)	$\begin{pmatrix} 4 \\ 4 \end{pmatrix}$	2	B1 for $\begin{pmatrix} 4 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 4 \end{pmatrix}$
8(a)(ii)	$\begin{pmatrix} -4 \\ 8 \end{pmatrix}$	2	B1 for $\begin{pmatrix} -4 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 8 \end{pmatrix}$
8(a)(iii)	5.39 or 5.385..	2	M1 for $(-2)^2 + 5^2$ oe
8(b)(i)	$\mathbf{a} + \mathbf{b}$	1	
8(b)(ii)	$\frac{3}{2}\mathbf{a} + \mathbf{b}$	2	M1 for a correct route, e.g. $\overrightarrow{OA} + \overrightarrow{AE}$
8(b)(iii)	$2\mathbf{a} + \frac{4}{3}\mathbf{b}$	3	M2 for unsimplified \overrightarrow{OD} or for $\frac{4}{3}\mathbf{b}$ or M1 for \overrightarrow{OD} attempted in terms of \mathbf{a} and \mathbf{b} or for $\overrightarrow{CD} = \frac{1}{3}\mathbf{b}$ or $\overrightarrow{DB} = \frac{2}{3}\mathbf{b}$ seen
9(a)	2, 3, 4, 5	2	B1 for 3 correct and no extra or 4 correct and one extra or M1 for $1 < x \leq 5$
9(b)(i)	$3y(2y - 5x)$	2	B1 for $3(2y^2 - 5xy)$ or $y(6y - 15x)$ or for the correct answer seen and then spoiled

Question	Answer	Marks	Partial Marks
9(b)(ii)	$(y - 3x)(y + 3x)$	2	B1 for $(y + 3)(y - 3)$
9(c)	$\frac{4x + 5}{(x - 1)(2x + 1)}$ or $\frac{4x + 5}{2x^2 - x - 1}$ final answer	3	M1 for $3(2x + 1) - 2(x - 1)$ oe isw M1 for $(x - 1)(2x + 1)$ oe isw
9(d)	$(1.74, 7.21 \text{ to } 7.24)$ and $(-3.74, -9.20 \text{ to } -9.22)$ cao	6	For the y values accept any value rounded to 2 decimal places in the given range B5 for $(1.74, 7.21 \text{ to } 7.24)$ or $(-3.74, -9.20 \text{ to } -9.22)$ or $x = 1.74$ and $x = -3.74$ OR M2 for $2x^2 + 4x - 13 = 0$ or $2y^2 + 4y - 13 = 0$ or M1 for $2x^2 + 7x - 11 = 3x + 2$ or $y = 2\left(\frac{y-2}{3}\right)^2 + 7\left(\frac{y-2}{3}\right) - 11$ AND FT their quadratic expression (not $2x^2 + 7x - 11$) M2FT for $\frac{-4 \pm \sqrt{4^2 - 4 \times 2 \times -13}}{2 \times 2}$ or $-1 \pm \sqrt{\frac{15}{2}}$ oe or M1FT for $\sqrt{4^2 - 4 \times 2 \times -13}$ oe or for $\frac{-4 + \sqrt{k}}{2 \times 2}$ or $\frac{-4 - \sqrt{k}}{2 \times 2}$ or $(x + 1)^2 [-13/2 - 1 = 0]$
10(a)	-23	2	M1 for $4 - 3(3^x)$ oe soi
10(b)	$\frac{4 - x}{3}$ oe final answer	2	M1 for $x = 4 - 3y$ or $y + 3x = 4$ or $x + 3y = 4$ or $\frac{y}{-3} = \frac{4}{-3} + x$ oe or $\frac{x}{-3} = \frac{4}{-3} + y$ oe
10(c)(i)	$1 + 6x$ final answer	2	M1 for $4 - 3(1 - 2x)$

Question	Answer	Marks	Partial Marks
10(c)(ii)	$20 - 36x$ or $4(5 - 9x)$ final answer	4	B3 for $20 - 36x$ seen in working then spoiled OR M1 for $(4 - 3x)^2 + 4 - 3x - 9(x^2 + x)$ or better B1 for $[(4 - 3x)^2 =] 16 - 12x - 12x + 9x^2$ or better B1 for answer $20 - kx$ or $k - 36x$ oe or answer $20 - 36x + kx^2$ $k \neq 0$
10(d)	$-\frac{1}{2}$ oe	2	M1 for $(3^2)^{kx}$ or $9^{kx} = 9^{-\frac{1}{2}x}$ oe
11A	24	B1	
	$5n - 1$ oe	B2	B1 for $5n - k$ or $jn - 1$ oe $j \neq 0$
11B	127	B1	
	$n^3 + 2$ oe	B2	B1 for n^3 oe
11C	256	B1	
	$4^{(n-1)}$ oe	B2	B1 for 4^k oe



Cambridge IGCSE™

MATHEMATICS

0580/41

Paper 4 (Extended)

May/June 2020

MARK SCHEME

Maximum Mark: 130

Published

Students did not sit exam papers in the June 2020 series due to the Covid-19 global pandemic.

This mark scheme is published to support teachers and students and should be read together with the question paper. It shows the requirements of the exam. The answer column of the mark scheme shows the proposed basis on which Examiners would award marks for this exam. Where appropriate, this column also provides the most likely acceptable alternative responses expected from students. Examiners usually review the mark scheme after they have seen student responses and update the mark scheme if appropriate. In the June series, Examiners were unable to consider the acceptability of alternative responses, as there were no student responses to consider.

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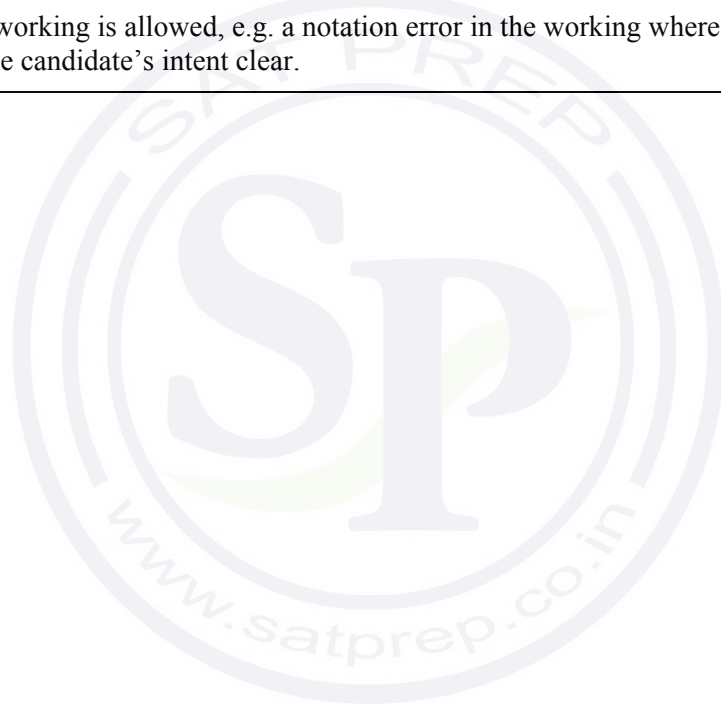
GENERIC MARKING PRINCIPLE 5:

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3	Allow alternative conventions for notation if used consistently throughout the paper, e.g. commas being used as decimal points.
4	Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored (isw).
5	Where a candidate has misread a number in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 mark for the misread.
6	Recovery within working is allowed, e.g. a notation error in the working where the following line of working makes the candidate's intent clear.

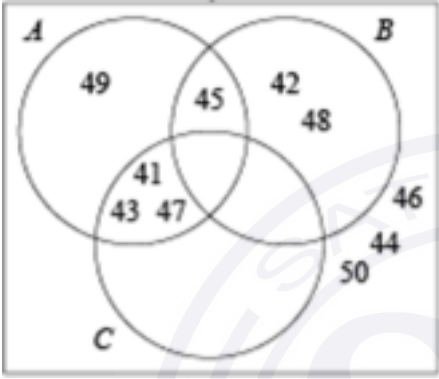


Abbreviations

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isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	7680	2	M1 for $0.24 \times 32\,000$ oe
1(a)(ii)	34 240	2	M1 for $32\,000 \times \frac{100+7}{100}$ oe
1(b)	5306.04	2	M1 for $5000 \times \left(1 + \frac{2}{100}\right)^3$ oe
1(c)	26.7 or 26.66... to 26.67	4	B3 for 96 or $\frac{96}{360}$ oe OR M3 for $\left(1 - \frac{1}{5}\right) \times \left(1 - \frac{2}{3}\right) \times 100$ oe or M2 for $\left(1 - \frac{1}{5}\right)$ and $\left(1 - \frac{2}{3}\right)$ oe OR M1 for $360 \div 5 [\times 4]$ oe M1 for <i>their</i> $288 \div 3 [\times 2]$
1(d)	33 500	2	M1 for $36\,515 \div \frac{100+9}{100}$ oe
1(e)	6525	4	M3 for $\left(\frac{65}{45} - \frac{63}{45}\right)[A] = 290$ oe or M2 for $\left(\frac{13}{9} - \frac{7}{5}\right)[A] = 290$ oe or M1 for correct attempt to convert to a common ratio value for Arjun or for $\frac{13}{9} - \frac{7}{5}$ oe
2(a)(i)	$1.5 < h \leq 1.6$	1	
2(a)(ii)	1.62 or 1.623... nfw	4	M1 for 1.35, 1.45, 1.55, 1.65, 1.75 1.85 soi M1 for Σfx M1 dep for <i>their</i> $\Sigma fx \div 120$

Question	Answer	Marks	Partial Marks
2(b)(i)	$\frac{14}{120}$ oe	1	
2(b)(ii)	$\frac{21}{20060}$ oe	4	<p>M3 for $3\left(\frac{14}{120} \times \frac{7}{119} \times \frac{6}{118}\right)$</p> <p>or M2 for $\frac{14}{120} \times \frac{7}{119} \times \frac{6}{118}$ isw</p> <p>or M1 for $\frac{14}{120}, \frac{7}{119}, \frac{6}{118}$</p> <p>After 0 scored, SC1 for answer $\frac{343}{864000}$ or $\frac{343}{288000}$ oe</p>
2(c)(i)	55, 79, 106, 120	2	B1 for 2 or 3 correct
2(c)(ii)	Correct diagram	3	<p>B1 for correct horizontal plots</p> <p>B1FT for correct vertical plots</p> <p>B1FT dep on at least B1 for reasonable increasing curve or polygon through <i>their</i> 6 points</p> <p>If 0 scored SC1 for 5 out of 6 points correctly plotted</p>
2(d)(i)	1.62 to 1.63	1	
2(d)(ii)	1.57 to 1.58	2	B1 for 48 soi
3(a)	75.6	2	M1 for $5.2 \times 7 + \frac{1}{2} \times 1.6 \times 7^2$
3(b)(i)	$2a - 3b$ final answer	2	B1 for answer $2a + kb$ or $ka - 3b$ or for $2a - 3b$ seen in working
3(b)(ii)	$\frac{3}{4}$	2	B1 for $\frac{45x}{60x}$ oe single fraction
3(c)(i)	-5	1	
3(c)(ii)	-0.25 or $-\frac{1}{4}$	3	<p>M1 for $20 - 12x = 23$ or for $5 - 3x = \frac{23}{4}$</p> <p>M1 for correct completion to $ax = b$ FT <i>their</i> first step</p>
3(d)	$9x^6$	2	B1 for $9x^k$ or kx^6
3(e)	$6x^2 - 7xy - 5y^2$	2	M1 for 3 terms out of 4 from $6x^2 - 10xy + 3xy - 5y^2$

Question	Answer	Marks	Partial Marks
4(a)	Triangle at $(-4, -4)$ $(-1, -3)$ $(-4, -3)$	2	B1 for correct points not joined or for reflection in any $y = k$ or for reflection in $x = -1$
4(b)	Triangle at $(1, 1)$ $(1, 4)$ $(2, 4)$	2	B1 for correct points not joined or rotation 90 clockwise around any point or rotation 90 anticlockwise around $(0, 0)$
4(c)	Translation $\begin{pmatrix} 5 \\ -6 \end{pmatrix}$	2	B1 for translation or correct vector oe
5(a)	Correct Venn diagram 	3	B2 for 8 or 9 numbers correct or B1 for 6 or 7 numbers correct
5(b)(i)	41, 43, 47	1	FT <i>their</i> Venn diagram
5(b)(ii)	44, 46, 49, 50	1	FT <i>their</i> Venn diagram
5(c)	0	1	FT <i>their</i> Venn diagram
6(a)	$y \geq x$ oe	1	
6(b)	$2.25x + 1.5y \leq 22.5$ oe	M1	
	One step shown to $3x + 2y \leq 30$	A1	
6(c)	$y = 10$ ruled	1	Broken line
	$3x + 2y = 30$ ruled	B2	Solid line B1 for line passing through $(0, 15)$ or $(10, 0)$
	$y = x$ ruled	B1	Solid line
	Correct region indicated	B1	
6(d)	412	2	M1 for $(4, 9)$ identified or for evaluation $40x + 28y$ for an integer point in the region ($x > 0$ and $y > 0$)
7(a)	$[BC^2 =] 80^2 + 115^2 - 2 \times 80 \times 115 \cos 72$ oe	M1	
	118.06...	A2	A1 for 13939...

Question	Answer	Marks	Partial Marks
7(b)	67.8 or 67.9 or 67.83 to 67.88	3	M2 for $[\sin B =] \frac{115 \times \sin 72}{118.1}$ oe or M1 for $\frac{115}{\sin B} = \frac{118.1}{\sin 72}$ oe
7(c)(i)	255	3	B1 for bearing of B from A is 75 soi M1 for $180 + 75$ oe
7(c)(ii)	[00]7.2	2	M1 for <i>their (c)(i) – their (b)</i> -180
7(d)	11.8 or 11.82 to 11.83	3	M1 for $115 \div 35$ oe M1 for <i>their</i> speed in m/s $\times 60 \times 60 \div 1000$
7(e)	76.1 or 76.08 to 76.09	3	M2 for $\frac{\text{distance}}{80} = \sin 72$ oe or M1 for distance required is perpendicular to AC soi
8(a)(i)	Correct sketch	2	B1 for correct shape but inaccurate
8(a)(ii)	Rotational [symmetry] order 2 [centre] (180, 0)	2	B1 for rotational [symmetry]
8(b)	48.6 or 48.59 to 48.60 and 131.4 or 131.40 to 131.41	3	B2 for 48.6 or 48.59 to 48.60 or 131.4 or 131.40 to 131.41 or M1 for $\sin x = 0.75$ or better If 0 scored, SC1 for two answers adding to 180
8(c)(i)	$(x + 5)^2 - 11$	2	M1 for $(x + 5)^2 + k$ or $(x + \text{their } 5)^2 + 14 - (\text{their } 5)^2$ or $a = 5$
8(c)(ii)	Sketch of U-shaped parabola with a minimum indicated at $(-5, -11)$ with no part of graph in 4 th quadrant	3	FT <i>their</i> $(x + 5)^2 - 11$ provided in that form B1 for U shape curve B1FT for turning point at $(-5, k)$ or $(k, -11)$
9(a)	39[.0] or 39.03 to 39.04...	3	M2 for $\frac{165}{360} \times 2 \times \pi \times 8 + 16$ or M1 for $\frac{165}{360} \times 2 \times \pi \times 8$
9(b)	2.71 or 2.708...	4	M3 for $\sqrt{\frac{\frac{165}{360} [\times \pi] \times 8^2}{4 [\times \pi]}}$ oe or M2 for $r^2 = \frac{\frac{165}{360} [\times \pi] \times 8^2}{4 [\times \pi]}$ oe or M1 for $\frac{165}{360} \times \pi \times 8^2$ oe seen

Question	Answer	Marks	Partial Marks
9(c)(i)	3.67 or 3.666 to 3.667	2	M1 for $\frac{165}{360} \times 2[\times\pi] \times 8 = 2[\times\pi] \times r$ or better or for $\frac{165}{360}[\times\pi] \times 8^2 = [\pi \times] r \times 8$ or better
9(c)(ii)	100 or 100.0 to 100.1... final answer	4	M3 for $\frac{1}{3}\pi \times their(c)(i)^2 \times \sqrt{8^2 - their\ radius^2}$ or M2 for $\sqrt{8^2 - their\ radius^2}$ or M1 for $(their\ (c)(i))^2 + h^2 = 8^2$
10(a)(i)	15.7 or 15.65...	3	M2 for $\sqrt{(4-10)^2 + (4-3)^2}$ oe or M1 for $(-4-10)^2 + (4--3)^2$ oe
10(a)(ii)	$\frac{-10-4}{4-3} [= -2]$ oe	M1	
	$10 = -2(-3) + c$ Or $-4 = -2(4) + c$ and correct completion to $y = -2x + 4$	A1	
10(a)(iii)	$y = \frac{1}{2}x + \frac{11}{4}$ oe	4	M1 for grad = $\frac{1}{2}$ soi M1 for [midpoint =] ($\frac{1}{2}$, 3) M1 for substitution of ($\frac{1}{2}$, 3) into <i>their</i> $y = mx + c$ oe
10(b)(i)	$\left(-\frac{1}{3}, -\frac{22}{27}\right)$ oe and $(-5, 50)$	6	B2 for $3x^2 + 16x + 5$ Or B1 for one correct M1 for derivative = 0 or <i>their</i> derivative = 0 M1 for $[x =] -\frac{1}{3}$ and $[x =] -5$ B1 for $-\frac{22}{27}$ and 50
10(b)(ii)	$\left(-\frac{1}{3}, -\frac{22}{27}\right)$ minimum $(-5, 50)$ maximum with correct reasons	3	B2 for one correct with reason or M1 for correct attempt e.g. 2 nd derivatives, gradients or sketching



Cambridge IGCSE™

MATHEMATICS

0580/42

Paper 4 (Extended)

May/June 2020

MARK SCHEME

Maximum Mark: 130

Published

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GENERIC MARKING PRINCIPLE 1:

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- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

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- marks are awarded when candidates clearly demonstrate what they know and can do
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- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

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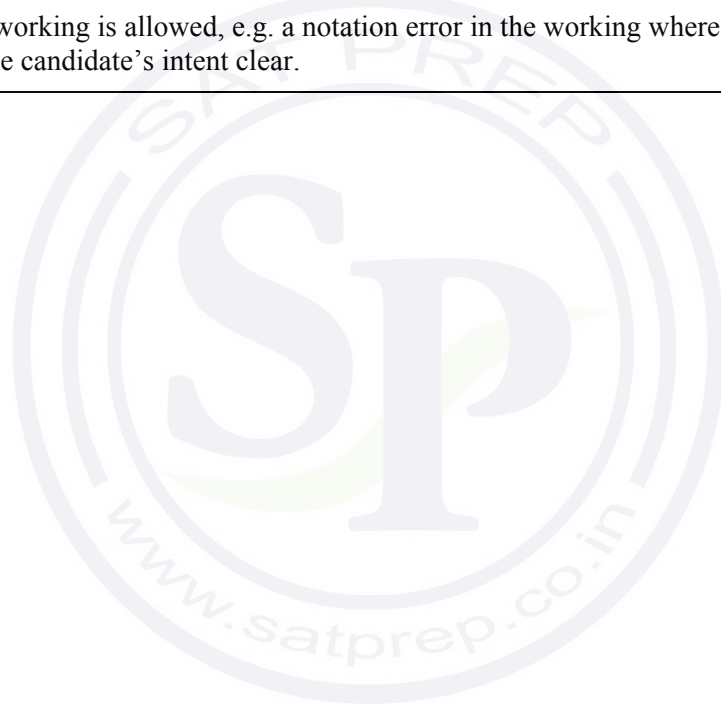
GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Maths-Specific Marking Principles	
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2	Unless specified in the question, answers may be given as fractions, decimals or in standard form. Ignore superfluous zeros, provided that the degree of accuracy is not affected.
3	Allow alternative conventions for notation if used consistently throughout the paper, e.g. commas being used as decimal points.
4	Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored (isw).
5	Where a candidate has misread a number in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 mark for the misread.
6	Recovery within working is allowed, e.g. a notation error in the working where the following line of working makes the candidate's intent clear.



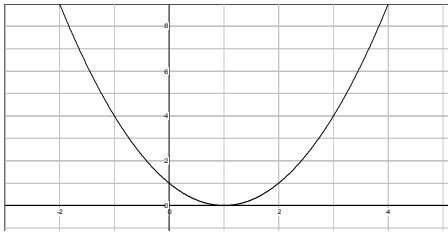
Abbreviations

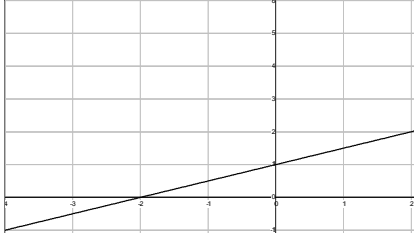
cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	14, 10	2	M1 for $24 \div (7 + 5)$
1(a)(ii)	$\frac{3}{350}$	2	B1 for correct fraction not in lowest terms
1(a)(iii)	120	1	
1(b)(i)	10.2[0]	2	M1 for $\frac{15}{100} \times 12$ oe or better
1(b)(ii)	45	2	M1 for $\frac{38.25}{1 - \frac{15}{100}}$ oe
1(c)(i)	85	2	M1 for $\frac{500 \times 1.7 \times 10}{100}$ oe
1(c)(ii)	203 or 202.5 to 202.6	2	M1 for $200 \times \left(1 + \frac{0.0035}{100}\right)^{365}$
1(c)(iii)	1.9	3	M2 for $\sqrt[6]{\frac{559.78}{500}}$ or M1 for $500 \left(1 + \frac{r}{100}\right)^6 = 559.78$
2(a)(i)	$\begin{pmatrix} 6 \\ 17 \end{pmatrix}$	2	B1 for each
2(a)(ii)	6.4[0] or 6.403...	2	M1 for $4^2 + 5^2$
2(b)	(1, 2)	1	
2(c)	(0, -2)	1	

Question	Answer	Marks	Partial Marks
2(d)	$\frac{1}{2}\mathbf{c} + \frac{1}{3}\mathbf{d}$	3	B2 for correct unsimplified answer or M1 for $\overrightarrow{CT} = -\mathbf{c} + \frac{2}{3}\mathbf{d}$ oe or $\overrightarrow{TC} = \mathbf{c} - \frac{2}{3}\mathbf{d}$ oe or for correct route
3(a)	41.4	4	M1 for 10, 30, 42.5, 47.5, 55, 70 M1 for Σfx where x lies in or on the boundary of each interval. M1 dep for $\frac{\Sigma fx}{200}$ dep on second M1
3(b)(i)	112, 170	1	
3(b)(ii)	Correct diagram	3	B1 for correct horizontal plot B1FT for correct vertical plots B1 FT dep on at least B1 earned for reasonable increasing curve or polygon through their 6 points If 0 scored SC1FT for 5 out of 6 points plotted correctly
3(b)(iii)(a)	48	1	
3(b)(iii)(b)	160	2	M1 for 40 seen
3(c)	$\frac{87}{3980}$ oe	2	M1 for $\frac{30}{200} \times \frac{29}{199}$ oe
3(d)	Correct histogram	3	B1 for each column If 0 scored SC1 for correct frequency densities soi 1.25, 12, 1
4(a)	65.4 or 65.36 to 65.37	3	M1 for $150^2 + 120^2 - 2 \times 150 \times 120 \cos 25$ A1 for 4270 or 4272 to 4273
4(b)	125 or 124.7 to 124.8	4	B1 for [angle $S =$] 80 M2 for $\frac{150 \sin 55}{\sin their 80}$ or M1 for $\frac{\sin their 80}{150} = \frac{\sin 55}{RS}$ oe
4(c)	10 400 or 10 410 to 10 440 nfw	3	M1 for $\frac{1}{2} \times 120 \times 150 \sin 25$ oe M1 for $\frac{1}{2} \times 150 \times their (b) \sin 45$ oe

Question	Answer	Marks	Partial Marks
5(a)	[0]38 or [0]37.9 or [0]37.87...	2	M1 for $\tan = \frac{350}{450}$ oe If 0 scored, SC1 for answer [0]52 or [0]52.1 or [0]52.12 to [0]52.13
5(b)	624 or 623.8 to 623.9	6	M2 for $450 - 400 \sin 50$ or M1 for $\sin 50 = \frac{\dots}{400}$ M2 for $350 + 400 \cos 50$ or M1 for $\cos 50 = \frac{\dots}{400}$ M1 for $(\text{their } (450 - 400 \sin 50))^2 + (\text{their } (350 + 400 \cos 50))^2$
5(c)	10 min 8 s	4	B3 for 10.1 or 10.13... or M2 for $(400 + 350 + 450 + \text{their } DA) \div 3 [\div 60]$ oe or M1 for any distance $\div 3$ M1 for rounding <i>their</i> minutes into minutes and seconds to nearest second if clearly seen
6(a)	256	1	
6(b)	8	2	M1 for $3(x^2 + 1) + 2$ or for $3(2) + 2$
6(c)	$9x^2 + 12x + 5$	3	M1 for $(3x + 2)^2 + 1$ B1 for $[(3x + 2)^2 =] 9x^2 + 6x + 6x + 4$ oe
6(d)	16	2	M1 for $3x + 2 = 7^2 + 1$ or better
6(e)	$\frac{x-2}{3}$ oe final answer	2	M1 for $x = 3y + 2$ or for $y - 2 = 3x$ or for $\frac{y}{3} = x + \frac{2}{3}$
6(f)	$\frac{4x^2 + 2x + 1}{3x + 2}$ final answer	3	B1 for $x^2 + 1 + x(3x + 2)$ or better seen M1 for common denominator $3x + 2$
6(g)	16	1	
7(a)	0.1	1	
7(b)(i)	0.2 oe 0.6, 0.3, 0.1 oe	2	B1 for 0.2 B1 for 0.6, 0.3, 0.1
7(b)(ii)	0.48 oe	2	FT <i>their</i> 0.6 from tree diagram M1 for $0.8 \times \text{their } 0.6$

Question	Answer	Marks	Partial Marks
7(b)(iii)	0.28 oe	3	M2 for $0.2 + 0.8 \times 0.1$ oe or M1 for 0.2 or 0.8×0.1 or $0.8 \times (0.6 + 0.3)$
7(c)	0.32 oe	3	M2 for $0.8 \times 0.2 + 0.2 \times 0.8$ oe M1 for one of these products
8(a)(i)	36	2	M1 for $\left(\frac{8}{12}\right)^2$ or $\left(\frac{12}{8}\right)^2$ oe
8(a)(ii)	30	3	M2 for $320 \div 16 \times \frac{12}{8}$ oe or M1 for $320 \div 16$
8(b)	3.375 cao	3	M2 for $\frac{\frac{4}{3}\pi \times 4.5^3}{\pi \times 6^2}$ or better or M1 for $\pi \times 6^2 \times h = \frac{4}{3} \times \pi \times 4.5^3$
8(c)	3.63 or 3.627 to 3.628	3	M2 for $\frac{20^3}{40 \times \frac{4}{3}\pi}$ or M1 for $40 \times \frac{4}{3} \times \pi \times r^3 = 20^3$
8(d)	$\frac{3x}{2}$ or $1.5x$ or $1\frac{1}{2}x$	3	B2 for $4R^2 = 9x^2$ oe or better or M1 for $4\pi R^2 = 2\pi x^2 + \pi \times 2x \times \frac{7x}{2}$
9(a)(i)	$(x+4)^2 - 25$	2	B1 for $(x+k)^2 - 9 - (their\ k)^2$ or $(x+4)^2 - h$ or $k = 4$
9(a)(ii)	$x + 4 = [\pm] 5$	M1	FT <i>their (a)(i)</i>
	-9 and 1	A1	
9(b)	$[b =] 7$ $[c =] -3$	3	B1 for $[b =] 7$ M1 for $b^2 - 4c = 61$
9(c)(i)(a)	Correct sketch 	2	B2 for correct quadratic curve with min touching x -axis or B1 for parabola vertex downwards

Question	Answer	Marks	Partial Marks
9(c)(i)(b)	Correct sketch 	2	B2 for correct straight line intersecting curve on y-axis or B1 for straight line with positive gradient and positive y-intercept
9(c)(ii)	2.8[0] or 2.795...	7	B3 for $x^2 - \frac{5}{2}x = 0$ oe or M1 for $(x-1)^2 = \frac{1}{2}x + 1$ B1 for $[(x-1)^2 =] x^2 - x - x + 1$ AND B2 for (0, 1) and $(\frac{5}{2}, \frac{9}{4})$ oe or B1 $[x =] 0$ and $\frac{5}{2}$ oe AND M1 for (difference in x) ² + (difference in y) ²
10(a)(i)	5	2	M1 for $(-1)^4 - 4(-1)^3$
10(a)(ii)	(0, 0) and (3, -27)	6	B2 for $4x^3 - 12x^2 [= 0]$ or B1 for $4x^3$ or $12x^2$ AND M1 for derivative = 0 or <i>their</i> derivative = 0 M1 for $4x^2(x-3)[= 0]$ B1 for $[x =] 0$ and $[x =] 3$ or $[y =] 0$ and $[y =] -27$ or for one correct coordinate pair
10(b)	$[p =] 11$ $[q =] 5$	2	B1 for each or M1 for $\frac{dy}{dx} = px^{p-1} + 2qx^{q-1}$



Cambridge IGCSE™

MATHEMATICS

0580/43

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May/June 2020

MARK SCHEME

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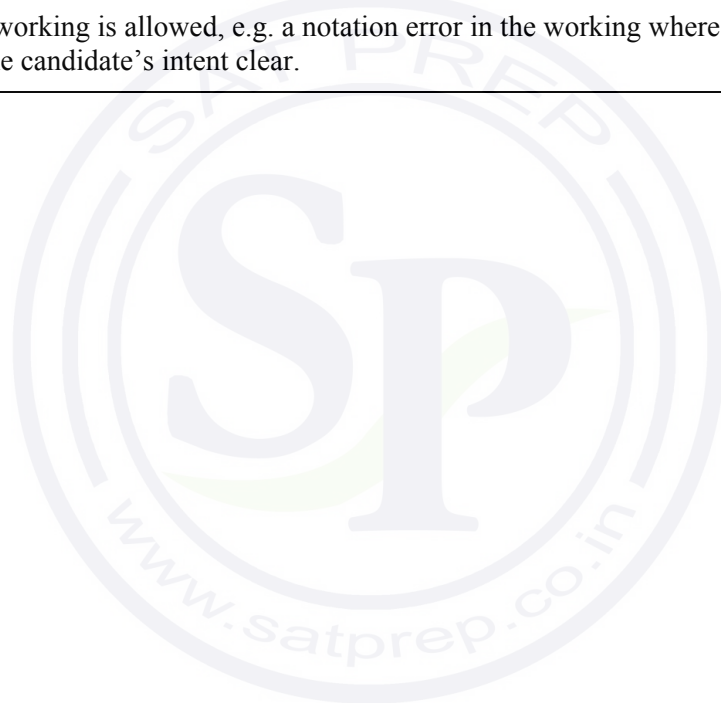
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Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)	1260	2	M1 for $15 \times 54 + 25 \times 18$
1(b)	38 800	2	M1 for $37054 \div \left(1 - \frac{4.5}{100}\right)$ oe
1(c)(i)	15 : 12 : 28	2	M1 for correct attempt to find a common multiple for the women oe
1(c)(ii)	216	3	M2 for $224 \div \text{their } 28 \times \text{their } (15 + 12)$ or M1 for $224 \div \text{their } 28$
1(d)	55.25	2	M1 for $8 + 0.5$ or $6 + 0.5$ seen
1(e)	156 or 156.3...	2	M1 for $\left(1 + \frac{1.5}{100}\right)^{30}$
2(a)(i)	triangle with vertices at (-2, -1) (-8, -1) (-2, -5)	2	B1 for correct reflection in $y = x$
2(a)(ii)	triangle with vertices at (-1, -1) (-1, -7) (3, -7)	2	B1 for translation by $\begin{pmatrix} k \\ -9 \end{pmatrix}$ or $\begin{pmatrix} -2 \\ k \end{pmatrix}$
2(b)(i)	Enlargement [centre] (-7, 8) [sf] $\frac{1}{2}$	3	B1 for each
2(b)(ii)	Rotation [centre] (0, 0) 90° clockwise oe	3	B1 for each
3(a)	correct diagram	4	B1 for median line correctly drawn at 148 B1 for 105 soi B1 for whisker at 159 soi
3(b)	6.48	3	M1 for $(5 \times 8) + (6 \times 2) + (12 \times 7) + \dots$ M1dep for $\text{their } \sum fx \div \text{their } (8 + 2 + 12 + 2 + 0 + 1)$
4(a)	$m \geq 3.4$ oe final answer	2	M1 for $12 + 5 \leq 8m - 3m$ or better or $3m - 8m \leq -5 - 12$ or better

Question	Answer	Marks	Partial Marks
4(b)	$x = -0.75$ oe	3	M1 for $15(2x+5) = 14(3-x)$ B1 for $30x + 75 = 42 - 14x$ or better
4(c)	$3x^2 - 16x - 35 [= 0]$ or $3y^2 - 8y - 51 [= 0]$	M3	M1 for $x^2 + 2(4-x)^2 = 67$ or $(4-y)^2 + 2y^2 = 67$ seen B1 for $16 - 8x + x^2$ or $16 - 8y + y^2$
	$(3x+5)(x-7) [= 0]$ or $(3y-17)(y+3) [= 0]$	M1	or for correct factors for <i>their</i> equation or for correct use of quadratic formula or completing the square for <i>their</i> equation
	$x = 7, y = -3$ $x = -\frac{5}{3}, y = 5\frac{2}{3}$	B2	B1 for $x = 7, x = -\frac{5}{3}$ or for $y = -3, y = 5\frac{2}{3}$ or for a correct pair of x and y values
5(a)	$(4x-5)(x+3) + (x+1)(x-3) = 342$ or $2x(4x-5) - (3x-6)(x-3) = 342$	M2	M1 for $(4x-5)(x+3)$ or $(x+1)(x-3)$ or for $2x(4x-5)$ or $(3x-6)(x-3)$
	$4x^2 + 12x - 5x - 15$ oe and $x^2 + x - 3x - 3$ oe seen OR $8x^2 - 10x$ and $3x^2 - 15x + 18$ seen	M2	M1 for each
	$5x^2 + 5x - 18 = 342$ leading to $x^2 + x - 72 = 0$	A1	no errors or omission
5(b)	$(x+9)(x-8)$	M2	B1 for $(x+a)(x+b)$ where $ab = -72$ or $a+b = 1$ and a, b are integers
	8, -9	B1	
5(c)	86	2	FT for $12 \times \text{their } x - 10$ (x positive) B1 for any one of 27, 11, 16 seen or for $2x + 2x + 4x - 5 + 4x - 5$ oe or better soi
5(d)	22.2 or 22.16 to 22.17	2	M1 for $\tan = \frac{11}{27}$ or $\frac{\text{their } x + 3}{4 \times \text{their } x - 5}$
6(a)(i)	29.5 or 29.50...	4	M2 for $\frac{11^2 + 5.3^2 - 6.9^2}{2 \times 11 \times 5.3}$ or M1 for $6.9^2 = 11^2 + 5.3^2 - 2 \times 11 \times 5.3 \cos x$ A1 for 0.87[0...] oe

Question	Answer	Marks	Partial Marks
6(a)(ii)	13.4 or 13.38...	4	B1FT 84 – <i>their</i> (a)(i) M2 for $\frac{11}{\sin 42} \times \sin$ <i>their</i> 54.5 or M1 for implicit form
6(b)	2700	4	M2 for $15 \times 2.5 \times 20 \times 60 \times 60$ or M1 for $15 \times 2.5 \times 20$ M1 for <i>their</i> volume $\div 1000$ If 0 scored, SC1 for figs 27 with no working
7(a)(i)	$\frac{3}{4}, \frac{1}{4}, \frac{2}{5}, \frac{3}{5}, \frac{2}{5}, \frac{3}{5}$	2	B1 for one correct pair
7(a)(ii)	$\frac{3}{10}$ oe	2	FT <i>their</i> tree diagram M1 for $\frac{3}{4} \times \frac{2}{5}$
7(a)(iii)	$\frac{11}{20}$ oe	3	M2 for $\frac{3}{4} \times \frac{3}{5} + \frac{1}{4} \times \frac{2}{5}$ or M1 for $\frac{3}{4} \times \frac{3}{5}$ or $\frac{1}{4} \times \frac{2}{5}$
7(b)	$\frac{36}{125}$ oe	3	M2 for $\left(\frac{2}{5}\right)^2 \times \frac{3}{5} \times 3$ oe or M1 for $\left(\frac{2}{5}\right)^2 \times \frac{3}{5}$
7(c)	$\frac{3}{28}$ oe	2	M1 for $\frac{3}{4} \times \frac{1}{7}$
8(a)	12	2	M1 for $150 = \frac{(n-2) \times 180}{n}$ or $\frac{360}{180-150}$ oe
8(b)(i)	45	2	B1 for angles at <i>M</i> or <i>K</i> = 45 or angle at <i>L</i> = 90
8(b)(ii)	85	2	B1 for either angle in alt segment = 58
8(b)(iii)	72	2	B1 for either angle at <i>J</i> or <i>H</i> = 108 or angle at <i>F</i> = 72
8(c)	$OA = OB = OC = OD$ Radii	B1	
	$AB = CD$ chords equidistant from centre are equal	B1	
	SSS implies congruent	B1	

Question	Answer	Marks	Partial Marks
9(a)(i)	$\frac{3}{8}$	2	M1 for $8y = 3x + 20$ or better
9(a)(ii)	(0, 2.5) oe	1	
(b)(i)	15.6 or 15.62...	3	M2 for $\sqrt{(9-3)^2 + (-2-8)^2}$ oe seen or M1 for $(9-3)^2$ or $(-2-8)^2$ oe seen
9(b)(ii)	$y = -\frac{5}{6}x + 4$ oe	3	M1 for gradient $\frac{-2-8}{9-3}$ oe M1 for substituting (6, -1) into a linear equation oe
9(b)(iii)	$y = \frac{6}{5}x - \frac{3}{5}$ oe	4	M1 for gradient -1 / <i>their</i> $\left(-\frac{5}{6}\right)$ B1 for midpoint at (3, 3) M1 for <i>their</i> midpoint substituted into $y = \text{their } m \times x + c$ oe
10(a)(i)	$x + 5$	2	B1 for linear equation with positive gradient or intercept 5
10(a)(ii)	$2 \sin x$ oe	2	B1 for recognition of sin or $\cos(x - 90)$
10(b)	tangent ruled at P	B1	
	1.3 to 1.4	B2	dep on tangent drawn M1 for rise/run
11(a)	4	1	
11(b)	52	2	M1 for $f(8)$ seen or $7 \times \frac{2x}{x-3} - 4$
11(c)	$7x^2 - 4$	1	
11(d)	$\frac{7x^2 - 21x + 12}{2(x-3)}$ or $\frac{7x^2 - 21x + 12}{2x-6}$ final answer	3	M1 for $(7x-4)(x-3) + 2 \times 2x$ B1 for denominator $2(x-3)$ or $2x-6$
11(e)	-3	2	M1 for $7x + 14 - 4 = -11$
11(f)	$[p =] 0$ and $[p =] 1$	2	B1 for each
12(a)(i)	$\left(-\frac{1}{2}, 4\right)$ and $\left(\frac{1}{2}, 2\right)$	5	B2 for $12x^2 - 3 [= 0]$ or B1 for $12x^2$ or -3 M1 for their derivative $= 0$ or $dy/dx = 0$ B1 for $[x =] -\frac{1}{2}$ and $\frac{1}{2}$ or one coordinate pair correct

Question	Answer	Marks	Partial Marks
12(a)(ii)	$\left(-\frac{1}{2}, 4\right)$ Max with reason $\left(\frac{1}{2}, 2\right)$ Min with reason	3	B2 for one correct with reason or M1 for correct attempt to find e.g. 2nd derivative/gradients/sketch
12(b)	line $y = x + 3$ ruled	M2	B1 for $[y =]x + 3$ identified or rules $y = x + k$ or $y = px + 3$
	-0.7 to -0.8 2.7 to 2.8	A1	





Cambridge IGCSE™

MATHEMATICS

0580/42

Paper 4 (Extended)

March 2020

MARK SCHEME

Maximum Mark: 130

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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This document consists of **9** printed pages.

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

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- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

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- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

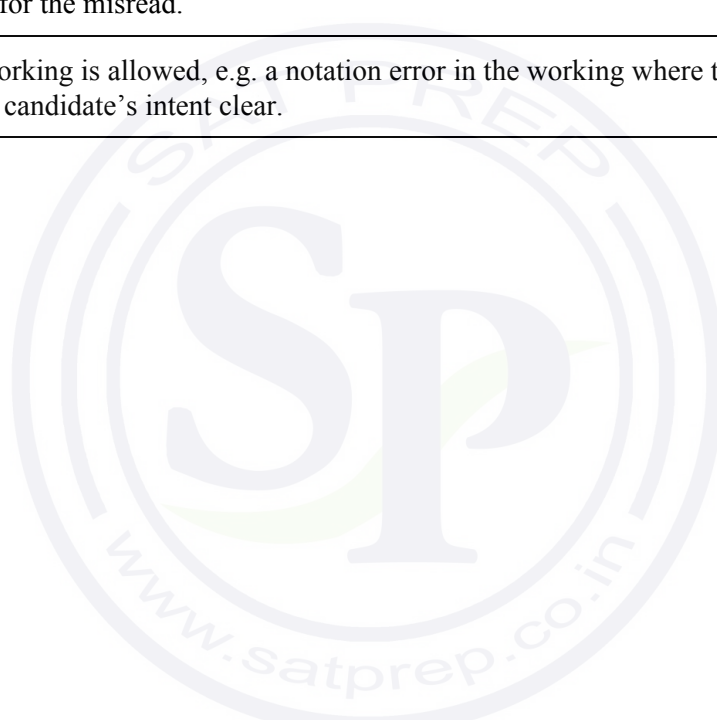
GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Maths-Specific Marking Principles	
1	Unless a particular method has been specified in the question, full marks may be awarded for any correct method. However, if a calculation is required then no marks will be awarded for a scale drawing.
2	Unless specified in the question, answers may be given as fractions, decimals or in standard form. Ignore superfluous zeros, provided that the degree of accuracy is not affected.
3	Allow alternative conventions for notation if used consistently throughout the paper, e.g. commas being used as decimal points.
4	Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored (isw).
5	Where a candidate has misread a number in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 mark for the misread.
6	Recovery within working is allowed, e.g. a notation error in the working where the following line of working makes the candidate's intent clear.



Abbreviations

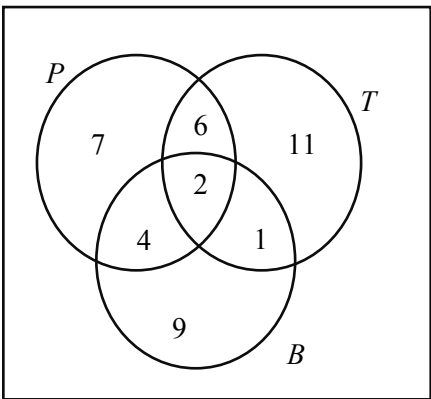
cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	295	2	M1 for $[87 +] 4 \times 52$ oe
1(a)(ii)	29.5 or 29.49...	1	FT $\frac{87}{\text{their(a)(i)}} \times 100$
1(b)	11	2	M1 for $18 \times 4 [\pm 61]$ oe
1(c)	4160 cao nfww	2	M1 for $64 \div 0.0154$ or B1 for rounding <i>their</i> answer to nearest 10
1(d)	2.4[0] nfww	2	M1 for $\left(1 + \frac{12.5}{100}\right)x = 2.7[0]$ oe
1(e)	53 : 36	3	M2 for $265 : 180$ oe or for answer $36 : 53$ or 53 min: 36 min or M1 for 4h 25 [mins] or 265 [mins] seen
1(f)	6[.00] or 5.999...	3	M2 for $\sqrt[5]{\frac{736}{550}}$ or M1 for $736 = 550 \times (x)^5$
2(a)(i)	3 2.25 1	3	B1 for each
2(a)(ii)	Fully correct smooth curve	4	B3FT for 7 or 6 correct plots B2FT for 5 or 4 correct plots B1FT for 3 correct plots
2(a)(iii)	-0.6 to -0.51, 0.75 to 0.85, 1.7 to 1.85	3	B1 for each If 0 scored, SC1 for $y = 1.5$ drawn
2(a)(iv)	-3 or -2 or -1 or 0	1	
2(b)(i)	Tangent ruled at $x = 1$	1	
2(b)(ii)	4.4 to 5.6	2	Dep on tangent at $x = 1$ or close attempt M1 for rise/run for <i>their</i> line

Question	Answer	Marks	Partial Marks
2(b)(iii)	$y = (4.4 \text{ to } 5.6)x - (1.8 \text{ to } 2.2)$ or [y =] <i>their</i> (b)(ii) $x + \text{their}(y\text{-intercept})$	2	FT for any line but not horizontal or vertical line for 2 marks or B1 B1FT for [m =] <i>their</i> 5 or for <i>their</i> y-intercept
3(a)	187	2	M1 for $220 \times \left(1 - \frac{15}{100}\right)$ oe or B1 for 33 seen
3(b)	19.8	3	M2 for $29.7 \times \sqrt[3]{\frac{0.4}{1.35}}$ oe or M1 for $\sqrt[3]{\frac{0.4}{1.35}}$ or $\sqrt[3]{\frac{1.35}{0.4}}$ oe seen or for $\frac{29.7^3}{x^3} = \frac{1.35}{0.4}$ oe
3(c)	12.4 or 12.44...	3	M1 for $90 \times 75 \times h = 7 \times \text{figs } 12$ B1 for $1000 \text{ cm}^3 = 1 \text{ litre}$ soi
4(a)	32.9 or 32.91 to 32.92...	2	M1 for $\pi \times 1.65 \times 4.7 + \pi \times 1.65^2$
4(b)	69.4 or 69.44 to 69.45	2	M1 for $\cos = 1.65 \div 4.7$ oe
4(c)(i)	12.5 or 12.54 to 12.55	4	M3 for $\frac{1}{3} \times \pi \times 1.65^2 \times \sqrt{4.7^2 - 1.65^2}$ oe or M2 for $\sqrt{4.7^2 - 1.65^2}$ oe or for $4.7 \times \sin(\text{their } \mathbf{(b)})$ oe or M1 for $1.65^2 + h^2 = 4.7^2$ oe or for $\frac{h}{4.7} = \sin(\text{their } \mathbf{(b)})$ oe
4(c)(ii)	41 nfw	4	B3 for 41.7... to 41.9 or M2 for $\frac{4}{3} \times \pi \times 5^3 \div \text{their } 12.5$ or M1 for $\frac{4}{3} \times \pi \times 5^3$ After M2 scored, M1 for truncating <i>their</i> decimal number of cones seen to an integer answer
5(a)	$\frac{10x}{(x-3)(x+2)}$ or $\frac{10x}{x^2 - x - 6}$ final answer	4	M1 for common denominator $(x-3)(x+2)$ isw M1 for $(x+3)(x+2) - (x-2)(x-3)$ isw B1 for correct numerator in terms of x only

Question	Answer	Marks	Partial Marks
5(b)	14	2	M1 for $12 - \frac{k}{2} = 5$ or $2^{\frac{k}{2}} = \frac{2^{12}}{2^5}$ oe or $\frac{4096}{32}$ or $12 - 5$ or $2^{12} \div 2^{\frac{14}{2}}$ [= 32] seen
5(c)	$2y^3 - 3y^2 - 23y + 12$ final answer	3	B2 for correct unsimplified expanded expression or for simplified four-term expression of correct form with 3 terms correct or B1 for correct expansion of 2 of the brackets with at least 3 terms correct
5(d)	$[x =] \frac{3}{y-1}$ final answer	3	M1 for $xy = 3 + x$ M1 for $xy - x = 3$ or $x - \frac{x}{y} = \frac{3}{y}$ M1 for factorising and dividing
6(a)(i)	$\frac{1}{3}$ oe	1	
6(a)(ii)	100	1	FT their (a)(i) $\times 300$ to at least 3 sf or rounded to the nearest integer
6(b)(i)	$\frac{2}{15}$ oe	3	M2 for $4 \times \frac{1}{6} \times \frac{1}{5}$ oe or M1 for $k \left(\frac{1}{6} \times \frac{1}{5} \right)$ oe or list or indication of 4 correct pairs
6(b)(ii)	$\frac{3}{5}$ oe	3	M2 for $1 - \frac{4}{6} \times \frac{3}{5}$ or $2 \left(\frac{2}{6} \times \frac{4}{5} \right) + \frac{2}{6} \times \frac{1}{5}$ oe or $\frac{2}{6} + \left(\frac{4}{6} \times \frac{2}{5} \right)$ oe or M1 for $\frac{4}{6} \times \frac{3}{5}$ oe seen or $\frac{2}{6} \times \frac{4}{5} [\times 2]$ oe seen or $\frac{2}{6} \times \frac{1}{5}$ oe seen or correct identification of 18 pairs or space diagram oe
7(a)	$n - 5 + 3n + 10 > 105$ or better	B1	
	$n > 25$ final answer	B2	M1 for $4n > 100$

Question	Answer	Marks	Partial Marks
7(b)	4.8	3	M1 for $y = \frac{k}{x^2}$ or better M1 for $[y =] \frac{\text{their } k}{5^2}$ OR M2 for $y \times 5^2 = 7.5 \times 4^2$
7(c)(i)	$6 - 2n$ oe final answer	2	B1 for answer $6 - kn$ ($k \neq 0$) oe or answer $j - 2n$ oe or for correct expression shown in working and then spoilt
7(c)(ii)	$2n^2 - 1$ oe final answer	2	B1 for 2nd diff = 4 or a quadratic expression or for correct expression shown in working and then spoilt
8(a)(i)	2.67 or 2.666...	3	M2 for $\frac{6 \times \sin 25}{\sin 72}$ or M1 for implicit version
8(a)(ii)	4.14 or 4.140...	3	M1 for $6^2 + 7.4^2 - 2 \times 6 \times 7.4 \times \cos 34$ A1 for 17.1 to 17.2
8(a)(iii)	20.4 or 20.35 to 20.36...	4	B1 for angle $SQR = 83$ M1 for $\frac{1}{2} \times 6 \times \text{their (a)(i)} \times \sin \text{their } (180 - 72 - 25)$ oe M1 for $\frac{1}{2} \times 6 \times 7.4 \times \sin 34$ oe
8(b)(i)	8.7[0] or 8.695...	4	B3 for $\sqrt{980}$ oe or 31.3 or 31.30... or M3 for $40 - \sqrt{20^2 + 18^2 + 16^2}$ oe or M2 for $20^2 + 18^2 + 16^2$ oe or M1 for any correct attempt at 2-dimensional Pythagoras' e.g. $18^2 + 16^2$
8(b)(ii)	30.7 or 30.73 to 30.74...	3	M2 for $[\sin =] \frac{16}{\sqrt{20^2 + 18^2 + 16^2}}$ oe or B1 for identifying angle GAC

Question	Answer	Marks	Partial Marks
9(a)		3	<p>B2 for 5 correct entries including '2' correctly placed at the intersection of the 3 sets</p> <p>or M1 for $k + 8 - k + 3 - k + 6 - k = 40 - (7 + 9 + 11)$ oe</p> <p>or for $k, 8 - k, 3 - k, 6 - k$, seen correctly placed on diagram with 7, 11 and 9 correctly placed</p>
9(b)	11	1	
9(c)	\emptyset or $\{ \}$	1	
9(d)	$\frac{7}{260}$ oe	2	M1 for $\frac{7}{40} \times \frac{6}{39}$ oe
9(e)	$\frac{14}{95}$ oe	2	<p>FT their Venn diagram</p> <p>M1 for $\frac{8}{20} \times \frac{7}{19}$</p>
10(a)(i)	$4x - 13$ final answer	1	
10(a)(ii)	$25x^2$ final answer	1	
10(b)	$\frac{x+1}{4}$ or $\frac{x}{4} + \frac{1}{4}$	2	<p>M1 for correct first step $x = 4y - 1$ or $y + 1 = 4x$ or $\frac{y}{4} = x - \frac{1}{4}$</p>
10(c)	0.6934 final answer	3	<p>B2 for 0.69336... or $3^{-\frac{1}{3}}$ oe or 0.693</p> <p>or M1 for $3^{-3^{-x}}$ oe</p>
10(d)(i)	$(3x - 2)^2 - 3^{-(-3)}$	M1	
	$9x^2 - 6x - 6x + 4 - 27$ or $9x^2 - 12x + 4 - 27$ leading to $9x^2 - 12x - 23$	A1	with no errors seen

Question	Answer	Marks	Partial Marks
10(d)(ii)	$\frac{-(-12) \pm \sqrt{(-12)^2 - 4(9)(-23)}}{2 \times 9}$ or better	B2	B1 for $\sqrt{(-12)^2 - 4(9)(-23)}$ oe or $\frac{-(-12) + \sqrt{q}}{2 \times 9}$ oe or $\frac{-(-12) - \sqrt{q}}{2 \times 9}$ oe or both
	– 1.07, 2.40 final answers	B2	B1 for each If B0, SC1 for answers – 1.1 or –1.06 or –1.065... to – 1.065 and 2.4 or 2.39 or 2.398 to 2.398... or – 1.07 and 2.40 seen in working or for –2.40 and 1.07 as final answer
10(e)	–5 final answer	2	M1 for $243 = 3^{-x}$
11(a)	(1, 2) (–1, 6)	5	B2 for [derivative oe =] $3x^2 - 3$ or B1 for [derivative oe =] $3x^2$ or $f(x) - 3$ M1 for <i>their</i> derivative = 0 or recognition of $\frac{dy}{dx} = 0$ oe B1 for $[x =] -1, 1$ or for one coordinate pair
11(b)	(1, 2) minimum with reason (–1, 6) maximum with reason	3	Reasons could be e.g. a reasonable sketch correct use of 2 nd derivative = $6x = 6$, $6 > 0$, so (1, 2) minimum oe 2 nd derivative = $6x = -6$, $-6 < 0$ so (–1, 6) maximum oe, or finds gradient on each side of both correct stationary points with correct conclusion B2 for 1 correct with reason or M1 for showing [2 nd derivative =] $6x$ or gradients for one value on either side of one correct stationary point or for reasonable sketch of cubic

MATHEMATICS**0580/41**

Paper 4 (Extended)

October/November 2019

MARK SCHEME

Maximum Mark: 130

Published

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Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)	$[p =] 132$ $[q =] 77$	3	B1 for 132 [=p] B2 for 77 [=q] or M1 for $180 - (55 + 48)$ oe or for <i>their</i> $p - 55$
1(b)	74	3	B2 for $5x - 10 = 360$ or M1 for $x + (x + 5) + (2x - 25) + (x + 10) = 360$ or for $5x - 10 = k$
1(c)	175	3	M2 for $180 - \frac{360}{72}$ or for $\frac{180(72 - 2)}{72}$ or M1 for $\frac{360}{72}$ or for $180 (72 - 2)$
1(d)	$[u =] 30$ $[v =] 60$ $[w =] 60$ $[x =] 120$ $[y =] 40$	6	B1 for 30 B1 for 60 B1 for 60 FT <i>their</i> v B1 for 120 FT $2 \times$ <i>their</i> w B2 for 40 or B1 for angle $BDC = 20$ or angle $ADO = 30$ or angle $ADB = 70$
1(e)	26	4	B3 for $360 - 22 = 10x + 3x$ oe or better or for $5x + 1.5x = 180 - 11$ oe or better or M2 for $360 - (3x + 22) = 2 \times 5x$ oe or for $5x + \frac{1}{2}(3x + 22) = 180$ oe or SC2 for $360 + 22 = 10x + 3x$ oe or better or M1 for $180 - 5x$, $10x$ or $360 - (3x + 22)$ correctly placed on the diagram or identified or for angle $A +$ angle $C = 5x$
2(a)	$[Ali] 2700$ $[Mo] 2100$	3	B2 for one correct or for correct values reversed or M1 for $600 \div (9 - 7)$ or for any equation that would lead to an answer of 300, 2700 or 2100, or 4800 (for the total)

Question	Answer	Marks	Partial Marks
2(b)	11	3	M2 for $\frac{220 - 195.8}{220} [\times 100]$ or for $[100 -] \frac{195.8}{220} \times 100$ or M1 for $220 - 195.8$ or for $\frac{195.8}{220}$ or a correct implicit equation for percentage reduction or for $\frac{195.8 - 220}{220}$
2(c)	84	3	M2 for $\frac{63}{1 - \frac{25}{100}}$ oe or M1 for associating 63 with $(100 - 25)\%$ or a correct implicit equation for the original price.
3(a)	662.45	2	M1 for $600 \times \left(1 + \frac{2}{100}\right)^5$ oe
3(b)(i)	800	2	M1 for $x \left(1 + \frac{5}{100}\right)^2 = 882$ oe or SC1 for answer 82
3(b)(ii)	5 nfw	2	M1 for trial with $882 \times \left(1 + \frac{5}{100}\right)^n$ with $n > 1$
4(a)(i)	955 or 955.0 to 955.2	2	M1 for $2 \times \pi \times 8 \times 19$ oe
4(a)(ii)	812 or 811.7 to 811.9...	2	FT <i>their</i> (i) $\times 0.85$ M1 for <i>their</i> (i) $\times 0.85$ or <i>their</i> (i) $\times 85$
4(b)(i)	$\frac{4}{3} \times \pi \times 6^3$ $\frac{1}{3} \times \pi \times 8^2$ seen to reach 13.5	M2	M1 for $\frac{4}{3} \times \pi \times 6^3 = \frac{1}{3} \times \pi \times 8^2 \times h$
4(b)(ii)	15.7 or 15.69...	2	M1 for $8^2 + 13.5^2$ or better
4(b)(iii)	394 or 395 or 394.3 to 394.6...	1	FT $\pi \times 8 \times$ <i>their</i> (b)(ii)

Question	Answer	Marks	Partial Marks
4(c)	567	3	M2 for $\frac{168}{V} = \left(\frac{80}{180}\right)^{\frac{3}{2}}$ oe or better or M1 for $\left(\frac{180}{80}\right)^{\frac{1}{2}}$ or $\left(\frac{80}{180}\right)^{\frac{1}{2}}$ oe seen or better
4(d)	51.3 or 51.34...	3	M2 for $\tan = \frac{5}{4}$ oe or M1 for recognition of angle <i>PBX</i>
5(a)	4.29 or 4.285 to 4.286	3	M2 for $\frac{150}{\frac{450}{3.6} - \frac{120}{4} - \frac{180}{3}}$ or M1 for [time =] $120 \div 4$ or $180 \div 3$ or $450 \div 3.6$ or $3.6 = \frac{150 + 180 + 120}{\text{total time}}$
5(b)	82.8 or 82.81 to 82.82 using cosine rule	4	M2 for $\frac{150^2 + 120^2 - 180^2}{2 \times 150 \times 120}$ or M1 for $180^2 = 120^2 + 150^2 - 2 \times 120 \times 150 \cos(\dots)$ A1 for $\frac{4500}{36000}$ oe
5(c)(i)	127.2 or 127.1 to 127.2 or 127	1	FT 210 – <i>their</i> (b)
5(c)(ii)	307.2 or 307.1 to 307.2 or 307	2	FT 180 + <i>their</i> (c)(i) M1 for 180 + <i>their</i> (c)(i)
5(d)	15 or 14.99 to 15.04	2	M1 for $\cos(\text{their (b)}) = \frac{\text{dist}}{120}$ oe
6(a)(i)	34	1	
6(a)(ii)	18	2	B1 for [l.q. =] 25 or [u.q. =] 43 seen
6(a)(iii)	60	2	M1 for 140 written
6(b)(i)	49	1	
6(b)(ii)	20	1	
6(b)(iii)	10	1	
6(b)(iv)	220	2	M1 for $3 \times 1 + 1 \times 2 + 3 \times 5 + 2 \times 10 + 4 \times 20 + 2 \times 50$
6(b)(v)	14.7 or 14.66 to 14.67	1	FT <i>their</i> (iv) $\div 15$

Question	Answer	Marks	Partial Marks
6(c)	13.25 nfw	6	<p>B2 for frequencies 30, 40, 30 soi or B1 for 2 of these</p> <p>M1 for 5, 12.5, 22.5</p> <p>M1 Σfx with <i>their</i> frequencies (if seen) and each x in correct interval including boundaries</p> <p>M1 dependent for $\frac{\Sigma fx}{100}$ (dependent on second M1)</p> <p>OR</p> <p>Alternative Method</p> <p>B2 for frequencies 15, 15, 40, 10, 10, 10 soi or B1 for 2 of 15, 40, 10</p> <p>M1 for 2.5, 7.5, 12.5, 17.5, 22.5, 27.5</p> <p>M1 Σfx with <i>their</i> frequencies (if seen) and each x in correct interval including boundaries</p> <p>M1 dependent for $\frac{\Sigma fx}{100}$ (dependent on second M1)</p>
7(a)	9	3	<p>M2 for $0.42x + 0.42 = 4.2$ oe or better</p> <p>or M1 for $0.21x + 0.21(x + 2)$ oe [= 420 or 4.20]</p> <p>or for $21x + 21(x + 2)$ oe [= 420 or 4.20]</p> <p>or for $420 \div 21$ oe [=20]</p>
7(b)	$5r + p = 245$	B1	
	$2r + 3p = 215$	B1	
	45	3	<p>Finds p</p> <p>M1 for correctly equating coefficients of r</p> <p>M1 for correct method to eliminate r</p> <p>OR</p> <p>M1 for correctly making r the subject of one of <i>their</i> equations</p> <p>M1 for correctly substituting <i>their</i> correct r to form an equation in p</p> <p>OR</p> <p>Finds r first</p> <p>M1 for correctly eliminating p from <i>their</i> equations</p> <p>M1 for correctly substituting <i>their</i> value of r to find p</p>

Question	Answer	Marks	Partial Marks
7(c)(i)	$\frac{12}{x} + \frac{6}{x-1} [= 5]$	M1	
	$12(x-1) + 6x = 5x(x-1)$	M1	Dependent on previous M1 earned May be over common denominator
	$5x^2 - 23x + 12 = 0$ reached, with at least one more line of working and with no errors or omissions	A1	
7(c)(ii)	$(5x-3)(x-4)$ final answer	2	B1 for $(5x+a)(x+b)$ with $ab = 12$ or $a+5b = -23$ or for $5x(x-4) - 3(x-4)$ or $x(5x-3) - 4(5x-3)$
7(c)(iii)	$\frac{3}{5}$ oe and 4	1	FT from their two brackets in (c)(ii)
7(c)(iv)	3 cao	1	
8(a)(i)	$\frac{4}{5}$ oe	1	
8(a)(ii)	$\frac{4}{5}$ oe	1	
8(b)(i)	$\frac{6}{20}$ oe nfw	3	M2 for $\frac{1}{5} \times \frac{3}{4} + \frac{3}{5} \times \frac{1}{4}$ oe or $2 \times \frac{1}{5} \times \frac{3}{4}$ oe or M1 for $\frac{1}{5} \times \frac{3}{4}$ alone or $\frac{3}{5} \times \frac{1}{4}$ alone or for answer $\frac{3}{20}$ nfw After 0 scored, SC1 for answer $\frac{6}{25}$
8(b)(ii)	$\frac{8}{20}$ oe nfw	3	M2 for $1 - \frac{4}{5} \times \frac{3}{4}$ or $\frac{1}{5} \times 1 + \frac{4}{5} \times \frac{1}{4}$ oe or $2 \times \frac{1}{5} \times 1$ or $2 \times \frac{1}{5} \times \frac{3}{4} + 2 \times \frac{1}{5} \times \frac{1}{4}$ or their (b)(i) + $2 \times \frac{1}{5} \times \frac{1}{4}$ or M1 for answer $\frac{2 \text{ or } 4 \text{ or } 5 \text{ or } 6 \text{ or } 7}{20}$ oe nfw After 0 scored, SC1 for answer $\frac{8}{25}$

9(a)	$x + y \geq 6$ oe $y \leq x$ oe $x \leq 8$	3	B1 for each
9(b)	$4x + 6y \leq 60$	1	
9(c)	Correct region indicated cao	6	B1 for $x + y = 6$ ruled and long enough B1 for $x = y$ ruled and long enough B1 for $x = 8$ ruled and long enough B2 for $2x + 3y = 30$ ruled and long enough or B1 for ruled line through (0, 10) or (15, 0) but not $y = 10$ or $x = 15$
9(d)(i)	6, 6	1	
9(d)(ii)	34	2	M1 for trying $4x + 6y$ with (4, 3) or (5, 2) or (6, 1) or (7, 0)
10(a)	-7 $13 - 4n$ oe 36 $(n + 1)^2$ oe 125 n^3 oe 128 2^{n+2} oe	11	B1 B2 or B1 for $13 - kn$ ($k \neq 0$) or for $k - 4n$ B1 B2 or B1 for any quadratic B1 B1 B1 B2 or B1 for 2^k oe
10(b),, 6, 10, 16 , 3, 4, 7, 2,, 1, 0,	3	B1 for each correct row
10(c)(i)	$\frac{q}{p + q}$	1	
10(c)(ii)	$\frac{18}{29}$	1	

MATHEMATICS**0580/42**

Paper 4 (Extended)

October/November 2019

MARK SCHEME

Maximum Mark: 130

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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This document consists of **8** printed pages.

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- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	5 : 6	1	
1(a)(ii)	$2.0736[0] \times 10^5$ final answer	3	B2 for 207360 oe or M1 for $16 \times 18 \times 720$
1(b)(i)	26780	2	M1 for $18540 \div 9$ soi
1(b)(ii)	1.36	2	M1 for 0.85×1.6 oe or B1 for 0.51 or 51
1(c)	66.7 or 66.66 to 66.67	5	<p>M4 for $\frac{(2.3 - 1.5 \times 0.92)}{1.5 \times 0.92} [\times 100]$ oe or $\frac{2.3 \times 100}{1.5 \times 0.92}$ oe</p> <p>OR <u>Working in euros</u> B2 for [€]1.38 or M1 for $1.5[0] \times 0.92$ M2dep on B2 or M1 for $\frac{2.3 - \text{their } 1.38}{\text{their } 1.38} [\times 100]$ oe or $\frac{2.3 - \text{their } 1.38}{\text{their } 1.38} \times 100$ oe</p> <p>or M1 for $2.3 - \text{their } 1.38$ or $\frac{2.3}{\text{their } 1.38}$</p> <p>OR <u>Working in dollars</u> B2 for [\$]2.50 or M1 for or $2.3[0] \div 0.92$ M2dep on B2 or M1 for $\frac{\text{their } 2.5 - 1.5}{1.5} [\times 100]$ oe or $\frac{\text{their } 2.5}{1.5} \times 100$ or M1 for $\text{their } 2.5 - 1.5$ or $\frac{\text{their } 2.5}{1.5}$</p>

Question	Answer	Marks	Partial Marks
1(d)	219 000 or 218814[.3....] rounded to 4 sf or more	3	B2 for 414000 or 414414[.3....] rounded to 4 sf or more or M2 for $195600 \times \left(1 + \frac{8.7}{100}\right)^9$ [– 195600] or M1 for $195600 \times \left(1 + \frac{8.7}{100}\right)^k$ or better ($k > 1$ and an integer)
2(a)(i)	54	1	
2(a)(ii)	29	2	M1 for [UQ =] 65 or [LQ =] 36
2(a)(iii)	32	1	
2(a)(iv)	17, 18 or 19	2	M1 for 61 to 63 written or for decimal answer in range 17 to 19
2(b)(i)	18, 26, 26	2	B1 for 1 or 2 correct
2(b)(ii)	51 nfw	4	M1 for 10 , 30 , 50 , 70 , 90 soi M1 for Σfx M1 dep for <i>their</i> $\Sigma fx \div \Sigma f$
2(c)(i)	75	1	
2(c)(ii)	IQR is bigger for the girls with [boys =] 20 seen oe	2	FT <i>their</i> IQR from (a)(ii) M1 for IQR for boys = 20 isw or for girls IQR is bigger than boys IQR oe isw FT <i>their</i> IQR from (a)(iii)
3(a)(i)	(3, 5.5)	2	B1 for either value correct
3(a)(ii)	$\frac{5}{4}x + \frac{7}{4}$ final answer	3	B2 for answer $\frac{5}{4}x + c$ oe or for correct equation in different form or M1 for $\frac{8-3}{5-1}$ oe and M1 for correct substitution shown of (1, 3) or (5, 8) or <i>their</i> (a)(i) into $y = (\text{their } m)x + c$ oe
3(b)(i)	(6, 1) (10, 6)	2	B1 for 2 or 3 values correct
3(b)(ii)	(–3, 1) (–8, 5)	2	B1 for 2 or 3 values correct If 0 scored, SC1 for (3, –1) and (8, –5)
3(b)(iii)	(3, 3) (–1, 8)	2	B1 for 2 or 3 values correct but not for (1, 3) and (5, 8)

Question	Answer	Marks	Partial Marks
3(b)(iv)	(5, -3) (11, -8)	2	B1 for either or M1 for $\begin{pmatrix} -1 & 2 \\ 0 & -1 \end{pmatrix} \begin{pmatrix} 1 \\ 3 \end{pmatrix}$ or $\begin{pmatrix} -1 & 2 \\ 0 & -1 \end{pmatrix} \begin{pmatrix} 5 \\ 8 \end{pmatrix}$
3(c)	Enlargement -2 Origin oe	3	B1 for each
4(a)	452 or 452.2 to 452.4...	2	M1 for $\left[\frac{1}{2} \times\right] \frac{4}{3} \times \pi \times 6^3$
	cm ³	1	
4(b)(i)(a)	400 or 399.6 to 399.9	6	B3 for $[CD =] \sqrt{72.96}$ or $[\text{angle } CBD =] 58.7$ or 58.66 to 58.67 or M2 for $\sqrt{10^2 - 5.2^2}$ oe or $[CBD =] \cos^{-1}\left(\frac{5.2}{10}\right)$ oe or M1 for $(CD)^2 + 5.2^2 = 10^2$ oe or $\cos [CBD] = \frac{5.2}{10}$ oe or $\sin [CDB] = \frac{5.2}{10}$ oe M1dep for $\frac{5.2 \times \text{their } CD}{2}$ oe or $\frac{1}{2} \times 5.2 \times 10 \times \sin(\text{their } CBD)$ oe M1 for $\text{their area} \times 18$ oe
4(b)(i)(b)	14.6 or 14.62 to 14.63...	4	M3 for $\sin BEC = \frac{5.2}{\sqrt{10^2 + 18^2}}$ oe or M2 for $[BE =] \sqrt{10^2 + 18^2}$ oe seen or $[EC =] \sqrt{18^2 + 10^2 - 5.2^2}$ oe seen or M1 for $[BE^2 =] 10^2 + 18^2$ oe seen or $[EC^2 =] 18^2 + 10^2 - 5.2^2$ seen
4(b)(ii)	125 or 124.9 to 125.0...	3	B2 for $55[.0\dots]$ seen or M2 for $180 - \tan^{-1}\left(\frac{10}{7}\right)$ oe or $\cos EGB = \frac{11^2 + (10^2 + 7^2) - (10^2 + 18^2)}{2 \times 11 \times \sqrt{10^2 + 7^2}}$ oe or M1 for $\tan[] = \left(\frac{10}{7}\right)$ oe or for $(10^2 + 18^2) = 11^2 + (10^2 + 7^2) - 2 \times 11 \times \sqrt{10^2 + 7^2} \cos EGB$ oe

Question	Answer	Marks	Partial Marks
5(a)	3.5, 15, 3.9	3	B1 for each
5(b)	Correct graph	5	B4 for correct curves but branches joined or touching y -axis or B3FT 10 or 11 points or B2FT for 8 or 9 points or B1FT for 6 or 7 points B1indep two separate branches not touching or crossing y -axis
5(c)	0.5 to 0.6 and 1.3 to 1.6	2	B1 for each or both correct but in reverse order
5(d)	1	1	
5(e)(i)	$y = 3x + 1$ ruled and 0.3 to 0.49	3	B2 for correct ruled line that crosses <i>their</i> curve or B1 for $y = 3x + 1$ soi or freehand line or ruled line with gradient 3 or with y – intercept at 1 (but not $y = 1$)
5(e)(ii)	$[a =] -6$ $[b =] -2$ $[c =] -4$	3	M2 for $x^4 + 2 - 4x = 6x^3 + 2x^2$ or better seen or B1 for each correct value to a maximum of 2 marks If 0 scored, SC1 for answer $[a =] 6, [b =] 2$ and $[c =] 4$ or for $x^5 + 2x - 4x^2 = 6x^4 + 2x^3$ or better
6(a)(i)	13.9[0...] from cosine rule	4	M2 for $8^2 + 13^2 - 2 \times 8 \times 13 \cos 79$ or M1 for $\cos 79 = \frac{13^2 + 8^2 - BC^2}{2 \times 8 \times 13}$ A1 for 193
6(a)(ii)	66.6 or 66.60... to 66.65 from sine rule	3	M2 for $[\sin ACB =] \frac{13 \times \sin 79}{\text{their}(a)(i)}$ or M1 for $\frac{\sin ACB}{13} = \frac{\sin 79}{\text{their}(a)(i)}$ oe
6(b)(i)	$\frac{1}{2}(x+4)(4x-5)\sin 30 = 70$	M1	
	$4x^2 + 16x - 5x - 20 = 280$	M2	Dep on M1 B1 for $4x^2 + 16x - 5x - 20$ or better
	Leading to $4x^2 + 11x - 300 = 0$	A1	with no errors or omissions seen

Question	Answer	Marks	Partial Marks
6(b)(ii)	$\frac{-11 \pm \sqrt{11^2 - 4 \times 4 \times -300}}{2 \times 4}$	B2	B1 for $\sqrt{11^2 - 4(4)(-300)}$ or better or for $\frac{-11 + \sqrt{q}}{2 \times 4}$ or $\frac{-11 - \sqrt{q}}{2 \times 4}$
	-10.14 and 7.39	B2	B1 for each or SC1 for final answers -10.1 or -10.144 to -10.143 and 7.4 or 7.393 to 7.394 or -10.14 and 7.39 seen in working or for -7.39 and 10.14 as final answer
6(b)(iii)	11.4 or 11.39...	1	FT <i>their</i> positive root + 4
7(a)(i)	13	1	
7(a)(ii)	3	2	M1 for $h\left(\frac{10}{30}\right)$ oe soi or $27^{\frac{10}{x}}$
7(a)(iii)	$\frac{7-x}{2}$ oe final answer	2	M1 for $x = 7 - 2y$ or $y - 7 = -2x$ or $7 - y = 2x$ or $-\frac{y}{2} = -\frac{7}{2} + x$ oe
7(b)	0.75 oe final answer	3	M1 for $\frac{10}{2x+1} = 4$ M1 for $10 = 8x + 4$ or better
7(c)	$\frac{70-19x}{x(7-2x)}$ or $\frac{70-19x}{7x-2x^2}$ final answer	3	M1 for $x + 10(7-2x)$ or better isw B1 for common denominator $x(7-2x)$ oe isw
7(d)	3 final answer	1	
8(a)(i)	$\frac{m-7}{5}$ oe final answer	2	M1 for $5p = m - 7$ or $p + \frac{7}{5} = \frac{m}{5}$
8(a)(ii)	$[\pm]\sqrt{\frac{y^2-h}{2}}$ or $[\pm]\sqrt{\frac{h-y^2}{-2}}$ oe final answer	3	M1 for first correct step isolate term in p or divide by ± 2 M1 for second correct step FT <i>their</i> first step
8(b)(i)	$\begin{pmatrix} 0 \\ 5 \end{pmatrix}$	1	
8(b)(ii)	$\begin{pmatrix} -3 \\ -1 \end{pmatrix}$	1	

Question	Answer	Marks	Partial Marks
8(b)(iii)	3.22 or 3.216... to 3.220...	6	<p>B3 for [angle $AOB =$] 36.8 or 36.9 or 36.84 to 36.87 or M2 for $\tan[AOB] = \frac{3}{4}$ oe or for $[AOB =]2 \times \sin^{-1}$ $\left(\frac{\sqrt{(5-4)^2 + (0-3)^2}}{10} \right)$ oe or for $\cos [AOB =]$ $\frac{5^2 + 5^2 - \left(\sqrt{(5-4)^2 + (0-3)^2} \right)^2}{2 \times 5 \times 5}$ oe or M1 for recognition of right-angle with perpendicular from B to OA or x-axis or for $[AB^2 =](5-4)^2 + (0-3)^2$ or better oe or $(their\ AB)^2 = 5^2 + 5^2 - 2 \times 5 \times 5 \times \cos OAB$ oe M2 for $\frac{their\ angle\ AOB}{360} \times 2 \times \pi \times 5$ oe or M1 for radius = 5 soi</p>
9(a)	171 or 171.0...	3	<p>M2 for $\frac{7.6}{160} \times 60 \times 60$ oe or M1 for $\frac{7.6}{160}$ or $\frac{7.6}{2\frac{2}{3}}$ or $\frac{7.6}{2\text{ min }40\text{ sec}}$ If 0 scored, SC1 for answer 189 or 188.6 to 188.7</p>
9(b)(i)	77 [min] 20 [s]	4	<p>M3 for $\frac{32}{12} \times 29$ oe or B2 for 4640 or 1.29 or 1.288 to 1.289, $\frac{58}{45}$ oe or 32 laps or 29 laps or M2 for $2^5 \times 5 \times 29$ oe or M1 for 2 m 40 sec \div (2 m 40 sec – 2 m 25 sec) soi for 2 m 25 sec \div (2 m 40 sec – 2 m 25 sec) soi or for an attempt to find LCM or 23 200 seen or correctly find prime factors of 145 or 160 or for $\frac{7.6}{145}$ or $\frac{7.6}{2\frac{5}{12}}$ or $\frac{7.6}{2\text{ min }25\text{ sec}}$ oe, provided SC1 not earned in part (a)</p>
9(b)(ii)	220.4	2	<p>M1 for $their\ (b)(i) \div 2\text{ min }40\text{ sec} [\times 7.6]$ oe or $their\ (a) \times their\ (b)(i) \div 60$ oe</p>

MATHEMATICS**0580/43**

Paper 4 (Extended)

October/November 2019

MARK SCHEME

Maximum Mark: 130

Published

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FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	1254	2	M1 for $342 \div 3$
1(a)(ii)	27.3 or 27.27...	1	
1(b)	867	2	M1 for $1020 \times \frac{15}{100}$ oe or $1020 \times \left(1 - \frac{15}{100}\right)$ oe
1(c)	4.5[0]	3	M2 for $\frac{79.5[0]}{100+6} [\times 6]$ oe or $\frac{79.5[0]}{100+6} \times 100$ oe or M1 for 79.5[0] associated with 106[%]
1(d)	22.6 or 22.58... nfw	4	M1 for $\frac{45}{20}$ or better and M2 for $\frac{60+45}{\text{their } 2\text{h } 24\text{min} + \text{their } \frac{45}{20}}$ or M1 for $\text{their } \frac{45}{20} + \text{their } 2\text{h } 24\text{min}$
1(e)	91.6[0] to 91.61	3	M2 for $480 \times \left(1 + \frac{2.1}{100}\right)^4 - 430$ oe OR M1 for $480 \times \left(1 + \frac{2.1}{100}\right)^4$ oe A1 for 522, 521.6[0] to 521.61
1(f)	112.8125	2	B1 for 2.5 or 9.5 seen

Question	Answer	Marks	Partial Marks
2(a)(i)	$2a + a + 2b + 3b + 10 = 180$ leading to $3a + 5b = 170$ without error or omission	1	
2(a)(ii)	$8a + 3a + 2b + b + 50 + 4b - 2a = 360$ leading to $9a + 7b = 310$ without error or omission	1	
2(a)(iii)	Correct method to eliminate one variable	M1	
	$[a =]15$ $[b =]25$	A2	A1 for each correct value If 0 scored, SC1 for two values that satisfy one of the equations or for two correct answers with no/incorrect working
2(a)(iv)	30	1	
2(b)	-1.5 or $-1\frac{1}{2}$ or $-\frac{3}{2}$	2	M1 for $6x = -12 + 3$ or better
2(c)	$\frac{3x+3}{2}$ oe final answer	3	M1 for $8x - 2y = 5x - 3$ or $4x - y = \frac{1}{2}(5x - 3)$ M1FT for isolating the y term correctly
2(d)	$9x^6$	2	M1 for $(3x^3)^2$ or $(729x^{18})^{\frac{1}{3}}$ seen or for $9x^k$ or kx^6 as final answer
2(e)	$\frac{x}{x-5}$ final answer nfw	3	M1 for $x(x+5)$ M1 for $(x-5)(x+5)$
3(a)	5, -3, 21	3	B1 for each
3(b)	Fully correct curve	4	B3 FT for 9 or 10 points or B2 FT for 7 or 8 points or B1 FT for 5 or 6 points
3(c)	-2.9 to -2.7 0 1.7 to 1.9	2	B1 for 2 correct values

Question	Answer	Marks	Partial Marks
3(d)	Tangent ruled at $x = 2$	B1	
	10 to 14	B2	Dep on correct tangent or close attempt at tangent at $x = 2$ M1 for rise/run also dep on correct tangent drawn or close attempt at tangent Must see correct or implied calculation from a drawn tangent
3(e)	6	1	
4(a)	36.8 or 36.84...	2	M1 for $\frac{h}{107} = \tan 19$ or $\frac{h}{\sin 19} = \frac{107}{\sin 71}$ oe or better
4(b)	42.1 or 42.12... from cosine rule	4	M2 for $[\cos BAC =] \frac{158^2 + 132^2 - 107^2}{2 \times 158 \times 132}$ or M1 for implicit version A1 for $[\cos BAC =] \frac{30939}{41712}$ or 0.7417...
4(c)	35.8 or 35.84... from sine rule	3	M2 for $\frac{86 \times \sin 116}{132} [= 0.58557...]$ or M1 for $\frac{\sin CAD}{86} = \frac{\sin 116}{132}$ oe
4(d)	9670 or 9669 to 9676	3	M2 for $\frac{1}{2} \times 158 \times 132 \times \sin(\text{their (b)})$ oe and $\frac{1}{2} \times 86 \times 132 \times \sin(64 - \text{their (c)})$ oe or M1 for either area
4(e)	214.2 or 214.1... or 214	2	M1 for $[180 +]70 - \text{their (c)}$ oe
5(a)(i)	52	1	
5(a)(ii)	36	1	
5(a)(iii)	26	1	FT 62 – <i>their</i> (a)(ii) evaluated correctly
5(b)	Valid comment	1	Strict FT <i>their</i> (a)(iii), e.g. distances for females are more varied
5(c)	$\frac{11}{20}$ oe	2	M1 for 27 written or answer of $\frac{27}{60}$ oe
5(d)(i)	[18 9] 14 12 5 [2]	2	B1 for 1 correct value

Question	Answer	Marks	Partial Marks
5(d)(ii)	48.75 nfw	4	M1 for midpoints soi M1 for use of $\sum fx$ with <i>their</i> frequencies M1 (dep on 2nd M1) for $\sum fx \div (60$ or by <i>their</i> $\sum f)$
6(a)(i)	Angle $ABC=52$ nfw	B1	ALTERNATIVE [Reflex] angle $AOC = 256$
	Opposite angles in cyclic quad oe Angles in opposite segments	B1	Angle at centre = $2 \times$ angle at circumference/arc
	[Angle $AOC=104$] Angle at centre = $2 \times$ angle at circumference/arc nfw	B1	Angles around a point
6(a)(ii)	22 nfw	2	B1 for angle $OAC = 38$ or angle $CAD = 24$
6(a)(iii)	28	1	
6(a)(iv)	36.6 or 36.62 to 36.63 nfw	3	B2 for 7.4 or 17.42 to 17.43 or M2 for $9.6 \times 2 + \frac{104}{360} \times 2 \times \pi \times 9.6$ or M1 for $\frac{104}{360} \times 2 \times \pi \times 9.6$
6(b)(i)	81	3	M2 for $\frac{A}{36} = \left(\sqrt[3]{\frac{2187}{648}} \right)$ oe or better or for $A \times \frac{648}{36} \times \sqrt[3]{\frac{2187}{648}} = 2187$ oe or better or M1 for $\frac{A^3}{36^3} = \frac{2187^2}{648^2}$ oe or $\sqrt[3]{\frac{2187}{648}}$ or $\sqrt[3]{\frac{648}{2187}}$
6(b)(ii)	8.05 or 8.051 to 8.052...	3	M2 for $\left[r^3 = \right] \frac{2187 \times 3}{4 \times \pi}$ oe or M1 for $\frac{4\pi r^3}{3} = 2187$ SC2 for $\frac{648 \times 3}{4 \times \pi}$ or SC1 for $\frac{4\pi r^3}{3} = 648$
7(a)	Reflection $y = -1$	2	B1 for each
7(b)(i)	Image at $(-6, 5) (-6, 7) (-5, 7) (-4, 5)$	2	B1 for translation by $\begin{pmatrix} -3 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 4 \end{pmatrix}$

Question	Answer	Marks	Partial Marks
7(b)(ii)	Image at (1, -1) (3, -1) (3, -3) (2, -3)	2	B1 for shape correct size and orientation but wrong position
7(b)(iii)	Image at (1, 2) (1, 6) (3, 6) (5, 2)	2	B1 for shape correct size and orientation, wrong position
8(a)(i)	$\frac{2}{5}$ oe	2	M1 for $\frac{4}{6} \times \frac{3}{5}$
8(a)(ii)	$\frac{3}{5}$ oe	1	FT 1 – <i>their</i> $\frac{12}{30}$ oe
8(b)	$\frac{5}{7}$ oe nfw	4	M3 for $\frac{2}{7} + \frac{5}{7} \times \frac{2}{6} + \frac{5}{7} \times \frac{4}{6} \times \frac{2}{5}$ oe or for $1 - \frac{5}{7} \times \frac{4}{6} \times \frac{3}{5}$ oe or M1 for each of $\frac{5}{7} \times \frac{2}{6}$ and $\frac{5}{7} \times \frac{4}{6} \times \frac{2}{5}$ oe or completed tree diagram with appropriate probabilities shown
9(a)(i)	5	1	
9(a)(ii)	1	2	M1 for $h(0)$ or 3^{9-x^2} or better
9(a)(iii)	$9 - 4x^2$ final answer	1	
9(a)(iv)	$15 - 2x^2$ final answer	2	M1 for $2(9 - x^2) - 3$ or better
9(b)	$\frac{x+3}{2}$ final answer	2	M1 for $x = 2y - 3$ or $y + 3 = 2x$ or better or $\frac{y}{2} = x - \frac{3}{2}$
9(c)	1.8 or $1\frac{4}{5}$ or $\frac{9}{5}$	2	M1 for $10x - 15 = 3$ or $2x - 3 = \frac{3}{5}$
9(d)	-1 and 4 nfw	4	M1 for $9 - (2x - 3)^2 = -16$ A1 for $4x^2 - 12x - 16 = 0$ oe M1 (dep on first M1) for correct factors or use of formula or completing the square for their 3-term quadratic OR M1 for $9 - y^2 = -16$ A1 for $y^2 = 25$ M1 (dep on first M1) for $2x - 3 = \pm 5$
9(e)	$\frac{1}{9}$	1	

Question	Answer	Marks	Partial Marks
10	$x + 1 - 2x = 3x(x + 1)$	M2	M1 for a common denominator of $x(x + 1)$ seen or attempt to multiply through by denominators or for $\frac{x+1-2x}{x(x+1)} = 3$
	$3x^2 + 4x - 1 [= 0]$ oe nfw	A1	
	$[x =] \frac{-4 \pm \sqrt{4^2 - 4 \times 3 \times (-1)}}{2 \times 3}$	B2	B1FT for $\sqrt{4^2 - 4 \times 3 \times (-1)}$ or better or for $\left(x + \frac{2}{3}\right)^2$ B1FT for $\frac{-4 + \sqrt{q}}{2 \times 3}$ or $\frac{-4 - \sqrt{q}}{2 \times 3}$ or for $-\frac{2}{3} \pm \sqrt{\frac{1}{3} + \left(\frac{2}{3}\right)^2}$
	-1.55 and 0.22 final answers	B2	B1 for each or B1 for -1.548 to -1.549 and 0.215... or for -1.55 and 0.22 seen in working or for -0.22 and 1.55 as final answer or for -1.5 or -1.54 and 0.2 or 0.21 as final answer
11(a)(i)	$8b - 4a$ oe	1	
11(a)(ii)	$6b$	1	
11(a)(iii)	$6b - 2a$ or $2(3b - a)$	1	FT $-2a + \text{their (a)(ii)}$
11(b)	2 : 1 oe final answer	3	Dep on correct \overrightarrow{BC} or correct \overrightarrow{AC} seen B2 for $\overrightarrow{BC} = 4b - 2a$ or M1 for a correct route for \overrightarrow{BC} in terms of a and b or for a correct route for \overrightarrow{AC} in terms of a and b If no/incorrect working seen then SC1 for final answer of 2 : 1 (oe)

MATHEMATICS**0580/41**

Paper 4 (Extended)

May/June 2019

MARK SCHEME

Maximum Mark: 130

Published

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This document consists of **8** printed pages.

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GENERIC MARKING PRINCIPLE 1:

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- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

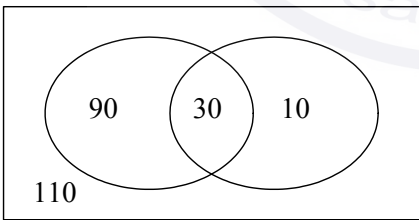
Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	Image at (1, 7), (4, 7), (4, 9), (3, 9)	2	B1 for translation by $\begin{pmatrix} -1 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 6 \end{pmatrix}$
1(a)(ii)	Image at (5, 3), (6, 3), (8, 5), (5, 5)	2	B1 for 180° rotation with wrong centre
1(a)(iii)	Rotation 180° (4.5, 6) OR Enlargement, [factor] – 1 (4.5, 6)	3	B1 for rotation B1 for 180° B1FT for centre from <i>their</i> (a)(i) B1 for enlargement B1 for – 1 B1FT for centre from <i>their</i> (a)(i)
1(b)(i)	Image at (1, 2), (1, 5), (3, 5), (3, 4)	2	B1 for $y = x$ drawn or for 3 correct points
1(b)(ii)	$\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$	2	B1 for one correct row or one column within a 2 by 2 matrix
2(a)	2, 2, 6	3	B1 for each
2(b)	Correct graph	4	B3FT for 10 or 11 correct plots or B2FT for 8 or 9 correct plots or B1FT for 6 or 7 correct plots
2(c)	–3.3 to –3.1	1	FT <i>their</i> graph
2(d)	$y = -2x$ ruled	M1	or B1 for $y = -2x$ stated
	–2.6 to –2.45	A1	
2(e)	3 or 4 or 5	1	FT <i>their</i> graph Allow more than one correct value

Question	Answer	Marks	Partial Marks
3(a)	530	4	B3 for $[DE] = 130$ m and $[DC] = 80$ m or B2 for $[DE] = 130$ m or $[DC] = 80$ m or M1 for $50^2 + 120^2$ or $170^2 - 150^2$
3(b)	52.9 or 52.89...	4	M2 for $\frac{100^2 + 150^2 - 120^2}{2 \times 100 \times 150}$ or M1 for $120^2 = 100^2 + 150^2 - 2 \times 100 \times 150 \cos(\dots)$ A1 for 0.603 or 0.6033... or $\frac{181}{300}$
3(c)(i)	28.1 or 28.07...	2	M1 for $\cos = \frac{15}{17}$ oe
3(c)(ii)	331.9 or 331.9...	2	FT 360 – <i>their (c)(i)</i> M1 for 360 – <i>their (c)(i)</i> oe
3(d)	1.5[0] or 1.498... nfw	4	M1 for $\frac{1}{2} \times 50 \times 120$ oe M1 for $\frac{1}{2} \times 100 \times 150 \sin(\text{their(b)})$ oe M1 for $\frac{1}{2} \times 150 \times \text{their CD}$ oe or $\frac{1}{2} \times 150 \times 170 \times \sin \text{their(c)(i)}$ If 0 scored, SC1 for dividing <i>their</i> area by 10 000
4(a)(i)	range = 7	1	
	mode = 21	1	
	median = 22.5	2	M1 for evidence of middle value
	mean = 22.7 or 22.71...	2	M1 for use of $\Sigma x \div 14$
4(a)(ii)	$\frac{3}{14}$ oe	1	
4(b)	$x - n + 1$ final answer	3	M2 for $nx - (n-1)(x+1)$ or M1 for $(n-1)(x+1)$
4(c)(i)	16.6 or 16.60 to 16.61 nfw	4	M1 for 5, 12.5, 17.5, 22.5, 30 soi M1 for Σfx where x is in correct interval, including boundaries M1 dep on second M1 for $\frac{\Sigma fx}{50 + 85 + 100 + 120 + 10}$

Question	Answer	Marks	Partial Marks
4(c)(ii)	Correct histogram	4	B1 for each correct block If 0 scored, SC1 for 5, 20, 24, 1 seen
5(a)	4.73 or 4.730 to 4.731...	3	M2 for $3 \times 1.2 + \pi \times 0.6^2$ oe or M1 for $\pi \times 0.6^2$ or $\frac{1}{2} \times \pi \times 0.6^2$ or 3×1.2
5(b)	946 or 946.0 to 946.2...	3	M2 for <i>their</i> (a) $\times 0.2 \times 1000$ oe or M1 for <i>their</i> (a) $\times 0.2$ or 20 implied by figs 946[0] to 9462
5(c)	1.28 or 1.29 or 1.284 to 1.290	3	M2 for $\frac{(1007 - \text{their}(\mathbf{b}))}{\text{their}(\mathbf{a})} \times 100$ oe or for $\frac{1007 - \text{their}(\mathbf{b})}{\text{their}(\mathbf{b})} \times 20$ oe or M1 for figs $\frac{1007 - \text{their}(\mathbf{b})}{\text{their}(\mathbf{a})}$ or figs $\frac{1007}{\text{their}(\mathbf{a})}$ or for $\frac{1007 - \text{their}(\mathbf{b})}{\text{their}(\mathbf{b})}$ or $\frac{1007}{\text{their}(\mathbf{b})} \times 20$ oe
6(a)		2	B1 for any one correct
6(b)	110	1	FT <i>their</i> 110 in Venn diagram
6(c)	$\frac{10}{240}$ oe	1	FT $\frac{\text{their}10}{240}$

Question	Answer	Marks	Partial Marks
6(d)	$\frac{870}{1560}$ oe	3	M2 for $\frac{their30}{40} \times \frac{their30-1}{39}$ or M1 for $\frac{p}{q} \times \frac{p-1}{q-1}$ $p < q$ or for $\frac{their30}{40}$ soi
7(a)(i)	1.991×10^3	4	B3 for 1991 or 1.99×10^3 or $1.991... \times 10^3$ or B2 for 1990 or 1991. ... OR M1 for $104.3 \times 26.5 + \frac{1}{2} \times (-2.2) \times 26.5^2$ oe B1 for <i>their</i> seen value correctly rounded to 4 sf B1 for <i>their</i> seen value correctly converted into standard form
7(a)(ii)	$\frac{2(s-ut)}{t^2}$ oe final answer	3	M1 for correct multiplication by 2 oe M1 for correct rearrangement to isolate term with a M1 for correct division by t^2 for 3 marks e.g. cannot have a fraction in denominator nor $\div t^2$ in numerator
7(b)(i)	$(2x+3)(x-1) - (x+1)(x-2) = 62$	M1	
	$2x^2 + 3x - 2x - 3$ oe or $x^2 + x - 2x - 2$ oe	B1	
	$x^2 + 2x - 63 = 0$	A1	Established with no errors or omissions
7(b)(ii)	$(x+9)(x-7)$	2	B1 for $(x+a)(x+b)$ where $ab = -63$ or $a+b=2$ or for $x(x-7)+9(x-7)$ or for $x(x+9)-7(x+9)$
7(b)(iii)	20	2	FT $2 \times$ <i>their</i> positive root + 6 M1 for substituting <i>their</i> positive root into four lengths or for stating $2x+6$

Question	Answer	Marks	Partial Marks
8(a)	6 nfw	3	M2 for $\frac{2.65 - 2.50}{2.50} [\times 100]$ or for $\frac{2.65}{2.50} \times 100$ or M1 for $\frac{2.65}{2.50}$
8(b)	552.5[0]	3	B2 for 52.5[0] or M2 for $500 \times \frac{1.5}{100} \times 7 + 500$ oe or M1 for $500 \times \frac{1.5}{100} [\times 7]$ oe
8(c)	37.4 or 37.36...	2	M1 for $\left(1 + \frac{1.6}{100}\right)^{20}$ oe soi 1.37...
8(d)	4[.00...]	3	M2 for $\sqrt[22]{\frac{2607}{6400}}$ or M1 for $6400 \times x^{22} = 2607$ oe or better
9(a)	82	2	M1 for $(3^x)^2 + 1$ soi by $(3^2)^2 + 1$ or g(9) isw
9(b)	$\frac{x+2}{7}$ final answer	2	M1 for $y + 2 = 7x$ or $\frac{y}{7} = x - \frac{2}{7}$ or $x = 7y - 2$
9(c)	[a =] 1, [b =] 2, [c =] 2	3	B2 for $x^4 + x^2 + x^2 + 1 + 1$ or M1 for $(x^2 + 1)^2 + 1$
9(d)	$\frac{6}{7}$ oe	3	M2 for $7x - 2 = 4$ or M1 for $3^x = 81$ soi $f(x) = 4$ or for $3^{7x-2} = 81$ or better
10(a)	10	1	
10(b)	6.2[0] or 6.203 to 6.204	3	M2 for $[x^3 =] 1000 \div \frac{4}{3}\pi$ oe or better or M1 for $\frac{4}{3}\pi x^3 = 1000$
10(c)	7.82 or 7.815 to 7.816	4	B3 for $[x^3 =] 1000 \div \frac{1}{3}\pi \div 2$ oe or better or M1 for $(x\sqrt{5})^2 - x^2$ soi by $4x^2$ or $2x$ M1dep for $\frac{1}{3}\pi \times x^2 \times theirh [= 1000]$

Question	Answer	Marks	Partial Marks
10(d)	$6\frac{2}{3}$ or 6.67 or 6.666 to 6.667	4	B3 for $[x^3 =]1000 \div \frac{27}{8}$ oe or $\frac{3x}{2} = 10$ or better or M2 for $\frac{1}{2} \times x \times \frac{x}{2} \times \frac{27x}{2} = 1000$ oe or M1 for $\frac{1}{2} \times x \times \frac{x}{2}$ If 0 scored, SC2 for answer 5.29 or 5.291..
11	[Total time =] 16 h 6 min or 16.1 h	2	B1 for 22 h 6 min or 22.1h or 966 mins If 0 scored, SC1 for 9 h 41 min
	[Distance to airport in New York =] 16.5	2	M1 for 18×55
	[Arc length =] 6200 or 6199 to 6200. ...	3	M2 for $\frac{55.5}{360} \times 2 \times \pi \times 6400$ or M1 for $\frac{55.5}{360}$ or $2 \times \pi \times 2400$
	[Distance Geneva to Chamonix =] 104	2	M1 for 65×1.6 or 65×96 oe
	392 to 393	2	M1 for $\frac{6316 \text{ to } 6322.4}{\text{their } 16.1}$ Must be correct value in numerator

MATHEMATICS**0580/42**

Paper 4 (Extended)

May/June 2019

MARK SCHEME

Maximum Mark: 130

Published

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oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)	16.5 or 16.49...	3	M2 for $\frac{1.13 - 0.97}{0.97} [\times 100]$ oe or $\frac{1.13}{0.97} \times 100$ oe or M1 for $\frac{1.13}{0.97}$ oe
1(b)(i)	35	2	M1 for $60 \div (5 + 7)$
1(b)(ii)	140	1	
1(c)	\$1.26 final answer	3	B2 for 1.259... or 1.26 but not as final answer or M1 for $2.25 \div 0.9416$ If 0 scored, SC1 for 1.13×0.9416
1(d)	15[.0...]	3	M2 for $\sqrt[21]{\frac{58000}{1763000}}$ oe or M1 for $58000 = 1763000 (k)^{21}$
1(e)	1239.75	2	B1 for $43 + 0.5$ or $28 + 0.5$ oe seen
2(a)	103	3	M1 for angle ABC or angle $ACB = \frac{1}{2}(180 - 26)$ oe M1 for angle $ABF = 26$ or angle CBD or angle $FBE = 77$ or exterior angle $ACB = 103$ correctly identified or in correct position

Question	Answer	Marks	Partial Marks
2(b)	75	5	<p>B4 for 105 at a or b or 73 at c and 32 at d</p> <p>or B3 for 58 at m or 58 at e and 17 at k</p> <p>or B2 for 32 at d and 90 soi at $(c+k)$ or 32 at d and 17 at k or 73 at c</p> <p>or B1 for 90 soi at $(c + k)$ or between tangent and radius or 32 at d or 17 at k</p>
3(a)	$1 - r$	1	
3(b)(i)	$(1 - r)(1.3 - r) [= 0.4]$	1	FT <i>their(a)</i> dep on (a) being an expression in r
3(b)(ii)	$1.3 - 1.3r - r + r^2$ or better nfw	M1	FT <i>their (b)(i)</i>
	$0.9 - 2.3r + r^2 [= 0]$ OR $13 - 13r - 10r + 10r^2 = 4$ oe	M1	Strict FT <i>their</i> expansion to a quadratic then equating to 0.4 and then collecting to 3 terms on 'one side' OR Strict FT <i>their</i> expansion to a quadratic = 0.4 all multiplied by 10
	$10r^2 - 23r + 9 = 0$	A1	no errors or omissions seen

Question	Answer	Marks	Partial Marks
3(b)(iii)	$(5r-9)(2r-1) [= 0]$	B2	or B2 for e.g. $5r(2r-1) - 9(2r-1)$ and then $5r-9 = 0$ and $2r-1 = 0$ or B1 for $5r(2r-1) - 9(2r-1) [= 0]$ or $2r(5r-9) - 1(5r-9) [= 0]$ or $(5r+a)(2r+b) [= 0]$ where a, b are integers and $ab = +9$ or $2a+5b = -23$ If 0 scored, SC1 for $5r-9$ and $2r-1$ seen but not in factorised form
	$[r =] \frac{9}{5}$ oe $[r =] \frac{1}{2}$ oe	B1	
3(b)(iv)	0.8 or $\frac{4}{5}$ oe	1	
4(a)(i)	1.5 oe	1	
4(a)(ii)	(0, 2)	1	
4(b)(i)	$y = -2x + 6$ oe final answer	3	B2 for $y = -2x + c$ oe or $y = mx + 6$ oe $m \neq 0$ or for answer $-2x + 6$ or B1 for [gradient =] $-\frac{6}{3}$ oe or $c = +6$ soi
4(b)(ii)	$y = 0.5x - 1.5$ oe final answer	3	B1 for [gradient =] -1 divided by <i>their</i> gradient from (b)(i) evaluated soi M1 for substitution of (9, 3) into $y = (\text{their } m)x + c$ seen in working
4(c)(i)	12.6 or 12.64 to 12.65	3	M2 for $\sqrt{(8-4)^2 + (5-1)^2}$ oe or M1 for $(8-4)^2 + (5-1)^2$ oe
4(c)(ii)	(2, 3)	2	B1 for each
5(a)	2.45, 0.25, -0.25	3	B1 for each
5(b)	Fully correct smooth curve	4	B3FT for 6 or 7 points or B2 FT for 4 or 5 points or B1 FT for 2 or 3 points
5(c)	0.7 to 0.8	1	FT <i>their</i> curve
5(d)(i)	Correct ruled line	2	M1 for good freehand, or ruled line with gradient -1.05 to -0.95 or ruled line through (0, 2) but not line $y = 2$

Question	Answer	Marks	Partial Marks
5(d)(ii)	Both intersections of <i>their</i> (b) and <i>their</i> (d)(i)	2	Strict FT intersection of <i>their</i> (b) and <i>their</i> (d)(i) B1FT for one correct OR B2 for 0.27 to 0.28 and 2.38 to 2.39
5(e)	Substitutes $x = \sqrt{2}$ into $\frac{1}{2x} - \frac{x}{4}$ OR Identifies $y = 0$ oe OR Correctly manipulates to a single fraction e.g. $\frac{2-x^2}{4x}$ oe seen	M1	
	Concludes 'read the graph at $y = 0$ ' oe OR Manipulates $0 = \frac{1}{2x} - \frac{x}{4}$ oe leading to $x^2 = 2$ OR States $\frac{2-x^2}{4x}$ oe = 0 leading to $x^2 = 2$	A1	
6(a)	$x^2 + 4x - 21$ final answer	2	B1 for three of x^2 , $+7x$, $-3x$, -21
6(b)(i)	$5q^2(3p^2 - 5q)$ final answer	2	B1 for $5(3p^2q^2 - 5q^3)$ or $q^2(15p^2 - 25q)$ or $q(15p^2q - 25q^2)$ or $5q(3p^2q - 5q^2)$ or for correct answer seen
6(b)(ii)	$(2g + 5k)(2f + 3h)$ final answer	2	B1 for $2g(2f + 3h) + 5k(2f + 3h)$ or $2f(2g + 5k) + 3h(2g + 5k)$ or for correct answer seen
6(b)(iii)	$(9k + m)(9k - m)$ final answer	2	M1 for $(9 + m)(9 - m)$ or for correct answer seen

Question	Answer	Marks	Partial Marks
6(c)	5.5	4	<p>M1 for $5 \times 3(x-4) + x + 2 = 5 \times 6$</p> <p>M1 for $15x - 60 + x + 2 = 30$ FT <i>their</i> first step or $3x - 12 + \frac{x+2}{5} = 6$</p> <p>If M0M0, SC1 for $3x - 12 + x + 2 = 30$ oe</p> <p>M1dep for $16x = 88$ FT <i>their</i> previous steps</p>
7(a)	$180 - \frac{360}{5}$ or $\frac{(5-2) \times 180}{5}$ or $\frac{(2 \times 5 - 4) \times 90}{5}$ or $\frac{5 \times 180 - 360}{5}$	M2	<p>or M1 for $\frac{360}{5}$ or $(5-2) \times 180$</p> <p>or $90(2 \times 5 - 4)$ or $3 \times 180 \div 5$ or $6 \times 90 \div 5$ or $5 \times 180 - 360$</p> <p>If 0 scored, SC1 for $\frac{5-2 \times 180}{5}$</p>
7(b)(i)	7.05 or 7.053...	3	<p>M2 for $12 \times \cos 54$ oe</p> <p>or M1 for implicit form or B1 for length of edge of pentagon = 14.1 to 14.11</p> <p>If 0 scored, SC1 for right angle at <i>M</i></p>
7(b)(ii)(a)	22.8 or 22.81 to 22.83... nfw	3	<p>M2 for $\frac{\text{their (b)(i)}}{\cos 72}$ oe</p> <p>or M1 for implicit form oe or B1 for $AX = 36.9$ or 36.93 to 36.94</p>
7(b)(ii)(b)	179 or 179.1 to 179.3...	3	<p>M2 for $\frac{1}{2} \times 12 \times \text{their } AX \times \sin 54$ oe or $\frac{1}{2} \times 12 \times \text{their } OX \times \sin 108$ oe or $\frac{1}{2} \times \text{their } AX \times \text{their } OX \times \sin 18$ or $\frac{1}{2} \times 12^2 \times \sin 72 + \text{area } OBX$ oe or $\frac{1}{2} \times 12^2 \times \sin 72 + \text{area } OMB + \text{area } MBX$ oe</p> <p>or M1 for a correct method to find area of one relevant triangle <i>AOB</i>, <i>OMB</i>, <i>MBX</i>, <i>OBX</i> or <i>ONX</i> seen</p>
8(a)(i)	15.7 or 15.70...	4	<p>M2 for $16.5^2 + 12.4^2 - 2 \times 16.5 \times 12.4 \times \cos 64$ or M1 for implicit form</p> <p>A1 for 246 to 247</p>

Question	Answer	Marks	Partial Marks
8(a)(ii)	18.7 or 18.68 to 18.69	4	B1 for 32 or angle $DBM = 37$ or angle $CBM = 58$ M2 for $\frac{12.4 \times \sin 53}{\sin 32}$ oe or M1 for implicit form oe
8(b)(i)	116.1 or 116.08 to 116.09...	2	M1 for $\frac{y}{360} \times 2 \times \pi \times 3.8 = 7.7$ oe
8(b)(ii)	14.6 or 14.61 to 14.63...	2	M1 for $\frac{\text{their(b)(i)}}{360} \times \pi \times 3.8^2$ oe
9(a)	12.8[0]	4	M1 for midpoints soi M1 for use of $\sum fm$ with m in correct interval including both boundaries M1 (dep on 2nd M1) for $\sum fm \div 100$
9(b)	54 84 93	2	B1 for 2 correct or 1 error and 2 correct or FT
9(c)	correct diagram with all points correctly plotted	3	B1FT their (b) for plots at 5 correct heights B1 for 5 points at upper ends of intervals on correct vertical line B1FT (dep on at least B1) for increasing curve or polygon through 5 points After 0 scored, SC1FT for 4 correct points plotted
9(d)(i)	9 to 9.8 final answer	1	
9(d)(ii)	8.5 to 11.5	2	B1 for [UQ =] 15.5 to 17.5 or [LQ =] 6 to 7 seen
9(d)(iii)	10, 11 or 12	2	B1 for 88 to 90 seen or for answer between 10 and 12
10(a)(i)	18[.0] or 17.99 to 18.00...	3	M2 for $\sqrt[3]{\frac{24430 \times 3}{4\pi}}$ oe or M1 for $\frac{4}{3}\pi r^3 = 24430$
10(a)(ii)	447 or 446.8 to 446.9...	3	M2 for $\pi \times 50^2 \times 60 - 24430$ oe or M1 for $\pi \times 50^2 \times 60$ oe

Question	Answer	Marks	Partial Marks
10(b)	4 [hours] 30 [mins] nfw	4	B3 for 16200 or 4.5 or 270 or M2 for $\frac{\text{figs } 18 \times \text{figs } 15 \times \text{figs } 12}{\text{figs } 2}$ oe or M1 for $\text{figs } 18 \times \text{figs } 15 \times \text{figs } 12$ oe
10(c)	12.5 or 12.50...	3	M2 for $17 \times \sqrt{\frac{159.5}{295}}$ oe or M1 for $\sqrt{\frac{159.5}{295}}$ or $\sqrt{\frac{295}{159.5}}$ seen or for $\frac{159.5}{295} = \frac{x^2}{17^2}$ oe
11(a)	40 54 26 34	4	B1 for each
11(b)	$n^2 + 3n$ or $n(n+3)$ oe	2	B1 for a quadratic expression or for 2nd common difference 2 (at least 2 shown) or for 2 correct equations seen or for subtracting n^2
11(c)	100	2	M1 for <i>their</i> (b) = 10300 seen
11(d)	$[a =] \frac{1}{2}$ oe and $[b =] \frac{5}{2}$ oe	2	B1 for each or M1 for one correct equation or for 2nd difference = 1 soi (at least 2 shown)

MATHEMATICS**0580/43**

Paper 4 (Extended)

May/June 2019

MARK SCHEME

Maximum Mark: 130

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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Cambridge International is publishing the mark schemes for the May/June 2019 series for most Cambridge IGCSE™, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

This document consists of **8** printed pages.

Generic Marking Principles

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GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

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- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

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- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Abbreviations

cao correct answer only

dep dependent

FT follow through after error

isw ignore subsequent working

oe or equivalent

SC Special Case

nfwf not from wrong working

soi seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	6h 27 mins	2	B1 for answerh 27 mins
1(a)(ii)	150 km/h	3	M2 for $\frac{90}{36} \times 60$ or M1 for $\frac{90}{\text{their time}}$ or B1 for 36 [mins] seen
1(a)(iii)	780	4	M3 for $\left(90 \times \frac{35}{3600}\right) \times 1000 - 95$ oe or M2 for $\left(90 \times \frac{35}{3600}\right) \times 1000$ oe or B1 for figs 875 or M1 for $90 \times \frac{35}{3600}$ seen or for $90 \times \frac{1000}{3600}$ oe If 0 scored, SC1 for <i>their</i> distance (> 95) – 95
1(b)(i)	7 : 5	1	
1(b)(ii)	66.7 or 66.66 to 66.67	3	M2 for $\frac{140 - 84}{84} [\times 100]$ oe or for $\frac{140}{84} \times 100$ oe or M1 for $\frac{140}{84}$ oe
1(b)(iii)	24 576	5	M4 for complete method, $40 \times 60 + 0.7 \times 220 \times 84 + 0.3 \times 220 \times 140$ oe OR B1 for 40 [children] M1 for $0.7 \times 220 \times 84$ oe M1 for $0.3 \times 220 \times 140$ oe B1 for 2400 or 12936 or 9240 nfwf

Question	Answer	Marks	Partial Marks
1(c)	3.5×10^5 nfw	3	M2 for $3.08 \times 10^5 \div \left(\frac{100-12}{100}\right)$ oe or M1 for $3.08 [\times 10^5]$ associated with (100–12)%
2(a)	–10	2	M1 for $-17 - 3 = 7x - 5x$ oe or better
2(b)	–1, 0, 1, 2 final answer	3	B2 for 3 correct values and no incorrect values or 4 correct values and one incorrect value or M2 for $-\frac{7}{4} < n \leq 2$ oe or M1 for $-\frac{7}{4} < n \leq k$ or $k < n \leq 2$ oe
2(c)(i)	a^9	1	
2(c)(ii)	$125x^3y^6$ final answer	2	B1 for 2 correct elements if in form kx^ny^m
2(c)(iii)	$\frac{4y^{[1]}}{3x^4}$ final answer	3	B2 for $\left(\frac{3x^4}{4y^{[1]}}\right)^{[-1]}$ oe seen OR B1 for $3x^4$ or $4y^{[1]}$ and M1 for $\left(\frac{64y^3}{27x^{12}}\right)^{[\frac{1}{3}]}$ oe If 0 scored, SC1 for $\frac{64y^{[1]}}{27x^4}$ or $\frac{0.333x^{-4}}{0.25y^{-1}}$ seen
3(a)(i)	Image at (–5, 4), (–2, 4), (–4, 6)	2	B1 for translation by $\begin{pmatrix} -3 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 2 \end{pmatrix}$
3(a)(ii)	Image at (2, 1), (4, –1), (2, –2)	2	B1 for reflection in $y = -x$ or $y = x$ drawn
3(b)	Rotation 90°[anticlockwise] oe (1, –1)	3	B1 for each
3(c)(i)	$\begin{pmatrix} -2 & 0 \\ 0 & -2 \end{pmatrix}$	2	B1 for 2 by 2 matrix with one correct row or column
3(c)(ii)	Strict FT <i>their</i> (c)(i)	1	Answer not equal to zero FT <i>their</i> (c)(i) only if 2 by 2

Question	Answer	Marks	Partial Marks
4(a)(i)	$\frac{1}{2} \times \frac{4}{3} \times \pi \times 5.6^3$	M1	
	367.8... to 367.9	A1	
4(a)(ii)	3.06 or 3.060 to 3.061...	4	M1 for $0.8 \times 368 [= 294.4]$ M2 for $[r^2 =] \frac{\text{their } 294.4}{10\pi}$ oe or M1 for $\pi r^2 \times 10 = \text{their } 294.4$ oe
4(b)(i)	44[.0] or 43.98 to 43.99 nfw	5	B2 for [slant height =] $\frac{25}{4}$ oe or M1 for $[l^2 =] 6^2 + 1.75^2$ oe M2 for $\pi \times 1.75 \times \text{their } l + \pi \times 1.75^2$ or M1 for $\pi \times 1.75 \times \text{their } l$ or $\pi \times 1.75^2$
4(b)(ii)(a)	SF = $\frac{1}{4}$ oe soi	B1	
	$\frac{1}{3} \pi \times 1.75^2 \times 6 - \frac{1}{3} \pi \times \text{their } 0.4375^2 \times 1.5$ OR $\frac{1}{3} \pi \times 1.75^2 \times 6 \times \left(1 - \left(\frac{1}{4}\right)^3\right)$ oe	M2	M1 for $\frac{1}{3} \pi \times 1.75^2 \times 6$ or $\frac{1}{3} \pi \times \text{their } 0.4375^2 \times 1.5$ OR M1 for $1 - \left(\frac{1}{4}\right)^3$ oe
	18.94 or 18.939 to 18.944...	A1	
4(b)(ii)(b)	95 final answer	3	B2 for 94.5 or 94.69 to 94.722 OR M2 for $18.9 \times 10^3 \div 200$ oe or M1 for 18.9×10^3 or $200 \div 10^3$ or figs 189.. \div 200 or 18.9.. \div figs 2
5(a)(i)	−3	1	
5(a)(ii)	6.2 to 6.4 oe	2	M1 for 3 seen or used
5(b)	$y = 5 - 3x$ ruled	2	B1 for $y = 5 - 3x$ soi or ruled line with gradient − 3 or with y − intercept at 5 (but not $y = 5$) or B1FT for incorrect line equation/expression shown in working and <i>their</i> line correctly drawn
	− 0.3 to − 0.2 1.65 to 1.8	2	B1 for each, dep on $y = 5 - 3x$ drawn or FT <i>their</i> line provided equation/expression shown in working, dep on B1FT for line

Question	Answer	Marks	Partial Marks
5(c)	Tangent ruled at $x = -2$	1	B1 for correct tangent
	-4.5 to -2.5	2	Dep on B1 for tangent or close attempt at tangent at $x = -2$ M1 for rise/run also dep on tangent drawn or close attempt at correct tangent Must see correct or implied calculation from a drawn tangent
5(d)(i)	8, 4, 0.25 oe	3	B1 for each
5(d)(ii)	Correct graph	3	B2FT for 6 or 7 correct plots or B1FT for 4 or 5 correct plots
5(d)(iii)	1.8 to 1.9	1	
6(a)	40.5 or 40.45[8..] or 40.46 nfw	4	M1 for 25, 32.5, 37.5, 50, 80 soi M1 for Σft M1 dep for their $\Sigma ft \div 120$
6(b)	Fully correct histogram	4	B1 for each correct bar If 0 scored, SC1 for frequency densities of 5.4, 4.2, 0.8 and 0.45 seen
7(a)	$[y =] 4x + 5$	3	B2 for answer $[y =] 4x + c$ oe (c can be numeric or algebraic) OR M2 for $\frac{y-9}{x-1} = \frac{9-(-3)}{1-(-2)}$ oe OR M1 for $\frac{9-(-3)}{1-(-2)}$ oe or for M1 for correct substitution of $(-2, -3)$ or $(1, 9)$ into $y = (their\ m)x + c$ oe
7(b)	76[.0] or 75.96...	2	M1 for $\tan[] = 4$ oe

Question	Answer	Marks	Partial Marks
7(c)(i)	$[y =] -\frac{1}{4}x + \frac{23}{8}$ oe	3	B2FT for $[y =] -\frac{1}{\text{their gradient from (a)}}x + c$ oe (c can be numeric or algebraic) OR M2 for $\frac{y-2}{x-3.5} = -\frac{1}{\text{their gradient from (a)}}$ oe OR M1 for $-\frac{1}{\text{their gradient from (a)}}$ soi M1 for correct substitution of (3.5, 2) into $y = (\text{their } m)x + c$ oe
7(c)(ii)	(-4.5, 4)	2	B1 for each value or for $\begin{pmatrix} -8 \\ 2 \end{pmatrix}$ seen
8(a)(i)	$\frac{x-1}{x+2}$	2	B1 for either numerator or denominator correct
8(a)(ii)(a)	$\frac{x}{x+3} \times \frac{x-1}{x+2} = \frac{7}{15}$	B1	FT <i>their (a)(i)</i> = $\frac{7}{15}$
	$15x(x-1) = 7(x+3)(x+2)$	M1	Removes all algebraic fractions FT <i>their</i> equation if in comparable form
	$15x^2 - 15x = 7x^2 + 21x + 14x + 42$	M1	Correctly expands all brackets FT <i>their</i> equation if in comparable form
	$[8x^2 - 50x - 42 = 0]$ $4x^2 - 25x - 21 = 0$	A1	With no errors or omissions seen and one further stage seen after final M1
8(a)(ii)(b)	$(4x+3)(x-7) [= 0]$	M2	M1 for $4x(x-7) + 3(x-7)$ or $x(4x+3) - 7(4x+3)$ or for $(4x+a)(x+b)$ where either $ab = -21$ or $4b+a = -25$ If 0 scored, SC1 for $4x+3$ and $x-7$ seen but not in factorised form
	7 and $-\frac{3}{4}$	B1	
8(a)(ii)(c)	7	1	FT <i>their</i> positive solution

Question	Answer	Marks	Partial Marks
8(b)	$\frac{1}{6}$ oe	4	M3 for $\frac{5}{9} \times \frac{4}{8} \times \frac{3}{7} + \frac{4}{9} \times \frac{3}{8} \times \frac{2}{7}$ or M2 for $\frac{5}{9} \times \frac{4}{8} \times \frac{3}{7}$ or $\frac{4}{9} \times \frac{3}{8} \times \frac{2}{7}$ or M1 for $\frac{5}{9}, \frac{4}{8}, \frac{3}{7}$ seen or $\frac{4}{9}, \frac{3}{8}, \frac{2}{7}$ seen If 0 scored, SC1 for $\frac{5^3 + 4^3}{729}$ oe
9(a)(i)	$\angle ACD = 46$ soi or $\angle CDE = 44$ soi	B2	B1 for angle $ADC = 108$ or angle $DCB = 18$
	$\frac{58 \sin 108}{\sin \text{their} 46}$	M2	M1 for $\frac{\sin 108}{x} = \frac{\sin \text{their} 46}{58}$ oe
	76.68... nfw	A1	
9(a)(ii)	10.9 or 10.91 to 10.94	3	B2 for $[AB =] 68.9$ or 68.91 to 68.94 or M2 for a correct explicit statement for AB or BD or M1 for $\frac{AB}{76.7} = \cos 26$ oe
9(b)(i)	10.4 or 10.43 to 10.44	4	M3 for $\sqrt{\frac{70}{\sin 40}}$ oe or M2 for $x^2 \times \sin 40 = 70$ oe or M1 for $\frac{1}{2}x \times 2x \times \sin 40 = 70$
9(b)(ii)	140	1	
10(a)(i)	3, -1	2	B1 for each
10(a)(ii)	$23 - 4n$ oe final answer	2	M1 for $k - 4n$ or $23 - jn$ ($j \neq 0$)
10(a)(iii)	22	2	M1 for <i>their</i> (a)(ii) = -65
10(b)	23	2	B1 for 37 or 60

MATHEMATICS**0580/42**

Paper 4 (Extended)

March 2019

MARK SCHEME

Maximum Mark: 130

Published

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GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

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Abbreviations

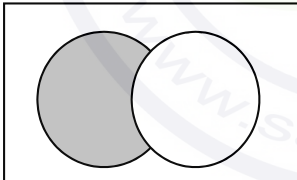
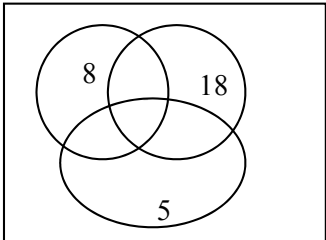
cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)	473	2	M1 for $645 \div (11 + 4)$
1(b)	212.5	2	M1 for 50×4.25
1(c)	31.5 or 31.45 to 31.46	3	M2 for $54 \div 1\frac{43}{60}$ oe or M1 for time = 1h 43min or 103 [mins] or $54 \div \text{their time}$
1(d)	875	1	
1(e)	10.4 or 10.38 to 10.39	1	
1(f)(i)	30 [\times] 70 and 2100	1	
1(f)(ii)	both numbers rounded up oe	1	
2(a)(i)	Reflection $x = 1.5$	2	B1 for each
2(a)(ii)	Rotation (0, -1) 90° [anticlockwise] oe	3	B1 for each
2(b)(i)	Image at (5, -1) (6, -1) (6, -3)	2	B1 for correct size and orientation but wrong position If 0 scored, SC1 for enlargement SF $\frac{1}{2}$ with centre (3, 0)
2(b)(ii)	Image at (-6, 3) (-4, 3) (-6, 7)	2	B1 for translation $\begin{pmatrix} -3 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 1 \end{pmatrix}$
2(b)(iii)	Image at (2, -1) (2, -3) (6, -3)	3	M2 for 3 correct coordinates soi or M1 for $\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix} \begin{pmatrix} -1 & -3 & -3 \\ 2 & 2 & 6 \end{pmatrix}$ or B1 for stating reflection in $y = x$

Question	Answer	Marks	Partial Marks
3(a)	$\frac{5}{9}$ oe	1	
3(b)	$\frac{80}{153}$ oe	3	<p>M2 for $2 \times \frac{10}{18} \times \frac{8}{17}$ oe</p> <p>or M1 for $\frac{10}{18} \times \frac{8}{17}$ oe</p> <p>If 0 scored, SC1 for $\frac{160}{324}$ oe</p>
3(c)	$\frac{11}{51}$ oe	4	<p>M3 for $\frac{10}{18} \times \frac{9}{17} \times \frac{8}{16} + \frac{8}{18} \times \frac{7}{17} \times \frac{6}{16}$ oe</p> <p>or M2 for $\frac{10}{18} \times \frac{9}{17} \times \frac{8}{16}$ oe or $\frac{8}{18} \times \frac{7}{17} \times \frac{6}{16}$ oe</p> <p>or M1 for $\frac{10}{18}, \frac{9}{17}, \frac{8}{16}$ or $\frac{8}{18}, \frac{7}{17}, \frac{6}{16}$</p> <p>If 0 scored, SC1 for $\frac{1512}{5832}$ oe</p>
4(a)	Correct ruled line with <i>D</i> marked	2	B1 for correct ruled line or short line
4(b)	47.5	2	B1 for 9.5 or 95 mm seen or for answer figs 465 to figs 485
4(c)	Correct arc radius 7 cm	2	B1 for complete arc other radius, centre <i>A</i> or correct but short arc
	Correct ruled perpendicular bisector of <i>BC</i> with correct pairs of arcs	2	B1 for correct perpendicular bisector without correct arcs or for correct arcs, no/incorrect line
	Correct ruled bisector of angle <i>BCD</i> with correct pairs of arcs	2	B1 for correct angle bisector without correct arcs or for correct arcs, no/incorrect line
	correct region shaded	1	Dep on at least B1B1B1 and five boundaries one of which is an arc
4(d)	[1 :] 500	1	

Question	Answer	Marks	Partial Marks
5(a)	-2.1, 1.6, -1.7, 2.1	3	B2 for 3 correct or B1 for 2 correct
5(b)	Fully correct curve	4	B3FT for 8 or 9 correct plots or B2FT for 6 or 7 correct plots or B1FT for 4 or 5 correct plots
5(c)	line $y = \frac{1}{2}(1-x)$ ruled	M2	M1 for line with gradient $-\frac{1}{2}$ M1 for line through $(0, \frac{1}{2})$ but not $y = \frac{1}{2}$
	-2.15 to -2.01 -0.45 to -0.2 2.25 to 2.45	B2	B1 for two correct
5(d)	number of intersections of <i>their</i> curve and the line $y = 1$	1	strict FT for <i>their</i> curve
6(a)	5.83 or 5.832 to 5.833	5	B2 for sector angle = 210 soi or M1 for $[\cos DOE =] \frac{0.25}{0.5}$ oe M2 for $\frac{their210}{360} \times 2 \times \pi \times 0.5 + 2 \times 1.5 + 2 \times 0.5$ oe or M1 for $\frac{their210}{360} \times 2 \times \pi \times 0.5$ oe isw
6(b)	1.21 or 1.208...	3	M2 for $\frac{their210}{360} \times \pi \times 0.5 \times 0.5 + 1.5 \times 0.5$ oe or M1 for $\frac{their210}{360} \times \pi \times 0.5 \times 0.5$ oe isw
6(c)(i)	4[.00...]	3	M2 for $0.5 \times \sqrt{\frac{77.44}{their(b)}}$ oe or M1 for $\sqrt{\frac{77.44}{their(b)}}$ or $\sqrt{\frac{their(b)}{77.44}}$ or for $\frac{their(b)}{77.44} = \frac{0.5^2}{r^2}$ oe
6(c)(ii)	2.20704	3	M2 for $77.44 \times 1.5 \times 19 \div 1000$ oe or M1 for figs 2207[04] or figs 221 seen or [vol =] 77.44×1.5

Question	Answer	Marks	Partial Marks
7(a)(i)	111.25	4	M1 for midpoints soi (25, 75, 112.5, 137.5, 175) M1 for $\sum fx$ with x in correct interval including both boundaries M1 (dep on 2nd M1) for $\sum fx \div 20$
7(a)(ii)	2 7 11 17	2	B1 for three correct
7(a)(iii)	$\frac{3}{20}$ oe	1	
7(b)	20 6	2	B1 for one correct value or [SF =] 5 or $\frac{1}{5}$ oe
7(c)(i)	5 nfww	3	M2 for $\sum fx \div \sum f = 4.28$ oe or M1 for $179 + 7x$ oe or $4.28 \times (45 + x)$ oe seen
7(c)(ii)	3	1	
7(c)(iii)	4	1	
8(a)	-3	1	
8(b)	$\frac{12}{11}$ oe	2	M1 for $\frac{3}{\frac{3}{x+2} + 2}$ soi
8(c)	$64x - 45$ final answer	2	M1 for $8(8x - 5) - 5$ isw
8(d)	$\frac{x+5}{8}$ oe final answer	2	M1 for a correct first step $y + 5 = 8x$, $\frac{y}{8} = x - \frac{5}{8}$ or $x = 8y - 5$
8(e)	$\frac{8x^2 + 11x - 13}{x + 2}$ final answer	3	M1 for $(8x - 5)(x + 2) - 3$ oe isw B1 for common denominator $(x + 2)$

Question	Answer	Marks	Partial Marks
8(f)(i)	$(8x-5)^2 + 6 = 19$	M1	
	$64x^2 - 40x - 40x + 25$	B1	
	$64x^2 - 40x - 40x + 25 + 6 = 19$ oe leading to $16x^2 - 20x + 3 = 0$	A1	with no errors and must show $(8x-5)^2 + 6 = 19$ with no omissions after this
8(f)(ii)	$\frac{[-]20 \pm \sqrt{([-]20)^2 - 4(16)(3)}}{2 \times 16}$ oe	2	B1 for $\sqrt{([-]20)^2 - 4(16)(3)}$ or better or B1 for $\frac{[-]20 + \sqrt{q}}{2(16)}$ oe or $\frac{[-]20 - \sqrt{q}}{2(16)}$
	0.17 and 1.08 final ans	2	B1 for each If 0 scored, SC1 for answer 0.2 and 1.1 or answer -0.17 and -1.08 or 0.174... and 1.075 to 1.076 seen or 0.17 and 1.08 seen in working
9(a)(i)(a)	\in	1	
9(a)(i)(b)	$A \cap B$	1	
9(a)(ii)	B or A'	1	
9(b)		1	
9(c)(i)	$3x + 7 = 19$ oe	M1	must see 19 and 7
	$3x = 19 - 7$ or better leading to $x = 4$	A1	with no errors seen
9(c)(ii)		2	B1 for 2 correct
9(c)(iii)	\emptyset or $\{ \}$	1	
9(c)(iv)	15	1	

Question	Answer	Marks	Partial Marks
10(a)	correctly equating one set of coefficients	M1	or making x or y the subject of one equation correctly
	correct method to eliminate one variable	M1	or substitution for x or y for <i>their</i> rearranged formula
	$x = 7$ $y = -3$	A2	A1 for one correct value If A0 scored, SC1 for 2 values satisfying one of the original equations or if no working shown, but 2 correct answers given
10(b)	2	3	M1 for $y = \frac{k}{(x+3)^2}$ oe M1 for $y = \frac{\text{their } k}{(7+3)^2}$ oe OR M2 for $8(2+3)^2 = y(7+3)^2$ oe
10(c)	$x > -5$ final answer	3	M1 for $3x - 6 < 7x + 14$ M1 for <i>their</i> $(-6) - \text{their}14 < 7x - 3x$ oe
11(a)(i)	77 243	2	B1 for each
11(a)(ii)(a)	$2n^2 + 5$ oe	2	M1 for a quadratic expression as the answer or B1 for common 2nd difference of 4
11(a)(ii)(b)	3^{n-1} oe	2	B1 for 3^k oe where k is a linear function of n
11(b)(i)	21	1	
11(b)(ii)	11	3	B2 for $(4n + 45)(n - 11)$ seen or B1 for $4n^2 + n + 3 = 498$ oe

MATHEMATICS**0580/41**

Paper 4 (Extended)

October/November 2018

MARK SCHEME

Maximum Mark: 130

Published

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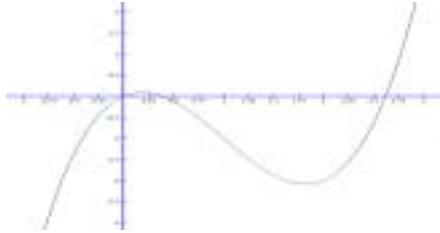
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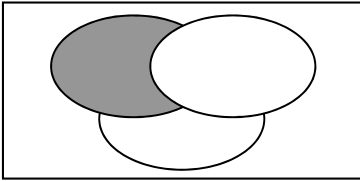
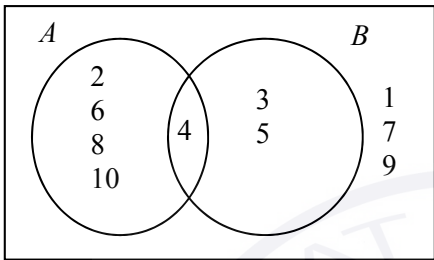
Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	2.25 final answer	2	M1 for $\frac{3}{5+3}$ or $\frac{6}{5+3}$ oe
1(a)(ii)	37.5	1	FT their $\frac{(a)(i)}{6} \times 100$
1(a)(iii)	5.5[0] or 5.499 to 5.500	2	M1 for $6 \div 1.091$
1(b)	21	3	M2 for $15 \times \sqrt{\frac{352.8}{15 \times 12}}$ oe or SC2 for answer 16.8 or M1 for $\sqrt{\frac{352.8}{15 \times 12}}$ or $\sqrt{\frac{15 \times 12}{352.8}}$ seen or M1 for a correct implicit statement for the length
1(c)	525	3	M2 for $\frac{483}{100-8} [\times 100]$ oe or M1 for 483 associated with 92 [%]
2(a)(i)	Translation $\begin{pmatrix} 5 \\ 8 \end{pmatrix}$	2	B1 for each Accept 5 right and 8 up
2(a)(ii)	Enlargement [sf] 0.5 oe [centre] (0, -7)	3	B1 for each
2(a)(iii)	Rotation 90 [anticlockwise] oe Origin oe	3	B1 for each
2(b)	Image at (-8, 1) (-8, 5) (-8, 7) (-4, 1)	2	B1 for reflection of flag <i>A</i> in the line $x = -1$ or $y = k$ or for vertices of triangle in correct place but not joined

Question	Answer	Marks	Partial Marks
3(a)	0 –2 0.9	3	B1 for each
3(b)	Correct curve 	4	B3 FT for 9 or 10 points or B2 FT for 7 or 8 points or B1 FT for 5 or 6 points
3(c)	–0.45 to –0.35 1 2.35 to 2.45	3	FT <i>their</i> graph B1 for each in the correct position If zero scored, SC1FT for 3 correct values
3(d)(i)	$y = 1 - x$ oe	2	B1 for $y = 1 - kx$ oe, $k \neq 0$ or $y = k - x$ oe or $1 - x$
3(d)(ii)	Correct ruled line and 2.25 to 2.4	3	B2FTdep for correct ruled line or B1 dep for line through (0, 1) when extended but not $y = 1$ or with gradient –1.1 to –0.9 or correct line but freehand or SC2 for $y = x - 1$ ruled after answer [$y =$] $x - 1$ in (d)(i) and B1 for 2.25 to 2.4
3(e)	Correct tangent and 1.7 to 3.7	3	No daylight between tangent and curve at $x = -0.25$. Point of contact is the midpoint between two vertices of daylight and this point of contact must be between –0.35 and –0.15 B2 for close attempt at tangent at $x = -0.25$ and answer in range OR B1 for ruled tangent at $x = -0.25$, no daylight Consider point of contact as midpoint between two vertices of daylight, the midpoint must be between $x = -0.35$ and –0.15 and M1 dep on B1 or close attempt at tangent at $x = -0.25$ for $\frac{\text{rise}}{\text{run}}$
4(a)	100.2 nfw	4	M1 for midpoints soi 65, 80, 95, 105, 112.5, 120 M1 for use of $\sum fx$ with x in correct interval including both boundaries M1 dep for $\sum fx \div 180$ dep on previous M1
4(b)	0.8 2.8 0.65	3	B1 for each If zero scored, SC1 for 1.6, 5.6 and 1.3 seen

Question	Answer	Marks	Partial Marks
4(c)	8 34 69 136 164	2	B1 for one error FT other values or for 3 or 4 correct
4(d)	Correct diagram	3	B1FT for correct vertical placement for 6 plots B1 for correct horizontal placement for 6 plots B1FT dep on at least B1 for reasonable increasing curve or polygon through <i>their</i> 6 points If zero scored, SC1FT for 5 out of 6 correct plots
4(e)(i)	15 to 17	2	B1 for [LQ =] 93 to 94 or [UQ =] 109 to 110
4(e)(ii)	107 to 109	2	B1 for 126 seen
4(e)(iii)	66 to 72	2	FT their graph for 2 marks B1 for answer 106 to 114 or B1FT <i>their</i> graph reading at 106 cm seen
5(a)(i)	$[h =] 253.8 \div 18 \div \left(\frac{6}{2}\right)$ or $[h =] \frac{253.8 \times 2}{6 \times 18}$ or $[h =] \frac{253.8}{18 \times \frac{6}{2}}$	3	For M3 no errors at any stage M2 for $253.8 = \frac{1}{2} \times 6 \times h \times 18$ oe (no previous errors) or M1 for triangle area = $\frac{1}{2} \times 6 \times h$ soi
5(a)(ii)	38.1 or 38.06 to 38.08	2	M1 for $\tan = \frac{4.7}{6}$ oe
5(b)	358 or 357.9 to 358	6	M1 for $6^2 + 4.7^2$ M1 for $\sqrt{6^2 + 4.7^2} \times 18$ [$\times 2$] M1 for 6×18 [$\times 2$] M1 for 4.7×18 M1 for $2 \times \frac{1}{2} \times 6 \times 4.7$ oe
6(a)(i)	14	1	
6(a)(ii)	16	1	
6(a)(iii)	$\frac{20}{462}$ oe	3	M2 for $\frac{5}{22} \times \frac{4}{21}$ or M1 for $\frac{5}{22}$ seen

Question	Answer	Marks	Partial Marks
6(a)(iv)	Correct shading 	1	
6(b)(i)	Fully correct Venn diagram 	4	B1 for each correct region
6(b)(ii)	3 4 5	1	FT <i>their (b)(i)</i>
7(a)	42.2 or 42.23....	2	M1 for $\frac{1}{2} \times 8.9 \times 12.5 \times \sin 130.6$ oe
7(b)(i)	27[.0] or 27.00 to 27.01	3	M2 for $\frac{11.6 \times \sin 123.5}{21.3}$ or M1 for $\frac{11.6}{\sin BCD} = \frac{21.3}{\sin 123.5}$ oe
7(b)(ii)	15.9 or 15.90 to 15.91	5	M1 for angle $ABD = \text{their angle } BCD + 33.5$ and M2 for $11.6^2 + 18^2 - 2 \times 11.6 \times 18 \times \cos(\text{their } ABD)$ or M1 for implicit version A1 for 252.9 to 253
8(a)	(5, 6)	1	
8(b)	$[y =] -\frac{4}{5}x + 3$ nfw	3	B2 for $[y =] -\frac{4}{5}x + c$ nfw or M1 for $\frac{\text{rise}}{\text{run}}$ using any two of $(-5, 7)$, $(0, 3)$ and $(5, -1)$ and B1 for $[y =]mx + 3$ ($m \neq 0$)

Question	Answer	Marks	Partial Marks
8(c)	$y = -\frac{4}{5}x - 2$ oe	2	FT <i>their</i> gradient from 8(b) B1 for $y = (\text{their gradient})x + c$ (c not 0) or for $y = mx - 2$ ($m \neq 0$) or for $-\frac{4}{5}x - 2$ alone
8(d)(i)	$y = \frac{5}{4}x + 4$ oe	3	M1 for $-\frac{1}{\text{their gradient}}$ from 8(b) M1 for (8, 14) substituted into <i>their</i> $y = mx + c$ or $\frac{y-14}{x-8} = m$ or better
8(d)(ii)	8.54 or 8.544...	3	M2 for $(14 - \text{their } 6)^2 + (8 - \text{their } 5)^2$ or better or M1 for $14 - \text{their } 6$ and $8 - \text{their } 5$ seen
8(d)(iii)	(4, 6)	2	B1 for each
9(a)(i)	$\frac{72}{m}$	1	
9(a)(ii)	$\frac{72}{m+0.9}$	1	
9 (b)	$\frac{72}{m} - \frac{72}{m+0.9} = 4$ oe	M1	FT <i>their</i> (a)(i) and (a)(ii) if expressions in m
	$72(m+0.9) - 72m = 4m(m+0.9)$ oe	M1	Dependent on M1 and correct fractions
	$[72m - 72m] + 64.8 = 4m^2 + 3.6m$ oe nfww	A1	
	Correct completion to $10m^2 + 9m - 162 = 0$	A1	
9(c)(i)	3.6 and -4.5 final answer	3	B2 for $(2m+9)(5m-18)$ or $\frac{-9 \pm \sqrt{(9)^2 - 4(10)(-162)}}{2 \times 10}$ or better or B1 for $(am+b)(cm+d)$ where $ac = 10$ and either $bd = -162$ or $ad + bc = 9$ or for $\frac{-9 \pm \sqrt{(9)^2 - 4(10)(-162)}}{2(10)}$ or better or $\frac{-9 \pm \sqrt{q}}{2(10)}$ or better
9(c)(ii)	20	1	

Question	Answer	Marks	Partial Marks
10(a)	132.26 to 132.28 or 132.3	5	B1 for angle ABO or angle $CBO = 90$ soi M1 for $\tan [XOB] = \frac{15}{8}$ oe M1 for $\tan [BOY] = \frac{22.4}{8}$ oe A1 for $[BOY =]70.3\dots$ or $[XOB =] 61.9\dots$
10(b)	18.4 or 18.5 or 18.43 to 18.48	2	M1 for $\frac{\text{their (a)}}{360} \times 2 \times \pi \times 8$ oe
10(c)	75.7 to 75.9	4	M1 for $\frac{1}{2}(15 + 22.4) \times 8$ oe M2 for $\frac{\text{their (a)}}{360} \times \pi \times 8^2$ oe or M1 for one sector either $\frac{\text{inv tan}\left(\frac{15}{8}\right)}{360} \times \pi \times 8^2$ oe or $\frac{\text{inv tan}\left(\frac{22.4}{8}\right)}{360} \times \pi \times 8^2$ oe
11(a)	$5(m - 2p^2)(m + 2p^2)$ final answer	3	M2 for $(5m + k)(m + j)$ where $kj = -20p^4$ or $5j + k = 0$ or M1 for $5(m^2 - 4p^4)$ seen
11(b)	$[P =] \frac{100A}{100 + RT}$ final answer	3	M1 for $100A = 100P + PRT$ or for $A = P(1 + \frac{RT}{100})$ M1 for $100A = P(100 + RT)$ or for $\frac{A}{1 + \frac{RT}{100}} = P$ or for $100A = P(1 + RT)$ after $100A = P + PRT$ as first step

MATHEMATICS**0580/42**

Paper 4 (Extended)

October/November 2018

MARK SCHEME

Maximum Mark: 130

Published

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Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	1200	2	M1 for $1962 \div 1.635$
1(a)(ii)	1667.7[0] final answer	2	M1 for $1962 \times (1 - \frac{15}{100})$ oe or B1 for 294.3[0] If 0 scored, SC1 for answer 1020
1(a)(iii)	275	2	M1 for $220 \div \text{their } (5 - 1)$ soi
1b(i)	165	3	M2 for $\frac{9752 - 3680}{3680} [\times 100]$ oe or $\frac{9752}{3680} \times 100$ oe or M1 for $\frac{9752}{3680}$ or $9752 - 3680$
1b(ii)	51 200	3	M2 for $\frac{74240}{100 + 45} [\times 100]$ oe or M1 for 74 240 associated with 145[%] oe
2(a)	-1.5	3	M1 for $30 + 2x = 9 - 12x$ or $10 + \frac{2}{3}x = 3 - 4x$ M1 for collecting <i>their</i> terms correctly to reach $ax = b$
2(b)	$6ab^2(2b + 3a^2)$ final answer	2	M1 for any correct partial factorisation seen or for correct answer seen
2(c)(i)	$10a^5c^9$ final answer	2	B1 for final answer with $10a^k c^9$ or $10a^5 c^k$ or $ka^5 c^9$
2(c)(ii)	$\frac{8a^6}{c^9}$ or $8a^6 c^{-9}$ final answer	2	B1 for final answer with $\frac{8a^6}{c^k}$ or $\frac{8a^k}{c^9}$ or $\frac{ka^6}{c^9}$ [$k \neq 0$] or for correct answer seen

Question	Answer	Marks	Partial Marks
2(d)	0.5 or $\frac{1}{2}$	3	M1 for $y = \frac{k}{(x+2)^2}$ oe B1 for $k = 50$ or M2 for $2(3+2)^2 = y(8+2)^2$ oe
2(e)	$\frac{7x-x^2}{2(x-2)}$ or $\frac{7x-x^2}{2x-4}$ oe final answer	3	M1 for $5 \times 2 - (x-5)(x-2)$ oe seen M1 for common denominator $2(x-2)$ oe isw
3(a)	Rotation 90 ^[o] clockwise oe Origin oe	3	B1 for each
3(b)(i)	Image at $(-4, -1)$ $(-4, -4)$ $(-2, -4)$	1	
3(b)(ii)	Image at $(3, -1)$ $(5, -1)$ $(3, -4)$	2	B1 for translation by $\begin{pmatrix} 7 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ -5 \end{pmatrix}$ or for 3 correct points not joined
3(b)(iii)	Image at $(-2, \frac{1}{2})$ $(-2, 2)$ $(-1, 2)$	3	B2 for 3 correct co-ordinates soi in working or correct size and orientation in wrong position or M1 for $\begin{pmatrix} 0.5 & 0 \\ 0 & 0.5 \end{pmatrix} \begin{pmatrix} -4 & -4 & -2 \\ 1 & 4 & 4 \end{pmatrix}$ shown or for statement: enlargement, sf 0.5, (0, 0)
4(a)	$\frac{1}{2} \times 4(x-1) \times (2x+5)[\sin 90] = 30$ oe	M1	
	$8x^2 - 8x + 20x - 20$ or better	B1	correct expansion of brackets
	Completion to $2x^2 + 3x - 20 = 0$	A1	with no errors or omissions seen
4(b)	$(2x-5)(x+4)$	M2	Allow M2 for e.g. $2x(x+4) - 5(x+4)$ then $2x - 5 [= 0]$ and $x + 4 [= 0]$ M1 for $2x(x+4) - 5(x+4)$ or $x(2x-5) + 4(2x-5)$ or $(2x+a)(x+b) [= 0]$ where $ab = -20$ or $a + 2b = 3$ [a, b integers]
	2.5 and -4 cao	B1	

Question	Answer	Marks	Partial Marks
4(c)	11.7 or 11.66 ... or 11.67	3	M2dep for $(4(\text{their } 2.5 - 1))^2 + (2 \times \text{their } 2.5 + 5)^2$ or M1dep for $4(\text{their } 2.5 - 1)$ or $2 \times \text{their } 2.5 + 5$ OR B1 for $\sqrt{20x^2 - 12x + 41}$ and M1dep for substituting $x = \text{their } 2.5$ into $\sqrt{20x^2 - 12x + 41}$ at any stage
5(a)	-3, 17	2	B1 for each
5(b)	Fully correct curve	4	B3 FT for 10 or 11 points or B2 FT for 8 or 9 points or B1 FT for 6 or 7 points
5(c)(i)	Correct ruled tangent for <i>their</i> curve through (0, -17)	1	
5(c)(ii)	(1.7 to 2.2, -1 to 2.5)	1	
5(c)(iii)	$[y =] 9x - 17$ final answer	3	M2dep for answer $[y =] 9x[+] - c$ OR M1dep for gradient = $\frac{\text{rise}}{\text{run}}$ for <i>their</i> tangent at any point B1 for answer $[y =] kx[+] - 17$ ($k \neq 0$)
5(d)	$y = 3x + 2$ ruled correctly and -2.2 ... to -2.1 -0.6 to -0.4 2.6 to 2.8	4	B2 for $y = 3x + 2$ ruled or B1 for $[y =] 3x + 2$ soi or $y = 3x + k$ ruled or $y = kx + 2$ but not $y = 2$ B2 for all 3 values or B1 for 2 values
6(a)	0.6	1	
6(b)	50.7	3	M2 for $1.2 \times 19 + \frac{1}{2}(19 + 12) \times 1.8$ oe or M1 for method for finding any relevant area
6(c)	17.9	3	M2 for <i>their</i> $50.7 - 1.2 \times 19 [- 10]$ oe or M1 for 1.2×19 oe seen isw
7(a)	29	1	
7(b)	128	2	FT $180 - 2(55 - \text{their } (a))$ M1 for angle OCA or angle $OAC = 55 - \text{their } (a)$ soi

Question	Answer	Marks	Partial Marks
7(c)	64	1	FT <i>their (b)</i> $\div 2$
7(d)	116	1	FT $180 - \text{their (c)}$
8(a)	370 or 370.2 to 370.3	2	M1 for $864 \div \text{their time}$
8(b)	991 or 990.5 ...	4	M2 for $864^2 + 928^2 - 2 \times 864 \times 928 \cos 67$ or M1 for correct implicit version A1 for 981100 to 981110
8(c)(i)	313	2	M1 for $180 + 133$ or $360 - 47$
8(c)(ii)	[0]79.5 to [0]79.6 ...	4	M2 for $\frac{928 \times \sin 67}{\text{their } 991}$ or $\frac{864 \times \sin 67}{\text{their } 991}$ oe or M1 for implicit form of either A1 for [angle <i>HGB</i> =] 59.5 to 59.6 ... or [angle <i>HGB</i> =] 53.4 or 53.37 to 53.42 M1 dep for <i>their</i> angle <i>HGB</i> + 20 leading to answer or for $133 - \text{their angle } HGB$ leading to answer
9(a)(i)	42.8 or 42.79 ... nfw	4	M1 for mid-values soi M1 for Σfm where <i>m</i> is any value in interval including boundaries M1 (dep on second M1) for <i>their</i> $\Sigma fm \div 120$
9(a)(ii)	Blocks of height 1.8 4.4 8 2.1 with correct widths	4	B1 for each correct block If B0, SC1 for correct frequency densities seen
9(b)	Valid general comment about distributions	1	e.g. [On average], shoppers spend less time shopping on Wednesday oe
10(a)(i)	$75\,000 \times 60 \times 20$ oe	M1	Allow $\times 1200$ for $\times 60 \times 20$
10(a)(ii)	16.4 or 16.36 ...	3	M2 for $\frac{9 \times 10^7 \times 100}{1000 \times 55 \times 10^4}$ oe or B2 for answer 0.164 or 0.1636 ... or B1 for answer figs 164 or 1636 ... or M1 for figs $9 \div \text{figs } 55$
10(a)(iii)	28.3 or 28.27 to 28.28	3	M2 for $\frac{76}{360} \times 2\pi \times 8.5 + 2 \times 8.5$ oe or M1 for $\frac{76}{360} \times 2\pi \times 8.5$ oe

Question	Answer	Marks	Partial Marks
10(b)(i)	3770 or 3769 to 3770. ...	2	M1 for $\frac{1}{3} \times \pi \times 10^2 \times 36$
10(b)(ii)	3.68 or 3.683 to 3.684 ...	4	<p>M3 for $[r^3 =] \frac{1}{2} \times \text{their (b)(i)} \times \frac{3}{4\pi \times 9}$ oe</p> <p>or M2 for</p> $\frac{4\pi r^3}{3} + \frac{4\pi(2r)^3}{3} = \frac{1}{2} \times \text{their (b)(i)}$ <p>or for $\frac{4\pi r^3}{3} = \frac{1}{1+8} \times \frac{1}{2} \times \text{their (b)(i)}$</p> <p>or M1 for $\frac{4\pi r^3}{3} + \frac{4\pi(2r)^3}{3}$</p> <p>or $\frac{1}{2} \times \frac{\pi \times 10^2 \times 36}{3}$ or $\frac{1}{2}$ <i>their (b)(i)</i> seen</p> <p>or ratio of vols = 1 : 2³ oe seen</p>
11(a)(i)	$\begin{pmatrix} -19 \\ -2 \end{pmatrix}$	2	<p>B1 for answer $\begin{pmatrix} -19 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ -2 \end{pmatrix}$</p> <p>or for $\begin{pmatrix} -9 \\ 6 \end{pmatrix}$ or $\pm \begin{pmatrix} 10 \\ 8 \end{pmatrix}$ seen</p>
11(a)(ii)	3.61 or 3.605 to 3.606	2	M1 for $\sqrt{([-]3)^2 + 2^2}$ oe
11(a)(iii)	$-3m + 5n = 14$ and $2m + 4n = 9$	B1	Accept equivalents
	$[m =] -\frac{1}{2}$ or -0.5 and $[n =] 2\frac{1}{2}$ or 2.5 or $\frac{5}{2}$ with evidence of a correct algebraic method	4	<p>M1 for correctly equating one set of coefficients of <i>their</i> equations or rearranges one of <i>their</i> equations to make <i>m</i> or <i>n</i> the subject</p> <p>e.g. $[m =] \frac{1}{2}(9 - 4n)$ oe</p> <p>M1 for correct method to eliminate one variable for <i>their</i> equations or correctly substitutes <i>their m</i> or <i>their n</i> into the other equation</p> <p>e.g. $-\frac{3(9 - 4n)}{2} + 5n = 14$ oe</p> <p>B1 for one correct answer</p>
11(b)(i)(a)	$-a + 2c$	1	
11(b)(i)(b)	$\frac{3}{8}(-a + 2c)$ or $-\frac{3}{8}a + \frac{3}{4}c$ oe	1	FT $\frac{3}{8}$ (<i>their (b)(i)(a)</i>) in simplest form

Question	Answer	Marks	Partial Marks
11(b)(i)(c)	$\frac{1}{2}(5a - 2c)$ or $\frac{5}{2}a - c$ oe	1	
11(b)(i)(d)	$\frac{1}{8}(5a - 2c)$ or $\frac{5}{8}a - \frac{1}{4}c$ oe	2	M1 for a correct unsimplified route
11(b)(ii)	4	1	
12(a)(i)	$\frac{10}{20} \times \frac{9}{19}$ oe	M2	B1 for $\frac{9}{19}$ oe seen
12(a)(ii)	$\frac{62}{95}$ oe	4	<p>M3 for $\frac{6}{20} \times \frac{14}{19} + \frac{10}{20} \times \frac{10}{19} + \frac{4}{20} \times \frac{16}{19}$ oe</p> <p>or $1 - \frac{6}{20} \times \frac{5}{19} - \frac{10}{20} \times \frac{9}{19} - \frac{4}{20} \times \frac{3}{19}$ oe</p> <p>or M2 for the sum of two products of different flavours isw</p> <p>or M1 for one correct product of different flavours isw</p>
12(b)	$\frac{5}{57}$ oe	3	<p>M2 for</p> $N \times \left(\frac{4}{20} \times \frac{3}{19} \times \frac{16}{18} \right) + \frac{4}{20} \times \frac{3}{19} \times \frac{2}{18} \text{ oe}$ <p>or for $3 \left(\frac{4}{20} \times \frac{3}{19} \times \frac{16}{18} \right)$ oe</p> <p>or</p> $1 - \left\{ N \times \left(\frac{4}{20} \times \frac{16}{19} \times \frac{15}{18} \right) + \frac{16}{20} \times \frac{15}{19} \times \frac{14}{18} \right\} \text{ oe}$ <p>or M1 for $\frac{4}{20} \times \frac{3}{19} \times \frac{k}{18}$ oe seen</p>

MATHEMATICS**0580/41**

Paper 4 (Extended)

May/June 2018

MARK SCHEME

Maximum Mark: 130

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

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This document consists of **8** printed pages.

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)	$\frac{9}{9+7+4} \times 680$	1	
1(b)	238 136	3	B2 for 238 or 136 or M1 for $\frac{7}{9+7+4} \times 680$ oe or $\frac{4}{9+7+4} \times 680$ oe seen
1(c)	272	2	M1 for $306 \div 1.125$
1(d)	1.37	3	M2 for $(17.56 - 5 \times 2.69) \div 3$ or M1 for $17.56 - 5 \times 2.69$ or B1 for 13.45 [cost of apples]
1(e)	40.8[0]	3	3FT for $0.3 \times \text{their } 136$ from part (b) or M2 for $\text{their } 136(\frac{1}{2} + \frac{1}{5})$ or better or M1 for $\text{their } 136 \times \frac{1}{2}$ or $\text{their } 136 \times \frac{1}{5}$ or B1 for 68 or 27.2 or $\frac{3}{10}$ or 0.3 seen
2(a)(i)	9	1	
2(a)(ii)	<i>ABCD</i> completed accurately with arcs	2	M1 for intersecting arcs radius <i>their</i> 9 cm or for <i>ABCD</i> completed accurately with no arcs
2(b)	Correct ruled perpendicular bisector of <i>AB</i> with 2 correct pairs of arcs Correct ruled bisector of angle <i>ABC</i> with 2 correct pairs of arcs Lines intersecting	4	B2 for correct ruled perpendicular bisector of <i>AB</i> with 2 correct pairs of arcs or B1 for correct perpendicular bisector without/wrong arcs and B2 for correct ruled bisector of angle <i>ABC</i> with 2 correct pairs of arcs or B1 for correct bisector of angle <i>ABC</i> without/wrong arcs If lines do not intersect, max B3

Question	Answer	Marks	Partial Marks
3(a)	6.06 or 6.060 to 6.061	3	M2 for $\frac{82500 - 77500}{82500}[\times 100]$ oe or M1 for $\frac{77500}{82500}[\times 100]$ soi
3(b)	13 674 cao	3	M1 for $12000\left(1 + \frac{2.2}{100}\right)^6$ A1 for 13673.7...
4(a)(i)	Translation $\begin{pmatrix} -8 \\ 2 \end{pmatrix}$ oe	2	B1 for each
4(a)(ii)	Enlargement [sf =] $\frac{1}{2}$ oe (-4, 0)	3	B1 for each
4(a)(iii)	Rotation 90° clockwise oe (1, -1)	3	B1 for each
4(b)	Triangle with (1, -1), (5, -1), (1, 7)	2	B1 for correct size and orientation in wrong position or for 3 correct points not joined
5(a)(i)	$(2n + m)(m - 3)$ final answer	2	M1 for $m(2n + m) - 3(2n + m)$ or $2n(m - 3) + m(m - 3)$
5(a)(ii)	$(2y - 9)(2y + 9)$ final answer	1	
5(a)(iii)	$(t - 4)(t - 2)$ final answer	2	B1 for $(t - 4)(t - 2)$ seen and spoiled or M1 for $t(t - 2) - 4(t - 2)$ or $t(t - 4) - 2(t - 4)$ or $(t + a)(t + b)$ where $a + b = -6$ or $ab = +8$
5(b)	$[x =] \frac{2m}{k + 1}$	4	M1 for $xk = 2m - x$ or $k = \frac{2m}{x} - 1$ M1 for $xk + x = 2m$ or $k + 1 = \frac{2m}{x}$ M1 for $x(k + 1) = 2m$

Question	Answer	Marks	Partial Marks
5(c)	correctly eliminating one variable	M1	
	$[x =] 6$	A1	
	$[y =] -2$	A1	If 0 scored SC1 for 2 values satisfying one of the original equations or SC1 if no working shown, but 2 correct answers given
5(d)(i)	$3m - 4(m + 4) = 6m(m + 4)$	M1	or $\frac{3m - 4(m + 4)}{m(m + 4)} [= 6]$ oe
	$3m - 4m - 16 = 6m^2 + 24m$	M1	removes brackets correctly
	$6m^2 + 25m + 16 = 0$	A1	with no errors or omissions
5(d)(ii)	$\frac{-25 \pm \sqrt{(25)^2 - 4(6)(16)}}{2 \times 6}$ or $\frac{-25}{12} \pm \sqrt{\left(\frac{25}{12}\right)^2 - \frac{16}{6}}$	2	B1 for $\sqrt{(25)^2 - 4(6)(16)}$ or better or B1 for $\left(m + \frac{25}{12}\right)^2$ and if in form $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$ B1 for $p = -25$ and $r = 2(6)$
	-0.79 and -3.38 final ans cao	2	B1 for each SC1 for -0.8 and -3.4 or for -0.78 and -3.37 or -0.789... and -3.377... or 0.79 and 3.38 or -0.79 and -3.38 seen in working
6(a)	4.79 or 4.788 to 4.789	3	M2 for $\sqrt[3]{\frac{230 \times 3}{2 \times \pi}}$ oe or M1 for $230 = \frac{2}{3} \times \pi \times r^3$ oe If 0 scored SC1 for answer 3.8[0...]
6(b)(i)	8.7[0] or 8.702 to 8.704	3	M2 for $(300 - 230) \div (1.6^2 \pi)$ or M1 for $\pi \times 1.6^2 \times h$
6(b)(ii)	6.4	3	M2 for $1.6 \times \sqrt[3]{\frac{19200}{300}}$ oe or M1 for sf $\sqrt[3]{\frac{19200}{300}}$ or $\sqrt[3]{\frac{300}{19200}}$ oe or for $\left(\frac{1.6}{r}\right)^3 = \frac{300}{19200}$

Question	Answer	Marks	Partial Marks
7(a)	$x = 0$	1	
7(b)	Tangent ruled at $x = 0.5$	B1	No daylight between tangent and curve at point of contact
	–9 to –6.5	2	dep on ruled tangent or close attempt at tangent at $x = 0.5$ M1 for rise/run also dep on tangent or close attempt at tangent at $x = 0.5$
7(c)(i)	0 2.4 or better 4	3	B1 for each
7(c)(ii)	Correct smooth curve	4	B3FT for 6 or 7 correct plots or B2 FT for 4 or 5 correct plots or B1 FT for 2 or 3 correct plots FT <i>their</i> table
7(d)	$x^3 + 3x + 4 = 10 - 8x^2$ and correctly completed	1	
7(e)	line $y = -2x + 2$ drawn and –0.45 to –0.35 nfw	3	B2 for ruled $y = -2x + 2$ or B1 for $-2x + 2$ seen or for line $y = -2x + c$ drawn or for $y = cx + 2$ ($c \neq 0$) drawn and B1 for –0.45 to –0.35 nfw
8(a)	18	3	B2 for 20 nfw or M1 for $8x + x = 180$ or better
8(b)	32	3	B1 for angle $DBC = 58$ B1 for angle $BCD = 90$
8(c)(i)	24	2	B1 for angle $PRQ = 24$
8(c)(ii)	29.4 or 29.40 to 29.41	3	M2 for $\frac{360 - 48}{360} \times 2 \times \pi \times 5.4$ or B2 for answer (minor arc) 4.52 or 4.523 to 4.524... or M1 for $\frac{48}{360} \times 2 \times \pi \times 5.4$
9(a)	$\frac{5}{8} \quad \frac{3}{8}$ $\frac{1}{6} \quad \frac{5}{6}$ $\frac{7}{10} \quad \frac{3}{10}$	3	B1 for each pair

Question	Answer	Marks	Partial Marks
9(b)	$\frac{5}{48}$ oe	2	M1FT for <i>their</i> $\frac{5}{8} \times \text{their} \frac{1}{6}$
9(c)	$\frac{304}{480}$ oe	3	M2 for $\text{their} \frac{5}{8} \times \text{their} \frac{5}{6} + \text{their} \frac{3}{8} \times \text{their} \frac{3}{10}$ oe or M1 for $\text{their} \frac{5}{8} \times \text{their} \frac{5}{6}$ or $\text{their} \frac{3}{8} \times \text{their} \frac{3}{10}$
10(a)	75	3	M2 for $79.5 \div 1.06$ oe or M1 for 79.5 associated with 106 [%]
10(b)	962.5 cao	2	B1 for 35 or 27.5 seen
10(c)(i)	16	1	
10(c)(ii)	50	1	
10(c)(iii)	$\frac{4}{50}$ oe	2	FT <i>their</i> (c)(ii) for 1 or 2 marks B1 for $\frac{4}{k}$, $k > 4$ or $\frac{k}{\text{their} 50}$, $k < 50$
10(c)(iv)	19	1	
11(a)(i)	12.6 or 12.64 to 12.65	3	M2 for $12^2 + (-4)^2$ OR B1 for $\begin{pmatrix} 12 \\ -4 \end{pmatrix}$ M1 for $(\text{their} 12)^2 + (\text{their} -4)^2$
11(a)(ii)	$\begin{pmatrix} -11 \\ 13 \end{pmatrix}$	2	B1 for $\begin{pmatrix} -11 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 13 \end{pmatrix}$ or for $[\overrightarrow{BA}] = \begin{pmatrix} -8 \\ 7 \end{pmatrix}$
11(b)	$\frac{1}{2}(\mathbf{b} - \mathbf{a})$ oe	2	M1 for correct route or correct unsimplified answer or B1 for $\overrightarrow{QS} = \mathbf{b} - \mathbf{a}$ oe
11(c)(i)	$\begin{pmatrix} 9 & 50 \\ 10 & 69 \end{pmatrix}$	2	B1 for 2 correct elements
11(c)(ii)	$\frac{1}{11} \begin{pmatrix} 8 & -5 \\ -1 & 2 \end{pmatrix}$ oe isw	2	B1 for $k \begin{pmatrix} 8 & -5 \\ -1 & 2 \end{pmatrix}$ or $\frac{1}{11} \begin{pmatrix} a & b \\ c & d \end{pmatrix}$ or det = 11 soi

Question	Answer	Marks	Partial Marks
12(a)	18 28	2	B1 for each
12(b)	$3n + 3$ oe	2	B1 for $3n + k$ oe or $cn + 3$ oe $c \neq 0$
12(c)	45	2	M1 for identifying 7th pattern or M1 for <i>their</i> $(3n + 3) = 24$
12(d)	$[a =] \frac{3}{2}$ oe $[b =] \frac{13}{3}$ oe	6	<p>M1 for any correct substitution e.g. $\frac{1}{6}(2)^3 + 2^2a + 2b$</p> <p>A1 for one of e.g. $\frac{1}{6} + a + b = 6$ oe $\frac{8}{6} + 4a + 2b = 16$ oe $\frac{27}{6} + 9a + 3b = 31$ oe $\frac{64}{6} + 16a + 4b = 52$ oe</p> <p>A1 for another of the above M1 for correctly eliminating one variable from <i>their</i> equations A1 for $a = \frac{3}{2}$ A1 for $b = \frac{13}{3}$ oe</p>



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MATHEMATICS

0580/42

Paper 4 (Extended)

May/June 2018

MARK SCHEME

Maximum Mark: 130

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

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Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	85	1	
1(a)(ii)	455	2	M1 for $260 \div 20 \times 35$ oe
1(a)(iii)	61	3	B2 for 61.5... seen or M1 for $2000 \div 650$ soi or for $\frac{x}{2000} = \frac{20}{650}$ oe or other attempt at scaling up with 650 or for $650 \div 20$ oe
1(b)(i)	40	3	M2 for $\frac{1.89 - 1.35}{1.35} [\times 100]$ oe or $\frac{1.89}{1.35} \times 100$ oe or M1 for oe $\frac{1.89}{1.35} [\times 100]$ soi
1(b)(ii)	1.75 nfw	3	M2 for $1.89 \div \left(\frac{100 + 8}{100}\right)$ or better or M1 for 1.89 associated with 108 [%]
1(c)	10.1 or 10.06...	3	M2 for $\sqrt[3]{\frac{20.8}{15.6}}$ oe or M1 for $15.6 \times k^3 = 20.8$ oe
1(d)(i)	14:15	3	B2 for correct unsimplified 3 term ratio A: B: C or correct unsimplified two term ratio A : C or M1 for attempt to find common multiple of 4 and 10 or other common value for B or for $7 \times \frac{4}{10}$ oe or $3 \times \frac{10}{4}$ oe

Question	Answer	Marks	Partial Marks
1(d)(ii)	147	3	M2 for $\frac{45}{15}(14 + 20 [+15])$ oe or $45 \div 3 \times 4 + (45 \div 3 \times 4) \div 10 \times 7 [+45]$ or M1 for $45 \div 3$ oe or $45 \div$ <i>their</i> (d)(i) value for C shown
2(a)(i)	$20 [< t \leq] 25$	1	
2(a)(ii)	$25 [< t \leq] 30$	1	
2(a)(iii)	28.3 or 28.33..	4	M1 for 22.5, 27.5, 32.5, 37.5, 42.5 soi M1 for $\sum fx$ where x is in the correct interval including boundaries M1dep for $\sum fx \div 120$ or $\sum fx \div (44 + 32 + 28 + 12 + 4)$
2(a)(iv)	$\frac{4}{120}$ oe isw	1	
2(b)(i)	76, 104, 116, 120	2	B1 for one error FT other values or for 3 correct
2(b)(ii)	Correct curve	3	B1 for correct horizontal placement for 6 plots B1FT for correct vertical placement for 6 plots B1FT dep on at least B1 for reasonable increasing curve or polygon through <i>their</i> 6 points If 0 scored SC1FT for 5 out of 6 points correctly plotted
2(b)(iii)	27 to 27.5	1	
2(b)(iv)	8.5 to 9.5	2	B1 for [UQ=] 32 to 32.5 or [LQ=] 23 to 23.5
2(b)(v)	8, 9, 10, 11 or 12	2	B1 for 108 to 112 seen or B1FT <i>their</i> graph reading at 37 mins seen
3(a)(i)	Image at (3, – 3), (7, – 3), (7, – 5)	2	B1 for reflection in any $x = k$ or if 3 correct points not joined
3(a)(ii)	Image at (– 5, 1), (– 1, 1), (– 5, – 1)	2	B1 for translation by $\begin{pmatrix} -2 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 4 \end{pmatrix}$ or if 3 correct points not joined

Question	Answer	Marks	Partial Marks
3(a)(iii)	Image at (6, 3), (6, 4), (4, 3)	3	B2 for correct size and orientation but wrong position or if 3 correct points not joined B1 for enlargement SF $\frac{1}{2}$ with centre (3, 1)
3(b)	Rotation 90° [anticlockwise]oe (- 6, - 2)	3	B1 for each
3(c)	Reflection $y = -x$ oe	2	B1 for each
4(a)(i)	$243p^{10}$ final answer	2	B1 for answer $243p^k$ or kp^{10} ($k \neq 0$)
4(a)(ii)	$9xy^4$ final answer	2	B1 for answer with two correct elements in correct form of expression
4(a)(iii)	$\frac{m^2}{25}$ final answer	1	
4(b)	10	4	B2 for $x = 8$ or for [length of rectangle =] 31 or M1 for $5x - 9 = 3x + 7$ oe or better M1 for $\frac{310}{(3 \times \text{their } x + 7)}$ or $\frac{310}{(5 \times \text{their } x - 9)}$ <u>Alt method using simultaneous eqns</u> M1 for $5xw - 9w = 310$ and $3xw + 7w = 310$ M1 for equating coefficients of xw M1 for subtraction to eliminate term in xw
5(a)	$8^2 + 7^2 - 2 \times 7 \times 8 \times \cos 78$ oe	M2	M1 for correct implicit version
	9.471.. to 9.472	A2	A1 for 89.7...
5(b)	46.3 or 46.29 to 46.30...	3	M2 for $[\sin OAC =] \frac{7 \sin 78}{9.47}$ or M1 for $\frac{\sin OAC}{7} = \frac{\sin 78}{9.47}$

Question	Answer	Marks	Partial Marks
5(c)	$29.5 - (7 + 8 + 9.47)$	M1	
	$\frac{360 \times (29.5 - (7 + 8 + 9.47))}{2 \times \pi \times 7}$	M3	M2 for $\frac{x}{360} \times 2 \times \pi \times 7 = \text{their arc length}$ oe or M1 for $\frac{x}{360} \times 2 \times \pi \times 7$ oe
	41.15 to 41.171..	B1	
5(d)	45[.0] or 44.98 to 45.01 nfw	4	M3 for $\frac{1}{2} \times 8 \times 7 \times \sin 78$ oe + $\frac{41.2}{360} \times \pi \times 7^2$ oe OR M1 for $\frac{1}{2} \times 8 \times 7 \times \sin 78$ oe or $\frac{1}{2} \times 8 \times 9.47 \times \sin \text{their (b)}$ oe M1 for $\frac{41.2}{360} \times \pi \times 7^2$ oe
6(a)	$-2[.0], -0.2, 2.5$	3	B1 for each
6(b)	Fully correct curve	5	B4 for correct curve, but branches joined or B3FT for 9 or 10 correct plots or B2FT for 7 or 8 correct plots or B1FT for 5 or 6 correct plots and B1 indep two separate branches not touching or cutting y-axis
6(c)(i)	Correct tangent and $3 \leq \text{grad} \leq 5$	3	B2 for close attempt at tangent to curve at $x = -2$ and answer in range OR B1 for ruled tangent at $x = -2$, no daylight at $x = -2$ and M1dep (dep on B1 or close attempt at tangent) [at $x = -2$] for $\frac{\text{rise}}{\text{run}}$
6(c)(ii)	$[y =] \text{their(c)(i)} x + \text{their } y\text{-intercept}$ final answer	2	Strict FT <i>their</i> y-intercept for <i>their</i> line M1 for $y = \text{their(c)(i)} x + \text{any value}$ or 'c' oe seen or for $y = \text{any value}(\text{non-zero}) x$ or 'mx' + <i>their</i> y-intercept seen oe
6(d)(i)	1.05 to 1.25	1	
6(d)(ii)	-2.3 to -2.2 -0.4 to -0.3 0.3 to 0.4	3	B1 for each After 0 scored B1 for $y = -4$ ruled

Question	Answer	Marks	Partial Marks
6(e)	$[a =] 2$ $[b =] 24$ $[n =] 5$	3	B2 for 2 correct or for $2x^5 + 24x^2 [-3 = 0]$ or B1 for 1 correct or for $\frac{2x^5 - 3 + 4(6x^2)}{6x^2} [= 0]$ oe If 0 scored SC1 for $2x^5$ seen in final line of algebra
7(a)	$x^2 + (2x - 3)^2 = 6^2$ oe or $x^2 + 4x^2 - 6x - 6x + 9 = 36$	M1	
	$4x^2 - 6x - 6x + 9$ or better	B1	
	$5x^2 - 12x - 27 = 0$	A1	Dep on M1B1 with no errors or omissions
7(b)	$\frac{-(-12) \pm \sqrt{(-12)^2 - 4(5)(-27)}}{2 \times 5}$ or better or $\frac{12}{10} \pm \sqrt{\left(\frac{12}{10}\right)^2 + \frac{27}{5}}$	B2	B1 for $\sqrt{(-12)^2 - 4(5)(-27)}$ or for $\left(x - \frac{12}{10}\right)^2$ oe or $\frac{-(-12) + \sqrt{q}}{2 \times 5}$ oe or $\frac{-(-12) - \sqrt{q}}{2 \times 5}$ oe or both
	- 1.42, 3.82 final answers	B2	B1 for each If B0 , SC1 for answers - 1.4 or -1.415... to - 1.415 and 3.8 or 3.815 to 3.815... or answers -1.41 and 3.81 or - 1.42 and 3.82 seen in working or for -3.82 and 1.42 as final ans
7(c)	14.4 or 14.5 or 14.44 to 14.46	2	2FT for $3 \times$ <i>their</i> positive root + 3 evaluated to 3sf or better M1 for $3 \times$ <i>their</i> positive root + 3 oe
7(d)	39.5 or 39.46 to 39.54...	2	M1 for trig statement seen to find either angle $\sin = \frac{\text{their } x}{6}$ oe or $\sin = \frac{\text{their } (2x - 3)}{6}$ oe
8(a)(i)	1	2	M1 for $h(0)$ or for 2^{8-3x}
8(a)(ii)	8	2	M1 for $g(\frac{1}{4})$ or for $\frac{10}{2^x + 1}$

Question	Answer	Marks	Partial Marks
8(a)(iii)	$\frac{10-x}{x}$ or $\frac{10}{x} - 1$ final answer	3	M2 for $x = \frac{10-y}{y}$ or better or $xy = 10 - x$ or better or $y + 1 = \frac{10}{x}$ or M1 for $x(y + 1) = 10$ or $y(x + 1) = 10$ or $x = \frac{10}{y+1}$ or $x + 1 = \frac{10}{y}$
8(a)(iv)	5	1	
8(b)	$\frac{-3x^2 + 5x + 18}{x + 1}$ final answer	3	M1 for $\frac{(8-3x)(x+1) + 10}{x+1}$ B1 for $-3x^2 - 3x + 8x + 8 [+10]$
9(a)(i)(a)	62 and Isosceles [triangle] and Angle at centre is twice angle at circumference oe	3	B2 for 62 and one correct reason or B1 for 62 with no/wrong reason or for angle $EOD = 124$ soi or for no/wrong angle with correct reason
9(a)(i)(b)	62 and [Angles in] same segment oe or angle at centre is twice angle at circumference oe	2	2FT <i>their (a)(i)(a)</i> and correct reason B1FT for <i>their (a)(i)(a)</i> with no/wrong reason or for no/wrong angle with correct reason
9(a)(ii)	8	3	M2 for $(180 - 109) - 28 - 35$ oe or M1 for [angle $AED =$] $180 - 109$ oe
9(b)(i)	24	3	$x =$ ext angle B2 for $[x =] 15$ isw or M1 for $x + 11x = 180$ oe or for $\frac{180(n-2)}{[n]} = \frac{360}{[n]} \times 11$
9(b)(ii)	3960	2	FT (<i>their</i> $24 - 2$) $\times 180$ dep on (b)(i) an integer and > 6 M1 for (<i>their</i> $24 - 2$) $\times 180$ oe or <i>their</i> $24 \times 11 \times$ <i>their</i> 15 oe or 11×360

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Abbreviations

cao correct answer only

dep dependent

FT follow through after error

isw ignore subsequent working

oe or equivalent

SC Special Case

nfwf not from wrong working

soi seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	13.5	3	M2 for $\frac{45.4[0]-40}{40} [\times 100]$ or $\frac{45.4[0]}{40} \times 100$ or M1 for $\frac{45.4[0]}{40} [\times 100]$
1(a)(ii)	35.5[0]	3	M2 for $42.6[0] \div \left(1 + \frac{20}{100}\right)$ or better or M1 for recognising 42.6[0] as 120[%]
1(b)	150 cao	2	M1 for $\frac{500 \times 2 \times 15}{100}$ oe
1(c)(i)	7800 cao	3	B2 for 7790 or 7785 to 7786 or M1 for $21000 \times \left(1 - \frac{18}{100}\right)^5$ oe isw If 0 or 1 scored, SC1 for <i>their</i> 7785... seen and rounded correctly to nearest 100
1(c)(ii)	9[.00...]	3	M2 for $\sqrt[12]{\frac{42190}{15000}}$ or better or M1 for $15000 \left(1 + \frac{x}{100}\right)^{12} = [42190]$
2(a)(i)	1,,,, 16	2	B1 for each
2(a)(ii)	14,,,, - 2	2	B1 for each
2(b)	Fully correct smooth curves	6	B3 for correct curve of $y = 2^x$ or B2FT for 4 or 5 correct points or B1FT for 2 or 3 correct points B3 for correct curve of $y = 14 - x^2$ or B2FT for 4 or 5 correct points or B1FT for 2 or 3 correct points
2(c)(i)	3.5 to 3.7	1	
2(c)(ii)	2.65 to 2.8	1	

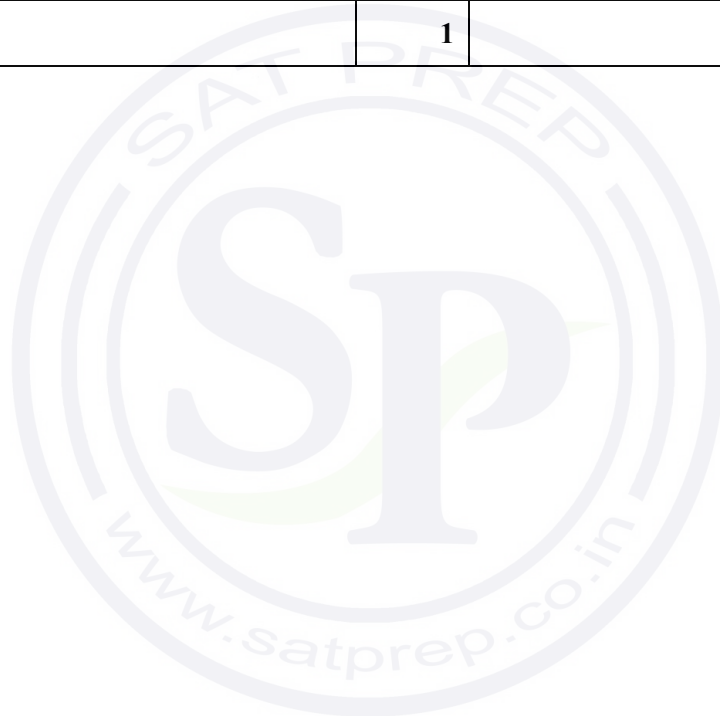
Question	Answer	Marks	Partial Marks
2(d)(i)	Correct line	1	Ruled, through (4, 2) and gradient -4
2(d)(ii)	Tangent (2, 10)	2	B1 for each
3(a)(i)	Positive	1	Ignore strong, weak, etc.
3(a)(ii)	Correct ruled line	1	
3(a)(iii)	2	1	
3(b)	[mode =] 0 [median =] 1 [mean =] 1.04 or 1.041 to 1.042	5	B1 B1 B3 or M2 for $([10 \times 0] + 8 \times 1 + 3 \times 2 + 2 \times 3 + [0 \times 4] + 1 \times 5) \div 24$ oe or M1 for $[10 \times 0] + 8 \times 1 + 3 \times 2 + 2 \times 3 + [0 \times 4] + 1 \times 5$ oe
3(c)(i)	60.9 or 60.91... nfw	4	M1 for 49, 57, 71 correct M1 for use of Σfx with x in the correct interval including both boundaries M1 (dep on 2nd M1) for <i>their</i> $(78 \times 49 + 180 \times 57 + 162 \times 71) \div (78 + 180 + 162)$
3(c)(ii)	Correct histogram	4	B1 for correct widths in correct position B1 height 13 B1 height 18 B1 height 9 If 0 scored B1 for 13, 18 and 9 seen
4(a)(i)	$\frac{8}{20}$ oe	3	M2 for $\frac{2}{5} \times \frac{1}{4} + \frac{3}{5} \times \frac{2}{4}$ or M1 for one of these products OR M1 for probability tree identifying all 20 outcomes with the correct 8 identified OR M1 for completed possibility space / 2-way table identifying the 8 possible outcomes out of 20, oe SC1 for $\frac{13}{25}$ with replacement

Question	Answer	Marks	Partial Marks
4(a)(ii)	$\frac{9}{25}$ oe	3	<p>M2 for $\frac{2}{5} \times \frac{3}{5} + \frac{3}{5} \times \frac{1}{5}$ oe or M1 for one of these products</p> <p>OR</p> <p>M1 for probability tree identifying all 25 outcomes with the correct 9 identified</p> <p>OR</p> <p>M1 for completed possibility space / 2-way table identifying the 9 possible outcomes out of 25, oe</p>
4(a)(iii)	Jojo and e.g. $\frac{40}{100} > \frac{36}{100}$	1	1FT <i>their (i) and (ii)</i> dep on being in range 0 to 1
4(b)	$\frac{24}{60}$ oe	3	<p>M2 for $\frac{2}{5} \times \frac{3}{4} \times \frac{1}{3} + \frac{3}{5} \times \frac{2}{4} \times \frac{1}{3} + \frac{3}{5} \times \frac{2}{4} \times \frac{2}{3}$ oe or M1 for any one correct product</p> <p>OR</p> <p>M1 for 4, 5, 4 and 5, 4, 4 and 5, 5, 4 clearly identified on a tree or in a list</p>
5(a)	15.6[0]	4	<p>B3 for $20900x = 326040$ or better or M2 for $18500x + 2400(x - 2.5[0]) = 320040$ or M1 for $18500x$ or $2400(x - 2.5[0])$</p>
5(b)(i)	$(y+12)(y-7)$ final answer	2	<p>B1 for $(y+a)(y+b)$ where $ab = -84$ or $a+b=5$ or $y(y+12)-7(y+12)$ or $y(y-7)+12(y-7)$</p>
5(b)(ii)	38 cao	3	<p>B2 for $y=7$ or M1 for $y(y+5)=84$ oe</p>
5(c)(i)	$168(m-0.75) + 207m = 100m(m-0.75)$ oe OR $207 = 100m - 168 - 75 + \frac{126}{m}$	M2	<p>May be all over common denominator M1 for $\frac{168}{m}$ or $\frac{207}{m-0.75}$ used</p>
	at least one interim line leading to $50m^2 - 225m + 63 = 0$	A1	No errors or omissions

Question	Answer	Marks	Partial Marks
5(c)(ii)	$(10m - 3)(5m - 21)$ OR $m = \frac{-(-225) \pm \sqrt{(-225)^2 - 4(50)(63)}}{2(50)}$ oe OR $m = \frac{225}{100} \pm \sqrt{\left(\frac{225}{100}\right)^2 - \frac{63}{50}}$ oe	B2	M1 for $(10m + a)(5m + b)$ where $ab = 63$ or $5a + 10b = -225$ or $10m(5m - 21) - 3(5m - 21)$ or $5m(10m - 3) - 21(10m - 3)$ OR M1 for $\sqrt{(-225)^2 - 4(50)(63)}$ or for $p = -(-225)$, $r = 2(50)$ if in form $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$ OR M1 for $\left(m - \frac{225}{100}\right)^2$ oe
	4.2[0] cao	B1	
6(a)(i)	116.6 or 116.56 to 116.57	4	M1 for $\sin[EAD] = \frac{6}{12}$ oe M1 for $\tan[BAC] = \frac{6}{12}$ oe B1 for [angle DAC] = 60
6(a)(ii)	13.4 or 13.41 to 13.42	2	M1 for $12^2 + 6^2$
6(a)(iii)	10.4 or 10.39...	3	M2 for $\sqrt{12^2 - 6^2}$ or M1 for $AE^2 + 6^2 = 12^2$
6(a)(iv)	130 or 129.5... to 129.6	4	M1 for $0.5 \times 6 \times \text{their } AE$ oe M1 for $0.5 \times 12 \times 12 \times \sin 60$ oe M1 for $0.5 \times 6 \times 12$ oe
6(b)(i)	3	1	
6(b)(ii)	51.3 or 51.30 to 51.34...	4	M3 for $\tan = \frac{8}{\sqrt{4^2 + 5^2}}$ or $\sin = \frac{8}{\sqrt{4^2 + 5^2 + 8^2}}$ oe or M2 for $\sqrt{4^2 + 5^2}$ or $\sqrt{4^2 + 5^2 + 8^2}$ or M1 for angle ARB clearly indicated
7(a)	204 or 203.5 to 203.6... nfw	4	M2 for $\pi \times 1.5^2 \times 8 \times 60 \times 60$ or M1 for $\pi \times 1.5^2$ M1 for dividing <i>their</i> volume by 1000 If 0 scored SC1 for an answer figs 204 or figs 2035 to 2036 without working
7(b)(i)	$\pi \times 6 \times 12 + \pi \times 6^2 = 108\pi$	M2	M1 for $\pi \times 6 \times 12$

Question	Answer	Marks	Partial Marks
7(b)(ii)	$[x =] 5.2[0]$ or $5.196\dots$ $[y =] 6$	4	B2 or M1 for $4\pi x^2 = 108\pi$ seen B2 or M1 for $\frac{1}{2}(4\pi y^2) + \pi y^2$ or better seen
8(a)(i)	× ✓ ✓ × × ✓	4	B3 for 5 correct B2 for 4 correct B1 for 3 correct
8(a)(ii)	$\begin{pmatrix} 5 \\ 3 \end{pmatrix}$	1	Fraction line and/or missing brackets scores 0
8(a)(iii)	$\begin{pmatrix} 4 & 8 \\ 1 & 2 \end{pmatrix}$	2	B1 for 2 or 3 correct elements (dep on 2×2 matrix)
8(a)(iv)	$\frac{1}{2} \begin{pmatrix} 3 & -1 \\ -4 & 2 \end{pmatrix}$ oe isw	2	B1 for $k \begin{pmatrix} 3 & -1 \\ -4 & 2 \end{pmatrix}$ or determinant = 2 soi
8(b)	Rotation Origin oe 90 [anticlockwise] oe	3	B1 for each
9(a)	$y = -2x + 5$ oe	3	B2 for $-2x + 5$ or M1 for gradient = $-1 \div \frac{1}{2}$ or better M1 for substituting (1, 3) into $y = (\text{their } m)x + c$ oe If 0 scored SC1 for (1, 3) satisfying their wrong equation ($c \neq 0$) with gradient $\neq \frac{1}{2}$
9(b)(i)	$x \geq 2$ oe $y \leq 5$ oe $y \geq \frac{1}{2}x$ oe	4	SC3 for $x > 2$ and $y < 5$ and $y > \frac{1}{2}x$ OR B1 for $x \geq 2$ B1 for $y \leq 5$ B2 for $y \geq \frac{1}{2}x$ or M1 for $y \geq kx$ ($k > 0$) OR SC2 for all three boundary lines identified but with incorrect sign(s) If 0 scored SC1 for one or two correct boundary lines with incorrect sign(s)

Question	Answer	Marks	Partial Marks
9(b)(ii)	(5, 4)	2	M1 for one trial of an integer point inside region or for $3x + 5y = 35$ drawn
10(a)(i)	26	2	M1 for $g(5)$ or for $(x^2 + 1)^2 + 1$
10(a)(ii)	$x^2 + 4x + 5$	2	M1 for $(x + 2)^2 + 1$
10(a)(iii)	5	2	M1 for $2x - 3 = 7$
10(a)(iv)	$\frac{x+3}{2}$ oe	2	M1 for $x = 2y - 3$ or $y + 3 = 2x$ or $\frac{y}{2} = x - \frac{3}{2}$ oe
10(b)(i)	[0].70 cao	2	B1 for [0].696 to [0].697
10(b)(ii)	4 cao	1	



MATHEMATICS**0580/42**

Paper 42 (Extended)

March 2018

MARK SCHEME

Maximum Mark: 130

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	23.27 final answer	2	M1 for 9×2.97 soi
1(a)(ii)	2.75 final answer	3	M2 for $2.97 \div \frac{108}{100}$ oe or M1 for 108[%] associated with 2.97 oe
1(b)	12.4[0] or 12.41 to 12.42	2	M1 for $35 \div 0.0153$ oe If 0 scored, SC1 for answer 0.19
1(c)	70 nfw	3	M2 for $(600 + 2.5) \div (9 - 0.5)$ or B1 for one of $600 + 2.5$ or $9 - 0.5$ seen
2(a)	128	2	M1 for $4 \times \frac{1}{2} \times 8 \times 8$ oe
2(b)(i)	18.3 or 18.26 to 18.29...	3	M2 for $\frac{1}{4}(\pi \times 8^2 - \text{their } 128)$ oe or M1 for $\pi \times 8^2 - \text{their } 128$ oe or for $\frac{1}{4} \times \pi \times 8^2$ oe OR SC2dep for answer 4.56 to 4.57...
2(b)(ii)	23.9 or 23.87 to 23.882	4	M3 for $\frac{90}{360} \times 2 \times \pi \times 8 + \sqrt{8^2 + 8^2}$ oe OR M1 for $\frac{90}{360} \times 2 \times \pi \times 8$ oe M1 for $\sqrt{128}$ oe OR SC3dep for answer 11.9 or 11.93 to 11.94...
3(a)	0 -0.17 2.4	3	B1 for each
3(b)	Fully correct smooth curve	4	B3FT for 9 or 10 correct points or B2FT for 7 or 8 correct points or B1FT for 5 or 6 correct points
3(c)	$x \leq 0.17$ to 0.25 and $x \geq 2.25$ to 2.3	3	B2 for strict inequalities or one correct or B1 for 0.17 to 0.25 and 2.25 to 2.3 seen

Question	Answer	Marks	Partial Marks
3(d)(i)	$y = 4 - x$ oe final answer	2	B1 for $4 - x$ or $y = k - x$ or $y = 4 + kx$ oe
3(d)(ii)	correct ruled line	1	FT if in form $y = mx + c$ oe ($m, c \neq 0$)
	0.125 to 0.2 and 2.15 to 2.2	2	B1 for each
4(a)	$[\pm]\sqrt{k-s}$ final answer	2	M1 for $t^2 = k - s$
4(b)(i)	$(x-5)(x+5)$ final answer	1	
4(b)(ii)	$\frac{x-5}{x-7}$ nfwf final answer	3	M2 for $(x-7)(x+5)$ or M1 for $x(x+5) - 7(x+5)$ or $x(x-7) + 5(x-7)$ or $(x+a)(x+b)$ where $a+b = -2$ or $ab = -35$
4(c)	$\frac{4x^2 - 7x - 8}{x(x+1)}$ or $\frac{4x^2 - 7x - 8}{x^2 + x}$ final answer	3	M1 for $(x-8)(x+1) + 3x \times x$ oe isw B1 for common denominator $x(x+1)$ oe isw
4(d)	3, 4, 5, 6 nfwf	3	B2 for 3 correct or 4 correct and 1 extra or M2 for $n > \frac{18}{8}$ oe and $n \leq 6$ or M1 for $18 < 8n [\leq 30 + 3n]$ or $[18 - 3n <] 5n \leq 30$ seen
5(a)(i)	1930 or 1940 or 1933.4 to 1935.3	5	B1 for interior angle 120 soi or angle at centre 60 soi or for correct use of Pythagoras' with 7 and 3.5 or with 14 and 7 M3 for $6 \times \frac{1}{2} \times 7^2 \times \sin 60 \times 15.2$ oe or complete other methods or M2 for $6 \times \frac{1}{2} \times 7^2 \times \sin 60$ oe OR M1 for $\frac{1}{2} \times 7^2 \times \sin 60$ oe or other partial area of hexagon M1dep for <i>their</i> area $\times 15.2$ evaluated

Question	Answer	Marks	Partial Marks
5(a)(ii)	893 or 892.8 to 893.0...	3	M2 for $6 \times 7 \times 15.2 + 2 \times 6 \times \frac{1}{2} \times 7^2 \times \sin 60$ oe or for $6 \times 7 \times 15.2 + 2 \times \text{their area of hexagon from (a)}$ oe or M1 for $[6 \times] 7 \times 15.2$ oe or $2 \times \text{their area of hexagon from (a)}$ oe
5(b)	2.71 or 2.709 to 2.710	3	M2 for $\sqrt[3]{500 \div \left(6 \times \frac{4}{3} \pi\right)}$ oe or M1 for $500 = 6 \times \frac{4}{3} \pi r^3$ oe If 0 scored, SC1 for answer 4.92 or 4.923 to 4.924
6(a)	$y > x$	1	
	$x \geq 15$	1	
	$y < 50$	1	
	$x + y \leq 70$	1	
6(b)	Four correct ruled lines and correct region indicated	5	all lines ruled B1 for $y = x$ broken B1 for $x = 15$ B1 for $y = 50$ broken B1 for $x + y = 70$
6(c)	189	2	M1 for (21, 49) seen or for $2x + 3y$ written for a point (x, y) in <i>their</i> region where x and y are integers
7(a)(i)	$\frac{9}{160}$ oe	1	
7(a)(ii)	58.125 nfw	4	M1 for mid-points soi M1 for use of Σfx with x in correct interval including both boundaries M1 (dep on 2nd M1) for $\Sigma fx \div 160$
7(b)	[3 42] 85 140 151 160	2	B1 for 1 error FT other values

Question	Answer	Marks	Partial Marks
7(c)	correct curve	3	B1FT <i>their</i> (b) for 6 correct heights B1 for 6 points at upper ends of intervals on correct vertical line B1FT dep on at least B1 for increasing curve through <i>their</i> 6 points After 0 scored, SC1 for <i>their</i> 5 correct points plotted
7(d)(i)	57 to 59	1	
7(d)(ii)	36 to 42	2	B1 for UQ = 76 to 80 or LQ = 38 to 40 soi
7(d)(iii)	92 to 94	2	B1 for 144 seen
7(d)(iv)	130 to 137	2	B1 for 23 to 30 seen
8(a)	356 or 356.2 to 356.3	4	B1 for [Angle <i>LPM</i>] = 74 soi M2 for $\frac{248 \times \sin \text{their } 74}{\sin 42}$ oe or M1 for implicit statement
8(b)(i)	320 or 319.9 to 320.2...	3	B1 for angle <i>PLM</i> = 64 soi or for angle between <i>LM</i> and perpendicular from <i>M</i> = 26 soi or [<i>PM</i> =] 333.[1...] M1 for <i>their</i> $356 \times \sin \text{their } 64$ oe or <i>their</i> $356 \times \cos \text{their } 26$ oe
8(b)(ii)	02 57 or 2 57 am	3	B2 for 6 hours 12 mins or 372 mins seen or M1 for $248 \div 40$ oe If 0 scored, SC1 for <i>their</i> time in hours converted to hours and minutes
9(a)	7.07 or 7.071...	2	M1 for $(-1)^2 + 7^2$ oe
9(b)	-6	2	M1 for $6 \times m - 5 \times 2m$ [= 24]
9(c)(i)	(10) final answer	2	B1 for answer 10 without brackets
9(c)(ii)	$\begin{pmatrix} 2 \\ 6 \end{pmatrix}$ final answer	2	M1 for $\begin{pmatrix} 2 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 6 \end{pmatrix}$
9(c)(iii)	$\begin{pmatrix} 19 & 55 \\ 33 & 96 \end{pmatrix}$ final answer	2	M1 for 2 or 3 correct elements
9(c)(iv)	$\frac{1}{3} \begin{pmatrix} 9 & -5 \\ -3 & 2 \end{pmatrix}$ oe isw	2	B1 for $k \begin{pmatrix} 9 & -5 \\ -3 & 2 \end{pmatrix}$ soi or det = 3 soi

Question	Answer	Marks	Partial Marks
10(a)	10.8 or 10.81 to 10.82	3	M2 for $\sqrt{(6-3)^2 + (-2-4)^2}$ oe or M1 for $(6-3)^2 + (-2-4)^2$ oe
10(b)(i)	(6, 4)	2	B1 for each
10(b)(ii)	2	2	M1 for $\frac{12-(-4)}{10-2}$ oe
10(b)(iii)	$y = -\frac{1}{2}x + 4$ oe final answer	3	M1 for gradient = $-\frac{1}{2}$ or $-\frac{1}{\text{their (b)(ii)}}$ M1 for (2, 3) substituted into <i>their</i> $y = mx + c$ or $y - y_1 = m(x - x_1)$ oe
11(a)	25 9 16	3	B1 for each
11(b)(i)	$(n-1)^2$ oe	2	B1 for any quadratic of form $[1]n^2[+bn+c]$
11(b)(ii)	$n+3$ oe	1	
11(c)	25	2	M1 for <i>their</i> $(n-1)^2 = 576$
11(d)(i)	$n^2 - 3n - 2$ final answer	3	M1 for <i>their</i> $(n-1)^2 - \text{their}(n+3)$ oe or 2nd diff = 2 soi B1 for $n^2 - n - n + 1$ or better or $-n - 3$ or for expression of form $n^2 - 2n - n + k$ or correct expression not in simplest form
11(d)(ii)	808 cao	2	M1 for substituting 30 in <i>their</i> (d)(i)

MATHEMATICS**0580/42**

Paper 4 (Extended)

October/November 2017

MARK SCHEME

Maximum Mark: 130

Published

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Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial marks
1(a)(i)	4 : 5	1	
1(a)(ii)	4 : 5	1	
1(a)(iii)	3 : 4	2	B1 for 12 : 16 or answer 4 : 3
1(b)(i)	26.8 or 26.79...	3	M2 for $\frac{15600 - 11420}{15600} [\times 100]$ or $\frac{11420}{15600} \times 100$ or M1 for $\frac{11420}{15600}$
1(b)(ii)	16 000 nfw	3	M2 for $15600 \times \frac{100}{100 - 2.5}$ oe or M1 for 15600 associated with 97.5[%] seen
1(c)	1.6 or $\frac{8}{5}$	2	M1 for $\frac{200 \times x \times 15}{100} = 48$ oe or M1 for figs 16
1(d)	2.5 or $\frac{5}{2}$ cao nfw	3	B2 for 2.49[9...] or 102.4[99...] or 1.024[99...] or 2.50 or 102.5 or 1.025 or M2 for $\sqrt[10]{\frac{256}{200}}$ oe or M1 for $256 = 200(x)^{10}$ seen

Question	Answer	Marks	Partial marks
2(a)(i)	1070 or 1072. ...	3	M1 for $\pi \times 8^2 \times 2 \times 8$ M1 for $\frac{4}{3} \times \pi \times 8^3$ or M2 for $\frac{2}{3} \pi r^3$ or M1 for $\pi r^2 2r - \frac{4}{3} \pi r^3$
2(a)(ii)	2.58 or 2.580 to 2.581	3	B2 for $r^3 = \frac{36 \times 3}{2\pi}$ or better or M1 for $\pi \times r^2 \times 2 \times r - \frac{4}{3} \times \pi \times r^3 = 36$ oe
2(b)(i)	4.24 or 4.241 to 4.242	4	M3 for $(\pi \times 5^2 + \pi \times 5 \times \sqrt{5^2 + 12^2})$ or M2 for $\pi \times 5 \times \sqrt{5^2 + 12^2}$ or M1 for $5^2 + 12^2$ or $\pi \times 5^2$
2(b)(ii)	64 cao final answer	3	M2 for $\frac{[k\pi] \times 5^2 \times 12}{[k\pi] \times 1.25^2 \times 3}$ or M1 for $\frac{1}{3} \times \pi \times 5^2 \times 12$ or $\frac{1}{3} \times \pi \times 1.25^2 \times 3$ OR M2 for 4^3 or $\left(\frac{1}{4}\right)^3$ seen or M1 for factor 4 or $\frac{1}{4}$ soi
3(a)	7040 or 7035. ...	3	M1 for $\frac{1}{2} \times 100 \times 70$ oe M1 for $\frac{1}{2} \times 100 \times 110 \times \sin 40$ oe
3(b)	374 or 375 or 374.4 to 374.5....	5	M2 for $110^2 + 100^2 - 2 \times 110 \times 100 \times \cos 40$ oe or M1 for implicit form A1 for 5250 or 5247. ... (or 72.4 or 72.43 to 72.44) M1 for $70^2 + 100^2$
3(c)	64.3 or 64.27 to 64.28 nfww	2	M1 for $\sin 40 = \frac{\text{distance}}{100}$ oe
3(d)	235	3	B2 for [angle ACB =] 34.99 to 35 or [angle ABC =] 55[.0...] or M1 for $\tan[ACB] = \frac{70}{100}$ or $\tan[ABC] = \frac{100}{70}$ or equivalent trig ratio

Question	Answer	Marks	Partial marks
4(a)(i)	Correct translation	2	B1 for translation $\begin{pmatrix} 6 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ -2 \end{pmatrix}$
4(a)(ii)	Correct rotation	2	B1 for rotation 180° but other centre
4(a)(iii)	Correct reflection	2	B1 for reflection in $y = -x$
4(b)(i)	Enlargement [factor] $\frac{1}{2}$ or 0.5 [centre] (0, 0) oe	3	B1 for each
4(b)(ii)	$\begin{pmatrix} \frac{1}{2} & 0 \\ 0 & \frac{1}{2} \end{pmatrix}$ oe	2	B1 for matrix of form $\begin{pmatrix} k & 0 \\ 0 & k \end{pmatrix}$ oe, $k \neq 0$ or 1
4(c)	± 2.5	3	B2 for $25u^2 = 156.25$ or $5u = [\pm]12.5$ or M1 for $(4u)^2 + (3u)^2$
5(a)	3.2 or 3.15 or 3.152 to 3.153 5.2 or 5.19 or 5.20 or 5.196...	2	B1 for each
5(b)	Correct graph for $0.5 \leq x \leq 3.5$	4	B3FT for 6 or 7 correct points or B2FT for 4 or 5 correct points or B1FT for 2 or 3 correct points
5(c)	1.7 to 1.8	1FT	FT <i>their</i> graph if one answer
5(d)(i)	Any integer $k \geq -1$	1	
5(d)(ii)	Any integer $k < -1$	1	
5(e)	Tangent ruled at $x = -3$	B1	
	2.5 to 4	B2	dep on tangent drawn at $x = -3$ or close attempt at tangent at $x = -3$ M1 for rise/run also dep on tangent at $x = -3$ or close attempt at tangent at $x = -3$

Question	Answer	Marks	Partial marks
5(f)(i)	$y = 6 - x$ ruled accurately	M2	M1 for correct line but freehand or ruled line gradient -1.1 to -0.9 , or through $(0, 6)$ but not $y = 6$
	$2.85 \leq x \leq 3$	A1	
5(f)(ii)	$[a =] 8$ $[b =] -48$ $[c =] -16$	4	B3 for 2 correct or $x^5 + 8x^3 - 48x^2 - 16 = 0$ seen or $-x^5 - 8x^3 + 48x^2 + 16 = 0$ seen or M2 for correct multiplication by $8x^2$ or B1 for answers $\pm 8, \pm 48, \pm 16$ or M1 for $\frac{x^2 \times x^3 - 8 \times 2}{x^2 \times 8} = 6 - x$ or M1 for correct multiplication by 8 or M1 for correct multiplication by x^2
6(a)(i)	280	1	
6(a)(ii)	320	1	
6(a)(iii)	90	1	
6(a)(iv)	10	2	M1 for 90 written
6(b)(i)	250.2 nfwf cao	4	M1 for at least 4 correct mid-values M1 for Σfx M1 dep on second M1 for $\Sigma fx \div 100$
6(b)(ii)	Correct completion of histogram	4	B1 for each correct block If zero scored, then SC1 for correct frequency densities seen
6(c)	[22 m] further oe	1	
7(a)	$\frac{5}{6}$	1	
7(b)	$\frac{4}{36}$ oe	2	M1 for $\frac{2}{6} \times \frac{2}{6}$
7(c)	20	1	

Question	Answer	Marks	Partial marks
7(d)(i)	Diagram completed correctly $\begin{array}{ccccccc} \times & \times & 3 & 3 & 3 & 9 \\ \times & \times & 2 & 2 & 2 & 6 \\ \times & \times & 2 & 2 & 2 & 6 \\ \times & \times & 2 & 2 & 2 & 6 \\ \times & \times & 1 & 1 & 1 & 3 \end{array}$	2	B1 for 3 correct columns or for 4 correct rows
7(d)(ii)(a)	$\frac{9}{36}$ oe	1FT	FT <i>their (d)(i)</i>
7(d)(ii)(b)	$\frac{4}{36}$ oe	1FT	FT <i>their (d)(i)</i>
7(e)	$\frac{512}{7776}$ oe	2	M1 for $\left(\frac{4}{6}\right)^k \times \frac{2}{6}$ oe $k = 3, 4$ or 5 only
8(a)(i)	$7a + 9p = 354$ oe final answer	1	
8(a)(ii)	$[a =] 21$ $[p =] 23$	3	M1 for correctly eliminating one variable A1 for $a = 21$ A1 for $p = 23$
8(b)(i)	$\frac{2}{x}$	1	
8(b)(ii)(a)	$\frac{2}{x} + \frac{3}{x-1} = 2$	M1	
	$2(x-1) + 3x = 2x(x-1)$ oe	M1dep	Both sides of the equation could be over $x(x-1)$ at this stage Dep on M1 or 3 term equation with fractions but one sign error
	$2x - 2 + 3x = 2x^2 - 2x$ oe $2x^2 - 7x + 2 = 0$	A1	Answer reached with one correctly expanded line seen and no errors seen
8(b)(ii)(b)	$\sqrt{(-7)^2 - 4(2)(2)}$	B1	or for $\left(x - \frac{7}{4}\right)^2$
	$\frac{- -7 + \sqrt{q}}{2 \times 2}$ or $\frac{- -7 - \sqrt{q}}{2 \times 2}$	B1	or for $\frac{7}{4} + \text{or} - \sqrt{-1 + \left(\frac{7}{4}\right)^2}$
	3.19 only	B2	B1 for 3.19 with other root or for 3.2 or 3.186... isw other root or for 0.31 or 0.314 or 0.3138 to 0.3139

Question	Answer	Marks	Partial marks
9(a)	3	1	
9(b)	$-\frac{2}{5}$ oe	2	M1 for $2(1-2x) = x+4$
9(c)	$-2x-7$ final answer	2	M1 for $1-2(x+4)$
9(d)	26	2	B1 for $h(5)$ soi or M1 for $(x^2+1)^2+1$
9(e)	$\frac{1-x}{2}$ oe final answer	2	M1 for $x=1-2y$ or $2x=1-y$ or $\frac{y}{2}=\frac{1}{2}-x$ or $y-1=-2x$
9(f)	$[p=]-20$ $[q=]26$	4	B3 for $[hgf(x)] = 4x^2 - 20x + 26$ seen and not spoilt by further working or M1 for $(1-2x)+4$ M1 dep for $(their (5-2x))^2+1$ B1FT dep for $25-10x-10x+4x^2$
10(a)	5.68 or 5.684 to 5.685	5	M2 for $2x\sqrt{x^2+x^2}$ oe or $2\times\sqrt{2}\times x^2$ or M1 for $x\sqrt{2}$ or $\sqrt{x^2+x^2}$ oe soi M1 for $\frac{270}{360}\times\pi\times x^2$ oe M1 for $0.5x^2$ oe
10(b)	4.4[0] or 4.398 to 4.401	2	dep on a correct value for k in (a) M1 for $[x^2]=\frac{110}{their k}$

MATHEMATICS**0580/43**

Paper 4 (Extended)

October/November 2017

MARK SCHEME

Maximum Mark: 130

Published

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nfw	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	$180 \div (2 + 3 + 5) \times 5 [= 90]$	1	with no errors seen
1(a)(ii)	7.05 or 7.053....	3	M2 for $\frac{x}{12} = \sin 36$ oe or better or B1 for 36 or 54 seen
1(b)(i)	13	2	M1 for $7.8 \div 3$ soi
1(b)(ii)	36.9 or 36.86 to 36.87	3	B1 for smallest angle identified M1 for $\sin[] = \frac{3}{5}$ oe or $\sin[] = \frac{7.8}{\text{their (b)(i)}}$ oe If zero scored, SC1 for calculation of 53.1
2(a)	343	1	
2(b)(i)	1	1	
2(b)(ii)	x^{10} final answer	1	
2(b)(iii)	$9x^{16}$ final answer	2	B1 for x^{12} or x^{16} or $(3x^8)^2$ seen
2(c)(i)	$2(x - 3)(x + 3)$ final answer	2	M1 for $(2x + 6)(x - 3)$ or $(2x - 6)(x + 3)$ or $(x - 3)(x + 3)$
2(c)(ii)	$\frac{2(x + 3)}{x + 10}$ or $\frac{2x + 6}{x + 10}$ final answer nfw	3	M2 for $(x + 10)(x - 3)$ or M1 for $(x + a)(x + b)$ where $ab = -30$ or $a + b = 7$

Question	Answer	Marks	Partial Marks
3(a)(i)	1890	2	M1 for $126 \div 4 [\times 60]$ oe If zero scored, SC1 for answer 31.5
3(a)(ii)	103.95	4	M3 for $0.5 \times \left(\frac{44}{60} + \frac{55}{60} \right) \times 126$ oe or SC3 for figs 10395 or figs 104 or M2 for two correct area methods or for a full method without minutes to hours conversion or M1 for one correct area with or without minutes to hours conversion
3(b)(i)	$126 \times 1000 \div (60 \times 60)$	1	
3(b)(ii)	46.3 or 46.28 to 46.29	3	M2 for $(1400 + 220) \div 35$ oe or M1 for distance \div speed or $1400 + 220$
3(c)	180 nfw	4	B3 for final answer 3 OR M3 for $\frac{217.5}{72.5} \times 60$ oe or M2 for $217.5 \div 72.5$ oe or $\frac{210 \text{ to } 220}{72.5} \times 60$ or $\frac{217.5}{72 \text{ to } 74} \times 60$ or M1 for 217.5 or 72.5 seen or $\frac{215}{73} \times 60$
4(a)	$80 < t \leq 100$	1	
4(b)	86 nfw	4	M1 for midpoints soi M1 for use of Σfx with x in correct interval including both boundaries M1 (dep on 2nd M1) for $\Sigma fx \div 150$
4(c)(i)	Reference to not knowing the individual values so we do not know the highest or the lowest values	1	
4(c)(ii)	62.4	2	M1 for $26 \div 150$ or $360 \div 150$ soi
4(d)	$\frac{22}{150}$ oe	1	

Question	Answer	Marks	Partial Marks
4(e)(i)	$\frac{90}{22350}$ oe	2	M1 for $\frac{10}{150} \times \frac{9}{149}$ After zero scored, SC1 for answer $\frac{100}{22500}$ oe
4(e)(ii)	$\frac{440}{22350}$ oe	3	M2 for $\frac{10}{150} \times \frac{22}{149} + \frac{22}{150} \times \frac{10}{149}$ oe or M1 for $\frac{10}{150} \times \frac{22}{149}$ or $\frac{22}{150} \times \frac{10}{149}$ oe After zero scored, SC1 for answer $\frac{440}{22500}$ oe
4(f)	13, 8.5, 7.25, 1.1	3	B2 for 3 correct or B1 for 1 correct or for 3 correct FD.s 5.2, 3.4, 2.9, 0.44 oe
5(a)(i)	Image at (0, 1), (0, 2), (–3, 1)	2	B1 for reflection in $y = 0$ or $x = k$
5(a)(ii)	Image at (0, 0), (0, –2), (6, –2)	2	B1 for correct size and correct orientation wrong position or for 2 correct vertices plotted
5(a)(iii)	Image at (–5, 4), (–5, 5), (–2, 4)	2	B1 for translation by $\begin{pmatrix} -5 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 3 \end{pmatrix}$
5(b)	Rotation 90° clockwise oe (4, –1)	3	B1 for each
5(c)(i)	(4, 1)	2	M1 for $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix} \begin{pmatrix} 1 \\ -4 \end{pmatrix}$
5(c)(ii)	(8, –1)	2	M1 for $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix} \begin{pmatrix} 3 & 1 \\ 0 & 2 \end{pmatrix} \begin{pmatrix} 1 \\ -4 \end{pmatrix}$ or $\begin{pmatrix} 0 & -2 \\ 3 & 1 \end{pmatrix} \begin{pmatrix} 1 \\ -4 \end{pmatrix}$ or $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix} \begin{pmatrix} -1 \\ -8 \end{pmatrix}$
5(c)(iii)	Rotation 90° anti-clockwise oe Origin oe	3	B1 for each

Question	Answer	Marks	Partial Marks
6(a)(i)	25.5 or 25.46...	2	M1 for $\pi \times 5^2 \times h = 2000$ oe
6(a)(ii)	9.85 or 9.847...	3	M2 for $[r^3=] 2000 \div \left(\frac{2}{3}\pi\right)$ oe or M1 for $\frac{2}{3}\pi r^3 = 2000$ oe
6(a)(iii)	952 or 952.4....	3	M2 for $[6 \times] \sqrt[3]{2000}^2$ or M1 for $\sqrt[3]{2000}$ or 6 times <i>their</i> area of one face
6(b)(i)	22.5 or 22.49...	2	M1 for $\frac{1}{2} \times 7 \times 10 \times \sin 40$
6(b)(ii)	$\sqrt{(10^2 + 7^2 - 2 \times 10 \times 7 \cos 40)} + 7 + 10$	M3	M2 for $10^2 + 7^2 - 2 \times 10 \times 7 \cos 40$ or M1 for correct implicit cosine rule
	23.46...	A2	A1 for 6.46... or 41.7 to 41.8
6(c)	64.9 or 64.92 to 64.94	3	M2 for $28.2 - 2 \times 9 = \frac{c}{360} \times 2 \times \pi \times 9$ oe or M1 for $\frac{c}{360} \times 2 \times \pi \times 9$ soi
7(a)	9, -6, 9	3	B1 for each
7(b)	Correct graph	4	B3FT for 6 or 7 correct points or B2FT for 4 or 5 correct points or B1FT for 2 or 3 correct points
7(c)	-3.5 to -3.35 and 0.8 to 0.9..	2FT	FT <i>their</i> graph B1FT for either
7(d)	$a = \frac{5}{4}$ or $1\frac{1}{4}$ or 1.25 $b = -\frac{49}{8}$ or $-6\frac{1}{8}$ or -6.125	3	B2 for either correct or M1 for $[2]\left(x + \frac{5}{4}\right)^2$ seen isw or for $2x^2 + 4ax + 2a^2 + b$
8(a)(i)	5	1	
8(a)(ii)	$-\frac{3}{2}$ oe	1	
8(b)	$\left(\frac{4}{5}, 0\right)$ oe	2	M1 for $5x - 4 = 0$ soi

Question	Answer	Marks	Partial Marks
8(c)	$y = -0.2x + 11$ final answer	4	M2 for $y = -0.2x + c$ oe (any form) FT <i>their</i> (a) or B1FT for $\text{grad} = \frac{-1}{\text{their (a)(i)}}$ soi and M1 for substitution of (10, 9) into <i>their</i> equation
8(d)	(2, 6)	3	M1 for elimination of one variable A1 for $x = 2$ or $y = 6$
8(e)	13	3	M2 for $(4 + 9) \times \text{their } 2 \div 2$ oe or B1 for 9 oe or 4 or -4 seen
9(a)	$\frac{10}{x-0.5}$ oe final answer	1	Accept $\frac{20}{2x-1}$
9(b)(i)	$\frac{10}{x-0.5} - \frac{10}{x} = 0.25$ oe	M1	FT <i>their</i> (a)
	$10x - 10(x - 0.5) = 0.25x(x - 0.5)$ oe	M1	Clears algebraic denominators or collects as a single fraction FT <i>their</i> algebraic fractions dep on two fractions with algebraic denominators
	$10x - 10x + 5 = 0.25x^2 - 0.125x$ or better	B1	Expands brackets
	$2x^2 - x - 40 = 0$	A1	Dep on M1M1B1 and no errors seen
9(b)(ii)	$\frac{- -1 \pm \sqrt{(-1)^2 - 4 \times 2 \times -40}}{2 \times 2}$ oe	B2	B1 for $\sqrt{(-1)^2 - 4(2)(-40)}$ or better or B1 for $\frac{- -1 + \sqrt{q}}{2 \times 2}$ or $\frac{- -1 - \sqrt{q}}{2 \times 2}$ or both
	-4.23 and 4.73 final answers	B1 B1	SC1 for -4.229... and 4.729... or for -4.23 and 4.73 seen in working or for -4.73 and 4.23 as final answer or for -4.2 or -4.22 and 4.7 or 4.72 as final answer
9(b)(iii)	2 [hours] 7 [minutes]	3	B2 for 2.11 or 2.114 to 2.115 or 126.8 to 126.9 or 127 or M1 for $10 \div \text{their positive root from (b)(ii)}$
10(a)(i)	$2^2 \times 3^2 \times 5$ oe	2	M1 for 3 correct prime factors in a tree or table seen before the first error or for 2, 3, 5 identified
10(a)(ii)	540	2	M1 for $2^2 \times 3^3 \times 5$ or 2×3^3 shown or answer 540k

Question	Answer	Marks	Partial Marks
10(b)	$X = 8575$ $Y = 6125$	4	B3 for $X = 8575$ or $Y = 6125$ or B2 for $a = 5$ or $b = 1$ soi or B1 for $1225 = 5^2 \times 7^2$ or $42875 = 5^3 \times 7^3$ or M1 for $a^2 \times 7^2 [= 1225]$ or $a^3 \times 7^{b+2} [= 42875]$



MATHEMATICS

0580/41

Paper 4 (Extended)

May/June 2017

MARK SCHEME

Maximum Mark: 130

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

Question	Answer	Marks	Part marks
1(a)(i)	275.31	2	M1 for $90 \times 23.15 + 1885 \times 13.5$ oe
1(a)(ii)	3202	3	M2 for $\frac{198.16 - 90 \times 0.245}{0.055}$ oe M1 for 90×0.245 or 90×24.5 oe
1(b)	17.[0] or 17.00 to 17.01	2	M1 for $13.5 \times \left(1 + \frac{8}{100}\right)^3$
1(c)(i)	40	3	M2 for $\frac{7.7 - 5.5}{5.5} [\times 100]$ oe or $\frac{7.7}{5.5} \times 100$ or M1 for $\frac{7.7}{5.5}$ oe
1(c)(ii)	11.9 or 11.86 to 11.87	3	M2 for $\sqrt[3]{\frac{7.7}{5.5}}$ oe or M1 for $5.5 \times x^3 = 7.7$ oe
1(d)	150 [million] oe	2	M1 for $390 [\text{million}] \div (5 + 2 + 6)$
1(e)	250 nfw	3	M2 for $258.25 \div ((100 + 3.3) \div 100)$ or M1 for 258.25 associated with 103.3[%]
2(a)	$71 < t \leq 72$	1	
2(b)	72.3 or 72.27 to 72.28 nfw	4	M1 for midpoints soi (condone 1 error or omission) M1 for use of $\sum fx$ with x in correct interval including both boundaries M1 (dep on 2nd M1) for $\sum fx \div 90$
2(c)(i)	41, 62, 80, 90	2	B1 for 2 correct values

Question	Answer	Marks	Part marks
2(c)(ii)	Correct curve	3	B1FT <i>their</i> (c)(i) for 5 correct heights B1 for 5 points plotted at upper ends of intervals B1FT (dep on at least B1) for increasing curve or increasing polygon through 5 points If zero scored, SC1FT for 4 correct points plotted
2(c)(iii)	72.1 to 72.4	1	
2(c)(iv)	1.9 to 2.2	2	M1 for $UQ = 73.2$ to 73.4 or $LQ = 71.2$ to 71.3
2(d)	180 cao nfw	4	B3 for 50 [m/s] nfw OR M3 for $\frac{3725 \div 1000}{74.5 \div 3600}$ OR M2 for $3725 \div 74.5$ or M1 for 3725 or 74.5 seen or for $(3715 \text{ to } 3725) \div (74.5 \text{ to } 75.5)$ M1 indep for multiply by 3.6 oe
3(a)(i)	Image at (5, 1), (7, 1), (7, 4)	2	B1 reflection in $y = 4$ or $x = k$
3(a)(ii)	Image at (−1, 1), (−4, 1), (−1, 3)	2	B1 correct size and correct orientation wrong position or for rotation 90° clockwise around (0, 0)
3(a)(iii)	Image at (2, −4), (4, −4), (2, −1)	2	B1 for translation by $\begin{pmatrix} 1 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ -5 \end{pmatrix}$
3(b)	Enlargement	1	
	[sf] − 0.5 oe	1	
	(5, 5)	1	
3(c)	$\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$	2	B1 for one correct column or row
3(d)(i)	(4, 2)	2	M1 for $\begin{pmatrix} 1 & 0 \\ 0 & 2 \end{pmatrix} \begin{pmatrix} 4 \\ 1 \end{pmatrix}$ oe

Question	Answer	Marks	Part marks
3(d)(ii)	$(-4, 2)$	3	M2 for $\begin{pmatrix} -1 & 0 \\ 0 & 2 \end{pmatrix}$ or $\begin{pmatrix} 1 & 0 \\ 0 & 2 \end{pmatrix} \begin{pmatrix} -4 \\ 1 \end{pmatrix}$ or M1 for $\begin{pmatrix} 1 & 0 \\ 0 & 2 \end{pmatrix} \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix} \begin{bmatrix} 4 \\ 1 \end{bmatrix}$ or $\begin{pmatrix} -4 \\ 1 \end{pmatrix}$
3(d)(iii)	$\frac{1}{2} \begin{pmatrix} 2 & 0 \\ 0 & 1 \end{pmatrix}$ oe isw	3	M2 for $\det = 2$ soi or $k \begin{pmatrix} 2 & 0 \\ 0 & 1 \end{pmatrix}$ soi or M1 for recognition that Q is inverse matrix of G or GQ = I or QG = I
4(a)	-1.6 to -1.4	1	
4(b)	-0.5	1	
4(c)	$k > -4$	2	B1 for identifying the -4 or for horizontal line drawn $y = -4$
4(d)	$y = x - 5$ ruled and -2.3 to -2.1 -1.2 to -1.1 1.3 to 1.4	3	B2 for correct line and 2 correct values or no line and 3 correct values or B1 for no line and 2 correct values or B1 for correct line
4(e)	Tangent ruled at $x = 1$	B1	No daylight at point of contact. Consider point of contact as midpoint between two vertices of daylight, the midpoint must be between $x = 0.8$ and 1.2
	-6 to -4	2	Dep on B1 or close attempt at tangent at $x = 1$ M1 for rise/run for <i>their</i> tangent at $x = 1$
5(a)(i)	50890 or 50893 to 50900.4	2	M1 for $\pi \times 18^2 \times 50$

Question	Answer	Marks	Part marks
5(a)(ii)	20.5 or 20.52 to 20.534	3	<p>B2 for answer 29.5 or 29.46 to 29.48 OR M2 for $(50900 - 30000) \div (\pi \times 18^2)$ oe</p> <p>or M1 for $(\text{figs } 50.9 - \text{figs } 30) \div (\pi \times \text{figs } 18^2)$ or M1 for $(50900 - 30000) = (\pi \times 18^2)h$ oe</p> <p>OR <u>alternative method</u> M2 for $50 - \frac{30000}{\pi \times 18^2}$ oe</p> <p>M1 for $\text{figs } 30 = \pi \times \text{figs } 18^2 \times (50 - h)$ oe or for $\frac{\text{figs } 30}{\pi \times \text{figs } 18^2}$ oe</p> <p>OR <u>alternative method</u> M2 for $\frac{(50.9 - 30)}{50.9} \times 50$ oe or M1 for $\frac{(50.9 - 30)}{50.9}$ or $\frac{30}{50.9} \times 50$ oe or M1 for $\frac{(\text{figs } 50.9 - \text{figs } 30)}{\text{figs } 50.9} \times 50$ oe</p>
5(a)(iii)	334 nfw	4	<p>M2 for $\text{figs } 30 \div \frac{2}{3} \pi \times 3.5^3$ oe or M1 for $\frac{1}{2} \times \frac{4}{3} \pi \times 3.5^3$ oe and B1 for 30 000</p>
5(b)(i)	3.28[6..] or 3.29	3	<p>M2 for $[r^2 =] \frac{95 \times 3}{8.4\pi}$ oe or M1 for $\frac{1}{3} \pi \times r^2 \times 8.4 [= 95]$</p>
5(b)(ii)	93.1 to 93.6	4	<p>M3 for $\pi \times 3.3 \times \sqrt{3.3^2 + 8.4^2}$ or M2 for $\sqrt{3.3^2 + 8.4^2}$ or M1 for $3.3^2 + 8.4^2$</p>
6(a)(i)	$-7x + 55$ final answer	2	<p>M1 for $8x + 20$ or $-15x + 35$ or answer $-7x + k$ or $kx + 55$</p>
6(a)(ii)	$x^2 - 14x + 49$ final answer	2	<p>M1 for 3 of $x^2 - 7x - 7x + 49$</p>

Question	Answer	Marks	Part marks
6(b)(i)	-18	3	M1 for a correct first step ie correctly multiplying by 3 or correctly dividing by 2 or for correctly subtracting 5 M1 for correctly reaching $ax = b$ from <i>their</i> first step
6(b)(ii)	15	3	M2 for $6x - 4x = 21 + 9$ oe or M1 for $6x - 21$ or correct division by 3 or for correctly reaching $ax = b$ from <i>their</i> first step
6(b)(iii)	5 and -5	3	B2 for 5 or -5 or M1 for $[x^2 =] (74 + 1) \div 3$ or better
7(a)	$(-0.5, 3)$	2	B1 for one correct value
7(b)	$[y =] -2x + 2$ final answer	3	M1 for $\frac{-2-8}{2-3}$ or better M1 for substitution of $(-3, 8)$ or $(2, -2)$ or <i>their</i> midpoint into $y = mx + c$ with <i>their</i> m
7(c)	$y = -2x + 7$ oe	2FT	FT <i>their</i> (b) M1 for $y = (their-2)x + k$ ($k \neq 2$) or $y = kx + 7$ ($k \neq 0$) If zero scored, SC1 for $(their - 2)x + 7$
7(d)	$x - 2y + 9 = 0$ or $2y - x - 9 = 0$ oe	4	B3 for any correct equivalent in wrong form Or M2 for $y = \frac{1}{2}x + k$ oe (FT negative reciprocal of <i>their</i> gradient in (b)) or M1 for $grad = \frac{1}{2}$ (FT negative reciprocal of <i>their</i> gradient in (b)) M1 for substitution of $(1, 5)$ into $y = mx + c$ oe with <i>their</i> m
8(a)(i)	290	2	M1 for $180 + 110$ oe
8(a)(ii)	156.8 or 156.7[9..]	5	B1FT for $CBA = 10^\circ$ (<i>their</i> (a) - 280) and B3 for $[angle ACB =]13.2^\circ$ or M2 for $[\sin C] = \frac{50 \sin(their10)}{38}$ or M1 for $\frac{50}{\sin C} = \frac{38}{\sin(their10)}$ oe

Question	Answer	Marks	Part marks
8(a)(iii)	8.68 or 8.677 to 8.684	3	M2 for $[x =]50\sin(\text{their}10)$ oe or M1 for $\sin(\text{their}10) = \frac{x}{50}$ oe or M1 for a correct right-angled triangle drawn with 50 as hypotenuse
8(b)(i)	$x(x - 25) = 2200$	1	and no errors seen
8(b)(ii)	$\frac{-(-25) \pm \sqrt{(-25)^2 - 4(1)(-2200)}}{2(1)}$ or better	B2	B1 for $\sqrt{(-25)^2 - 4(1)(-2200)}$ or better or for $\left(x - \frac{25}{2}\right)^2$ oe or B1 for $\frac{-(-25) + \sqrt{q}}{2(1)}$ or $\frac{-(-25) - \sqrt{q}}{2(1)}$ or both or for $\frac{25}{2} + \text{or} - \sqrt{\left(\frac{25}{2}\right)^2 + 2200}$
	-36.04 and 61.04 final answer	B1,B1	If B0B0 , SC1 for values in ranges -36.042 to -36.041 and 61.041 to 61.042 seen or for answers -36[.0] or -36.042 to -36.041 and 61[.0] or 61.041 to 61.042 or -36.04 and 61.04 seen in working or for -61.04 and 36.04 as final ans
9(a)(i)	5 and 13	1	
9(a)(ii)	$8n - 3 = 203$	M1	Evaluation of 25th or 26th term with supporting evidence or explanation
	25.75 or $25\frac{3}{4}$	A1	Second evaluation of 25th or 26th terms with supporting evidence or explanation If zero scored, SC1 for 25.75 or 197 and 205 with partial evidence or explanation
9(b)(i)	$6n + 7$ oe final answer	2	B1 for $6n + c$ or $kn + 7$ $k \neq 0$
9(b)(ii)	$n^2 + n + 2$ oe final answer	2	B1 for a quadratic expression or second difference = 2
9(c)	$[y =] 10$	2	M1 for $5(20 - y) = 50$
	[First term =] 14	2	M1 for $5(x - \text{their } y) = 20$ or for $20 \div 5 + \text{their } y$



Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

MATHEMATICS

0580/42

Paper 4 (Extended)

May/June 2017

MARK SCHEME

Maximum Mark: 130

Published

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Question	Answer	Marks	Part marks
1(a)(i)	$600 \div (11 + 9) \times 11$ [=330] with no errors seen	M1	Could be in separate steps
1(a)(ii)	270	1	
1(b)(i)	372 cao nfw	3	B2 for answer 371.7... or M1 for $330 \times \left(1 + \frac{1.5}{100}\right)^8$ oe not spoiled After zero scored, SC1 for answer 42 or 41.7...
1(b)(ii)	12.6 or 12.7 or 12.63 to 12.73	2	M1 for $\frac{\text{their (b)(i)} - 330}{330}$ or $\frac{\text{their (b)(i)}}{330} \times 100$ soi by 112.7 or 113 After zero scored, SC1 for answer 12%
1(c)(i)	$\frac{99}{280}$ cao final answer	1	
1(c)(ii)	27.5[0]	3	M2 for $24.75 \div \frac{100 - 10}{100}$ oe or M1 for recognising 24.75 as 90[%] oe
1(d)(i)	32 cao	2	M1 for $\left(1 - \frac{20}{100}\right)\left(1 - \frac{15}{100}\right)[x]$ oe or for $0.15 \times 0.8 [x]$ oe
1(d)(ii)	13 cao	2	M1 for $\left(1 - \frac{20}{100}\right)\left(1 - \frac{15}{100}\right) \times x = 40.84 - 32$ oe seen or for $\text{their (d)(i)} + \left(1 - \left(\frac{\text{their (d)(i)}}{100}\right)\right)x = 40.84$ oe
2(a)(i)	Image at (8, 1), (10, 5), (8, 5)	2	B1 for translation $\begin{pmatrix} 6 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ -5 \end{pmatrix}$ or 3 correct points not joined
2(a)(ii)	Image at (4, 10), (4, 8), (8, 8)	2	B1 for rotation 90° anticlockwise but different centre or for rotation 90° clockwise about (4, 10) or 3 correct points not joined
2(a)(iii)	Image at (6, 3), (6, 5), (7, 5)	2	B1 for enlargement factor $\frac{1}{2}$ but incorrect centre or 3 correct points not joined
2(b)	Reflection	1	
	$y = -x$ oe	1	If zero scored, M1 for correct use of matrix product

Question	Answer	Marks	Part marks
2(c)(i)(a)	$\begin{pmatrix} 13 \\ 16 \end{pmatrix}$	2	B1 for each in a 2 by 1 matrix or SC1 for $\begin{pmatrix} 13 \\ 16 \end{pmatrix}$
2(c)(i)(b)	$\begin{pmatrix} 2 & 10 \\ 3 & 15 \end{pmatrix}$	2	B1 for answer any 2 by 2 matrix
2(c)(i)(c)	$\frac{1}{2} \begin{pmatrix} 4 & -3 \\ -2 & 2 \end{pmatrix}$ oe isw	2	B1 for $k \begin{pmatrix} 4 & -3 \\ -2 & 2 \end{pmatrix}$ oe soi ($k \neq 0$) or for determinant = 2 oe soi
2(c)(ii)	NM or MP or N² oe or P² oe	1	
3(a)(i)	175.5 nfw	4	M1 for at least four of 50, 125, 175, 225, 325 soi M1 for Σfx with x inside or on boundary of each interval M1 (dep on second M1) for $\frac{\text{their } \Sigma fx}{200}$
3(a)(ii)	Fully correct histogram	4	B1 for each correct bar If zero scored, B1 for 0.2, 1.32, 0.7, 0.16 seen
3(b)(i)	Fully correct cumulative frequency diagram	3	B1 for correct horizontal plots B1 for correct vertical plots B1FT dep on at least B1 earned for points joined with smooth increasing curve or polygon If zero scored, SC1 for 4 correct plotted points
3(b)(ii)(a)	170 to 175	1	
3(b)(ii)(b)	152 to 158	2	M1 for 42 to 48 written
4(a)	-1.75 to -1.7	1	
	1.7 to 1.75	1	
4(b)(i)	Correct ruled solid tangent at (-1.5, 3.5)	1	
4(b)(ii)	-7 to -5	2 dep	dep on close attempt at ruled solid tangent at $x = -1.5$ in part (b)(i) M1 for rise/run dep on close attempt at ruled solid tangent at $x = -1.5$
4(c)(i)	1	1	
4(c)(ii)	Correct curve	3	B2 for 4 or 5 correct points or B1 for 2 or 3 correct points

Question	Answer	Marks	Part marks
4(d)(i)	−0.95 to −0.8	1	
	1.1 to 1.45	1	
4(d)(ii)	<i>their</i> (−0.95 to −0.8) < x < <i>their</i> (1.1 to 1.45) oe	1FT	correct or FT their (d)(i)
4(e)(i)	0.125 oe and 0.03125 oe and 0.000976 to 0.000977 oe	1	
4(e)(ii)	0	1	accept zero, nought, etc
5(a)(i)	94.2 or 94.3 or 94.24 to 94.26	2	M1 for $\pi \times 3 \times 10$
5(a)(ii)	9.54 or 9.539...	3	M2 for $\sqrt{10^2 - 3^2}$ or M1 for $h^2 + 3^2 = 10^2$ oe
5(a)(iii)	89.9 or 89.90 to 89.92...	2	M1 for $\frac{1}{3} \times \pi \times 3^2 \times \text{their (a)(ii)}$
5(b)	108 or 107.9 to 108.1 nfw	4	M3 for $\frac{\pi \times 3 \times 10}{\pi \times 10^2} \times 360$ oe or $\frac{\text{their (a)(i)}}{\pi \times 10^2} \times 360$ oe or $\frac{2 \times \pi \times 3}{2 \times \pi \times 10} \times 360$ oe or M2 for $\frac{x}{360} \times \pi \times 10^2 = \text{their (a)(i)}$ oe or $\frac{x}{360} \times 2 \times \pi \times 10 = 2 \times 3 \times \pi$ oe or M1 for $\frac{x}{360} \times \pi \times 10^2$ seen or $\frac{x}{360} \times 2 \times \pi \times 10$ seen
5(c)	46.6 to 46.8	4	M3 for $\frac{\text{their (b)}}{360} \times \pi \times 10^2 - \frac{1}{2} \times 10 \times 10 \times \sin(\text{their (b)})$ oe or M1 for $\frac{\text{their (b)}}{360} \times \pi \times 10^2$ or <i>their (a)(i)</i> soi and M1 for $\frac{1}{2} \times 10 \times 10 \times \sin(\text{their (b)})$ soi
6(a)	$\frac{1}{3}, \frac{6}{7}$ correctly placed	1	
	$\frac{4}{7}, \frac{3}{7}$ correctly placed	1	

Question	Answer	Marks	Part marks
6(b)	$\frac{2}{21}$ oe	2	M1 for $\frac{2}{3} \times \frac{1}{7}$
6(c)(i)	$\frac{15}{21}$ oe	3	M2 for $\frac{2}{3} \times \frac{6}{7} + \frac{1}{3} \times \frac{3}{7}$ oe or M1 for $\frac{2}{3} \times \frac{6}{7}$ oe or $\frac{1}{3} \times \frac{3}{7}$ oe seen
6(c)(ii)	50	2FT	FT ($70 \times$ <i>their</i> (c)(i)) rounded up or down to integer M1 for $70 \times$ <i>their</i> (c)(i)
6(d)	$\frac{10}{243}$ oe	2	M1 for $\frac{2}{3} \times \frac{1}{3} \times \frac{1}{3} \times \frac{1}{3} \times \frac{1}{3} [\times k]$ oe nfw where k is positive integer less than 5
7(a)(i)	4.5 or $4\frac{1}{2}$ or $\frac{9}{2}$ final answer	3	M2 for $[2](4x + 7) = [2](6x - 2)$ oe or M1 for $2(2x + 6) + 2(2x + 1)$ oe or $4(3x - 1)$ oe or M1 for correctly reaching $ax = b$ from <i>their</i> linear equation
7(a)(ii)	$(2x + 6)(2x + 1) = (3x - 1)^2$	M1	May be seen in different stages
	$5x^2 - 20x - 5 [= 0]$ oe	B3	B1 for $4x^2 + 2x + 12x + 6$ or better B1 for $9x^2 - 3x - 3x + 1$ or better
	$\frac{-(-20) \pm \sqrt{(-20)^2 - 4(5)(-5)}}{2(5)}$ oe	M2	FT their 3 term quadratic provided formula used or complete the square M1 for $\sqrt{(-20)^2 - 4(5)(-5)}$ oe or if in form $\frac{-(-20) + \sqrt{q}}{2(5)}$ or $\frac{-(-20) - \sqrt{q}}{2(5)}$ FT \pm <i>their</i> quadratic or for completing the square M2 for $2 \pm \sqrt{1 + 2^2}$ or M1 for $(x - 2)^2$
	4.24 or 4.236... cao	B1	
7(b)(i)	$(x + 5)(x - 1)$ final answer	2	B1 for $x(x - 1) + 5(x - 1)$ or $x(x + 5) - [1](x + 5)$ or for $(x + a)(x + b)$ where $ab = -5$ or $a + b = 4$

Question	Answer	Marks	Part marks
7(b)(ii)	$5(x+1) - 8x = x(x+1)$ or $5x + 5 - 8x = x^2 + x$	M2	Could be seen in different stages M1 for $5(x+1) - 8x$ seen or for common denominator of $x(x+1)$ for LHS or both sides soi
	-5 and 1 cao	A2	A1 for $x^2 + 4x - 5 [= 0]$ oe
8(a)	66[.0] or 66.03 to 66.04	2	M1 for $\tan = \frac{9}{4}$ oe
8(b)	$\sqrt{3^2 + 4^2}$ or $\frac{1}{2}\sqrt{6^2 + 8^2}$	M1	Any alternative method must be full and complete and result in exactly 5
8(c)	60.9 or 60.94 to 60.95	2	M1 for $\tan = \frac{9}{5}$ oe
8(d)	5.83 or 5.84 or 5.827 to 5.840	6	M1 for $[PB \text{ or } PC =] \sqrt{9^2 + 5^2}$ or $[XC =] \sqrt{9^2 + 5^2} - 7.5$ M1 for angle $BPX = 2 \times \text{invsin} \frac{3}{\text{their } PB}$ oe B1 for $[PB \text{ or } PC =] \sqrt{106} = 10.29 \text{ to } 10.30$ or $XC = 2.79 \text{ to } 2.8[0]$ or angle $BPX = 33.9 \text{ or } 33.86 \text{ to } 33.90\dots$ M2 for $\sqrt{(\text{their } PB)^2 + 7.5^2 - 2 \times \text{their } PB \times 7.5 \times \cos(\text{their } BPX)}$ oe or M1 for correct implicit equation
9(a)(i)	100	1	
9(a)(ii)	92.3 or 92.29... to 92.31	3	M2 for $200 \div (2 + \frac{10}{60})$ oe or M1 for $200 \div \text{their time interval}$ or M1 for $\frac{10}{60}$ soi oe
9(b)(i)	240 nfw	3	M2 for $\frac{V}{2} \left(\frac{30}{60} + \frac{20}{60} \right) = 100$ oe or M1 for any correct relevant area seen in terms of V
9(b)(ii)	$\frac{2}{9}$ oe	2FT	FT for $\text{their } (b)(i) \div 1080 \text{ to } 3 \text{ sf or better}$ M1 for $\text{their } (b)(i) \times \frac{1000}{3600}$ soi

Question	Answer	Marks	Part marks
10(a)	-11	1	
10(b)	7	2	M1 for $3x - 2 = 19$ or better
10(c)	25	2	M1 for $3 \times 3^x - 2$ oe
10(d)	$9x^2 - 8x + 2$ final answer	3	M1 for $(3x - 2)^2 + 3x - 2 + x$ oe B1 for $\left[(3x - 2)^2 = \right] 9x^2 - 6x - 6x + 4$ oe
10(e)	$\frac{x+2}{3}$ oe final answer	2	M1 for $x = 3y - 2$ or $y + 2 = 3x$ or $\frac{y}{3} = x - \frac{2}{3}$ or better





Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

MATHEMATICS

0580/43

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MARK SCHEME

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Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

Question	Answer	Marks	Part marks
1(a)(i)	9550	1	
1(a)(ii)	23 158 750	2FT	FT <i>their (a)(i)</i> $\times 2425$ correctly evaluated M1 for <i>their</i> lower bound $\times 2425$
1(a)(iii)	23 160 000	1FT	FT <i>their (a)(ii)</i> rounded to 4 sf
1(a)(iv)	2.316×10^7	1FT	FT <i>their (a)(iii)</i> or <i>their (a)(ii)</i> rounded to 3sf or more and in standard form
1(b)	520 nfw	3	M2 for $546 \times \frac{100}{(100+5)}$ oe or M1 for 105[%] associated with 546 oe
1(c)	3380 or 3376 to 3377	2	M1 for $3000 \times \left(1 + \frac{3}{100}\right)^4$ oe
2(a)	38	1	
	118	1	
	62	1FT	FT $180 - \text{their } y$
2(b)	69	3	B2 for $ACB = 42$ or B1 for $ADB = 42$ If zero scored, SC1 for $ACB = \text{their } ADB$
2(c)	107	2	B1 for $QPS = 73$ or [reflex] $QOS = 214$
3(a)	0 2.25 2 1.25	4	B1 for each
3(b)	Fully correct smooth curve	4	B3 FT for 7 or 8 points or B2 FT for 5 or 6 points or B1 FT for 3 or 4 points

Question	Answer	Marks	Part marks
3(c)	1	1	
3(d)(i)	$[y =] x + 1$	1	
3(d)(ii)	–2.2 to –2.1	1	
	–0.45 to –0.4	1	
	0.51 to 0.6	1	If zero scored, SC1 for <i>their</i> line in (d)(i) drawn. It must be of the form $y = mx + c$ ($m \neq 0$) and drawn ‘fit for purpose’
3(e)	$-1.33 < k < 0$ to 0.1	2FT	FT Strict fit of <i>their</i> max point and min point dep on cubic graph or accept correct answer from calculus B1 for each If zero scored, SC1 for two correct values reversed
4(a)(i)	17.5 or 17.46....nfww	6	B3 for triangle height 3.46[4...] or $\sqrt{12}$ oe or M2 for $\sqrt{4^2 - 2^2}$ or M1 for $h^2 + 2^2 = 4^2$ and M2 for $2 \times 7 + \frac{1}{2} \times 2 \times \text{their } h$ oe or M1 for $\frac{1}{2} \times 2 \times \text{their } h$
4(a)(ii)	140 or 139.6 to 139.7...	1FT	FT <i>their</i> (a) $\times 8$
4(b)(i)	2.62 or 2.618...	3	M2 for $[r^2 =] \frac{280}{13\pi}$ oe or M1 for $280 = \pi \times r^2 \times 13$
4(b)(ii)	10.2 or 10.20... or $10\frac{10}{49}$	3	M2 for $\frac{280}{14^3} [\times 100]$ oe or B1 for 2744 or 14^3 seen
5(a)(i)	80 33 20	1, 1, 1	
5(a)(ii)	17.3 nfww	4	M1 for 5, 15, 22.5, 27.5, 40 soi M1 for $\sum fx$ with <i>their</i> f 's and x in correct interval including both boundaries M1 (dep on 2nd M1) for $\sum fx \div 200$

Question	Answer	Marks	Part marks
5(b)(i)	$\frac{30}{210}$ oe	2	M1 for $\frac{6}{15} \times \frac{5}{14}$ If zero scored, SC1 for answer $\frac{36}{225}$ oe
5(b)(ii)	$\frac{108}{210}$ oe	3	M2 for $\frac{6}{15} \times \frac{9}{14} + \frac{9}{15} \times \frac{6}{14}$ oe or $1 - \frac{9}{15} \times \frac{8}{14} - \frac{6}{15} \times \frac{5}{14}$ or M1 for $\frac{6}{15} \times \frac{9}{14}$ or $\frac{9}{15} \times \frac{6}{14}$ or $\frac{9}{15} \times \frac{8}{14} + \frac{6}{15} \times \frac{5}{14}$ If zero scored, SC1 for answer $\frac{108}{225}$ oe
5(c)	150	1	
6(a)(i)	Translation	1	
	$\begin{pmatrix} 3 \\ -13 \end{pmatrix}$ oe	1	
6(a)(ii)	Enlargement	1	
	$[\text{sf}] - \frac{1}{2}$ oe	1	
	$(0, -4)$	1	
6(b)	Image at $(0, 0) (0, 6) (-4, 6) (-4, 2)$	2	B1 for rotation of 90° anticlockwise about the wrong centre or 90° clockwise about $(3, -1)$ or 4 points correct but not joined.
6(c)	Image at $(4, 0) (10, 0) (10, -4) (6, -4)$	2	B1 for reflection in $y = k$ or in $x = 1$ or 4 points correct but not joined
6(d)	Enlargement	1	
	$[\text{sf}] 3$	1	
	Origin oe	1	

Question	Answer	Marks	Part marks
7(a)	$[x =] -5$ $[y =] 7$ with correct working	4	M1 for correctly equating one set of coefficients M1 for correct method to eliminate one variable OR M1 for correctly rearranging one equation M1 for correct method to eliminate one variable A1 $x = -5$ A1 $y = 7$ both dep on M2 If zero scored, SC1 for 2 values satisfying one of the original equations SC1 if no correct working shown, but 2 correct answers given
7(b)	$[a =] 36$ $[b =] -6$	3	B2 for either correct or M1 for $a = b^2$ or for $x^2 + bx + bx + b^2$ or better or for $(x - 6)^2$ seen and M1 for $2b = -12$ soi
7(c)	$\frac{7x^2 - 12x - 10}{(2x - 5)(x - 1)}$ oe final answer nfw	4	B1 for common denom $(2x - 5)(x - 1)$ seen oe isw M1 for $x(x - 1) + (3x + 2)(2x - 5)$ soi isw B1 for $6x^2 - 15x + 4x - 10$ soi
8(a)(i)	4 points correctly plotted	2	B1 for 2 or 3 points correctly plotted
8(a)(ii)	Positive	1	
8(b)	mean 3.1	3	M2 for $\frac{\text{sum of products}}{30}$ or M1 for at least 4 correct products soi
	median 3	2	M1 for 15.5 oe indicated
	mode 5	1	
	range 5	1	
8(c)	24 nfw	3	M1 for $\frac{x \times 52 + 45 \times 75 + 11 \times 91}{x + 45 + 11}$ [= 70.3] M1 for clearing <i>their</i> fraction

Question	Answer	Marks	Part marks
9(a)	1120 or 1121.	4	M2 for $[AC^2 =]$ $525^2 + 872^2 - 2 \times 525 \times 872 \times \cos 104$ or M1 for implicit version A1 for 1257000 to 1258000
9(b)	$[QB \text{ or } x =] 872 \times \tan 1$ seen	M2	M1 for $\tan 1 = \frac{QB}{872}$
	$\tan = \text{their } QB \div 525$	M1	
	1.7 or 1.660 to 1.661 nfw	A1	dep on M3
9(c)(i)	222 000 or 222 100. or 222 101	2	M1 for $\frac{1}{2} \times 525 \times 872 \times \sin 104$
9(c)(ii)	5.55 or 5.550 to 5.553 nfw	2FT	FT <i>their</i> (c)(i) $\times 100^2 \div 20\,000^2$ M1 for <i>their</i> (c)(i) $\times 100^2 \div 20\,000^2$ or restart
10(a)		4	All 8 regions correct M3 for 6 or 7 regions correct M2 for 4 or 5 regions correct M1 for 3 regions correct
10(b)(i)	\notin	1	
10(b)(ii)	\emptyset	1	
10(c)	21, 23, 24, 29	2FT	Correct or FT SC1 for 1 omission or 4 correct and 1 extra
10(d)(i)	5	1FT	Correct or FT if less than 10
10(d)(ii)	9	1FT	Correct or FT if less than 10
10(e)	\subset or \subseteq	1	

Question	Answer	Marks	Part marks
11	64 $(n+3)^2$ oe final answer	1, 2	M1 for a quadratic expression seen or second differences 2
	17 $3n+2$ oe final answer	1, 2	B1 for $3n+k$ (any k) or $kn+2$ ($k \neq 0$)
	47 $(n+3)^2 - (3n+2)$ oe isw	1, 2FT	FT <i>their</i> difference expressions $A - B$ M1 for expression $an^2 + bn + c$ seen or second differences 2
	$\frac{7}{6}$ $\frac{n+2}{n+1}$ oe final answer	1, 2	B1 for $\frac{n+k+1}{n+k}$ seen





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Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Part Marks
1 (a)	22.9 or 22.85 to 22.86	2	M1 for $\frac{8}{10+17+8} [\times 100]$ oe
(b)	$5635 \times \frac{17}{10+17+8}$ or better [= 2737]	2	M1 for $\frac{5635}{(10+17+8)}$
(c)	5000	3	M2 for $5635 = k \left(1 + \frac{2.42}{100}\right)^5$ oe or B1 for $\left(1 + \frac{2.42}{100}\right)$
(d)	9950	2	M1 for 2×2500 or 3×1650
(e)	1.98 final answer	2	B1 for 1.976 or 1.98 not final answer or M1 for 130×0.0152
2 (a) (i)	Rotation	1	
	90° [anticlockwise] oe	1	
	(9, 5)	1	
(ii)	Translation	1	
	$\begin{pmatrix} -8 \\ -14 \end{pmatrix}$ oe	1	
(iii)	Enlargement	1	
	[sf] $\frac{1}{3}$	1	
	(- 8, - 2)	1	
(b) (i)	Image at (1, - 3) (2, - 3) (2, - 5)	2	M1 for triangle correct size and orientation, wrong position or SC1 for correct reflection in $y = -x$
(ii)	$\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$	2	B1 for 1 correct column or row

Question	Answer	Marks	Part Marks
3 (a)	0 0.5 oe 1.25 oe	1, 1, 1	
(b)	Fully correct smooth curve	4	B3 FT for 7 or 8 points or B2 FT for 5 or 6 points or B1 FT for 3 or 4 points
(c)	3.6 to 3.8	2	M1 for $y = 3.5$ soi
(d)	line $y = x + 1$ ruled	M1	
	–1.55 to –1.40 4.55 to 4.8	A1 A1	If 0 scored SC1 for $y = x + 1$ stated or implied or for 2 correct values given
(e) (i)	Point plotted at (5, 5)	1	
(ii)	Tangent ruled from A	1	
(iii)	1.2 to 1.4	B2	B2 and M1 dep on reasonable attempt at tangent from (5, 5) M1 for change in y / change in x of <i>their</i> ruled line
4 (a)	$\frac{1}{8}$ oe	3	M2 for $\frac{1}{2} \left(1 - \frac{1}{6} - \frac{1}{4} - \frac{1}{3} \right)$ oe or M1 for $\frac{1}{6} + \frac{1}{4} + \frac{1}{3}$ seen oe or idea that all sum to 1
(b)	$\frac{7}{12}$ oe	2	M1 for $\frac{1}{3} + \frac{1}{4}$ oe
(c) (i)	$\frac{1}{16}$ oe	2	M1 for $\frac{1}{4} \times \frac{1}{4}$ oe
(ii)	$\frac{2}{24}$ oe	3	M2 for $2 \times \frac{1}{6} \times \frac{1}{4}$ oe or M1 for $\frac{1}{6} \times \frac{1}{4}$ oe
(d)	12	1	

Question	Answer	Marks	Part Marks
5 (a) (i)	$(3x-1)(x+4)$	2	M1 for $(3x+b)(x+c)$ with $bc = -4$ or $3c + b = 11$ or for $3x(x+4) - 1(x+4)$ or for $x(3x-1) + 4(3x-1)$
(ii)	$\frac{1}{3}$ oe and -4	1	
(b) (i)	$2 \times 2(x-4) - 2(2x+11) = (2x+11)(x-4)$ or better	M2	M1 for common denom $2(2x+11)(x-4)$ seen or attempt to multiply through by denoms or for $\frac{2(x-4) - (2x+11)}{(2x+11)(x-4)} \left[= \frac{1}{2} \right]$
	$2x^2 + 11x - 8x - 44$ or better	B1	or for other correct relevant 2 bracket expansion if alt method used
	$4x - 16 - 4x - 22 = 2x^2 - 8x + 11x - 44$ $2x^2 + 3x - 6 = 0$	A1	correct solution reached with all brackets expanded and no errors or omissions seen
(ii)	$\frac{-3 \pm \sqrt{(3)^2 - 4(2)(-6)}}{2 \times 2}$	2	B1 for $\sqrt{(3)^2 - 4(2)(-6)}$ or better or $\left(x + \frac{3}{4}\right)^2$ oe and B1 for $\frac{-3 + \sqrt{q}}{2(2)}$ or $\frac{-3 - \sqrt{q}}{2(2)}$ or better or $-\frac{3}{4} + \sqrt{\frac{57}{16}}$ oe or $-\frac{3}{4} - \sqrt{\frac{57}{16}}$ oe
	-2.64 and 1.14 final ans cao	B1B1	SC1 for -2.6 or $-2.637...$ and 1.1 or $1.137...$ or -2.64 and 1.14 seen in working or 2.64 and -1.14 as final answers
6 (a) (i)	27	1	
(ii)	3.89 or 3.888 to 3.889	2	M1 for $\frac{7}{EZ} = \frac{9}{5}$ oe
(b)	76 cao	3	B2 for $ABC = 104$ or $AOC = 152$ or $COD = 28$ or $OBA = 52$ and $OBC = 52$ or $BCD = 128$ and $OCB = 52$ or B1 for any one of $OBA, OBC, OCB = 52$ or $BCD = 128$

Question	Answer	Marks	Part Marks
(c) (i)	90	1	
	angle in semicircle	1	
(ii)	27	1	
	tangent [perpendicular to] radius	1	
(iii)	rectangle	1	
7 (a)	72.7 or 72.70 to 72.71 nfw	4	<p>M1 for midpoints soi (condone 1 error or omission) (47.5, 55, 65, 80, 95, 110)</p> <p>M1 for use of $\sum fx$ with x in correct interval including both boundaries (condone 1 further error or omission) (1092.5, 3520, 7930, 10880, 2470, 3190)</p> <p>M1 (dep on 2nd M1) for $\sum fx \div 400$</p>
(b) (i)	[23] 87 209 345 371 [400]	2	B1 for 2 or 3 correct
(ii)	Correct graph	3	<p>B1FT <i>their</i> (b)(i) for 6 correct heights</p> <p>B1 for 6 points at upper ends of intervals on correct vertical line</p> <p>B1FT (dep on at least B1) for increasing curve or polygon through 6 points</p> <p>After 0 scored, SC1FT <i>their</i> (b)(i) for 5 correct points plotted</p>
(iii) (a)	69 to 70	1	
(b)	20 to 23	2FT	<p>FT <i>their</i> cumulative freq curve</p> <p>M1 for correct UQ or LQ for <i>their</i> cumulative freq curve</p>
(c)	72 to 75	2	M1 for 240 soi
8 (a) (i)	5.14 or 5.135 to 5.142 nfw	4	<p>M2 for $[XY^2 =] 12.5^2 + 9.9^2 - 2 \times 12.5 \times 9.9 \times \cos 23$ or M1 for implicit version A1 for 26.4 to 26.5 OR B1 for $[XYT =] 108$ or $[TXY =] 49$ M2 for $\frac{12.5 \sin 23}{\sin(180 - 72)}$ oe or M1 for $\frac{\sin(180 - 72)}{12.5} = \frac{\sin 23}{XY}$ oe</p>

Question	Answer	Marks	Part Marks
(ii)	15.6 or 15.7 or 15.64 to 15.68	3	M2 for $[TZ]=\frac{9.9}{\sin 37} \times \sin(72)$ oe or M1 for $\frac{9.9}{\sin 37} = \frac{TZ}{\sin 72}$ oe OR M2 for $\frac{12.5 \times \sin(180-23-108)}{\sin 37}$ oe or M1 for $\frac{\sin 37}{12.5} = \frac{\sin(180-23-108)}{TZ}$ oe
(b)	3.79 or 3.793 to 3.794	4	M3 for $r = 20.5 \div \left(2 + \frac{3 \times 65 \times 2\pi}{360}\right)$ oe or M2 for $20.5 = 2r + \frac{3 \times 65}{360} \times 2\pi r$ oe or M1 for $[3 \times] \frac{65}{360} \times 2\pi r$ oe or $20.5 = 2r +$ expression involving π
9 (a)	$x < 10$ oe	1	Accept $x \leq 9$
	$y \geq 2$ oe	1	Accept $y > 1$
(b)	$x + 3y \leq 21$ oe	1	Mark answer line isw
(c)	ruled broken line $x = 10$	B1	or ruled line $x = 9$
	ruled line $y = 2$	B1	or ruled broken line $y = 1$
	ruled line from (0, 7) to (21, 0)	B2	SC1 for line with negative gradient correct only at (0, 7) or (21, 0)
	correct region indicated cao	1	
(d) (i)	4	1	
(ii)	20	1	
10 (a) (i)	$(6 - 2) \times 180$ or $(2 \times 6 - 4) \times 90$ or $(360 \div 6)$ $(6 - 2) \times 180 \div 6$ or $(2 \times 6 - 4) \times 90 \div 6$ or $180 - (360 \div 6)$	M1 M1dep	 dep on previous M1
(ii)	$1.73x$ or $x\sqrt{3}$ oe	3	M2 for $2x \sin 60$ or $2x \cos 30$ oe or for $\sqrt{x^2 + x^2} - 2 \times x \times x \times \cos 120$ or M1 for $x \sin 60$ or $x \cos 30$ oe or for $x^2 + x^2 - 2 \times x \times x \times \cos 120$

Question	Answer	Marks	Part Marks
(iii)	$(10 - x)\sin 30$ seen oe	M1	
	$10 + 2((10 - x)\sin 30)$ oe	M1dep	dep on previous M1
	$10 + 10 - x$ or $10 + 2 \times \frac{1}{2} \times (10 - x)$	A1	with no errors or omissions seen
(b)	12.7 or 12.67 to 12.68.... nfw	4	B3 for 7.32 to 7.33 or M2 for $x = 20 \div (1 + 1.73)$ oe or M1 for $20 - x = \text{their (a)(ii)}$ oe
11 (a)	<div style="display: flex; justify-content: space-around; margin-bottom: 5px;"> 4567 </div> <div style="display: flex; justify-content: space-around;"> 8163264128 </div>	1	
		3	B2 for 3 or 4 correct or B1 for first 2 correct If 0 scored, SC1 for 4 values correctly doubled FT one error
(b)	2^n oe	1	
(c) (i)	$2 + 4 + 8 = 14$	1	
	$16 - 2 = 14$	1	or for $14 + 2 = 16 = 2^4$
(ii)	62 and 6	2	B1 for each
(iii)	$2^{n+1} - 2$ oe	1	
(iv)	9	1	

MATHEMATICS**0580/41**

Paper 4 Paper 4 (Extended)

October/November 2016

MARK SCHEME

Maximum Mark: 130

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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Page 2	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2016	0580	41

Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

Question	Answer	Mark	Part marks
1	(a) (i) 60 and 45	2	M1 for $105 \div (4 + 3)$
	(ii) 117.6[0] final answer	2	M1 for 105×1.12 oe
	(iii) 125	3	M2 for $105 \div (1 - \frac{16}{100})$ oe or M1 for 105 seen associated with 84%
	(b) 30.68 final answer	6	B5 for 30.7[0] or 30.68... or B4 for 905 to 906 and 875 or 405 to 406... and 375 OR M1 for $500 \times \left(1 + \frac{2}{100}\right)^{30}$ [- 500] oe M1 for $[500 +] \frac{500 \times 2.5 \times 30}{100}$ B1 for 905 to 906 or 875 or 405 to 406 or 375
	(c) 480 or 479.8 to 479.9...	3	M2 for $1469 \div \left(1 + \frac{3.8}{100}\right)^{30}$ oe or M1 for $P \times \left(1 + \frac{3.8}{100}\right)^{30} = 1469$ oe
	(d) 6.5[0] or 6.500...	3	M2 for $\sqrt[11]{\frac{120150}{60100}} [\times 100 - 100]$ oe or M1 for $60100 \times ()^n = 120150$ oe where $n = 5$ or 11 or 55

Page 3	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2016	0580	41

Question	Answer	Mark	Part marks
2 (a) (i)	15 to 15.2	1	
	(ii) 10.8 to 11	1	
	(iii) 9 to 9.2	1FT	FT 20 – <i>their</i> (a)(ii)
	(iv) 10	1	
	(v) 24	2	B1 for 176 written
	(b) (i) 16.75 nfw	4	isw attempted time conversion after correct answer M1 for 5, 12.5, 17.5, 25, 45 soi M1 for Σfx M1 dep for $\text{their } \Sigma fx \div 200$
	(ii) Fully correct histogram	4	B1 for each correct block If zero scored, SC1 for frequency densities of 9.6, 12, 2.6 and 0.6 seen
3 (a) (i)	51.7 or 51.69 to 51.70...	4	M3 for $(2 \times \frac{2}{3} \times \pi \times 13^3 + \pi \times 13^2 \times 25) \times 2.3 [\div 1000]$ oe or SC3 for figs 517 or figs 5169 to 5170... or M2 for $(2 \times \frac{2}{3} \times \pi \times 13^3 + \pi \times 13^2 \times 25)$ oe OR M1 for $2 \times \frac{2}{3} \times \pi \times 13^3$ seen or $\pi \times 13^2 \times 25$ seen M1indep for <i>their</i> volume $\times 2.3 \div 1000$
	(ii) 1.96 or 1.957 to 1.958 ...	4	M3 for $(2 \times 2 \times \pi \times 13^2 + \pi \times 2 \times 13 \times 25) [\div 100^2] \times 4.7$ oe or SC3 for figs 196 or figs 1957 to 1958... M2 for $(2 \times 2 \times \pi \times 13^2 + \pi \times 2 \times 13 \times 25)$ oe OR M1 for $2 \times 2 \times \pi \times 13^2$ seen or $\pi \times 2 \times 13 \times 25$ seen M1indep for <i>their</i> area divided by 100^2 soi

Page 4	Mark Scheme	Syllabus	Paper
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Question	Answer	Mark	Part marks
(b)	6.2[0] or 6.203 to 6.204	3	M2 for $x^3 = \frac{500}{\frac{2}{3}\pi}$ oe or better or M1 for $\frac{1}{3} \times \pi \times x^2 \times 2x = 500$ oe
(c)	286 or 285.7...	3	M2 for $\frac{180}{A} = \left(\frac{180}{360}\right)^{\frac{2}{3}}$ oe or M1 for $\left(\sqrt[3]{\frac{360}{180}}\right)^{[2]}$ oe or $\left(\sqrt[3]{\frac{180}{360}}\right)^{[2]}$ oe seen or $\frac{A^3}{180^3} = \frac{360^2}{180^2}$
4 (a)	0.92, ..., ..., 0.5, -1, ..., ..., -1, 0.5, ..., ..., 0.92	3	B2 for 4 or 5 correct or B1 for 2 or 3 correct
(b)	Fully correct graph	5	B4 for correct graph but branches joined OR B3FT for 11 or 12 correct points or B2FT for 9 or 10 correct points or B1FT for 7 or 8 correct points Blindep for a branch on each side of the y-axis, without touching it
(c) (i)	Correct ruled line through (-2, 1) and (2, -3)	2	B1 for straight line with gradient -1 or cutting y-axis at -1 or correct line but freehand or short correct ruled line
(ii)	0.7 to 0.95	1	
(iii)	$[p =] 2$ and $[q =] -2$	3	B2 for $x^3 + 2x^2 - 2 = 0$ oe or B1 for $x^2 - 2 = -x^3 - x^2$ oe or better or $1 + 1 - \frac{2}{x^2} + x [= 0]$ or better
(d) (i)	(1.3 to 1.6, 0)	1	
(ii)	Ruled line from (0, -2) to intersection of <i>their</i> graph with positive x-axis	1FT	
(iii)	Tangent [to curve] A or (1.3 to 1.6, 0)	1 1	

Page 5	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2016	0580	41

Question	Answer	Mark	Part marks
5 (a) (i)	Image at $(-2, -4), (4, -4), (4, 0)$	2	SC1 for translation $\begin{pmatrix} -4 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ -8 \end{pmatrix}$
(ii)	8.94 or 8.944...	2	M1 for $\sqrt{(-4)^2 + (-8)^2}$ or $\sqrt{4^2 + 8^2}$
(b) (i)	Enlargement [factor] 0.5 oe [centre] (0, 0) oe	1 1 1	
(ii)	$\begin{pmatrix} 0.5 & 0 \\ 0 & 0.5 \end{pmatrix}$ oe	2FT	FT their scale factor from (b)(i) dep on enlargement and centre (0, 0) B1FT for one row or column
(iii)	0.25 or $\frac{1}{4}$	1FT	Strict FT <i>their</i> matrix but not for identity matrix
6 (a)	126 or 126.4 to 126.5	3	M2 for $\sqrt{220^2 - 180^2}$ oe or M1 for $BC^2 + 180^2 = 220^2$ oe
(b)	99.9 or 99.86 to 99.87	4	M2 for $180^2 + 170^2 - 2 \times 180 \times 170 \cos 33$ or M1 for $\cos 33 = \frac{180^2 + 170^2 - CD^2}{2 \times 180 \times 170}$ A1 for 9970 or 9973 to 9974
(c)	92.6 or 92.58 to 92.59	2	M1 for $\frac{\text{dist}}{170} = \sin 33$ oe
(d)	115.1 or 115.0 to 115.1	3	M1 for $\cos = \frac{180}{220}$ oe M1dep for $47 + 33 + \text{their angle } BAC$
(e)	19700 or 19708 to 19720	3	M1 for $0.5 \times 180 \times 170 \times \sin 33$ oe or $0.5 \times 180 \times \text{their (c)}$ oe M1 for $0.5 \times 180 \times \text{their (a)}$ oe or $0.5 \times 180 \times 220 \times \sin(\text{their } BAC)$ oe

Page 6	Mark Scheme	Syllabus	Paper
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Question	Answer	Mark	Part marks
7 (a)	0.7, 0.1 oe correctly placed 0.2, 0.8 oe correctly placed	1 1	
(b) (i)	0.44 nfwv oe	3	M2 for $1 - \text{their } 0.7 \times \text{their } 0.8$ or for $0.3 + \text{their } 0.7 \times \text{their } 0.2$ oe or M1 for $\text{their } 0.7 \times \text{their } 0.8$ or for two of 0.3×0.9 , $0.3 \times \text{their } 0.1$, $\text{their } 0.7 \times \text{their } 0.2$
(ii)	110	1FT	FT $250 \times \text{their (b)(i)}$
(c)	If late at first two stations then certain to be late at station C oe	1	Indication of certain event (allow 1 or 100% probability or sure) at third station if late at first two stations
8 (a)	$\frac{323}{x} + \frac{323}{x+2} = 36$ oe three term equation $323(x+2) + 323x = 36x(x+2)$ oe or $\frac{323x + 646 + 323x}{x(x+2)} = 36$ oe $36x^2 - 574x - 646 = 0$ $18x^2 - 287x - 323 = 0$	B2 M1 A1	B1 for $\frac{323}{x}$ seen oe or $\frac{323}{x+2}$ seen oe i.e. for clearing the fractions (or all still over common denominator) or reducing the two algebraic fractions to one fraction and expanding the brackets in the numerator answer reached without any omissions or errors with at least one intermediate line with brackets expanded after M1
(b) (i)	17, 19	1	
(ii)	(..... + 19)(..... - 17)	2	SC1 for (..... + a)(..... + b) where a, b are integers and $ab = -323$ or $a + 18b = -287$
(iii)	$17, -\frac{19}{18}$ oe	1FT	FT <i>their (b)(ii)</i>
(c)	11 cao	1	

Page 7	Mark Scheme	Syllabus	Paper
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Question	Answer	Mark	Part marks
9 (a)	236	3	B2 for 243 and 7 or M2 for $3^{2(2)+1} - (2(3^{[1]}) + 1)$ oe B1 for h(5) or f(3) soi or M1 for $3^{2x+1} - (2(3^x) + 1)$ or better
(b)	$6x + 1$ final answer	2	M1 for $3(2x + 1) - 2$
(c)	$x < 3$ oe final answer	2	M1 for $1 + 2 > 3x - 2x$ or $2x - 3x > -2 - 1$ oe
(d)	-2	1	
(e)	$\frac{x+2}{3}$ oe final answer	2	M1 for $x = 3y - 2$ or $y + 2 = 3x$ or $\frac{y}{3} = x - \frac{2}{3}$
(f)	$\frac{6x^2 - x + 3}{2x + 1}$ final answer	3	M1 for $5 + (2x + 1)(3x - 2)$ or better isw B1 for common denominator $2x + 1$ isw
(g)	9	1	
10 (a)	115 or 114.5 to 114.6	3	M2 for $\frac{r^2}{\frac{\pi r^2}{360}}$ or better or M1 for $\frac{w}{360} \times \pi \times r^2 = r^2$
(b)	126	3	M2 for $\frac{x}{360} \times 2\pi r [+ 2r] = [2r +] \frac{7\pi r}{10}$ or better or M1 for $\frac{x}{360} \times 2\pi r$
(c)	120	4	B3 for $\frac{y}{2} = 60$ or x (base angle) = 30 OR M3 for $\cos x$ or $\sin\left(\frac{y}{2}\right) = \frac{\sqrt{3}}{2}$ oe or $\cos y = -\frac{1}{2}$ oe or M2 for $\cos x$ or $\sin\left(\frac{y}{2}\right) = \frac{q\sqrt{3}}{2q}$ or $[\cos y] = \frac{q^2 + q^2 - (q\sqrt{3})^2}{2 \times q \times q}$ oe or M1 for $\left[(q\sqrt{3})^2 = \right] q^2 + q^2 - 2 \times q \times q \cos y$ oe After M0 , SC1 for $[h^2 =] q^2 - \left(\frac{1}{2} q\sqrt{3}\right)^2$ or for q replaced by 1, 2, 4, etc.

MATHEMATICS**0580/42**

Paper 4 Paper 4 (Extended)

October/November 2016

MARK SCHEME

Maximum Mark: 130

Published

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Page 2	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2016	0580	42

Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

Question	Answer	Mark	Part marks
1	(a) (i)	2	M1 for $18000 \times \left(1 - \frac{15}{100}\right)^3$ oe
	(ii)	3	M2 for $14025 \div \left(1 - \frac{15}{100}\right)$ oe or M1 for recognition of 14 025 as 85% soi
	(b)	2	M1 for $P\left(1 + \frac{5}{100}\right)^2 = 286.65$ oe
	(c) (i)	3	M2 for $\frac{224.72 - 200}{200 \times 2} \times 100$ oe or $\frac{1}{2} \left(\frac{224.72}{200} \times 100 - 100 \right)$ or M1 for $\frac{200 \times r \times 2}{100}$ oe or $\frac{224.72 - 200}{200 \times 2}$ or $\frac{224.72}{200} \times 100 - 100$ soi by 12.36 If zero scored, SC1 for 56.18 or 56.2 as final answer
	(ii)	3	M2 for $\sqrt{\frac{224.72}{200}}$ or $\sqrt{\frac{224.72}{2}}$ soi by 1.06 or 106 or 10.6 or M1 for $200 \left(1 + \frac{r}{100}\right)^2 = 224.72$ oe

Page 3	Mark Scheme	Syllabus	Paper
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Question	Answer	Mark	Part marks
2 (a)	1 1	1 1	
(b)	Fully correct graph	4	B3FT for 6 or 7 points plotted or B2FT for 4 or 5 points plotted or B1FT for 2 or 3 points plotted
(c) (i)	$-1 < \text{ans} < -0.8$ $1.25 < \text{ans} < 1.45$ $2.5 < \text{ans} < 2.6$	1 1 1	
(ii)	$-0.7 < \text{ans} < -0.5$	2	M1 for evidence of $y = -x$ or $\frac{x^3}{3} - x^2 + 1 = -x$
(d) (i)	$y = 1$ to 1.1 oe	1FT	FT only if a clear maximum point
	$y = -0.4$ to -0.33 oe	1FT	FT only if a clear minimum point
(ii)	-0.4 to -0.33 oe	1FT	Correct or FT <i>their</i> graph
3 (a)	$\frac{240 \sin 85}{\sin 50}$ 312 or 312.1	M2 B1	or M1 for $\frac{\sin 50}{240} = \frac{\sin 85}{AB}$ oe
(b)	$\frac{1}{2} \times 180 \times 240 \times \sin A = 12000$ 33.748 to 33.749	M1 A2	A1 for $\sin = \frac{24000}{43200}$ or better or 0.555 or 0.556 or 0.5 or 0.5555 to 0.5556
(c)	328 or 328.3 to 328.5	5	B1 for [angle $A =$] 78.75 seen M2 for $180^2 + (\text{their } AB)^2 - 2 \times 180 \times \text{their } AB \times \cos 78.75$ or M1 for $\cos 78.75 = \frac{180^2 + (\text{their } AB)^2 - x^2}{2 \times 180 \times (\text{their } AB)}$ A1 for 107 800 to 107 900
(d) (i)	108.75 or 108.7 or 108.8	1	
(ii)	288.75 or 288.7 or 288.8	2FT	FT 180 + <i>their</i> (d)(i) M1 for 180 + <i>their</i> (d)(i) or $360 - (180 - \text{their}(d)(i))$

Page 4	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2016	0580	42

Question	Answer	Mark	Part marks
4 (a)	15	2	M1 for $10 \div 40 [\times 60]$
(b)	49.2 nfw	4	M1 for 35, 42.5, 47.5, 52.5, 57.5, 70 soi M1 for Σfx $8 \times 35 + 22 \times 42.5 + 95 \times 47.5 + 55 \times 52.5 + 14 \times 57.5 + 6 \times 70$ M1 dep for <i>their</i> $\Sigma fx \div 200$
(c)	Fully correct histogram	4	B3 for 4 correct blocks or B2 for 2 or 3 correct blocks or B1 for 1 correct block If zero scored, SC1 for correct frequency densities 0.8, 19, 11, 2.8, 0.3 soi
(d) (i)	125, 180	1	
(ii)	Correct diagram	3	B1FT <i>their</i> (d)(i) for 6 correct heights within correct square(including boundaries) or touching correct line if should be on a grid line and B1 for 6 points at upper ends of intervals on correct vertical line and B1FT (dep on at least B1) for increasing curve or polygon through 6 points If zero scored, SC1FT for 5 correct points plotted
(iii) (a)	48 to 49	1	
(b)	55	1	
(c)	8 to 14	2FT	B1FT for 186 to 192 seen

Page 5	Mark Scheme	Syllabus	Paper
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Question	Answer	Mark	Part marks
5 (a) (i)	$\frac{3}{4}, \frac{1}{4}$ $\frac{7}{8}, \frac{1}{8}$	2	B1 for any 2 correct
(ii)	$\frac{21}{32}$ oe	2	M1 for $\frac{7}{8} \times \frac{3}{4}$ oe
(iii)	$\frac{441}{1024}$ oe	2FT	M1 for $\left(\frac{7}{8} \times \frac{3}{4}\right)^2$ or <i>their</i> ((a)(ii)) ² oe
(b)	175	2	M1 for $200 \times \frac{7}{8}$
(c)	2400	2	M1 for $1575 \div \text{their(a)(ii)}$

Page 6	Mark Scheme	Syllabus	Paper
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Question	Answer	Mark	Part marks	
6	(a) (i)	1.32	2	M1 for $0.8 \times 1.5 \times 1.1$
	(ii)	0.725 or 0.7246 to 0.7247...	2	M1 for $\pi r^2 \times 0.8 = \text{their(a)(i)}$ or $\pi r^2 = 1.5 \times 1.1$ oe
	(iii)	0.513 to 0.518 nfw	5	M1 for $2(1.5 \times 1.1 + 1.5 \times 0.8 + 1.1 \times 0.8)$ M1 for $[2 \times] \pi \times (\text{their (a)(ii)})^2$ M2 for $\pi \times 2 \times (\text{their (a)(ii)}) \times 0.8$ or M1 for $\pi \times 2 \times (\text{their (a)(ii)})$
	(b) (i)	$x + y \geq 9$ oe	1	
		$y \geq 2$ oe	1	If zero scored, SC1 for $x + y > 9$ and $y > 2$
	(ii)	Fully correct diagram with unwanted region shaded	4	B1 for $2x + 3y = 24$ ruled B1 for $x + y = 9$ ruled B1 for $y = 2$ ruled
	(iii)	20	1	
		$[x =] 7$	1	
		$[y =] 2$	1	If zero scored, SC1 for $2x + 3y$ evaluated from integers

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7	(a)	54.50 final answer	2	B1 for 54.495 to 54.496 or 54.5 or M1 for $200 \div 3.67$
	(b) (i)	$\frac{1000}{x(x+1)}$ final answer	3	M1 for $1000(x+1) - 1000x$ M1 for denominator $x(x+1)$
	(ii)	$\frac{1000}{x} - \frac{1000}{x+1} = 4.5[0] \text{ oe}$ or $\frac{1000}{x(x+1)} = 4.5$ $1000 = 4.5x(x+1)$ $4.5x^2 + 4.5x - 1000 = 0$ $9x^2 + 9x - 2000 = 0$	M1 M1dep A1	Allow <i>their</i> (b)(i) for first M1 only for a single fraction Correctly multiplying by algebraic denominator Equation reached without any errors or omissions and at least one step after clearing the denominators of the fractions still with brackets included
	(iii)	$\frac{-9 \pm \sqrt{9^2 - 4(9)(-2000)}}{2(9)}$ - 15.42 14.42	2 B1 B1	B1 for $\sqrt{9^2 - 4(9)(-2000)}$ If in form $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$ then B1 for $p = -9$ and $r = 2(9)$ SC1 for answers - 15.4 or - 15.42 to - 15.41 and 14.4 or 14.41 to 14.42 or for - 14.42 and 15.42 or - 15.42 and 14.42 seen but not final answer Answers without working only score B1, B1 or SC1
	(iv)	69.34 to 69.37 final answer must be 2 dp	2FT	FT $1000 \div \text{their positive } x$ with final answer rounded up or down to 2 dp or M1 for $1000 \div \text{their positive } x$

Page 8	Mark Scheme	Syllabus	Paper
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8	(a)	$[u =] 80$ $[v =] 160$	1 1	
	(b)	6.24 or 6.244 to 6.245	3	M2 for $\sqrt{8^2 - 5^2}$ oe or M1 for $l^2 + 5^2 = 8^2$ oe or B1 for suitable right angled triangle drawn with 5 on correct side
	(c)	5.05 or 5.052....	2	M1 for $\frac{4.8}{2.5} = \frac{9.7}{MN}$ oe
	(d)	4 nfw	4	M3 for $[x^n](x+1) = 4 \times \frac{5}{12}[x^n](x-1)$ oe, $n = 1, 2$ or 3 or M2 for $\frac{[x](x+1)}{\frac{5}{12}[x](x-1)} = \left(\frac{2[x]}{[x]}\right)^2$ oe or M1 for 2^2 or $\left(\frac{1}{2}\right)^2$ soi
9	(a) (i)	1.5 oe	1	
	(ii)	$\frac{3}{y-2}$ oe final answer	3	M1 for correct removal of fraction M1 for collection of terms in x and factorises OR M1 subtracts 2 from both sides M1 multiplies by x to remove fraction and M1 for correct division by expression of the form $ay + b$, a and $b \neq 0$
	(b) (i)	-3	1	
	(ii)	65 536 final answer	2	B1 for $h(16)$ oe e.g. $h(2^4)$
	(iii)	-6	2	M1 for $2 - x = 2^3$ oe
	(iv)	3	1	
10	(a)	7.5	2	M1 for $3x + x + 3x + x = 60$ oe
	(b)	5	3	B2 for $3x + 4x + 5x [= 60]$ or better or M1 for $(3x)^2 + (4x)^2$ oe
	(c)	16.8 or 16.80....	3	M2 for $x + x + \frac{90}{360} \times \pi \times 2 \times x [= 60]$ oe or M1 for $\frac{90}{360} \times \pi \times 2 \times x$ oe

MATHEMATICS**0580/43**

Paper 4 (Extended)

October/November 2016

MARK SCHEME

Maximum Mark: 130

Published

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Page 2	Mark Scheme	Syllabus	Paper
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Abbreviations

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dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

Question	Answer	Mark	Part marks
1 (a) (i)	1050	2	M1 for $924 \div 22$ oe or $924 \div 0.88$ oe If zero scored, SC1 for 126 seen
(ii)	12	1	
(iii)	5 ¼ hrs or 5.25 hrs	2	M1 for $9 \div (7 + 5)$ or $540 \div (7 + 5)$ If zero scored, SC1 for answer 3.75h or 3h 45 mins
(b)	24.6[0]	3	M2 for $15.99 \div \left(1 - \frac{35}{100}\right)$ oe or M1 for 65% associated with 15.99
(c)	63	3	M2 for $35 \times \sqrt{\frac{2835}{875}}$ oe or M1 for $\sqrt{\frac{2835}{875}}$ or $\sqrt{\frac{875}{2835}}$ or better or $\frac{\sqrt{2835}}{?} = \frac{\sqrt{875}}{35}$ oe OR M2 for $\sqrt{2835 \times \frac{35}{\text{their}(875 \div 35)}}$ oe or M1 for $\frac{35}{\text{their}(875 \div 35)}$ or $\frac{\text{their}(875 \div 35)}{35}$
(d) (i)	0.661[0]	1	
(ii)	48	3	M2 for $\frac{18.50 - 12.50}{12.50} \times 100$ or M1 for $\frac{18.50 - 12.50}{12.50}$ or $\frac{18.50}{12.50} \times 100$

Page 3	Mark Scheme	Syllabus	Paper
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Question	Answer	Mark	Part marks
2 (a)	−4.5 and 10.5	2	B1 for each value
(b)	Correct curve	5	B4 for correct curve with branches joined OR B3 FT for 9 or 10 points or B2 FT for 7 or 8 points or B1 FT for 5 or 6 points and B1 independent for one branch on each side of the y -axis and not touching or crossing the y -axis
(c)	5	1	
(d) (i)	Line $y = 15 - 3x$ ruled and −0.4 to −0.31 0.35 to 0.45 2.2 to 2.3	4	B3 for correct line and 2 correct values or B2 for correct line or M1 for ruled line with gradient −3 or through (0, 15) or SC2 for no/wrong line and three correct values or SC1 for no/wrong line and two correct values or for correct freehand line
(ii)	$[a =] 6$ $[b =] -14$ $[c =] 0$	3	B2 for $6x^3 - 14x^2 + 2 = 0$ oe or M1 for correct removal of denominator or collection of terms on one side
3 (a)	2.25 oe	2	M1 for $8x + 4x = 22 + 5$ or better
(b)	$x \geq 3.5$ final answer	2	M1 for $6x - 2x \geq 14$ or better
(c)	$(x - 7)(x + 3)$ final answer	2	M1 for $x(x + 3) - 7(x + 3)$ or $x(x - 7) + 3(x - 7)$ or for $(x + a)(x + b)$ where $ab = -21$ or $a + b = -4$
(d)	$12x^2 + xy - 6y^2$ final answer	3	M2 for $12x^2 + 9xy - 8xy - 6y^2$ or M1 for any two of the four terms correct
4 (a)	Triangle drawn at (−4, 3), (−1, 3), (−1, 4)	2	SC1 for correct reflection in $x = k$ or $y = 1$
(b)	Triangle drawn at (1, 7), (1, 6), (4, 6)	2	SC1 for translation by $\begin{pmatrix} -2 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 3 \end{pmatrix}$
(c)	Triangle drawn at (2, 3), (2, 1), (8, 1)	2	M1 for two correct vertices or SC1 for correct enlargement about the wrong centre
(d)	Rotation 90° clockwise oe (7, 4)	1 1 1	Accept −90°

Page 4	Mark Scheme	Syllabus	Paper
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Question	Answer	Mark	Part marks
5 (a)	$\frac{1}{64}$	2	M1 for $\frac{1}{8} \times \frac{1}{8}$
(b)	$\frac{63}{64}$	1FT	FT 1 – their (a)
(c)	$\frac{30}{64}$ oe	2	M1 for $[2 \times] \frac{3}{8} \times \frac{5}{8}$ oe
(d)	$\frac{7}{64}$	3	M2 for $\frac{1}{8} \times \frac{1}{8} + \frac{1}{8} \times \frac{3}{8} + \frac{3}{8} \times \frac{1}{8}$ oe or M1 for identifying combinations required, (8, 8) and (8, 6) and (8, 5) or identifying 6 out of the 7 possible outcomes
(e)	$\frac{24}{64}$ oe	3	M2 for $\frac{1}{8} \times \frac{7}{8} + \frac{3}{8} \times \frac{4}{8} + \frac{2}{8} \times \frac{2}{8} + \frac{1}{8} \times \frac{1}{8}$ oe or $\frac{7}{8} \times \frac{1}{8} + \frac{6}{8} \times \frac{1}{8} + \frac{4}{8} \times \frac{2}{8} + \frac{1}{8} \times \frac{3}{8}$ oe or M1 for the sum of any two correct products from above oe isw
6 (a)	$[\cos ABL =] \frac{40^2 + 61.1^2 - 92.1^2}{2 \times 40 \times 61.1}$ 130.11...	M2 A2	M1 for correct implicit version A1 for $[\cos ABL =] -0.644...$ or $-\frac{7873}{12220}$ or $-\frac{3149.2}{4888}$
(b)	[0]59.5 or 59.50 to 59.511	4	M2 for $\frac{40 \sin 130.1}{92.1}$ or $\frac{61.1 \sin 130.1}{92.1}$ or M1 for $\frac{\sin A}{40} = \frac{\sin 130.1}{92.1}$ or $\frac{\sin L}{61.1} = \frac{\sin 130.1}{92.1}$ and A1 for 19.39 to 19.4... or 30.48 to 30.49...

Page 5	Mark Scheme	Syllabus	Paper
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Question	Answer	Mark	Part marks
(c)	1h 50min	5	<p>M2 for $[BC =] 2 \times 40 \times \cos(180 - 130.1)$ oe or M1 for $\frac{x}{40} = \cos(180 - 130.1)$ oe</p> <p>OR M2 for $[BC =] \sqrt{40^2 + 40^2 - 2 \times 40 \times 40 \cos(\text{their } 80.2)}$ or M1 for correct implicit version</p> <p>OR M2 for $[BC =] \frac{40 \sin(\text{their } 80.2)}{\sin 49.9}$ or M1 for correct implicit version</p> <p>and M1 for $\frac{\text{their } BC}{28}$ A1 for 1.84[0...] to 1.841</p>
7 (a) (i)	6000 [7600] 10200 4200	2	<p>B1 for 6000 or 10200 If B0 then B1FT for <i>their</i> (UQ – LQ)</p>
(ii)(a)	True, median price is lower	1	No inclusion of other statistic
(ii)(b)	False, A's UQ < 13 600 oe	1FT	FT <i>their</i> UQ in (a)(i)
(b)	11 025	4	<p>Listed values are in thousands M1 for 3, 7, 9, 11, 13, 18 soi</p> <p>M1 for Σfm [1323]</p> <p>M1 (dep on second M1) for <i>their</i> $\Sigma fm \div 120$</p>
(c)	323.25 nfw	3	<p>M2 for $9948 - 0.25 \times 8760$ or M1 for 0.25×8760</p>
8 (a)	Attempt to use $18 - r$ in Pythagoras'	M1	
	$144 = r^2 - 324 + 18r + 18r - r^2$ oe	B2	or B1 for $324 - 18r - 18r + r^2$
	$468 = 36r$ oe	A1	Correct simplification with no errors
(b)	$[2 \times] \sin^{-1}\left(\frac{12}{13}\right)$ oe	M1	<p>or $\cos = \left(\frac{13^2 + 13^2 - 24^2}{2 \times 13 \times 13}\right)$ or better or</p> <p>$[180 -] 2 \times \sin^{-1}\left(\frac{5}{13}\right)$</p>
	134.76...	A1	Not 67.4×2

Page 6	Mark Scheme	Syllabus	Paper
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Question	Answer	Mark	Part marks
(c) (i)	332 or 332.1 to 332.2...	3	M2 for $\frac{(360-134.8)}{360} \times \pi \times 13^2$ or M1 for $\frac{134.8}{360} \times \pi \times 13^2$
(ii)	392 or 392.0 to 392.2...	3	M2 for $\frac{1}{2} \times 24 \times 5 + \text{their (c)(i)}$ or $\frac{1}{2} \times 13^2 \times \sin 134.8 + \text{their (c)(i)}$ or M1 for $\frac{1}{2} \times 24 \times 5$ or $\frac{1}{2} \times 13^2 \times \sin 134.8$
(iii)	15 700 or 15 670 to 15 690	1FT	FT for answer to $40 \times \text{their (c)(ii)}$
(d)	29.5 or 29.6 or 29.51 to 29.57...	2FT	M1 for $\pi \times 13^2 \times h = \text{their (c)(iii)}$ or better
9 (a) (i)	$\begin{pmatrix} 12 \\ -5 \end{pmatrix}$	2	M1 for $\begin{pmatrix} 12 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ -5 \end{pmatrix}$
(ii)	13 nfw	2FT	M1FT for $\sqrt{\text{their } 12^2 + \text{their } (-5)^2}$ FT dep on <i>their (a)</i> being $\begin{pmatrix} a \\ b \end{pmatrix}$ where a, b are both non-zero
(b)(i)(a)	$\mathbf{b} - \mathbf{a}$	1	
(i)(b)	$\frac{3}{5}(\mathbf{b} - \mathbf{a})$ or $\frac{3}{5}\mathbf{b} - \frac{3}{5}\mathbf{a}$ final answer	1FT	FT $\frac{3}{5}$ <i>their</i> vector, in terms of \mathbf{a} and \mathbf{b} , in (b)(i)(a)
(i)(c)	$\frac{1}{5}(2\mathbf{a} + 3\mathbf{b})$ or $\frac{2}{5}\mathbf{a} + \frac{3}{5}\mathbf{b}$ final answer	2	M1 for $\mathbf{a} + \text{their vector in (b)(i)(b)}$ or any correct route
(ii)	$\frac{3}{2}\text{oe}$	1	

Page 7	Mark Scheme	Syllabus	Paper
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Question	Answer	Mark	Part marks
10 (a)	A: 14 $3n - 1$ oe	3	B1 for 14 B2 for $3n - 1$ oe or M1 for $3n + k$, for any k oe
	B: -4 $26 - 6n$ oe	3	B1 for -4 B2 for $26 - 6n$ oe or M1 for $k - 6n$, for any k oe
	C: 25 n^2 oe	2	B1 for 25 B1 for n^2 oe
	D: 20 $n^2 - n$ oe	2	B1 for 20 B1 for $n^2 - n$ oe
(b) (i)	$\frac{n(3n+1)}{2} = 155$	M1	Accept $\frac{3n^2 + n}{2} = 155$
	$3n^2 + n = 310$		Intermediate step must include elimination of fraction eg $n(3n + 1) = 310$
	$3n^2 + n - 310 = 0$	A1	With no errors or omissions
	(ii) $10, -\frac{31}{3}$ oe	3	M2 for $(3n + 31)(n - 10) [= 0]$ or M1 for $3n(n - 10) + 31(n - 10)$ or $n(3n + 31) - 10(3n + 31)$ or $(3n + a)(n + b)$ where $ab = -310$ or $a + 3b = 1$
(iii)	10	1FT	FT their b(ii) if only one positive integer solution

Page 8	Mark Scheme	Syllabus	Paper
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Question	Answer	Mark	Part marks
11	5 and $-\frac{27}{2}$ oe	7	<p>M2 for $12 \times 2(2x - 1) + (x + 3)(2x - 1) = 12 \times 3(x + 3)$ oe or M1 for a common denominator with 2 or more of the terms</p> <p>and B2 for $2x^2 + 17x - 135 [= 0]$ oe or B1 for $48x - 24$ or $2x^2 - x + 6x - 3$ or $36x + 108$ or $2x^2 - x + 54x - 27$ or $132 - 12x$ or $37x + 111 - 2x^2 - 6x$</p> <p>and M2 for $(2x + 27)(x - 5)$ or <i>their</i> correct factors or formula or M1 for $2x(x - 5) + 27(x - 5)$ or $x(2x + 27) - 5(2x + 27)$ or $(2x + a)(x + b)$ where $ab = -135$ or $a + 2b = 17$</p>



Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

MATHEMATICS

0580/41

Paper 4 (Extended)

May/June 2016

MARK SCHEME

Maximum Mark: 130

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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This document consists of 7 printed pages.

Page 2	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – May/June 2016	0580	41

Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

Question	Answer	Mark	Part marks
1 (a) (i)	48	2	M1 for $\frac{72}{3}$
(ii)	32.4[0]	1	
(iii)	$\frac{13}{30}$	2	M1 for $\frac{72 - \text{their(ii)} - 8.4}{72}$ oe
(iv)	24	3	M2 for $\frac{19.2}{0.8}$ oe or M1 for recognising 19.2 is 80%
(b)	660	3	M2 for $\frac{550 \times 2 \times 10}{100} + 550$ oe or M1 for $\frac{550 \times 2 \times 10}{100}$ oe
(c)	663.9[0]	2	M1 for 550×1.019^{10} oe
(d)	1.5[0]	3	M2 for $\sqrt[10]{\frac{638.3[0]}{550}}$ oe or M1 for $550 \times m^{10} = 638.3[0]$
2 (a) (i)	Triangle drawn, vertices (2, – 4), (2, – 5), (4, – 4)	2	SC1 for translation $\begin{pmatrix} 5 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ -2 \end{pmatrix}$ or correct points not joined
(ii)	Triangle drawn, vertices (– 3, 4), (– 3, 5), (– 1, 4)	2	SC1 for reflection in line $y = k$ or line $x = 1$ or correct points not joined
(iii)	Enlargement	1	
	[factor] 3	1	
	[centre] (– 6, – 5)	1	
(b) (i)	$\begin{pmatrix} 2 & 5 \\ 3 & 10 \end{pmatrix}$	1	

Page 3	Mark Scheme	Syllabus	Paper
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Question	Answer	Mark	Part marks
(ii)	$\begin{pmatrix} 10 & 14 \\ 18 & 24 \end{pmatrix}$ final answer	2	SC1 for one row or one column correct
(iii)	$\frac{1}{4}$ oe	3	M2 for $1 \times 4 - 2 \times 3 = 4 \times k - 3 \times 1$ or better or B1 for $1 \times 4 - 2 \times 3$ or $4 \times k - 3 \times 1$ seen
(c) (i)	Rotation	1	
	90° [anti-clockwise] oe	1	
	(0, 0) oe	1	
(ii)	$\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$	2	SC1 for one correct row or column
3 (a) (i)	400	1	
(ii)	350	1	
(iii)	70	1	
(iv)	170	2	B1 for 30 seen
(b) (i)	Mid-values 40, 80, 125, 200 soi	M1	
	Σfx with correct frequencies and x 's in correct intervals or on boundaries of correct intervals	M1	
	$\div 200$	M1(dep)	Dependent on second M1
	106 nfw	A1	SC2 for correct answer without working
(ii)	Correct histogram	4	B1 for correct widths and B1 for each rectangle of correct height at 0.8, 1.6, 1.6 (up to B3) After 0 scored, SC1 for 3 correct frequency densities seen
(iii)	$\frac{10712}{39800}$ oe isw	2	M1 for $\frac{104}{200} \times \frac{103}{199}$ oe
4 (a)	14 137 to 14 137.2 or 14 139	2	M1 for $\frac{4}{3} \times \pi \times 15^3$
(b) (i)	104 000 or 103 600 to 103 700	3	M2 for $\pi \times 25^2 \times 60 - 14140$ or M1 for $\pi \times 25^2 \times 60$

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Question	Answer	Mark	Part marks
(ii)	52.8 or 52.75 to 52.81...	2	M1 for <i>their</i> (b)(i) $\div (\pi \times 25^2)$ or $14\,140 \div (\pi \times 25^2)$
(c) (i)	15.8 or 15.81.....	3	M2 for $[r^2 =] \frac{14140}{\frac{1}{3} \times \pi \times 54}$ or M1 for $\frac{1}{3} \times \pi \times r^2 \times 54 = 14\,140$ oe
(ii)	3580 or 3576 to 3581 nfw	4	M1 for $(\text{their (c)(i)})^2 + 54^2$ M1 for $\pi \times (\text{their (c)(i)}) \times \sqrt{\{(\text{their (c)(i)})^2 + 54^2\}}$ M1 for $\pi \times (\text{their (c)(i)})^2$
5 (a)	9 10.5	1 1	
(b)	Fully correct curve	5	SC4 for correct curve, but branches joined B3 FT for 9 or 10 points plotted or B2 FT for 7 or 8 points plotted or B1 FT for 5 or 6 points plotted and B1 for two separate branches not touching or cutting y-axis
(c)	2.1 to 2.6 8.5 to 9	1 1	
(d)	2, 3, 5, 7	2	SC1 for correct 4 values and no more than one extra positive integer or $\pm 2, \pm 3, \pm 5, \pm 7$ or 3 correct values and no extras
(e)	(-2, -12)	1	
(f) (i)	$20 + x^2 = x^3$ $x^3 - x^2 - 20 = 0$	M1 A1	Multiplication by x No errors or omissions
(ii)	Fully correct curve $y = x^2$	2	SC1 for U – shaped parabola, vertex at origin
(iii)	2.5 to 3.5	1	
(iv)	3.[0] to 3.1 or FT their answer to (iii)	1FT	FT dep on (iii) > 0

Page 5	Mark Scheme	Syllabus	Paper
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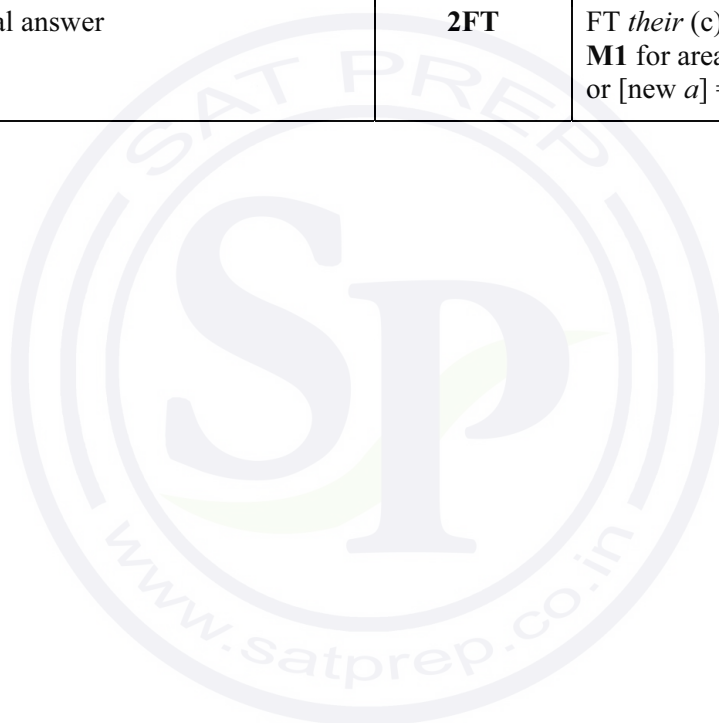
Question	Answer	Mark	Part marks
6	(a) (i)		
	$[y =] \frac{1}{2}(80 - 2x)$	M1	40 – x is enough
	$A = \text{their } \frac{1}{2}(80 - 2x) \times x$ oe	M1	
	$A = 40x - x^2$ and $x^2 - 40x + A = 0$	A1	No errors or omissions
	(ii)		
	$(x - 30)(x - 10)$	B2	B1 for $x(x - 30) - 10(x - 30) [= 0]$ or $x(x - 10) - 30(x - 10) [= 0]$ or SC1 for $(x + a)(x + b)$ where $ab = 300$ or $a + b = -40$
	30, 10	B1	
	(iii)		
	$\sqrt{(-40)^2 - 4(1)(200)}$ or better	B1	or for $(x - 20)^2$
	$p = -40$ and $r = 2(1)$	B1	Must see $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$ or both or for $20 \pm \sqrt{200}$
(b)	(i)		
	$\frac{200}{x} - \frac{200}{x + 10}$	B1	If B0 , SC1 for 5.9 or 5.857 to 5.858 and 34.1 or 34.14...
	$\frac{200(x + 10) - 200x}{x(x + 10)} = \frac{2000}{x(x + 10)}$	B1	or 5.86 and 34.14 seen in working or -5.86 and -34.14 as final answers
		M2	or M1 for $\frac{200}{x}$ or $\frac{200}{x + 10}$ soi
		A1	No errors or omissions
	(ii)		
	16 [min] 40 [s]	3	B2 for $0.2\dot{7}$ or 0.278 or 0.2777 to 0.2778 or $\frac{5}{18}$ [h] oe or $16.\dot{6}$ or 16.7 or 16.66 to 16.67 or $\frac{50}{3}$ [min] or M1 for $2000 \div 80(80 + 10)$ or $\frac{200}{80} - \frac{200}{90}$

Page 6	Mark Scheme	Syllabus	Paper
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Question	Answer	Mark	Part marks
7 (a) (i)	$\frac{1}{2} \mathbf{p}$	1	
	(ii) $\frac{1}{2} \mathbf{p} - \frac{1}{3} \mathbf{r}$	1	
	(iii) $\mathbf{p} + \frac{2}{3} \mathbf{r}$	1	
	(b) $\mathbf{r} + \frac{3}{2} \mathbf{p}$	2	M1 for correct unsimplified answer or for correct route or for recognising $\overline{\mathbf{OU}}$ as position vector
	(c) 6 nfw	3	B2 for $(2k)^2 + ([-]k)^2 = 180$ oe or M1 for $(2k)^2 + ([-]k)^2$ oe
8 (a)	2	2	M1 for $2x + 1 = 1 + 4$
	(b) 17	2	B1 for $[h(3) =] 8$ soi or $2 \times 2^x + 1$ oe
	(c) $\frac{x-1}{2}$ oe final answer	2	M1 for $y-1=2x$ or $\frac{y}{2} = x + \frac{1}{2}$ or $x = 2y + 1$
	(d) $4x^2 + 4x + 5$ final answer	3	M1 for $(2x+1)^2 + 4$ and B1 for $[(2x+1)^2 =] 4x^2 + 2x + 2x + 1$ or better
	(e) $\sqrt{2}$ or 1.41 or 1.414....	1	
	(f) -1	1	
9 (a) (i)	$-\frac{1}{2}x + 2$ oe	3	SC2 for $y = -\frac{1}{2}x + c$ oe or SC1 for $y = kx + 2$ oe, $k \neq 0$ or M1 for $[\text{gradient} =] \frac{-2}{4}$ and M1 for substituting (4, 0) or (0, 2) into $y = (\text{their } m)x + c$
	(ii) $\frac{16}{a^2} \left[+ \frac{0^{[2]}}{b^2} \right] = 1$ or $\frac{4^2}{a^2} \left[+ \frac{0^{[2]}}{b^2} \right] = 1$ and $a^{[2]} = 4^{[2]}$ $\left[\frac{0^{[2]}}{a^2} \right] + \frac{4}{b^2} = 1$ or $\left[\frac{0^{[2]}}{a^2} \right] + \frac{2^2}{b^2} = 1$ and $b^{[2]} = 2^{[2]}$	1 1	

Page 7	Mark Scheme	Syllabus	Paper
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Question	Answer	Mark	Part marks
(b) (i)	1.73 or 1.732.. or $\sqrt{3}$	3	M2 for $\frac{k^2}{4} = \frac{3}{4}$ or better or M1 for $\frac{2^2}{16} + \frac{k^2}{4} = 1$ oe
(ii)	81.8 or 81.78 to 81.79	3	M2 for $2 \times \tan^{-1}\left(\frac{\text{their}\sqrt{3}}{2}\right)$ oe or M1 for $\tan = \frac{\text{their}\sqrt{3}}{2}$ oe
(c) (i)	8π final answer	1	
(ii)	72π final answer	2FT	FT <i>their</i> (c)(i) $\times 9$ in terms of π M1 for area factor of 3^2 or 9 or [new a] = 12, [new b] = 6



MATHEMATICS

0580/42

Paper 4 (Extended)

May/June 2016

MARK SCHEME

Maximum Mark: 130

Published

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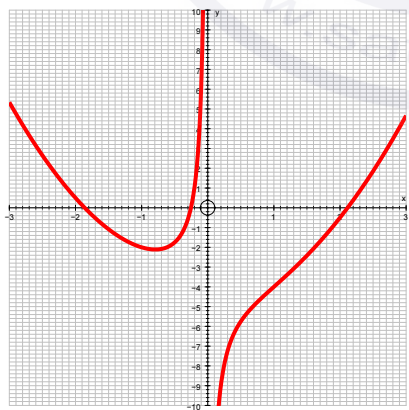
Page 2	Mark Scheme	Syllabus	Paper
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Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

Question	Answer	Mark	Part marks
1 (a) (i)	12 45 [pm]	2	B1 for 20 45 seen or 8 45 pm seen or [0]1 35 seen
	(ii) 788 or 787.8 to 788.1	2	M1 for $8800 \div 11$ h 10 mins oe
	(b) (i) 4230[.00]	2	M1 for $2350 \div 5$ oe
	(ii) 22.2 or 22.2...	1	
	(c) (i) 3808 final answer	2	M1 for $2240 \times \frac{100+70}{100}$ oe
	(ii) 800	3	M2 for $2240 \div \frac{100+180}{100}$ oe or M1 for 2240 associated with 280%
	(d) (i) 1130	4	M3 for $(826.5[0] - 12 \times (28 + 6.5[0])) \div 1.25$ seen or M2 for $826.5[0] - 12 \times (28 + 6.5[0])$ seen or M1 for $12 \times (28 + 6.5[0])$ seen
	(ii) \$146.9[0] final answer	2FT	FT <i>their</i> (d)(i) $\times 0.13$ correctly evaluated If answer not exact to at least 3 sf or better M1 for <i>their</i> (d)(i) $\div 10 \times 1.3$
2 (a) (i)	5	1	
	(ii) $\frac{1}{2}$ oe	1	
	(iii) $\frac{5}{3}$ oe	2	M1 for $2^{3x} = 2^5$ oe or better or SC1 for either denominator or numerator of index correct in final answer
	(iv) $-\frac{2}{3}$ oe	2	M1 for $3^{3x} = 3^{-2}$ oe or better or $\left(\frac{1}{3}\right)^{-3x} = \left(\frac{1}{3}\right)^2$ or better or SC1 for $\frac{2}{3}$ or any negative index

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Question	Answer	Mark	Part marks
(b)	$(y - 10)(y + 3)$ seen 10 and – 3 final answers	B2 B1	B1 for $y(y - 10) + 3(y - 10) [= 0]$ or $y(y + 3) - 10(y + 3) [= 0]$ or for $(y + a)(y + b) [= 0]$ where $ab = -30$ or $a + b = -7$ or for $y - 10 [= 0]$ and $y + 3 [= 0]$
3 (a) (i)	Image at (3, 1), (5, 1), (5, 4), (4, 4), (4, 2), (3, 2)	2	SC1 reflection in $y = 1$ or $x = k$ or 6 correct points not joined
(ii)	Image at (2, 1), (6, 1), (6, – 5), (4, – 5), (4, – 1), (2, – 1)	2	SC1 for other enlargement of scale factor –2, correct size and correct orientation or 6 correct points but not joined
(iii)	Image at (– 1, – 1), (– 2, – 1), (– 2, – 2), (– 4, – 2), (– 4, – 3), (– 1, – 3)	3	M2 for 6 correct points shown in working or plotted correctly but not joined or M1 for $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix} \begin{pmatrix} -1 & -1 & -2 & -2 & -3 & -3 \\ 1 & 2 & 2 & 4 & 4 & 1 \end{pmatrix}$ or for rotation 90° [anticlockwise] centre (0, 0) stated
(b)	Enlargement [sf] 3 origin oe	3	B1 for each
4 (a) (i)	$-2, -0.5$ or $-\frac{1}{2}$	2	B1 for each
(ii)	Complete correct curve 	5	SC4 for correct curves but branches joined or touching y-axis or B3FT 9 or 10 points or B2FT for 7 or 8 points or B1FT for 5 or 6 points and B1indep two separate branches not touching or crossing y-axis
(b)	– 1.95 to – 1.8 – 0.4 to – 0.2 2.05 to 2.2	3	B1 for each
(c)	Any integer k where $k \leq -3$	1	

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Question	Answer	Mark	Part marks
(d) (i)	Correct line $y = -5x - 2$ ruled and – 0.4 to – 0.2 0.55 to 0.75	4	M2 for correct ruled line or M1 for correct line but freehand or for ruled line gradient – 5 or ruled line y -intercept – 2, but not $y = -2$ and A1 for each correct solution dependent on at least M1 If 0 scored, SC1 for both correct with no line drawn
(ii)	$[a =] 5$ and $[b =] -2$	2	B1 for one correct value or M1 for $x^3 + 5x^2 - 2x - 1 = 0$ seen
5 (a)	0.05 oe	2	M1 for $1 - (0.2 + 0.3 + 0.45)$ oe
(b)	15	1	
(c) (i)	0.75 oe	2	M1 for $0.45 + 0.3$ oe
(ii)	0.135 oe	2	M1 for 0.45×0.3 oe
(iii)	0.12 oe	3	M2 for $2(0.3 \times 0.2)$ oe or M1 for 0.3×0.2 or 0.06 oe nfw
(d)	0.243 oe	5	M4 for $3(0.45 \times 0.45 \times 0.2) +$ $3(0.3 \times 0.3 \times 0.45)$ oe or M3 for $3(0.45 \times 0.45 \times 0.2)$ or $3(0.3 \times 0.3 \times 0.45)$ oe or M2 for $0.45 \times 0.45 \times 0.2$ and $0.3 \times 0.3 \times 0.45$ or M1 for $0.45 \times 0.45 \times 0.2$ or $0.3 \times 0.3 \times 0.45$ oe or for identifying the correct 6 outcomes e.g. 10 0 0, 0 0 10, 0 10 0, 5 5 0, 5 0 5, 0 5 5
6 (a)	3	1	
(b) (i)	9900	3	M2 for $2(60 \times 35) + 2(60 \times 30) + 2(30 \times 35)$ oe or M1 for one correct rectangle
(ii)	0.99 oe	1FT	FT <i>their</i> (b)(i) $\div 10\,000$

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Question	Answer	Mark	Part marks
(c) (i)	75.7 or 75.66 to 75.67	4	M3 for $\sqrt{60^2 + 30^2 + 35^2}$ oe could be in stages or M2 for $60^2 + 30^2 + 35^2$ oe or M1 for $60^2 + 30^2$ or $60^2 + 35^2$ or $35^2 + 30^2$ oe
(ii)	23.4 or 23.3 or 23.34 to 23.36...	3	M2 for $\sin^{-1}(30 \div \sqrt{60^2 + 35^2 + 30^2})$ oe or for $\sin^{-1}(30 \div \text{their (c)(i)})$ or M1 for $\sin = 30 \div \sqrt{60^2 + 35^2 + 30^2}$ oe or for $\sin = 30 \div \text{their (c)(i)}$
(d) (i)	$30 \times 35 \times 60 [= 63\,000]$	1	With no errors seen
(ii)	22.4 or 22.38 to 22.391	3	M2 for $\sqrt{\frac{63\,000}{40\pi}}$ oe or M1 for $40\pi r^2 = 63\,000$ oe
7 (a)	$360 - 210 [= 150]$ $(180 - 150) \div 2 [= 15]$ or $150 \div 2 [= 75]$ and $180 - 75 - 90 [= 15]$	M1 M1	
(b)	15.5 or 15.45 to 15.46 nfw	4	M3 for $2 \times 8 \cos 15$ oe or M2 for $8 \cos 15$ oe or M1 for $\frac{x}{8} = \cos 15$ oe
(c)	29.5 or 29.4 or 29.39 to 29.50..	3	M2 for $[\sin ABC =] \frac{8 \times \sin 72}{\text{their}(b)}$ or M1 for $\frac{\sin ABC}{8} = \frac{\sin 72}{\text{their}(b)}$ oe
(d)	194 or 193.7 to 194.1 nfw	6	M2 for $\frac{210}{360} \times \pi \times 8^2$ or M1 for $[k] \pi \times 8^2$ seen and M1 for $\frac{1}{2} \times 8^2 \times \sin 150$ oe and M2 for $\frac{1}{2} \times 8 \times \text{their (b)} \times \sin(108 - \text{their (c)})$ oe or B1 for $[\text{angle } CAB =] 108 - \text{their (c)}$
(e)	12.1 or 12.11 to 12.13	2FT	FT $\text{their (d)} \div 4^2$ oe M1 for 4^2 or $\left(\frac{1}{4}\right)^2$ soi

Page 7	Mark Scheme	Syllabus	Paper
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Question	Answer	Mark	Part marks
(b)	$[y =] 3x + 1$	3	B2 for answer $[y =]3x + c$ oe or answer $kx + 1$ ($k \neq 0$) or M1 for $\frac{13 - -5}{4 - -2}$ oe or 3 and M1 for correct substitution of $(-2, -5)$ or $(4, 13)$ into $y = (their\ m)x + c$ oe
(c)	$y = 3x - 5$ oe	2FT	FT <i>their</i> gradient from (b) M1 for $y = mx - 5$ with other m , $m \neq 0$ or $y = \{their\ gradient\ from\ (b)\}x + c$ If 0 scored, SC1 for answer $3x - 5$
(d)	$y = -\frac{1}{3}x + \frac{13}{3}$ oe isw	5	B2FT for $-\frac{1}{3}x + c$ (c can be numeric or algebraic) FT $-1/$ <i>their</i> gradient from (b) or M1 for $-1/$ <i>their</i> gradient from (b) soi and B1 for [midpoint of $AB =$] $(1, 4)$ and M1 for substitution of $(1, k)$ or $(k, 4)$ into a linear equation

MATHEMATICS**0580/43**

Paper 4 (Extended)

May/June 2016

MARK SCHEME

Maximum Mark: 130

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

Question	Answer	Mark	Part marks
1 (a) (i)	36 600	3	M2 for $6100 \div 2 \times (2 + 7 + 3)$ oe or M1 for $6100 \div 2$ soi
(ii)	$16\frac{2}{3}$ or 16.7 [16.66 to 16.67]	1	
(b)	1 231 708 final answer nfw	5	M4 for $5964 \times 15 + 28400 \times 35 + 8236 \times 18$ or M3 for 5964×15 and 28400×35 or for $5964 \times 15 + 42\,600 \times \text{their decimal } \frac{2}{3}$ $\times 35 + (42\,600 - 5964 - 42\,600 \times \text{their decimal } \frac{2}{3}) \times 18$ or M2 for 5964×15 or 28400×35 or for $42\,600 \times \text{their decimal } \frac{2}{3} \times 35$ or M1 for $0.14 \times 42\,600$ or $42\,600 \div 3 \times 2$
(c)	27.2[0] nfw	5	M2 for $23.80 \div 0.7$ oe or M1 for 23.80 associated with 70% oe and M2 for $\text{their } (23.80 \div 0.7) \times 0.8$ or M1 for $\text{their } (23.80 \div 0.7) \times 0.2$
2 (a)	$x > \frac{12}{5}$ oe final answer	2	B1 for $\frac{12}{5}$ oe in answer with incorrect or no sign or M1 for one correct step e.g. $5x > 9 + 3$
(b) (i)	$(y - 6)(x + 3)$ final answer	2	M1 for $y(x + 3) - 6(3 + x)$ or $x(y - 6) + 3(y - 6)$
(ii)	$8(x + 3y)(x - 3y)$ final answer	3	M2 for $2(2x + 6y)(2x - 6y)$ or $(8x + 24y)(x - 3y)$ or $(8x - 24y)(x + 3y)$ or $4(2x - 6y)(x + 3y)$ or $4(2x + 6y)(x - 3y)$ or $(4x - 12y)(2x + 6y)$ or $(4x + 12y)(2x - 6y)$ or M1 for $8(x^2 - 9y^2)$ or $(x + 3y)(x - 3y)$

Page 3	Mark Scheme	Syllabus	Paper
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Question	Answer	Mark	Part marks
(c)	$r = \frac{1}{p+7}$ final answer nfw	4	M1 removes fraction correctly M1 collects terms in r M1 removes r as a factor from their terms in r M1dep divides by bracket to leave r and denominator simplified
3 (a) (i)	10	1	
(ii)	–3.4 to –3.3 and –0.4 to –0.3 and 1.6 to 1.7	3	B1 for each
(iii)	$y = -2.3$ to -2.1 oe $y = 10$ to 10.1 oe	2	B1 for each
(b) (i)	2, –1, 4	3	B1 for each
(ii)	Fully correct curve drawn	4	SC3 for correct curves but branches joined or touching y -axis or B2FT for 8 or 9 correct plots or B1FT for 6 or 7 correct plots and B1 indep for two separate branches not touching or crossing y -axis
(iii)	–3.4 to –3.2 and 1.8 to 1.9	2	B1 for each
(c)	3.2 oe	2FT	FT 2 ÷ <i>their</i> (a)(i) + 3 M1 for $f(-2) = 10$ or <i>their</i> (a)(i) used
(d)	1	1	
4 (a) (i)	0.0025 or $\frac{1}{400}$ oe	2	M1 for 0.05^2 oe
(ii)	0.9975 or $\frac{399}{400}$ oe	1FT	FT for $1 - (\text{their (a)(i)})$ oe
(b)	0.171 or 0.1714 to 0.1715 or $\frac{6859}{40\,000}$	3	M2 for $4(0.05 \times 0.95^3)$ oe M1 for 0.05×0.95^3 oe seen or for the 4 combinations correctly identified

Page 4	Mark Scheme	Syllabus	Paper
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Question	Answer	Mark	Part marks
(c)	376 nfw	4	M1 for midpoints soi (condone 1 error or omission) (225, 275, 325, 375, 425, 475) and M1 for use of Σfx with x in correct interval including both boundaries (condone 1 further error or omission) and M1 (dependent on second M) for $\Sigma fx \div 200$
(d) (i)	16	1	
(ii)	33	2	M1 for $0.8 \times 50 + 0.26 \times 100$
5 (a) (i)	275	2	M1 for $360 - 40 - 45$ oe
(ii)	095	2FT	FT <i>their</i> (a) – 180 M1 for <i>their</i> (a) – 180 oe or $180 - 40 - 45$
(b)	464.66 to 464.67 [= 464.7]	4	M2 for $510^2 + 720^2 - 2 \times 510 \times 720 \cos 40$ or M1 for correct implicit equation A1 for 215 900 to 215 920
(c)	44.9 or 44.86 to 44.87...	3	M2 for $\frac{510 \sin(40)}{464.7}$ or M1 for correct implicit equation
6 (a) (i)	Correct image (2, –5) (4, –5) (4, –1)	2	SC1 for reflection in $y = 0$ or 3 correct points not joined
(ii)	Correct image (–2, 1) (–6, 1) (–6, –1)	2	SC1 for rotation 90 clockwise any centre or 3 correct points not joined
(iii)	Translation by $\begin{pmatrix} 1 \\ 9 \end{pmatrix}$	2	B1 for each
(iv)	Enlargement [SF] – $\frac{1}{2}$ oe [Centre] (2, 1)	1 1 1	
(b) (i)	$\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$	2	B1 for one correct row or column but not the identity matrix
(ii)	Reflection $x = 0$ oe	1 1	

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Question	Answer	Mark	Part marks
7 (a) (i)	$\frac{12}{x-1} - \frac{10}{x} = 0.5$ oe $12x - 10(x-1) = 0.5x(x-1)$ or better Brackets expanded $x^2 - 5x - 20 = 0$ with no errors or omissions seen	M2 M1 A1	M1 for $\frac{12}{x-1}$ or $\frac{10}{x}$ FT $\frac{10}{x} - \frac{12}{x-1} = 0.5$ only Dep on M3 and brackets expanded
(ii)	$\sqrt{(-5)^2 - 4(1)(-20)}$ or better $p = -(-5), r = 2(1)$ or better – 2.62, 7.62 final answers	B1 B1 B1B1	Seen anywhere or $(x - \frac{5}{2})^2$ oe Must be in the form $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$ or for $\frac{5}{2} + \sqrt{\left(\frac{5}{2}\right)^2 + 20}$ or $\frac{5}{2} - \sqrt{\left(\frac{5}{2}\right)^2 + 20}$ SC1 for – 2.6 or – 2.623 to – 2.624 and 7.6 or 7.623 to 7.624 or – 2.62 and 7.62 seen in working or answers 2.62 and – 7.62
(iii)	1 [hr] 49 [mins]	2FT	FT $12 \div (\text{their +ve root} - 1)$ or $0.5 + 10 \div (\text{their } 7.62)$ in hrs and mins, rounded to nearest min M1 for $12 \div (\text{their +ve root} - 1)$ or $0.5 + 10 \div (\text{their } 7.62)$
(b) (i)	2.5	1	
(ii)	1312.5 final answer	3	M2 for any complete correct method e.g $25 \times 10 \div 2 + 45 \times 25 + 5 \times 25 \div 2$ M1 for any correct method for a relevant area under the graph
8 (a) (i)	Not possible	1	
(ii)	$\begin{pmatrix} 4 & 0 \\ -2 & 10 \\ 6 & -8 \end{pmatrix}$ final answer	1	
(iii)	$\begin{pmatrix} 14 & 35 \\ -8 & -20 \end{pmatrix}$ final answer	2	M1 for one correct column or row
(iv)	(–6) final answer	2	M1 for $14 - 20$
(v)	$\begin{pmatrix} -2 & 18 \\ -6 & 22 \end{pmatrix}$ final answer	2	M1 for one correct column or row

Page 6	Mark Scheme	Syllabus	Paper
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Question	Answer	Mark	Part marks
(b)	$\frac{1}{8}\begin{pmatrix} 5 & -3 \\ 1 & 1 \end{pmatrix}$ or better isw	2	B1 for $k\begin{pmatrix} 5 & -3 \\ 1 & 1 \end{pmatrix}$ seen or implied, $k \neq 0$ or $\frac{1}{8}\begin{pmatrix} a & b \\ c & d \end{pmatrix}$ seen
9 (a)	270 or 270.17 to 270.22	3	M2 for $\frac{360-145}{360} \times \pi 12^2$ oe or B1 for 215 seen or M1 for $\frac{\theta}{360} \times \pi 12^2$ used
(b)	518 or 517.6 to 517.8 nfw	6	B4 for vertical height = 9.62 to 9.63 or B3 for radius = 7.166 to 7.17 or B2 for length of sector = 45.[0] or 45.02 to 45.04 or M1 for $\frac{360-145}{360} \times 2 \times \pi \times 12$ oe or for $\sqrt{12^2 - \text{their radius}^2}$ and M1 indep for $\frac{1}{3} \pi \times \text{their radius}^2 \times \text{their } h$ ($h \neq 12$ or $r \neq 12$)
10 (a)	10 15 15 21 35 48	6	B1 for each correct entry
(b) (i)	3	2	M1 for any correct substitution in $n^2 + 4n + p$ = number of tiles eg $2^2 + 4(2) + p = 15$
(ii)	143	1FT	FT 140 + their (b)(i)
(c)	$a = \frac{1}{2}$ oe $b = \frac{3}{2}$ oe nfw	5	B1 for a correct simplified equation e.g. $a + b + 1 = 3$, $4a + 2b + 1 = 6$, $9a + 3b + 1 = 10$ etc B1 for a 2 nd correct simplified equation M1 for correctly eliminating one variable for their equations in a and b A1 for $a = \frac{1}{2}$ nfw A1 for $b = \frac{3}{2}$ nfw

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Question	Answer	Mark	Part marks
(d) (i)	171	2FT	FT <i>their</i> $a \times 17^2 + \text{their } b \times 17 + 1$ M1 for <i>their</i> $a \times 17^2 + \text{their } b \times 17 + 1$
(ii)	673	1FT	FT <i>their</i> (d)(i) $\times 4 - 11$



CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International General Certificate of Secondary Education

MARK SCHEME for the March 2016 series

0580 MATHEMATICS

0580/42

Paper 4 (Extended), maximum raw mark 130

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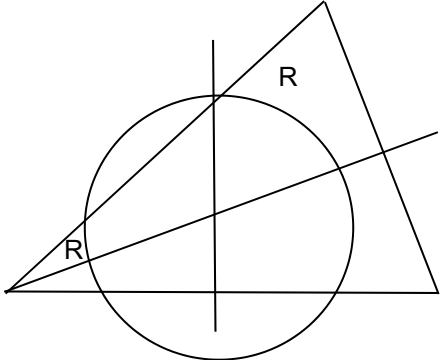
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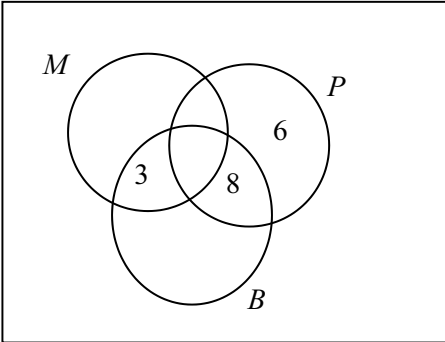
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Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

Qu.	Answers	Mark	Part Marks
1	(a) $\frac{8}{8+15+9} \times 640$ oe	1	With no errors seen
	(b) 300 and 180	2	B1 for each or SC1 for answers reversed
	(c) 10 nfw	2	M1 for $160 \div 15.25$ implied by 10.5 or 10.49... nfw
	(d) $\frac{7}{24}$	3	M1 for $\frac{3}{8} + \frac{1}{3}$ oe M1dep on previous M1 for $1 - \text{their} (\frac{3}{8} + \frac{1}{3})$ oe
2	(a) Correct perpendicular bisector of <i>AB</i> with 2 pairs of correct arcs isw	2	B1 for accurate with no/wrong arcs or M1 for correct intersecting arcs with no or wrong line
	(b) Correct angle bisector at <i>A</i> with two pairs of correct arcs isw	2	B1 for accurate with no/wrong arcs or M1 for two pairs of correct arcs with no or wrong line
	(c) Circle centre <i>E</i> radius 5 cm isw	2FT	FT circle centre <i>their E</i> radius 5 cm provided (a) and (b) attempted M1 for $250 \div 50$ oe soi e.g. from arc If 0 scored SC1 for circle centre <i>their E</i>
	(d) 	2	cao B1 for each If 0 scored, SC1 for two 'correct' regions but in part (c), centre correct but radius incorrect

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Qu.	Answers	Mark	Part Marks
3 (a) (i)		3	B1 for each
(ii)	46	1FT	FT 29 + <i>their</i> 3 values from (a)
(iii)	11	1	
(iv)	$\frac{7}{19}$ oe	2	M1 for $\frac{n}{16 + \text{their } 3}$ ($0 < n < (16 + \text{their } 3)$) or $\frac{4 + \text{their } 3}{k}$ ($k > (4 + \text{their } 3)$)
(b) (i)	$\frac{9}{200}$ or 0.045	1	
(ii)	10800	3	M2 for $\frac{1}{2} (900 + 1500) \times 9$ oe or M1 for method of finding a relevant area
(iii)	7.2	1FT	FT (<i>their</i> 10800) \div 1500
4 (a) (i)	64	1	
(ii)	16 to 16.5	2	M1 for UQ = 71 to 71.5 or LQ = 55
(iii)	62	2	B1 for 24 indicated
(iv)	6	2	B1 for 54 seen
(b)	[8] 12 23 11 [4] 2	3	B2 for 1 incorrect reading FT others B1 for 2 correct
(c)	Blocks of height 0.6 2.3 1.1 0.4 with correct widths	4FT	FT <i>their</i> (b) for heights B1FT for each correct block If B0, SC1 for blocks of widths 20, 10, 10, 10 or for <i>their</i> correct frequency densities
5 (a)	6250	3	M2 for $\frac{6000}{100 - 4} \times 100$ oe or M1 for 6000 associated with 96 [%]
(b)	4441	3	B2 for 4441.1 to 4441.2 or 4440 or M1 for $\frac{6000}{1.351}$

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Qu.	Answers	Mark	Part Marks
(c)	1.58 or 1.581...	5	M1 for $6000 \times \left(1 + \frac{1.5}{100}\right)^8$ oe A1 for 6758.95..... or 6758.96 to 3 sf or better or 758.95 or 758.96 rounded or truncated to 3 sf and M2 for $\{their(6000 \times 1.015^8) - 6000\} \times \frac{100}{6000 \times 8}$ oe or M1 for $\frac{6000 \times r \times 8}{100}$ oe
6 (a) (i)	Rotation	1	
	90° [anticlockwise] oe	1	
	(4, 4)	1	
(ii)	Enlargement	1	
	[centre] (5, 1)	1	
	[scale factor] 2	1	
(b) (i)	Image at (–2, 5) (–2, 7) (–1, 7)	2	B1 for translation by $\begin{pmatrix} -5 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 3 \end{pmatrix}$
(ii)	Image at (–2, 1) (–2, –1) (–1, –1)	2FT	FT <i>their</i> triangle <i>P</i> reflected in line $y = 3$ B1 for reflection of triangle P in the line $x = 3$ or $y = k$
(c)	Image at (–2, 3) (–4, 3) (–4, 4)	3	B2 for 2 vertices correct in triangle or 3 correct co-ordinates soi in working or B1 for 1 vertex in triangle correct soi or M1 for $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix} \begin{pmatrix} 3 & 3 & 4 \\ 2 & 4 & 4 \end{pmatrix}$ shown or statement rotation 90° [anticlockwise] about (0, 0)
7 (a)	3.5[0] 1.94 3.11	3	B1 for each
(b)	Fully correct curve	5	B3 FT for 10 or 11 points or B2 FT for 8 or 9 points or B1 FT for 6 or 7 points B1 indep two separate branches not touching or cutting <i>y</i> -axis SC4 for correct curve, but branches joined
(c)	– 0.7 to – 0.6	1	

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Qu.	Answers	Mark	Part Marks
(d) (i)	– 1 2.5	1 1	If 0,0, M1 for $y = 2.5 - x$ oe seen in working
(ii)	– 0.6 to – 0.5 with correct ruled line	3	B2FT for drawing <i>their</i> ruled line from (d)(i) or M1 for ruled line through (0, 2.5)FT or gradient –1 FT
(e)	Correct tangent and $0.5 \leq \text{grad} \leq 0.85$	3	B2 for close attempt at tangent at $x = 2$ and answer in range OR B1 for ruled tangent at $x = 2$, no daylight at $x = 2$ Consider point of contact as midpoint between two vertices of daylight, the midpoint must be between $x = 1.8$ and 2.2 and M1 (dep on B1 or close attempt at tangent [at any point] for $\frac{\text{rise}}{\text{run}}$
8 (a)	15 nfw	3	M1 for $y = k\sqrt{(x+2)}$ oe A1 for $k = 3$
(b)	$\frac{x+6}{x-2}$ nfw final answer	5	B2 for $(x+6)^2$ oe or SC1 for $(x+a)(x+b)$ where $ab = 36$ or $a + b = 12$ or $x(x+6) + 6(x+6)$ B2 for $(x-2)(x+6)$ or SC1 for $(x+a)(x+b)$ where $ab = -12$ or $a + b = 4$ or $x(x+6) - 2(x+6)$ or $x(x-2) + 6(x-2)$
(c)	$\frac{X}{W^2+1}$ nfw final answer	5	M1 for $W^2 = \frac{X-a}{a}$ or $W\sqrt{a} = \sqrt{X-a}$ M1 for next productive step M1 for 2nd productive step M1 for 3rd productive step M1 for final step leading to $a =$
(d)	$\frac{-7x-1}{x^2-1}$ or $\frac{-7x-1}{(x-1)(x+1)}$ final answer	5	M1 for common denominator $(x-1)(x+1)$ isw M1 for $(x-2)(x-1) - (x+3)(x+1)$ B2 for $x^2 - 2x - x + 2 - (x^2 + 3x + x + 3)$ oe or B1 for either expansion

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Qu.	Answers	Mark	Part Marks
9	(a) (i) y	1	
	(ii) $x + y$	1	
	(iii) $x + 2y$	2	M1 for a correct unsimplified route or identifying \overline{OS}
	(b) $-(\frac{1}{2}x + y)$ oe	2	M1 for a correct unsimplified route or $\overline{GR} = -\frac{1}{2}x$ or $\overline{RG} = \frac{1}{2}x$
	(c) (i) $\overline{MG} = 2x + 2y$	2	M1 for a correct unsimplified route e.g. $2\overline{PQ}$
	(ii) $\overline{MH} = x + y$ or $\overline{HG} = x + y$	M1	Accept $\overline{HM} = -x - y$ or $\overline{GH} = -x - y$
	$\overline{MG} = 2\overline{MH}$ oe	A1	Dep on (c)(i) correct, arrows essential
10	(a) 5.2[0] or 5.196...	3	M2 for $[h^2=] 6^2 - 3^2$ or better or M1 for $h^2 + 3^2 = 6^2$ or B1 for PR (or PQ or QR) = 6
	(b) (i) 7.2[0] or 7.196...	1FT	FT their (a) + 2
	(ii) 62.4 or 62.35...	5	M4 for $12 \times 6 \times \frac{1}{2} \tan 60$ oe or M3 for $6 \times \frac{1}{2} \tan 60$ oe or M2 for realising that $\frac{1}{2} \text{ base} = 1 \times \tan 60$ oe or B1 for angle 30 or 60 in correct position on diagram or in a calculation If 0 scored, SC1 for volume = an area $\times 12$ seen
11	(a) (i) 11	1	
	(ii) $14x + 3$ final answer	1	
	(b) $17 - 21x$ final answer	2	M1 for $7(2 - 3x) + 3$ oe
	(c) $-\frac{1}{9}$	3	M1 for $3(2 - 3x) = 7$ oe M1 for correct first step
	(d) -1.3	3	M1 for $2 - 3(x + 4) - (7x + 3) = 0$ M1 for $-10x - 13 = 0$ oe If 0 scored, SC1 for answer -0.7 oe after $2 - 3(x + 4) - 7x + 3 = 0$ shown previously

CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International General Certificate of Secondary Education

MARK SCHEME for the October/November 2015 series

0580 MATHEMATICS

0580/41

Paper 4 (Extended), maximum raw mark 130

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Question	Answer	Mark	Part marks
1 (a)	6	3	B2 for $5\frac{1}{4}$ or 5.25 shown in working isw or M1 for $\frac{3}{4} \times 7$ soi by answer 5
(b)	21.45 cao final answer	2	M1 for 17.16×0.25 or 17.16×1.25
(c)	16.5[0] nfw	3	M2 for $17.16 \div 1.04$ oe or M1 for 17.16 associated with 104[%] oe isw
(d)	1.34 cao final answer	2	M1 for $13.32 \div 0.72$ soi by 18.5[0] or for any correct complete longer method If zero scored, SC1 for 0.96 [euros] seen
(e) (i)	750	1	
(ii)	4.7 cao	3	B2 for 4.658 to 4.66 or M2 for $\sqrt{\text{their (e)(i)} \div 11\pi}$ or M1 for $11\pi^2 = \text{their (e)(i)}$
(iii)	6	2	M1 for 2^3 or $\frac{1}{2^3}$ oe seen or for $\pi \times (2 \times \text{their (e)(ii)})^2 \times 22$ If zero scored, SC1 for answer 6 000
(f)	8 950	1	
(g)	210	2	M1 for $0.07 \times 3\,000$
(h)	160 000	3	M2 for $2 \times 60 \times 100^3 \div 750$ oe or M1 for figs 16 as answer or 100^3 seen
2 (a)	1.62 or 1.62...	1	
(b) (i)	7	1	
(ii)	4	1	
(iii)	7	1	
(iv)	$\frac{1}{3}$ oe	1	

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Qu	Answers	Mark	Part Marks
(c) (i)	0.25 oe and 1	2	B1 for each
(ii)	Correct curve	4	B3FT for 6 or 7 correct plots or B2FT for 4 or 5 correct plots or B1FT for 2 or 3 correct plots
(iii)	2.3	1FT	Correct or FT where $y = 5$ on <i>their</i> graph
(iv)	$y = 3x - 1$ oe 3 term equation	3	B2 for $3x - 1$ or $y = 3x [+ c]$ oe or for $m = 3$ and $c = -1$ or M1 for [gradient =] $\frac{8-2}{3-1}$ oe soi by $3x$ and M1 for substitution of (1, 2) or (3, 8) into <i>their</i> $y = mx + c$
(v)	-1.7 to -1.5 and 2	2	B1 for either or M1 for $y = x + 2$ seen or drawn
3 (a) (i)	25.4 or 25.35... nfw	5	M2 for $\sqrt{60^2 - 50^2}$ oe soi by 33.1 to 33.2 or M1 for $TB^2 + 50^2 = 60^2$ oe and M2 for $\tan = \frac{\text{their}TB}{70}$ oe or B1 for recognising angle TCB as required angle
(ii)	109 or 109.0 to 109.1	4	M2 for $50^2 + 70^2 - 2 \times 50 \times 70 \times \cos 130$ M1 for implicit cos rule A1 for 11 899 to 11 900
(iii)	1 340 or 1 340.0 to 1 341	2	M1 for $\frac{1}{2} \times 50 \times 70 \times \sin 130$ oe
(b)	51.5 or 51.50 to 51.51	4	M3 for $[XY] = \sqrt{45^2 + 22^2 + 12^2}$ or M2 for $[XY^2 =] 45^2 + 22^2 + 12^2$ soi by 2 653 or M1 for $45^2 + 22^2$ oe or $45^2 + 12^2$ oe or $12^2 + 22^2$ oe

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Qu	Answers	Mark	Part Marks
4	(a) (i)		Condone $5 \leq x \leq 15$ Condone $0 < y \leq 8$
		4	B1 for each – 1 for first occurrence of strict inequalities used in first 3 inequalities
	(ii)	1 1 1 1	Allow $y = x + 1$ ruled only after $y \geq x + 1$ in (a)(i)
	(b)	1dep 2	Dependent on all marks for lines earned Accept R written in correct quadrilateral or any other unambiguous indication or accept in triangle if $y = x + 1$ used and all marks for lines earned B1 for (7, 8) chosen or M1 for a calculation shown of the form $6x + 4.5y$ where (x, y) is clearly in <i>their</i> region and both x and y are integers
5	(a)	1 1dep	Dependent on 37 or [angle] BAD
	(b)	1 1dep	Dependent on 2×37 or $2 [\times \text{angle}] BAD$ or $2 [\times \text{angle}] BED$ Must use the terms circumference, centre and angle
	(c)	1 1dep	Dependent on $180 - 37$ or $180 - [\text{angle}] BAD$ or $180 - [\text{angle}] BED$

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Qu	Answers	Mark	Part Marks
6 (a)	1.35 nfw	4	M1 for 0.5, 1.5, 2.5, 3.5, 4.5, 5.5 soi, M1 for Σfm soi by 162 where m is in correct interval including boundaries M1dep for $\Sigma fm \div 120$ or $\Sigma fm \div \Sigma f$ dependent on second M1 earned
(b) (i)	93, 102, 113, 118	2	SC1FT for 1 error
(ii)	Correct diagram	3	B1FT for correct vertical plots and B1 for correct horizontal plots and B1FT dep on at least B1 for reasonable <u>increasing</u> curve or polygon through <i>their</i> 6 points If zero scored, SC1FT for 5 out of 6 correct plots
(iii) (a)	0.6 to 0.85	1	
(b)	1.3 to 1.7	2	B1 for UQ = 1.7 to 1.9 or LQ = 0.2 to 0.4
(c)	0.3 to 0.6	2FT	Allow in correct range provided there is no evidence of reading at 35 or FT <i>their</i> reading at 42 B1 for 42 soi
(c) (i)	30 and 18	2	B1 for each
(ii)	0.75 and 0.3	3FT	FT (<i>their</i> 30) \div 40 and (<i>their</i> 18) \div 60 B2FT for either 0.75 or 0.3 or M1 for <i>their</i> 30 \div 2 or \div 20 or for <i>their</i> 18 \div 3 or \div 20
7 (a)	123 to 127	1	
(b)	288 to 292	1	
(c)	[1:] 1000000	1	

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Qu	Answers	Mark	Part Marks
(d)	Correct ruled perpendicular bisector of CB with correct arcs	2	B1 for correct perpendicular bisector without/wrong arcs
	Correct two pairs of arcs		
	Correct ruled bisector of angle ACB with correct pair of arcs	2	B1 for correct bisector of angle ACB without/wrong arcs
	Ruled line parallel to CB in triangle	1	Provided this line is not the perpendicular bisector of AC
	1.3 to 1.7 cm from CB in triangle	1	
(e)	Correct region indicated	1dep	Dependent on at least B1,B1,1,1 earned
	40	2	M1 for 0.4×10^2 oe
8 (a)	$(x - 5)(x + 2)$ final answer	2	B1 for $(x - 5)(x + 2)$ seen and then spoiled or M1 for $(x + a)(x + b)$ where $a + b = -3$ or $ab = -10$ [a, b integers]
(b) (i)	$x(x + 2) + 3(x + 1) = 3x(x + 1)$ or $x^2 + 2x + 3x + 3 = 3x^2 + 3x$	M2	M1 for $x(x + 2) + 3(x + 1)$ or better seen Allow recovery of omitted brackets for M marks but not A mark
	$0 = 2x^2 - 2x - 3$	A1	Brackets expanded correctly and/or no errors or omission of brackets seen
(ii)	$\frac{[-]2 \pm \sqrt{([-]2)^2 - 4(2)(-3)}}{2(2)}$	B2	B1 for $\sqrt{([-]2)^2 - 4(2)(-3)}$ or $\sqrt{28}$ or $\sqrt{1.75}$ oe in completion of square
	or $0.5 \pm \sqrt{1.75}$		and B1 for in form $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$, $p = -2$ and $r = 2(2)$ or better or $(x - 0.5)^2$ oe in completion of square
	- 0.823 and 1.823 final answer	B1 B1	If B0B0 for answers, SC1 for - 0.82 or - 0.822... and 1.82 or 1.822.. as final answers or - 0.823 and 1.823 seen or -1.823 and 0.823 as final answers

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Qu	Answers	Mark	Part Marks
(c)	$\frac{x^2 + 3x + 3}{(x + 2)(x + 1)}$ or $\frac{x^2 + 3x + 3}{x^2 + 3x + 2}$ final answer nfw	4	<p>M1 for $(2x + 3)(x + 1) - x(x + 2)$ oe isw</p> <p>B1 for common denominator $= (x + 2)(x + 1)$ isw or $x^2 + 3x + 2$ isw</p> <p>B1 for $2x^2 + 2x + 3x + 3$ or better or $-x^2 - 2x$ or $x^2 + 3x + 3$</p>
9 (a) (i)	16	1	
(ii)	n^2	1	
(b) (i)	43	1	
(ii)	7	1	
(c)	$a = \frac{5}{2}$ oe, $b = \frac{5}{6}$ oe with supporting working	6	<p>M1 for any correct substitution eg $\frac{2}{3}(2)^3 + 2^2a + 2b$</p> <p>A1 for one of eg $\frac{2}{3} + a + b = 4$ or better eg $\frac{16}{3} + 4a + 2b = 17$ or better eg $\frac{54}{3} + 9a + 3b = 43$ or better</p> <p>A1 for another of eg $\frac{2}{3} + a + b = 4$ or better eg $\frac{16}{3} + 4a + 2b = 17$ or better eg $\frac{54}{3} + 9a + 3b = 43$ or better</p> <p>M1 for correctly eliminating one variable from two of <i>their</i> equations in a and b</p> <p>A1 for $a = \frac{5}{2}$ oe</p> <p>A1 for $b = \frac{5}{6}$ oe</p> <p>After zero scored, SC2 for 2 correct answers without supporting working or SC1 for 2 of 17, 43, 86, 150, 239 seen</p>

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Qu	Answers	Mark	Part Marks
10 (a)	$\mathbf{b - a}$ or $-\mathbf{a + b}$	1	
(b)	$\frac{4}{5}\mathbf{b} - \frac{3}{10}\mathbf{a}$ or $\frac{1}{10}(8\mathbf{b} - 3\mathbf{a})$	4	<p>B3 for correct unsimplified expression in a and b</p> <p>or</p> <p>M1 for $\vec{XA} + \vec{AC} + \vec{CM}$ or $\vec{XB} + \vec{BM}$</p> <p>or $-\frac{1}{5}(\text{their } \mathbf{a}) + \mathbf{b} - \frac{1}{2}\mathbf{a}$</p> <p>or $\frac{4}{5}(\text{their } \mathbf{a}) + \frac{1}{2}\mathbf{a}$</p> <p>and M1 indep for $\pm\frac{1}{5}$ oe or $\pm\frac{4}{5}$ oe used</p> <p>After zero scored, SC2 for answer $\frac{1}{4}(3\mathbf{b} - \mathbf{a})$ or $\frac{3}{4}\mathbf{b} - \frac{1}{4}\mathbf{a}$</p>

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Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Mark	Part marks
1 (a) (i)	$\frac{512}{7+11+14} \times 14$	M2	or M1 for $\frac{512}{7+11+14}$
(ii)	112	1	
(b)	10 100	2	M1 for 224×45 soi by 10080
(c)	19	2	M1 for $224 \div 12$ soi by 18.66 to 18.67 or 18.7 or $18\frac{2}{3}$
(d) (i)	4093000	1	
(ii)	4.093×10^6	1FT	FT <i>their</i> (d)(i)
(e)	198 or 198.1 to 198.2	3	M2 for $\frac{8.2-2.75}{2.75} \times 100$ oe or M1 for $\frac{8.2}{2.75} \times 100$ or $\frac{8.2-2.75}{2.75}$
2 (a)	0 4 0.625 0.875	1,1,1,1	
(b)	Fully correct smooth curve	4	B3 FT for 8 or 9 points or B2 FT for 6 or 7 points or B1 FT for 4 or 5 points
(c)	line $y = x + 1$ ruled and 0.2 to 0.3 and 1.8 to 1.95	3	Line must be fit for purpose ie at least from $x = 0$ to $x = 2$ B2 for correct line and 1 correct value or B1 for correct line or SC1 for no/wrong line and 2 correct values

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	(d)	Tangent ruled at $x = -1.5$	B1	No daylight between tangent and curve at point of contact. Consider point of contact as midpoint between two vertices of daylight, the midpoint must be between $x = -1.6$ and $x = -1.4$
		2.2 to 5	2	dep on B1 M1 for $\frac{\text{rise}}{\text{run}}$ also dep on any tangent drawn or close attempt at tangent at any point Must see correct or implied calculation from a drawn tangent
3	(a)	Correct diagram	3	B1 for correct vertical plots and B1 for correct horizontal plots and B1 dep on at least B1 for reasonable <u>increasing</u> curve or polygon through <i>their</i> 6 points If zero scored, SC1 for 5 out of 6 correct plots
	(b) (i)	32 to 34	1	
	(ii)	120 – reading at $r = 50$	2FT	B1FT for reading at $r = 50$ seen
	(c)	8 18 27	2	B1 for 2 correct
	(d)	35.2 or $35\frac{1}{6}$ or 35.16 to 35.17 nfw	4	M1 for mid-values soi M1 FT for $\sum fx$ with x in the correct interval including boundaries M1dep for $\sum fx \div 120$ dependent on second M1 earned
	(e)	1.6 1.35 0.3	4FT	FT from (c) <i>their</i> $8 \div 5$ and <i>their</i> $27 \div 20$ B3FT for any 2 correct or B2FT for first or second answer correct or B1 for 0.3 only
4	(a)	1.6[0] or 1.601 to 1.602	3	M2 for $\frac{0.6}{\cos 68}$ oe or M1 for $\cos 68 = \frac{0.6}{AC}$
	(b)	43.5 or 43.6 or 43.49 to 43.56	4	M2 for $\frac{1.9^2 + 2.3^2 - \text{their } 1.6^2}{2 \times 1.9 \times 2.3}$ or M1 for implicit statement A1 for $[\cos =]$ 0.724 to 0.726

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(c)	1.33 or 1.332...nfww	4	<p>M2 for $\sqrt{2.3^2 - \left(\frac{1}{2} \times 1.2\right)^2}$ or M1 for $2.3^2 = h^2 + (0.5 \times 1.2)^2$</p> <p>and M1 for $\frac{1}{2} \times 1.2 \times \text{their } 2.22$ (<i>their 2.22</i> must come from attempt at Pythag or from trig in triangle <i>BCD</i>)</p>
(d)	41.1 or 41.13 to 41.14	3	<p>M2 for $\sin = \frac{1.25}{1.9}$ oe or M1 for correct angle identified</p>
5 (a) (i)	$4x(3x+13) - 2x(4x - \{3x-9\}) = 24$ oe $12x^2 + 52x - 2x^2 - 18x$ $5x^2 + 17x - 12 = 0$	<p>M1</p> <p>M1</p> <p>A1</p>	<p>Correct removal of all <i>their</i> brackets Dep on two areas added or subtracted</p> <p>with no errors or omissions seen and at least one more line of working showing collection of like terms or division by 2</p>
(ii)	$(5x-3)(x+4) [= 0]$ $\frac{3}{5}$ oe, -4	<p>M2</p> <p>A1</p>	<p>M1 for $(5x+a)(x+b)$ where $ab = -12$ or $5b+a=17$ [a, b integers]</p> <p>If zero scored SC1 for correct answers with no working or from other methods.</p>
(b)	<p>For correctly eliminating one variable</p> <p>$x = 3$ $y = -7$</p>	<p>M1</p> <p>A1</p> <p>A1</p>	<p>SC1 if no working shown, but 2 correct answers given If zero scored SC1 for 2 values satisfying one of the original equations</p>
(c)	$t = -2$ nfww	5	<p>M1 for $2(t+3)(t+3) - t^2$ or better seen M1 for denominator[s] $t(t+3)$ isw or for $t(t+3)$ isw on RHS M1dep for $2t^2 + 12t + 18 - t^2 = t^2 + 3t$ oe dependent on both numerators and denominator expanding to give quadratics A1 for $9t + 18 = 0$ oe</p>

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6	(a) (i)	43	1	
	(ii)	62	1	
		Isosceles triangle or OYZ is isosceles	1	
		Angle at centre is twice angle at circumference	1	
	(iii)	30	2	M1 for $p + 5p = 180$ oe
		[Opposite angles of a]cyclic quadrilateral [add up to 180°]	1	
	(b) (i)	1 : 2 oe	1	
	(ii)	OQ	1	
		$MQ = NQ$	1	
		$OM = ON$	1	
		Centre or O	1	Not origin
7	(a) (i)	Rotation	1	
		[+]90 or 90 anticlockwise oe	1	
		(0 , 2)	1	Not as column vector
	(ii)	Reflection	1	
		$y = 1$ oe	1	
	(iii)	Enlargement	1	
		[s f] $-\frac{1}{2}$ oe	1	
		Origin oe	1	
	(b)	$\begin{pmatrix} -\frac{1}{2} & 0 \\ 0 & -\frac{1}{2} \end{pmatrix}$ oe	2FT	FT their s f from (a)(iii) SC1 for $\begin{pmatrix} k & 0 \\ 0 & k \end{pmatrix}$, $k \neq 1$ or 0
	(c)	Image at (4 , 1) (6 , 1) (6 , 5) (4 , 3)	2	ruled or good freehand SC1 for translation $\begin{pmatrix} 2 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ -3 \end{pmatrix}$ or for 4 correct vertices not joined
	(d)	Reflection	1	
		$y = x$ oe	1	

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8	(a)	(4, 6)	1, 1	
	(b)	4.47 or 4.472	3	M2 for $\sqrt{(8-4)^2 + (5-3)^2}$ or better or M1 for $(8-4)^2 + (5-3)^2$ or better
	(c)	$y = 2x - 2$ oe	3	B2 for $2x - 2$ or $y = 2x + c$ oe or M1 for $[m =] \frac{8-4}{5-3}$ oe soi by $2x$ and M1 for (3, 4) or (5, 8) or <i>their</i> midpoint substituted into <i>their</i> $y = mx + c$ with m numerical
	(d)	-3	3	M1 for use of gradient \times <i>their</i> $m = -1$ soi by $-\frac{1}{2}$ M1 for $r = \text{their gradient} \times 6$ [+0]
9	(a) (i)	11	1	
	(ii)	256	2	M1 for $[g(3) =] 8$ or 2^3 or 2^{2^x}
	(b)	$\frac{x-5}{2}$ oe final answer	2	M1 for $x = 2y + 5$ or $2x = y - 5$ or better or $\frac{y}{2} = x + \frac{5}{2}$
	(c)	$19 - 6x$ final answer	2	M1 for $2(7 - 3x) + 5$
	(d)	-1, 0, 1, 2	3	Additional values count as errors B2 for one error /omission or B1 for two errors/omissions or M2 for $-2 < x \leq 2$ oe seen or M1 for $-2 < x$ or $x \leq 2$ or $x = -2$ and $x = 2$ or $-4 < 2x \leq 4$
10	(a)	8 25 17	2	B1 for 2 correct
	(b)	$n + 2$ oe	1	
	(c) (i)	$(n - 1)^2$ oe	2	M1 for $(n + k)^2$ for integer k
	(ii)	92	2	M1 for $\sqrt{8281}$ or 91 seen
	(d) (i)	$n^2 - 3n - 1$ final answer	2	M1 for <i>their</i> $(n - 1)^2 - \text{their } (n + 2)$ soi
	(ii)	39	1	

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(e)	1 and $-\frac{1}{2}$ oe	1	
	$\frac{1}{4}$ oe	1	
	$-\frac{1}{8}$ oe	1	



CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International General Certificate of Secondary Education

MARK SCHEME for the October/November 2015 series

0580 MATHEMATICS

0580/43

Paper 4 (Extended), maximum raw mark 130

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Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

Question	Answer	Mark	Part marks
1 (a) (i)	3.9[0]	2	M1 for $2.6 \div 2$
(ii)	$\frac{13}{18}$ cao	2	B1 for any correct unsimplified fraction
(iii)	24	3	M2 for $9 \div 0.375$ oe or M1 for associating 9 with $(100 - 62.5)\%$
(b)	109 cao	3	B2 for 108.5 to 108.6 or M1 for $250 \times \left(1 - \frac{8}{100}\right)^{10}$ oe
2 (a) (i)	Image at $(-2, 5), (1, 5), (1, 7)$	2	SC1 for translation $\begin{pmatrix} -4 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 4 \end{pmatrix}$ or 3 correct vertices plotted but not joined
(ii)	Image at $(2, -3), (5, -3), (5, -5)$	2	SC1 for a reflection in a horizontal line or in the line $x = -1$ or 3 correct vertices plotted but not joined
(b)	Rotation	1	Alt
	180 oe	1	Enlargement SF -1 $(-1, 0)$
	$(-1, 0)$	1	Not as column vector
(c) (i)	Reflection	1	
	$y = -x$ oe	1	
(ii)	$\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$	2	SC1 for a correct row or column

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3	(a)	43 200	3	M2 for $0.5 \times (35 + 25) \times 12 \times 120$ oe or M1 for $0.5 \times (35 + 25) \times 12$ oe
	(b) (i)	$0.5 \times (25 + 30) \times 6 \times 120 [= 19\,800]$	M2	Dep on a valid method for obtaining the width of 30 cm B1 for $0.5 \times (25 + 35)$ oe
	(ii)	45.8 or 45.83...	1FT	FT for $\frac{19\,800}{\text{their (a)}} \times 100$
	(c)	1 hr 39 min	4	B3 for 1.65 [h] or 99 mins or $\frac{33}{20}$ or M2 for $\frac{19\,800}{12 \times 1000}$ oe or M1 for $\frac{19\,800}{12}$ or $\frac{19\,800}{1000}$ or 12×1000 If zero scored then SC1 for figs 165 and B1 for converting their time (in hours) into hours and minutes
	(d)	12.8 or 12.80 to 12.81	3	M2 for $\sqrt[3]{\frac{19\,800}{3\pi}}$ or M1 for $\pi r^2 3r = 19\,800$
	(e)	21[.0]	2	M1 for $\frac{19\,800}{1000} + 1.2$

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4	(a)	–1.5, 0.5	2	B1, B1
	(b)	Correct curve	5	B3 FT for 10 or 11 points or B2FT for 8 or 9 points or B1FT for 6 or 7 points and B1 independent for two branches SC4 for correct curve but branches joined
	(c)	1.25 to 1.35	1	
	(d)	–1	1	
	(e) (i)	$2 - x$	1	
	(ii)	Ruled line with gradient –1 through (0, 2) and fit for purpose 1.15 to 1.25 cao	2FT 1	SC1 for ruled line, with gradient –1 or through (0, 2), but not $y = 2$ FT <i>their</i> $y = mx + c$ from (e)(i), if $m \neq 0$ SC1FT for ruled line either with correct gradient or through (0, c), but not $y = c$
5	(a)	2180 or 2181.... nfw	4	M2 for $680^2 + 2380^2 - 2 \times 680 \times 2380 \cos 65^\circ$ oe or M1 for correct implicit cosine formula A1 for 4 760 000 or 4 758 000 to 4 759 000
	(b)	78.7 or 78.71...	3	M2 for $\frac{2380 \sin 40^\circ}{1560}$ or M1 for $\frac{1560}{\sin 40^\circ} = \frac{2380}{\sin M}$ oe
	(c)	309 or 308.7...	2FT	FT $230 + \text{their (b)}$ B1FT $50 + \text{their (b)}$ for 129 or 128.7... [i.e. for C from M]
	(d) (i)	23 39 oe	1	
	(ii)	650	2	M1 for $1560 \div \text{journey time}$

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6	(a)	101.5625 or 102 or 101.5 to 101.6 nfw	4	<p>M1 for 55, 90, 110, 160 soi</p> <p>M1 for Σfm with frequencies and each m in or on a boundary of a correct interval 2750, 2700, 4400, 6400</p> <p>M1 dep on 2nd M for $\div 160$</p>
	(b)	Correct histogram drawn with correct widths and heights 1, 1.5 and 2 (no gaps)	3	<p>B1 for each correct block</p> <p>If zero scored, SC1 for correct heights or frequency densities</p>
	(c)	$\frac{40}{160}$ oe	1	
	(d) (i)	$\frac{1560}{25440}$ oe	2	M1 for $\frac{40}{160} \times \frac{39}{159}$
	(ii)	$\frac{4000}{25440}$ oe	3	<p>M2 for $\frac{40}{160} \times \frac{50}{159} + \frac{50}{160} \times \frac{40}{159}$ oe</p> <p>or</p> <p>M1 for one of these products soi</p>
7	(a)	83 nfw	4	<p>B3 for $17x = 1411$ or $17x = 14.11$ oe in form $ax = b$ or final answer of 0.83 or</p> <p>B2 for $6x + 11x - 55 = 1356$ oe or $6x + 11x - [0.] 55 = 13[.]56$ or</p> <p>M1 for $6x + 11(x - [0.0]5) = 13[.]56$</p>
	(b)	$\frac{1}{3}$ oe nfw	4	<p>M1 for $y(y + 3)$ oe or $\frac{1}{2}(2y + 1)(y + 1)$ oe and</p> <p>B2 for $2y^2 + 6y = 2y^2 + 2y + y + 1$ oe or better or</p> <p>B1 for $(2y + 1)(y + 1) = 2y^2 + 2y + y + 1$ soi</p>

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(c)	25 nfw	4	<p>M1 for $\frac{4[.]80}{w-1}$ or $\frac{7[.]80}{2w-11}$</p> <p>M1 for $\frac{4[.]80}{w-1} = \frac{7[.]80}{2w-11}$ oe</p> <p>M1 for $480(2w-11) = 780(w-1)$ oe</p> <p>or</p> <p>ALT</p> <p>M1 for $n(w-1) = 4[.]80$ or $n(2w-11) = 7[.]80$</p> <p>M1 for $2wn - 11n = 7[.]80$</p> <p>$2wn - 2n = 9[.]60$ oe</p> <p>M1 for $9n = 180$ oe or better</p> <p>or</p> <p>ALT</p> <p>M1 for $n(w-1) = 4[.]80$ or $n(2w-11) = 7[.]80$</p> <p>M1 for $\frac{4[.]80 + n}{n} = \frac{7[.]80 + 11n}{2n}$</p> <p>M1 for $9n = 180$ oe or better</p>
	<p>(d) (i) $\frac{1}{2}u(3u-2) = 2.5$</p> <p>One further correct step leading to $3u^2 - 2u - 5 = 0$ with no errors</p>	<p>M1</p> <p>First step must involve $\frac{1}{2}u(3u-2)$</p>	
	(ii) $(3u-5)(u+1)$	A1	
	(iii) 29.1 or 29.05...	2	<p>SC1 for $(3u+a)(u+b)$</p> <p>where $ab = -5$ or $a+3b = -2$ [a, b integers]</p>
8	(a) (i) Angle A is common to both triangles oe $ADB = ABC$ Third angle of triangles equal oe	3	<p>M2 for $\tan = \frac{\text{their } \frac{5}{3}}{3 \times \text{their } \frac{5}{3} - 2}$</p> <p>or</p> <p>M1 for substituting <i>their</i> positive value of u into [u and] $3u-2$</p>
	(ii) Similar	1	
	(iii) 8.25	1dep	Dep on previous mark
	(b) (i) 38	2	M1 for $\frac{16}{12} = \frac{11}{BD}$ oe or better
	(ii) 38	1	
	(iii) 78	1	
	(iv) 26	1	

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(c)	36 nfw	5	<p>B4 for an equation in m that simplifies to $5m = 180$</p> <p>or</p> <p>B1 for each of 3 of the listed angles expressed in terms of m, in it's simplest form, stated or labelled on diagram</p> <p>Angle $PQO = m$</p> <p>Angle $QOR = m$</p> <p>Angle $OQR = 2m$</p> <p>Angle $PQR = 3m$ or $180 - 2m$ or $90 + \frac{m}{2}$</p> <p>Angle $POR = 180 - m$ or $4m$ or $360 - 6m$</p> <p>Reflex angle $POR = 360 - 4m$ or $6m$ or $180 + m$</p>
9 (a)	8	1	
(b)	3	2	<p>B1 for $[g(0.5) =] 2$ soi</p> <p>or</p> <p>M1 for $2\left(\frac{1}{x}\right) - 1$ or better</p>
(c)	$\frac{x+1}{2}$ final answer	2	<p>M1 for $x = 2y - 1$ or $y + 1 = 2x$ or better</p> <p>or $\frac{y}{2} = x - \frac{1}{2}$</p>
(d)	$4x - 3$	2	M1 for $2(2x - 1) - 1$
(e)	$4x^2 - 4x + 7$	2	B1 for $\left[(2x - 1)^2\right] = 4x^2 - 2x - 2x + 1$
(f)	x	1	
(g)	$g^{-1}(x) = g(x)$	1	
(h)	$fh(x)$	1	

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10	A	$-13, -20$	1	SC1 for $-7n + k$ or $kn + 22$ oe
		$-7n + 22$ oe	2	
	B	$\frac{9}{22}, \frac{10}{23}$	1	B1 for $n + 4$ oe or $n + 17$ oe seen, but not in wrong position
		$\frac{n+4}{n+17}$ oe	2	
	C	$26, 37$	1	
		$n^2 + 1$ oe	1	
	D	$162, 486$	1	SC1 for $k \times 3^{n+p}$ [k, p integers] Accept $2 \times \frac{3^n}{3}$
		$2 \times 3^{n-1}$ oe	2	

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0580/41

Paper 4 (Paper 4 – Extended), maximum raw mark 130

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Abbreviations

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dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

Question	Answers	Mark	Part Marks
1	(a) (i) $\frac{13}{13+8+3} \times 12000$ with no subsequent errors	1	
	(ii) 4000	1	
	(b) $2 \times 6500 + 5 \times \text{their(a)(ii)} + (12000 - 6500 - \text{their(a)(ii)})$ or $(13 \times 2 + 8 \times 5 + 3 \times 1) \times 500$	2	B1 for any two of 2×6500 , $5 \times \text{their(a)(ii)}$, $(12000 - 6500 - \text{their(a)(ii)})$ seen or $13 \times 2 + 8 \times 5 + 3 \times 1$
	(c) 37 500	3	M2 for $\frac{34500}{100-8} \times 100$ oe or M1 for 34500 associated with $(100-8)\%$
	(d) $\frac{11}{26}$ cao	2	M1 for any correct simplified version of $\frac{2750}{6500}$
	(e) 89 500	1	
2	(a) 1.5 1.25 -0.75 0.5	4	B1 for each
	(b) Fully correct curve	5	B5 for correct curve over full domain or B3 FT for 11 or 12 points or B2 FT for 9 or 10 points or B1 FT for 7 or 8 points and B1 independent for one complete branch on each side of the y -axis and not touching or crossing the y -axis SC4 for correct curve with branches joined

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Question	Answers	Mark	Part Marks
(c)	–1.35 to –1.25	1	
	–0.27 to –0.251	1	
	1.51 to 1.55	1	
	(d) $k < 1.2$ or 1.15 to 1.25	2	SC1 for 1.15 to 1.25 seen or horizontal line drawn at min point
	(e) tangent ruled at $x = -1$	B1	No daylight at $x = -1$ Consider point of contact as midpoint between two vertices of daylight, the midpoint must be between $x = -1.1$ and -0.9
	–1.7 to –1.3	2	dep on B1 or a close attempt at tangent at $x = -1$ or M1 for rise/run also dep on any tangent drawn or close attempt at tangent at any point. Must see correct or implied calculation from a drawn tangent
3 (a) (i)	image at (1, 4) (1, 5) (2, 5) (4, 4)	2	SC1 for translation by $\begin{pmatrix} -1 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 3 \end{pmatrix}$ or 4 correct vertices plotted but not joined
	(ii) image at (–2, –1) (–5, –1) (–2, –2) (–3, –2)	2	SC1 for correct size and orientation, wrong position or 4 correct vertices plotted but not joined
	(iii) image at (2, –1) (2, –2) (3, –2) (5, –1)	3	B2 for 3 correct vertices plotted or if no / wrong plots allow SC2 for 4 correct coordinates in column matrix or shown in working or SC1 for any 3 correct coordinates or M1 for $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix} \begin{pmatrix} 2 & 2 & 3 & 5 \\ 1 & 2 & 2 & 1 \end{pmatrix}$ oe
	(b) enlargement	B1	
	[centre] (1, 0)	B1	not as column vector
	[scale factor] – 3	B1	
(c)	$\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$	2	B1 for one correct row or column or $\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$

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Question	Answers	Mark	Part Marks
4 (a)	5	1	
(b)	$C \cap M$ oe	1	Allow e.g. $(B \cap C \cap M) \cup (C \cap M)$
(c)	3	1	
(d) (i)	$\frac{8}{30}$ oe	1	0.267 or better
(ii)	$\frac{14}{30}$ oe	1	0.467 or better
(e)	$\frac{30}{272}$ oe	3	M2 for $\frac{6}{17} \times \frac{5}{16}$ or M1 for $\frac{6}{17}$ seen 0.110[2...] or better
5 (a) (i)	10.6 or 10.59...	2	M1 for $\tan = \frac{55}{294}$ oe
(ii)	175 or 174.9[...] to 175.[1...]	4	M2 for $[\text{adj}] = \frac{55}{\tan 24.8}$ oe or M1 for implicit version and M1 dep on at least M1 for $294 - \text{their adj}$
(b) (i)	4.9 or 4.89 to 4.9	4	M3 for $\sqrt{4^2 + \left(\frac{1}{2}\sqrt{4.8^2 + 3^2}\right)^2}$ or M2 for $\frac{1}{2}\sqrt{4.8^2 + 3^2}$ or M1 for $\sqrt{4.8^2 + 3^2}$ or $2.4^2 + 1.5^2$
(ii)	54.7 or 54.71 to 54.722	2	M1 for $\sin = \frac{4}{\text{their } 4.9}$

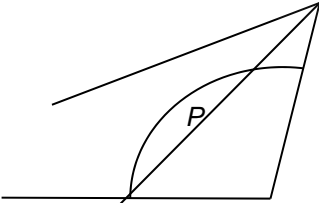
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6	(a) (i)	$24 < t \leq 30$	1	
	(ii)	30.9 or 30.875 nfw	4	<p>M1 for midpoints soi (condone 1 error or omission) 5, 17, 27, 35, 50, 65 soi</p> <p>M1 for use of $\sum fx$ with x in correct interval including both boundaries (condone 1 further error or omission) (50, 1530, 3645, 2975, 3500, 650) and M1 (dep on 2nd M1) for $\sum fx \div 400$</p>
	(b) (i)	[10 100] 235 320 390 [400]	2	<p>B1 for any two correct SC1 for 235, n, $n + 70$ $n > 235$</p>
	(ii)	Correct curve or polygon	3	<p>B1 for correct horizontal placement B1FT for correct vertical placement</p> <p>B1FT dep on at least B1 for reasonable increasing curve or polygon through their 6 points</p> <p>If zero scored SC1 for 5 out of 6 points correctly plotted</p>
	(c) (i)	27.5 to 29	1	
	(ii)	12 to 14	2	B1 for 36 to 38 or 24 seen
	(iii)	18 to 20	2	B1 for 60 seen or marked on grid
	(iv)	30 to 45	2	B1 for 355 to 370 seen

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7	(a) (i)	8.27 or 8.269... nfw	4	M2 for $7.6^2 + 8.4^2 - 2 \times 7.6 \times 8.4 \times \cos(62)$ oe or M1 for implicit form A1 for $[PQ^2 =]$ 68.3 to 68.5
	(ii)	28.2 or 28.18..	2	M1 for $0.5 \times 7.6 \times 8.4 \times \sin 62$ oe
	(b)	55.8 or 55.78 to 55.79 nfw	5	B1 for $[HGJ] = 81$ B1 for $[GHJ] = 61$ M2 for $[GJ =] \frac{63}{\sin(\text{their } 81)} \times \sin(\text{their } 61)$ or M1 for implicit form After M0, SC1 for final answer of 68.1...
8	(a)	$5x = 75$ or $5x + 48 = 123$ 15	B2 B1	M1 for $x + (x + 12) + 3(x + 12) = 123$ oe
	(b)	6, 7	3	B2 for answer of 6 or 7 OR M1 for $t < 8$ M1 for $t \geq \frac{37}{7}$ OR SC2 for final answer of 5, 6, 7 or 6, 7, 8 or SC1 for final answer of 5, 6, 7, 8
	(c) (i)	1.8 oe	3	M1 for $21 - x = 4(x + 3)$ or better B1 for $[\pm]5x = k$ or $kx = [\pm]9$
	(ii)	$\sqrt{7^2 - 4 \times 3 \times (-5)}$ or better nfw and $\frac{-7 + \sqrt{q}}{2(3)}$ or $\frac{-7 - \sqrt{q}}{2(3)}$ oe -2.91 and 0.57 final ans cao	B1 B1 B1B1	or for $\left(x + \frac{7}{6}\right)^2$ or for $-\frac{7}{6} \pm \sqrt{\frac{5}{3} + \left(\frac{7}{6}\right)^2}$ SC1 for 0.6 or 0.573... and -2.9 or -2.907 or -2.906... or -0.57 and 2.91 or 0.57 and -2.91 seen in working

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9	(a) (i)	42	2	B1 for $BAC = 90 - 48$
	(ii)	111	2	B1 for 111 or 69 or $ACD = 27$ correctly placed on diagram or indicated
	(b) (i)	37.7 or 37.69 to 37.704 nfw	2	M1 for $6\pi + 4\pi \pm 2\pi$ oe
	(ii)	12100, 12060, 12070, 12062.4 to 12065.6 nfw	5	SC4 for answer with figs 121 or 1206 to 1207 OR M2 for total area = $\frac{1}{2}\pi 6^2 + \frac{1}{2}\pi 4^2 - \frac{1}{2}\pi 2^2$ or $\frac{1}{2}\pi 60^2 + \frac{1}{2}\pi 40^2 - \frac{1}{2}\pi 20^2$ or M1 for $\frac{1}{2}\pi 6^2$ or $\frac{1}{2}\pi 4^2$ or $\frac{1}{2}\pi 2^2$ or $\frac{1}{2}\pi 60^2$ or $\frac{1}{2}\pi 40^2$ or $\frac{1}{2}\pi 20^2$ A1 for area = 75.39 to 75.41 or 7539 to 7541 and M1 dep for volume = <i>their</i> area \times thickness
10	(a)	475 or 465 to 485	2	B1 for 9.3 to 9.7 [cm] seen
	(b)	Correct perpendicular bisector with two pairs of intersecting arcs	2	B1 for accurate with no/wrong arcs or M1 for correct intersecting arcs
	(c)	Compass drawn arc centre B radius 5.8	2	M1 for compass drawn arc centre B or B1 for 5.8 cm stated or used
		Accurate angle bisector at C with correct intersecting arcs 	2	B1 for accurate with no/wrong arcs or M1 for correct intersecting arcs
			1	cao

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11	(a)	$\frac{At}{t+r}$ final answer oe nfwv	4	<p>B1 for $t(A-x) = xr$ or $tA - tx = xr$ or $A = \frac{xr}{t} + x$</p> <p>M1 for correctly completing multiplication by t (eliminating any bracket) and x terms isolated M1 for correct factorisation M1 dep for correct division</p>
	(b)	<p>$[a =] 64$</p> <p>$[b =] -8$</p>	3	<p>B1 for $2b = -16$ or $(x-8)^2$</p> <p>B1 for $a = (their\ b)^2$</p> <p>If 0 scored, SC1 for $x^2 + 2bx + b^2$ soi</p>
	(c)	$\frac{13x+8}{(x-4)(3x-2)}$ final answer nfwv	3	<p>B1 for $6(3x-2) - 5(x-4)$ or better seen</p> <p>B1 for $(x-4)(3x-2)$ oe seen as denom</p> <p>or SC2 for final answer $\frac{13x-32}{(x-4)(3x-2)}$</p>

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Question	Answer	Mark	Part marks
1 (a)	1848 final answer	2	M1 for $1650 \times \left(1 + \frac{12}{100}\right)$ oe
(b) (i)	1750	2	M1 for $\frac{500}{9-5}$ [$\times 5$] or [$\times 9$] or any equation which would lead to $4x = 500$ or $4x = 2500$ or $4x = 4500$ or $4x = 7000$ when simplified
(ii)	$64\frac{2}{7}$ or 64.3 or 64.28 to 64.29	1	
(c) (i)	33 : 20 oe	2	B1 for 33 : 6 or 20 : 6 or 5.5 oe seen or 3.33...oe seen or M1 for two ratios with a common number of children implied by $20k$ and $33k$ seen, $k > 0$
(ii)	236	3	M2 for $\frac{24}{2} \times 11 + \frac{24}{3} \times 10$ oe or $((3 \times 11) + (2 \times 10)) \times 24 \div 6$ or $\frac{6}{6+20+33} \times x = 24$ or M1 for $\frac{24}{2} \times 11$ or $\frac{24}{2} \times 13$ soi or $\frac{24}{3} \times 10$ or $\frac{24}{3} \times 13$ soi oe or $24 \div 6$ soi
(d)	17[.00]	3	M2 for $20.40 \div \left(1 + \frac{20}{100}\right)$ oe or M1 for $(100 + 20)\%$ oe associated with 20.40 seen

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Question	Answer	Mark	Part marks
2			
(a) (i)	66	1	
(ii)	24	1FT	FT 90 – <i>their (a)(i)</i>
(iii)	66	2FT	FT 90 – <i>their (a)(ii)</i> M1 for [<i>BOD</i> =] 180 – 48 or 180 – 2 × <i>their (a)(ii)</i>
(iv)	114	1FT	FT 180 – <i>their (a)(iii)</i>
(b)	83.6 or 83.60[...]	2	M1 for $\frac{1}{2} \times 15 \times 15 \times \sin(180 - 48)$ oe or $\frac{1}{2} \times 15 \times 15 \times \sin(180 - 2 \times \textit{their (a)(ii)})$ oe
(c)	Opposite angles add up to 180 OR Angle in a semicircle [=90]	1	

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Question	Answer	Mark	Part marks
3	(a) (i) $\frac{600}{x+20}$ final answer	1	
	(ii) $\frac{600}{x} - \text{their } \frac{600}{x+20} = 1.5$ oe	M1	
	$600(x+20) - 600x = 1.5x(x+20)$ or $\frac{600(x+20) - 600x}{x(x+20)} [= \text{their } 1.5]$	M1	Correctly clearing, or correctly collecting into a single fraction, two fractions both with algebraic denominators, one being $\frac{600}{x}$
	$600x + 12\,000 - 600x = 1.5x^2 + 30x$ [$0 = 1.5x^2 + 30x - 12\,000$]	M1	Dep on previous M1, correctly multiplying <i>their</i> brackets and clearing fraction
	$0 = x^2 + 20x - 8000$	A1	With no errors or omissions seen, dep on M3
(b)	-100, 80	3	M2 for $(x+100)(x-80)$ or M1 for $(x+a)(x+b)$ where $ab = -8000$ or $a+b = 20$ OR B1 for $\sqrt{20^2 - 4 \times 1 \times (-8000)}$ or better and B1 for $\frac{-20 + \sqrt{q}}{2 \times 1}$ or $\frac{-20 - \sqrt{q}}{2 \times 1}$
(c)	6.67 or 6.666 to 6.667 oe	2FT	FT $\frac{12}{2(\text{their } 80) + 20} \times 100$ correctly evaluated to at least 3 sf M1 for choosing and using <i>their</i> positive root

Page 5	Mark Scheme	Syllabus	Paper
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Question	Answer	Mark	Part marks
4	(a) (i) 9π final answer	2	M1 for $\frac{135}{360} \times 2 \times \pi \times 12$ oe
	(ii) (a) 4.5[0] or 4.497 to 4.504...	2FT	FT <i>their</i> $9 \div 2$ M1 for $2\pi r = \text{their } 9\pi$ or $12\pi r = \frac{135}{360}\pi 12^2$ oe
	(b) 11.1 or 11.12[...]	3FT	FT their $\sqrt{12^2 - \text{their } 4.5^2}$ to 3 sf or better (<i>their</i> $4.5 < 12$) M2 for $\sqrt{12^2 - \text{their } 4.5^2}$ (<i>their</i> $4.5 < 12$) or M1 for $12^2 = h^2 + \text{their } 4.5^2$ oe (<i>their</i> $4.5 < 12$)
	(b) (i) 75 nfw	3	M2 for $l = \frac{35}{7} \times 15$ or $x = \frac{35}{7} \times 8$ oe or for 40 seen nfw or correct trig or Pythagoras' method leading to value rounding to 40.0 M1 for $\frac{l}{15} = \frac{35}{7}$ oe or $\frac{x}{8} = \frac{35}{7}$ oe or $\frac{l-35}{8} = \frac{35}{7}$ oe or $\frac{l-35}{l} = \frac{8}{15}$ oe
	(ii) 2730 or 2730.0 to 2730.4 nfw	3	M2 dep for $\pi \times 15 \times \text{their } 75 - \pi \times 8 \times$ (<i>their</i> $75 - 35$) [$+\pi \times 8^2$] dep <i>their</i> $75 > 35$ or 805π [2527.7 to 2530] nfw or 869π [2728.6 to 2731.2] nfw or M1 for $\pi \times 15 \times \text{their } 75$ or 1125π [3532.5 to 3535.8] nfw seen or $\pi \times 8 \times (\text{their } 75 - 35)$ or 320π [1004.8 to 1005.8] nfw seen or $\pi \times 8^2$ or 64π [200.9 to 201.2] nfw seen
	(c) (i) $16r^3$	2	M1 for $[M=] k \times r^3$ or $1458 = k \times 4.5^3$ oe or $\frac{M}{1458} = \frac{r^3}{4.5^3}$ oe After M0 , SC1 for 16 seen
	(ii) 8 : 27 oe	1	Must be numeric, e.g. 128:432

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5	(a)	2 and 7	2	B1 for each value
	(b)	Complete correct curve	5	B3 FT for <i>their</i> 9 or 10 points or B2 FT for <i>their</i> 7 or 8 points or B1 FT for <i>their</i> 5 or 6 points and B1 independent for one branch on each side of the y -axis and not touching the y -axis SC4 for correct curve with branches joined
	(c)	Correct tangent and $-13 \leq \text{grad} \leq -8$	3	B2 for close attempt at tangent at $x = 1$ and answer in range OR B1 for ruled tangent at $x = 1$, no daylight at $x = 1$ Consider point of contact as midpoint between two vertices of daylight, the midpoint must be between $x = 0.8$ and 1.2 and M1 (dep on B1 or close attempt at tangent [at any point] for $\frac{\text{rise}}{\text{run}}$
	(d) (i)	5 to 6	1	
	(ii)	2 to 2.35 and -2.55 to -2.35	2FT	FT <i>their</i> k B1FT for each correct solution
	(e)	$[a =] -5$ $[b =] -1$ $[c =] 12$	3	B2 for two correct values or for $x^3 - 5x^2 - x + 12 [= 0]$ oe or M1 for $x^2 - 2x + \frac{12}{x} = 3x + 1$

Page 7	Mark Scheme	Syllabus	Paper
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6	(a)	$95.5^2 + 83.1^2 - 2 \times 95.5 \times 83.1 \times \cos 101$ 138.0...	M2	M1 for $\cos 101 = \frac{95.5^2 + 83.1^2 - AB^2}{2 \times 95.5 \times 83.1}$
	(b)	110 or 109.7 to 109.8	A2 4	A1 for 19054[...] also implies M2 B3 for 36.2 or 36.20 to 36.24[1..] or M2 for $[\sin =] \frac{83.1 \times \sin 101}{138[.0..]}$ oe or M1 for correct implicit version After M0, SC1 for angle $ABC = 42.76$ to 42.8
	(c)	18.8 or 18.79[...]	2	M1 for $46.2 \times \cos(45 + 21)$ oe After M0, SC1 for answer 42.2 or 42.20 to 42.21
7	(a) (i)	316	4	M1 for 100, 250, 325, 375, 450 soi M1 for Σfm with m 's in intervals including boundaries [15800] M1 (dep on 2nd M1) for $their \Sigma fm \div 50$
	(ii)	Three correct blocks with heights 0.09, 0.36, 0.24 with correct widths and no gaps	3	B2 for two correct blocks or B1 for one correct block or three correct frequency densities soi
	(b)	Students have a greater range of estimates oe [On average] adults estimated a greater mass oe	B1 B1	

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8	(a) (i)	$x \geq 100$ final answer	1	with no errors seen but isw substitution of values after correct inequality
	(ii)	$y \geq 120$ final answer	1	
	(iii)	$x + y \leq 300$ final answer	1	
	(iv)	$40x + 80y \geq 16000$ or $0.4x + 0.8y \geq 160$	M1	
	(b)	$x = 100$ ruled	B1	Allow B1 for line with negative gradient passing through (400, 0) or (0, 200) when extended
		$y = 120$ ruled	B1	
		$x + y = 300$ ruled	B1	
		$x + 2y = 400$ ruled	B2	
(c)		Correct shading	B1	Dep on all previous marks earned Condone any clear indication of the required region
		200	2	M1 for $x = 100$ and $y = 200$ selected or for $x \times 0.4 + y \times 0.8$ oe evaluated where (x, y) is an integer point in <i>their</i> [unshaded] region

Page 9	Mark Scheme	Syllabus	Paper
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9	(a)	$4x - 3x^2$ or $x(4 - 3x)$ nfw final answer	3	B2 for $3x^2 - 6x - 6x^2 + 10x$ or M1 for $3x^2 - 6x$ or $-6x^2 + 10x$
	(b) (i)	$(2 + y)(3w - 2x)$ oe final answer	2	M1 for $3w(2 + y) - 2x(2 + y)$ or $2(3w - 2x) + y(3w - 2x)$
	(ii)	$(2x + 5y)(2x - 5y)$ final answer	2	M1 for $(2x \pm 5y)(2x \pm 5y)$ or $(2x + ky)(2x - ky)$ or $(kx + 5y)(kx - 5y)$, $k \neq 0$ or $(2x + 5)(2x - 5)$ or $(2 + 5y)(2 - 5y)$
	(c)	$\frac{27x^6}{64}$ final answer	2	B1 for 2 [out of 3] elements correct in the right form in final answer or final answer contains 27 and 64 and $x^{[-]6}$ or $\frac{3x^2}{4}$ seen or $\frac{729x^{12}}{4096}$ seen
	(d) (i)	$2n$ is even and subtracting 1 gives an odd number	1	Must interpret the $2n$ as even or not odd and then the -1 oe
	(ii)	$2n + 1$ oe final answer	1	
	(iii)	$their(2n + 1)^2 - (2n - 1)^2$	M1	Could use alternate correct expressions for consecutive odd numbers. Allow method and accuracy marks if correct. Could reverse the algebraic terms $their(2n - 1)^2 - (2n + 1)^2$ leading to $-8n$. Allow method and accuracy marks if correct.
		$4n^2 + 4n + 1 - 4n^2 + 4n - 1$	M1	Dep on M1 for expanding brackets in <i>their</i> expressions. If seen alone and completely correct then implies previous M1 Allow $4n^2 + 4n + 1 - (4n^2 - 4n + 1)$
		$8n$	A1	With no errors seen. After 0 scored, allow SC1 for two correctly evaluated numeric examples of subtracting consecutive odd squares isw

Page 10	Mark Scheme	Syllabus	Paper
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10	(a) (i)	9.43[...]	2	M1 for $5^2 + ([-]8)^2$ or better
	(ii)	(-3, 5)	1	
	(b) (i)	(a) $\frac{1}{2}(a + b)$ or $\frac{1}{2}a + \frac{1}{2}b$	2	M1 for $a + \frac{1}{2}AB$ oe, e.g. $a + AM$, $OA + \frac{1}{2}AB$
		(b) $\frac{1}{4}(a + b)$ or $\frac{1}{4}a + \frac{1}{4}b$	1FT	FT $\frac{1}{2}$ <i>their</i> (b)(i)(a) <u>in terms of a and/or b</u> in simplest form
		(c) $\frac{1}{4}(b - 3a)$ or $\frac{1}{4}b - \frac{3}{4}a$	2	M1 for $-a + \text{their (b)(i)(b)}$ or any correct route
	(ii)	3 : 4 final answer	3	M1 for $[AN =] -a + \frac{1}{3}b$ A1 for $\frac{1}{4} : \frac{1}{3}$ oe or $AN = \frac{1}{3}(-3a + b)$ or $3k$ to $4k$ After 0 scored SC1 for final answer 4 : 3
	(c) (i)	Triangle drawn at (-3, -3), (-6, -3), $(-6, -4\frac{1}{2})$	3	B2 for 2 vertices correct in triangle or 3 correct co-ordinates soi in working or B1 for 1 vertex in triangle correct soi or triangle of correct size and orientation but wrong position or M1 for correct set up e.g. $\begin{pmatrix} -1.5 & 0 \\ 0 & -1.5 \end{pmatrix} \begin{pmatrix} 2 & 4 & 4 \\ 2 & 2 & 3 \end{pmatrix}$
	(ii)	$\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$	2	SC1 for 1 correct row or column or for $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$

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11	(a)	$\frac{38}{56}$ or $\frac{19}{28}$ oe	4	<p>[0.679 or 0.6785 to 0.6786]</p> <p>M3 for $\frac{4}{8} \times \frac{4}{7} + \frac{3}{8} \times \frac{5}{7} + \frac{1}{8} [\times \frac{7}{7}]$ oe</p> <p>or</p> <p>M2 for sum of two of the products isw</p> <p>$\frac{4}{8} \times \frac{4}{7}, \frac{3}{8} \times \frac{5}{7}, \frac{1}{8} [\times \frac{7}{7}]$ oe</p> <p>or</p> <p>M1 for $\frac{4}{8} \times \frac{4}{7}$ or $\frac{3}{8} \times \frac{5}{7}$ oe isw</p> <p>or $\frac{1}{8} \times \frac{7}{7}$ isw</p> <p>After 0 scored, SC1 for answer of $\frac{38}{64}$ oe</p>
	(b)	$\frac{60}{336}$ or $\frac{5}{28}$ oe	2	<p>M1 for $\frac{5}{8} \times \frac{4}{7} \times \frac{3}{6}$</p> <p>or $\left(\frac{4}{8} \times \frac{3}{7} \times \frac{2}{6}\right) + 3\left(\frac{4}{8} \times \frac{1}{7} \times \frac{3}{6}\right)$ oe</p>

CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International General Certificate of Secondary Education

MARK SCHEME for the May/June 2015 series

0580 MATHEMATICS

0580/43

Paper 4 (Extended), maximum raw mark 130

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Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

Qu		Answers	Mark	Part Marks
1	(a) (i)	Triangle at $(-3, 1)$, $(-3, 3)$, $(-4, 3)$	2	SC1 for reflection in line $y = -1$ at $(1, -3)$, $(1, -5)$, $(2, -5)$ or reflection in any vertical line or three correct points not joined
	(ii)	Triangle at $(-1, -1)$, $(-2, -3)$, $(-1, -3)$	2	SC1 for rotation 180° but other centre or three correct points not joined
	(b) (i)	Translation	1	
		$\begin{pmatrix} -2 \\ 2 \end{pmatrix}$ oe	1	
		(ii) Enlargement	1	
		$(0, 3)$	1	
		[factor] 3	1	
2	(a) (i)	640×1.02^6 oe $= 720.7\dots$	M1 B1	Must be seen
	(ii)	3.02 or 3.020 to 3.024... nfw	4	M3 for $[x =] \sqrt[4]{721 \div 640}$ or better (implied by answer of 1.03[02...] or $r = 0.0302[4\dots]$ or M2 for $(their\ x)^4 = 721 \div 640$ or M1 for $640 \times (their\ x)^4 = 721$ oe
	(b)	874.8[0] final answer	2	M1 $1200 \times (1 - 0.1)^3$ oe

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Qu		Answers	Mark	Part Marks
3	(a)	1 3 2.5	1 1 1	
	(b)	Fully correct graph	5	B3FT for 11, 12 points correct or B2FT for 9, 10 correct points or B1FT for 7, 8 correct points B1 for branch each side of y -axis and not touching y -axis SC4 for correct graph but branches joined
	(c)	–2.6 to –2.4	1	
	(d)	Correct ruled line fit for purpose –1.6 to –1.5	2 1	SC1 for ruled line through (0, 1) but not $y = 1$ or ruled line with gradient –1 or for correct line but freehand
	(e)	Correct tangent and $0.9 \leq \text{grad} \leq 1.5$	3	Consider point of contact as midpoint between two vertices of daylight, the midpoint must be between $x = -3.4$ and -2.6 B2 if close attempt at correct tangent and answer in range (may be small amount of daylight) or B1 for ruled tangent at $x = -3$ within tolerance, no daylight at the point of contact and M1 (dep on B1 or close attempt at tangent) for a tangent at any point and $\frac{\text{rise}}{\text{run}}$ used
4	(a)	72.5	3	M1 for Σfm with correct frequencies and correct mid-interval values M1 for $\div 200$ dep on first M1
	(b)	Correct histogram	4	B1 four correct widths – no gaps B3 for blocks of correct heights 0.5, 5, 16, 4 or B2 for 3 blocks of correct heights or B1 for 2 blocks of correct heights If 0 scored for the heights then SC1 for all four frequency densities soi

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Qu		Answers	Mark	Part Marks
5	(a) (i)	$\frac{4}{7}$ oe	1	
	(ii)	$\frac{6}{7}$ oe	1	
	(iii)	$\frac{5}{7}$ oe	1	
	(b) (i)	$\frac{12}{42}$ oe nfw	2	M1 for $\frac{4}{7} \times \frac{3}{6}$
	(ii)	$\frac{28}{42}$ oe nfw	3	M2 for $\frac{4}{7} \times \frac{3}{6} + \frac{2}{7} \times \frac{5}{6} + \frac{1}{7}$ or $1 - \frac{4}{7} \times \frac{3}{6} - \frac{2}{7} \times \frac{1}{6}$ oe or M1 for the sum of two terms of $\frac{4}{7} \times \frac{3}{6}, \frac{2}{7} \times \frac{5}{6}, \frac{1}{7}$
	(c)	$\frac{120}{210}$ oe nfw	2	M1 for $\frac{6}{7} \times \frac{5}{6} \times \frac{4}{5}$ or $\left(\frac{4}{7} \times \frac{3}{6} \times \frac{2}{5}\right) + 3\left(\frac{4}{7} \times \frac{3}{6} \times \frac{2}{5}\right) + 3\left(\frac{4}{7} \times \frac{2}{6} \times \frac{1}{5}\right)$ oe

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Qu		Answers	Mark	Part Marks
6	(a)	100 nfww	4	M3 for a correct calculation that would lead to the answer or B2 two correct relevant different size angles in <i>their</i> diagram or one relevant angle and total in <i>their</i> polygon or angle $EDA + \text{angle } FAD = 140$ or B1 for one relevant angle or total in <i>their</i> polygon
	(b) (i)	50	2	B1 for angle $ADC = 80$ or angle $BAC = 30$ or angle $ADB = 50$ soi
	(ii)	41	2FT	FT 91 – <i>their</i> (b)(i) B1 for angle $XBC = 41$
	(iii)	Similar	1	
	(c)	27.8 or 27.83	2	M1 for evidence of $\left(\frac{11}{10}\right)^2$ or 1.21 or $\left(\frac{10}{11}\right)^2$ or 0.826(4...)
	(d) (i)	60	3	M2 for $\frac{n}{10} = \frac{360}{n}$ oe e.g. $\frac{180(n-2)}{n} = 180 - \frac{n}{10}$ or B1 for exterior sum = 360 or $180(n-2)$ seen
	(ii)	174	2	M1 for $\frac{\text{their } n}{10}$ or $\frac{360}{\text{their } n}$ for <i>their</i> $n < 1800$

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Qu		Answers	Mark	Part Marks
7	(a) (i)	331 or 331.1 to 331.2	2	M1 for $\pi \times 6.2 \times 10.8 + \pi \times 6.2^2$
	(ii)	$\frac{A - \pi r^2}{\pi r}$ oe final answer	2	M1 for correct re-arrangement isolating term in l M1 for correct division by πr
	(b) (i)	4.39 or 4.390...	3	M2 for $18 \div \left(\frac{10}{4} + \frac{8}{5}\right)$ or M1 for $\frac{10}{4}$ or $\frac{8}{5}$
	(ii)	$x + x + 4$ oe	B1	Must be seen
		$\frac{x}{5}$ or $\frac{x+4}{10}$	B1	Must be seen
		$\frac{x+x+4}{\frac{x}{5} + \frac{x+4}{10}} = 7$ oe	M2	or M1 for evidence of total distance \div <i>their</i> total time
		12	B1	
	(c) (i)	16.5[0] final answer	3	M2 for $19.8 \div \left(1 + \frac{20}{100}\right)$ oe or M1 for evidence of $(100 + 20)\%$ associated with 19.8
	(ii)	$\frac{100x}{100+y}$ final answer	3	B2 for $\frac{x}{1 + \frac{y}{100}}$ or $\frac{x}{1 + 0.01y}$ oe or B1 for $1 + \frac{y}{100}$ or $100 + y$ or $1 + 0.01y$ seen

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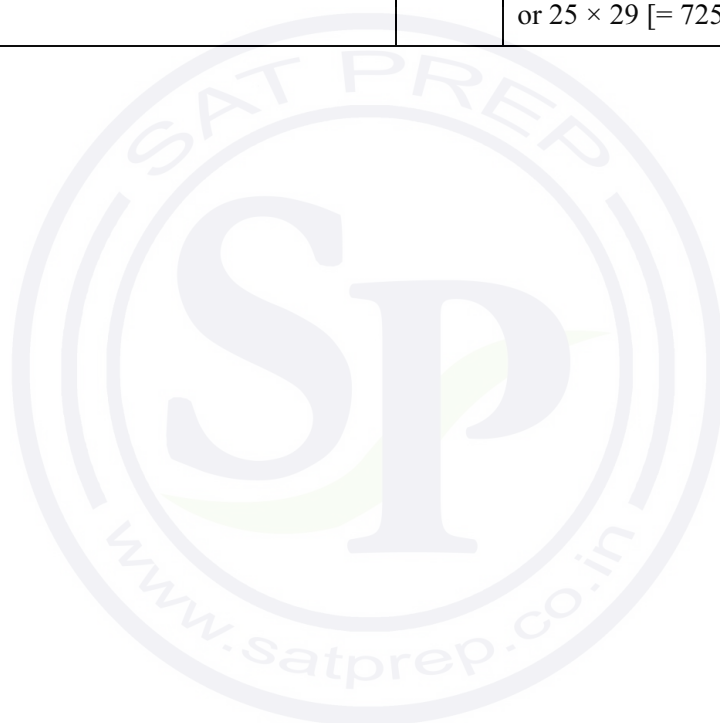
Qu		Answers	Mark	Part Marks
8	(a)	28.3 or 28.29...	2	M1 for $180\,000 \div (\pi \times 45^2)$
	(b) (i)	360 000	3	M2 for $\frac{1}{2}(70+50) \times 40 \times 150$ oe or M1 for $\frac{1}{2}(70+50) \times 40$ oe or <i>their</i> area of $ABCD \times 150$ dependent on <i>their</i> area being two dimensional
	(ii)	360	1FT	FT <i>their</i> (b)(i) $\div 1000$
	(c)	3 h 20 min	3	M2 for $180\,000 \div 15 \div 60$ (implied by 200) or M1 for $180\,000 \div 15$ (implied by 12000) or correct conversion of <i>their</i> seconds into h and min
	(d) (i)	$\frac{h}{40} = \frac{\frac{1}{2}(x-50)}{10}$ oe $h = 2(x-50)$	M1 A1	i.e. a correct statement from similar figures which must contain h , x and numbers Answer established with at least one more step and no errors or omissions
	(ii)	$\frac{1}{2}(x+50) 2(x-50)$	M1	
	(iii)	60.8 or 60.82 to 60.83	2	M1 for $(x^2 - 2500) \times 150 = 180\,000$ or better
	(iv)	21.7 or 21.65 to 21.66	1FT	FT for $2(\text{their (d)(iii)} - 50)$ evaluated only if $x > 50$

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Qu		Answers	Mark	Part Marks
9	(a)	$\begin{pmatrix} 2 & 13 \\ 1 & 14 \end{pmatrix}$	2	SC1 for one correct column or row
	(b)	$\frac{1}{3}\begin{pmatrix} 3 & -2 \\ 0 & 1 \end{pmatrix}$ oe isw	2	B1 for $k\begin{pmatrix} 3 & -2 \\ 0 & 1 \end{pmatrix}$ oe for $k \neq 0$ or $\frac{1}{3}\begin{pmatrix} a & c \\ b & d \end{pmatrix}$
	(c)	$\begin{bmatrix} u = \\ v = \end{bmatrix} \begin{matrix} 3 \\ 2 \end{matrix}$	3	B2 for two of $3 = u, 2u + 3v = 4u, 4 = 2 + v, u + 4v = 3 + 4v$ or B1 for one or M1 for $\begin{pmatrix} 2 & 3 \\ 1 & 4 \end{pmatrix} \begin{pmatrix} 0 & u \\ 1 & v \end{pmatrix} = \begin{pmatrix} 0 & u \\ 1 & v \end{pmatrix} \begin{pmatrix} 2 & 3 \\ 1 & 4 \end{pmatrix}$ B1 for $\begin{pmatrix} 3 & 2u + 3v \\ 4 & u + 4v \end{pmatrix}$ or $\begin{pmatrix} u & 4u \\ 2 + v & 3 + 4v \end{pmatrix}$
	(d)	12 nfw	2	M1 for $w \times 2 - 8 \times 3 [= 0]$ oe
10	(a)	9	2	B1 for $[f(3) =] 5$ or $2(2x - 1) - 1$
	(b)	$4x^2 - 2x$ or $2x(2x - 1)$ final answer	3	M1 for $(2x - 1)^2 + (2x - 1)$ B1 for $[(2x - 1)^2 =] 4x^2 - 2x - 2x + 1$ or $(2x - 1)(2x - 1 + 1)$
	(c)	$\frac{x+1}{2}$ oe final answer	2	M1 for $x = 2y - 1$ or $y + 1 = 2x$ or $\frac{y}{2} = x - \frac{1}{2}$
	(d)	$\frac{4x+4}{x(x+2)}$ or $\frac{4x+4}{x^2+2x}$ or $\frac{4(x+1)}{x(x+2)}$ or $\frac{4(x+1)}{x^2+2x}$ final answer	4	B1 for $x(x+2)$ oe isw as common denominator B2 for $4x + 4$ as numerator or B1 for $2(x+2) + 2x$ or better as numerator

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Qu		Answers	Mark	Part Marks
11	(a)	$\frac{5}{7}$ $\frac{n}{n+2}$ oe 7 $n+2$ oe 3 $n-2$ oe 21 n^2-4 oe	8	B1 each
	(b)	72	2	M1 for $\frac{72}{74}$ or <i>their</i> $\frac{n}{n+2} = \frac{36}{37}$
	(c)	27	2	M1 for <i>their</i> $(n^2-4) = 725$ or $25 \times 29 [= 725]$



CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International General Certificate of Secondary Education

MARK SCHEME for the March 2015 series

0580 MATHEMATICS

0580/42

Paper 4 (Paper 42 – Extended), maximum raw mark 130

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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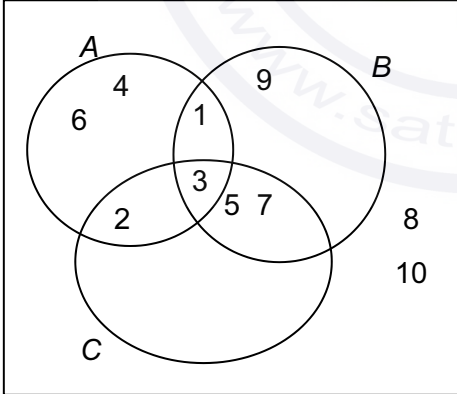
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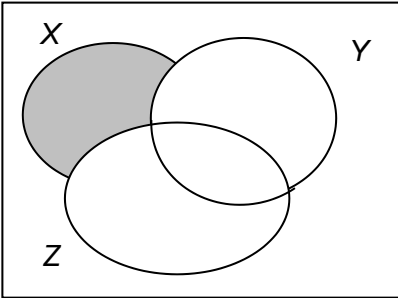
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Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

Qu.	Answers	Mark	Part Marks
1 (a)	$\frac{1.5}{100} \times 450\,000$ oe	1	Accept equivalent methods
(b)	6000	3	M2 for $\frac{6750}{112.5} \times 100$ oe or M1 for 112.5% associated with 6750 oe
(c)	376.25 cao final answer	2	B1 for 21.5 and 17.5 seen
(d)	22.4	2	M1 for 200^2 or 2^2 seen oe
(e)	5184	2	M1 for $12 \times 16 \times 27$
(f)	9023	3	M1 for $12000 \div 1.33$ A1 for 9022.55 to 9022.56 or 9022.6 or 9020 B1indep for their answer rounded to the nearest euro if possible
2 (a) (i)		3	B2 for 8 or 9 numbers correct B1 for 6 or 7 numbers correct
(ii)	<p>\in cao</p> <p>{3}</p> <p>\emptyset or {}</p>	<p>1</p> <p>1FT</p> <p>1</p>	<p>FT <i>their</i> intersection of all 3 sets – <i>their</i> diagram</p>
(iii)	5	1FT	FT <i>their</i> set B on diagram
(b) (i)	\subset	1	

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(ii)		1	
3 (a)	2 0 -2 2	3	B2 for 3 correct B1 for 2 correct
(b)	smooth correct curve through correct points	4	B3FT for 8 or 9 correct plots B2FT for 6 or 7 correct plots B1FT for 4 or 5 correct plots FT <i>their</i> table
(c)	line $y = \frac{1}{2}(x+1)$ ruled and -2.85 to -2.95 -1 0.85 to 0.95	4	B3 for correct line and 2 correct values or B2 for correct line and 1 correct value or B1 for correct line or SC2 for no/wrong line and 3 correct values or SC1 for no/wrong line and 2 correct values
(d)	tangent ruled - 1.1 to - 1.5	B1 2	No daylight between tangent and curve at point of contact. Consider point of contact as midpoint between two vertices of daylight, the midpoint must be between $x = -1.85$ and $x = -1.65$ dep on B1 M1 for rise/run also dep on any tangent drawn or close attempt at tangent at any point Must see correct or implied calculation from a drawn tangent Accept M1 for answer in range 1.1 to 1.5 after B1
4 (a)	$(11y - m)(11y + m)$ final answer	2	B1 for $11y$ seen
(b)	$\frac{3x^2 + 5x - 14}{(3x - 5)(x - 1)}$ final answer	3	B1 for denom $(3x - 5)(x - 1)$ oe isw and B1 for $3x^2 + 6x - 5x - 10$ soi

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(c)	$\frac{-2 \pm \sqrt{2^2 - 4(3)(-7)}}{2 \times 3}$	2	B1 for $\sqrt{2^2 - 4(3)(-7)}$ or better seen and if in form $\frac{p+or-\sqrt{q}}{r}$ B1 for $p = -2$ and $r = 2 \times 3$
	- 1.90 1.23 final answers	1, 1	SC1 for -1.9, -1.896 or -1.897 and 1.2 or 1.230 or -1.23 and 1.90 final answers or -1.90 and 1.23 seen in working
	(d) (i) $\frac{1}{2}(x+4+3x+2)(x+1)=15$ $4x^2 + 4x + 6x + 6 = 30$ or $2x^2 + 2x + 3x + 3 = 15$ $2x^2 + 5x - 12 = 0$	M1 M1 A1	Allow $\frac{1}{2}(4x+6)(x+1)=15$ Dep on 1 st M1 With no errors or omissions
	(ii) 1.5 or $\frac{3}{2}$, -4	3	B2 for $(2x-3)(x+4)$ or $\frac{-5 \pm \sqrt{5^2 - 4(2)(-12)}}{2 \times 2}$ or SC1 for $(2x+a)(x+b)$ where a and b are integers and $a+2b=5$ or $ab=-12$ or $\sqrt{5^2 - 4(2)(-12)}$ or $\frac{p+or-\sqrt{q}}{r}$ where $p=-5$ and $r=2 \times 2$
(iii)	6.5 or $\frac{13}{2}$	1FT	FT $3 \times$ their pos root from (d)(ii) + 2
5	(a) $\frac{1}{2} \times 16 \times 5.4 \times \sin 62$ oe 38.14...	M1 A1	
	(b) 95.6 or 95.64 to 95.65	4	M2 for $\frac{6.7 \times \sin 48}{8.4}$ or M1 for implicit form and M1dep for $180 - 48 -$ their 36.4

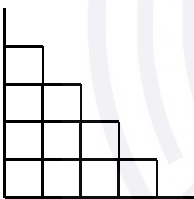
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	(c)	286 or 285.7 to 285.8	5	<p>B1 for [Angle $APB=$] 83°</p> <p>M2 for $180^2 + 245^2 - 2 \times 180 \times 245 \times \cos \text{their } 83$</p> <p>or M1 for implicit form and A1 for [$AB^2 =$] 81676[.1...]</p> <p>After 0 scored, SC2 for ans 406.87 to 406.88 or 406.9 or 407 if 146° used in cos rule Or SC1 for $180^2 + 245^2 - 2 \times 180 \times 245 \times \cos 146$</p>
6	(a)	$\frac{4}{15}$	1	
	(b)	80	1FT	FT $300 \times \text{their (a)}$
	(c) (i)	$\frac{40}{225}$ oe $\left[\frac{8}{45} \right]$	3	<p>M2 for $\frac{5}{15} \times \frac{4}{15} \times 2$ oe</p> <p>or M1 for $\frac{5}{15} \times \frac{4}{15}$</p>
	(ii)	$\frac{121}{225}$	3	<p>M2 for $\frac{11}{15} \times \frac{11}{15}$ oe</p> <p>or M1 for $\frac{11}{15}$ or $1 - \frac{4}{15}$ seen</p>
	(d) (i)	$\frac{108}{210}$ oe $\left[\frac{18}{35} \right]$	3	<p>M2 for $\frac{6}{15} \times \frac{9}{14} + \frac{9}{15} \times \frac{6}{14}$ oe</p> <p>or M1 for $\frac{6}{15} \times \frac{9}{14}$ oe or $\frac{9}{15} \times \frac{6}{14}$ oe</p> <p>or $\frac{6}{15} \times \frac{5}{14}$ oe or $\frac{6}{15} \times \frac{4}{14}$ oe</p>
	(ii)	$\frac{148}{210}$ oe $\left[\frac{74}{105} \right]$	4	<p>M3 for $\frac{5}{15} \times \frac{10}{14} + \frac{6}{15} \times \frac{9}{14} + \frac{4}{15} \times \frac{11}{4}$ oe</p> <p>or $1 - \frac{5}{15} \times \frac{4}{14} - \frac{6}{15} \times \frac{5}{14} - \frac{4}{15} \times \frac{3}{14}$</p> <p>or M2 for equivalent of 2 of above products added together oe</p> <p>or M1 for one correct relevant product oe</p>
7	(a) (i)	Rotation [centre] (0, 0) or origin 90° [anticlockwise] oe	1 1 1	

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	(ii)	Enlargement [centre] $(-2, 1)$ [s.f.] -2	1 1 1	
	(b)	vertices at $(-3, 4)$ $(-3, 5)$ $(-3, 6)$ $(-2, 6)$	2	SC1 for translation by $\begin{pmatrix} 2 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 1 \end{pmatrix}$
	(c)	vertices at $(7, 3)$ $(7, 4)$ $(7, 5)$ $(6, 5)$	2	SC1 for reflection in $y = 1$ or reflection in any vertical line
	(d)	reflection x -axis oe	1 1	
8	(a) (i)	47.7 or 47.74 to 47.75	3	M1 for [arc =] $68 - 2 \times 24$ or $24 + 24 + \frac{x}{360} \times 2\pi \times 24 = 68$ M1 for $[x =]$ $their \text{ arc} \times 360 \div (2 \times \pi \times 24)$
	(ii)	252 or 252.3 to 252.4....	6	M1 for $r = \frac{20}{2\pi}$ or $\left(\frac{their 47.7}{360} \times 2 \times \pi \times 24 \right) \div (2\pi)$ A1 for $r = 3.18$ or 3.182 to 3.183... or $\frac{10}{\pi}$ M1 for $h^2 = 24^2 - their r^2$ A1 for $h = 23.8$ or 23.78... to 23.79 M1dep on M1 earned for $V = \frac{1}{3} \pi \times their h \times their r^2$
	(b)	139 or 139.3 to 139.4... nfw	5	M4 for $8^2 + \frac{1}{4} \pi \times 8^2 + \frac{1}{2} \pi \times \left(\frac{8}{2} \right)^2$ or M1 for $\frac{1}{4} \pi \times 8^2$ and M1 for $\frac{1}{2} \pi \times \left(\frac{8}{2} \right)^2$ and M1 for 8^2 added to at least one term with π
9	(a)	$140 < h \leq 144$	1	
	(b)	144.875 nfw	4	M1 for at least 4 correct mid-values soi M1 for $\sum fx$ where x is in the correct interval, allow one further error/omission M1 dep for $\div 40$ dependent on second method mark

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(c)	4 correct blocks	4	B3 for 3 correct blocks B2 for 2 correct blocks B1 for 1 correct block or at least 3 correct frequency densities (1.4, 1, 1, 0.65)
10	(a) $4x + 10y < 80$	1	With no errors seen
	(b) $y > x$	1	
	$y \leq 6$ or $y < 7$	1	Accept $0 \leq y \leq 6$ or $0 < y \leq 6$ or $0 \leq y < 7$ or $0 < y < 7$
	(c) ruled broken line through (5, 6) to (10,4) ruled broken line $y = x$ ruled solid line $y = 6$ or broken $y = 7$ correct region indicated	B2 B1 B1 B1	SC1 for correct only at (5, 6) or (10, 4) Must be consistent with <i>their</i> (b)
	(d) 76	2	SC1 for (4, 6) indicated or $4x + 10y$ evaluated for (x , y) in <i>their</i> region, x, y integers
11	(a) 	1	
	(b) 30 10	1 1	
	(c) $n(n+1)$ oe	2	B1 for $an^2 + bn + c$ a, b, c numeric $a \neq 0$
	(d) $\frac{1}{2}n(n-1)$ oe	2	B1 for using $\frac{1}{2}$ oe in expression of form $\frac{1}{2}(an^2 + bn + c)$ $a \neq 0$ or $kn(n-1)$ $k \neq 0$

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0580/42

Paper 4 – Extended, maximum raw mark 130

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Abbreviations

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dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

Qu.	Answer	Mark	Part marks
1	(a) (i) 49.5[0]	3	M2 for $16.5[0] \div 5 \times (5 + 3 + 7)$ or M1 for $16.5[0] \div 5$
	(ii) 66	1FT	FT <i>their (a)(i)</i> $\div 75 \times 100$ to 3 sf or better
	(b) 2 hours 39 mins 45 secs	3	B2 for 159.75 oe, e.g. 2.6625 [h] 9585 [s] or M1 for 3 hrs 33 mins oe / (2 + 9 + 1) oe
	(c) 18.75 final answer	3	M2 for $16.5[0] \div 0.88$ oe or M1 for 16.5[0] associated with 88[%]
2	(a) $x > 0.5$ oe final answer nfw	3	B2 nfw for 0.5 with no/incorrect inequality or equals sign as answer or M2 for $7x + 15x > 6 + 5$ or better or $-6 - 5 > -7x - 15x$ or better or M1 for $6 - 15x$ seen
	(b) (i) $(p - 2)(q + 4)$ final answer	2	M1 for $q(p - 2) + 4(p - 2)$ or $p(q + 4) - 2(q + 4)$
	(ii) $(3p - 5)(3p + 5)$ final answer	1	
	(c) $(5x - 9)(x + 2)$	M2	M1 partial factorisation, e.g. $x(5x - 9) + 2(5x - 9)$ or SC1 for $(5x + a)(x + b)$ where $ab = -18$ or $a + 5b = 1$
	$\frac{9}{5}$ oe and -2 final answer	B1	

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3	(a)	$35 < t \leq 40$	1	
	(b)	22.5, 27.5, 32.5, 37.5, 42.5, 47.5 $(2 \times 22.5 + 6 \times 27.5 + 7 \times 32.5 + 19 \times 37.5 + 9 \times 42.5 + 7 \times 47.5)$ $\div 50$ or their $\sum f$ 37.3	M1 M1 M1dep A1	At least 4 correct mid-values soi $\sum fx$ where x is in the correct interval allow one further slip [45 + 165 + 227.5 + 712.5 + 382.5 + 332.5 = 1865] Dependent on second method SC2 for correct answer with no working
	(c) (i)	15, 19, 16	1	
	(ii)	rectangular bars of height 1, 3.8 and 1.6 correct widths of 15, 5, 10 and no gaps	B2FT B1	FT their (c)(i), on correct boundary lines B1FT for 2 correct heights If 0 scored for heights then SC1 for 3 correct frequency densities soi
4	(a)	Enlargement [SF] – $\frac{1}{2}$ oe [centre] (2, 5)	3	B1 for each
	(b) (i)	Image at (–2, 6), (–8, 3), (–4, 3)	2	SC1 for reflection in any vertical line or for 3 correct points not joined
	(ii)	Image at (3, –2), (3, 2), (6, 4)	2	SC1 for rotation 90° [anti clockwise] around origin at (–3, 2) (–3, –2) (–6, –4) or for 3 correct points not joined
	(iii)	Image at (–5, 1), (–3, –2), (1, –2)	2	SC1 for translation by $\begin{pmatrix} -1 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ -5 \end{pmatrix}$ or for 3 correct points not joined
(c)	(i)	$\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$	2	B1 for a correct row or column
	(ii)	Rotation, 90° [anticlockwise] oe origin oe	2	B1 for two elements correct

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5	(a) (i)	8	1	
	(ii)	4	2	M1 for $[g(17) =] \frac{7}{14}$ or $2\left(\frac{7}{x-3}\right)^2 + 7\left(\frac{7}{x-3}\right)$
	(b)	4 or -4	3	M2 for $x^2 = 16$ or $x^2 - 16 = 0$ or M1 for $7 = (x-3)(x+3)$ or better
	(c)	$2x^2 + 7x - 11 [= 0]$ soi $\frac{-7 \pm \sqrt{(7)^2 - 4(2)(-11)}}{2(2)}$	B1 B1FT B1FT	FT $2x^2 + 7x \pm \text{their } k \ [k \neq 0]$ oe B1FT for $\sqrt{7^2 - 4(2)(-11)}$ or better or $\left(x + \frac{7}{4}\right)^2$ oe If in form $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$, B1FT for -7 and 2(2) or better or $-\frac{7}{4} +$ or $-\sqrt{\frac{137}{16}}$ oe
		-4.68, 1.18 final answers	B1B1	If B0 , SC1 for answers -4.7 and 1.2 or -4.676... and 1.176.. seen or for -4.68 and 1.18 seen or for answer 4.68 and -1.18
	(d)	$\frac{x+2}{5}$ or $\frac{x}{5} + \frac{2}{5}$	2	M1 for correct first step or better, e.g. $5y = x + 2$ or $x = \frac{y+2}{5}$ or $x = 5y - 2$ or $y + 2 = 5x$ or $\frac{y}{5} = x - \frac{2}{5}$
	(e)	-2	1	

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6	(a)	–3, 7.375, 8.875	1, 1, 1	Accept 7.4 or 7.37 or 7.38 for 7.375 and 8.9 or 8.87 or 8.88 for 8.875
	(b)	Correct curve	4	B3FT for 8 or 9 correct plots B2FT for 6 or 7 correct plots B1FT for 4 or 5 correct plots Point must touch line if exact or be in correct square if not exact (including boundaries)
	(c) (i)	Any integer less than 7 or greater than 10	1	
	(ii)	7, 8 or 9	1	
	(d)	$y = 15x + 2$ ruled and fit for purpose	B2	B1 for short line but correct or freehand full length correct line or for ruled line through (0, 2) (but not $y = 2$) or for ruled line with gradient 15 (acc ± 1 mm vertically for 1 horizontal unit)
	(e)	–1.45 to –1.35 and 0.4 to 0.5	B2	B1 for each
7		Tangent ruled at $x = 1.5$	B1	No daylight at point of contact. Consider point of contact as midpoint between two vertices of daylight, the midpoint must be between $x = 1.4$ and 1.6
		7 to 12	2	Dep on B1 or close attempt at tangent at $x = 1.5$ M1 for $y - \text{step}/x - \text{step}$ for their tangent
	(a) (i)	$120 \times 55 \times 75 [= 495000]$	M1	
		$\div 1000 [= 495]$ or $495[1] \times 1000 = 495000[\text{ml}]$	M1	
	(b) (i)	11	2	M1 for $495000 \div 750 [\div 60]$ oe [660] After 0 scored, SC1 for answer figs 11
	(ii)	37.5 or 37.50 to 37.51	3	M2 for $\sqrt{\frac{\text{figs}495}{112\pi}}$ oe or M1 for $[112r^2 =] \frac{\text{figs}495}{\pi}$ or $[\pi r^2 =] \frac{\text{figs}495}{112}$ or better

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(c)	15	4	B3 for answer 60 or M3 for $75 - \sqrt{145^2 - (55^2 + 120^2)}$ oe M2 for $\sqrt{145^2 - (55^2 + 120^2)}$ oe or M1 for $\sqrt{55^2 + 120^2}$
(d)	24.4[4..] to 24.45	3	M2 for $\cos^{-1}(\sqrt{55^2 + 120^2}/145)$ oe, e.g. or $\sin^{-1}(75 - \text{their (c)})/145$ or $\tan^{-1}((75 - \text{their (c)})/\sqrt{55^2 + 120^2})$ or M1 for $\cos = \sqrt{55^2 + 120^2}/145$ oe or $\sin = (75 - \text{their (c)})/145$ or $\tan = (75 - \text{their (c)})/\sqrt{55^2 + 120^2}$
8 (a)	Angle $LPQ = 32$ soi $58^2 + 74^2 - 2 \times 58 \times 74 \cos \text{their } P$ 39.50[1...]	B1 M2 A2	M1 for correct implicit cos rule A1 for 1560.3 to 1560.4 or 1560
(b)	$\sin PQL = \frac{58 \sin \text{their } P}{39.5}$ oe 51.1 or 51.08 to 51.09	M2 B1	M1 for $\frac{\sin PQL}{58} = \frac{\sin(\text{their } P)}{39.5}$ oe B1
(c) (i)	322	2	M1 for $180 + 142$ oe
(ii)	[0]13[.1] or 13.08 to 13.09	1FT	FT <i>their (b)</i> – 38
(d)	17.8 or 17.77 to 17.78	3	M1 for $74 \div 2.25$ oe soi by 32.888... to 3 sf or better M1 for dist or speed $\div 1.85$
(e)	30.7 or 30.73 to 30.74...	3	M2 for $58 \sin \text{their } P$ oe or $39.5 \sin \text{their (b)}$ or M1 for $\frac{x}{58} = \sin \text{their } P$ oe or $\frac{x}{39.5} = \sin \text{their (b)}$
9 (a)	28 45 17 21 45 66	1, 1 1 1	
(b) (i)	$4n - 3$ oe	2	M1 for $4n + k$
(ii)	237	1	
(iii)	50	2FT	FT <i>their (b)(i)</i> = 200 solved and then answer truncated dep on linear expression of form $an + k$ M1 for <i>their</i> $4n - 3 = 200$ or <i>their</i> $4n - 3 \leq 200$

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(c)	$p = 2$ and $q = -5$ with some correct supporting working leading to the solutions	5	<p>M2 for any 2 of $p + q + 3 = 0$ oe, $2^2 p + 2q + 3 = 1$ oe, $3^2 p + 3q + 3 = 6$ oe, $4^2 p + 4q + 3 = 15$ oe , $5^2 p + 5q + 3 = \text{their } 28$ oe, etc. or M1 for any one of these M1 indep for correctly eliminating p or q from pair of linear equations A1 for one correct value If 0 scored SC1 for 2 values that satisfy one of their original equations After M0, 2 correct answers SC1</p>
(d)	$2n^2 - n$ or $n(2n - 1)$	2	<p>B1 for answer $2n^2 + k[n]$ or M1 for <i>their quadratic</i> from (c) + <i>their linear</i> from (b)(i)</p>
10 (a) (i)	$\frac{1}{36}$ final answer	2	M1 for $\frac{1}{6} \times \frac{1}{6}$
(ii)	$\frac{1}{12}$ final answer	3	<p>M2 for $3\left(\frac{1}{6} \times \frac{1}{6}\right)$ oe or M1 for identifying 3 correct pairs (4, 6), (6, 4) and (5, 5)</p>
(b)	7	1	
	Refers to most combinations oe	1	Dependent on previous mark
(c)	$\frac{141}{1296}$ oe $\left[\frac{47}{432}\right]$	5	<p>M4 for $\frac{2}{36} + \left[\left(1 - \frac{3}{36}\right) \times \frac{2}{36}\right] + \left(\frac{1}{36} \times \frac{3}{36}\right)$ oe or M3 for 2 correct probabilities shown <u>added</u> from those above or M1 for $\left(1 - \frac{3}{36}\right) \times \frac{2}{36}$ seen oe And M1 for $\frac{1}{36} \times \frac{3}{36}$ seen oe or $\frac{1}{6} \times \frac{1}{6} \times \frac{1}{6} \times \frac{1}{6}$ oe alone or added to a probability not of the form $\frac{n}{36}$</p>

CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International General Certificate of Secondary Education

MARK SCHEME for the October/November 2014 series

0580 MATHEMATICS

0580/43

Paper 4 (Extended), maximum raw mark 130

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

Qu.	Answers	Mark	Part Marks
1	(a) (i) 5.37[1...]	2	M1 for $[AD^2 =] 2.6^2 + 4.7^2$ oe or better
	(ii) 54.1 or 54.11 to 54.12	3	M2 for $\tan [BCD =] \frac{4.7}{(17-11-2.6)}$ oe or B1 for 3.4 seen
	(iii) 65.8	2	M1 for $\frac{11+17}{2} \times 4.7$ oe
	(b) 263.2 or 263	3FT	FT <i>their (a)(iii)</i> $\times 4$ correctly evaluated M2 for <i>their (a)(iii)</i> $\times \left(\frac{9.4}{4.7}\right)^2$ oe or M1 for [scale factor =] $\left(\frac{9.4}{4.7}\right)^2$ or $\left(\frac{4.7}{9.4}\right)^2$ soi
2	(a) (i) $\frac{920}{8} \times 7 [=805]$ oe	1	$\frac{2990}{26} \times 7 [= 805]$
	(ii) 30.8 or 30.76 to 30.77	2	M1 for $\frac{8}{(11+8+7)} [\times 100]$
	(b) 1211 final answer	5	B4 for 13 926.5[0] [area A total sales] or B3 for 11 040 [area B] and 10 867.50 [area C] or 21 907.5 [area B + area C] or B2 for 11 040 [area B] or 10 867.50 [area C] or M1 for 736 [B tickets] and M1 for 483 [C tickets] After 0 scored SC2 for answer of 1196 or SC1 for 13754 (A total sales)

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(c)	37 720	3	M2 for $\frac{35834}{0.95}$ oe or M1 for 35834 associated with 95[%]
3 (a) (i)	52 Angles in same segment	1 1dep	Accept same arc, same side of same chord
(ii)	104 Angle at centre is twice angle at circumference	1 1	Accept double, $2 \times$ but not middle, edge
(iii)	34 Angle between tangent and radius = 90°	1 1	Accept right angle, perpendicular
(b) (i)	7.65 to 7.651	4	M2 for $8.92 + 72 - 2 \times 8.9 \times 7 \times \cos 56$ or M1 for correct implicit formula and A1 for 58.5 to 58.6
(ii)	49.3 or 49.33 to 49.34...	3	M2 for $[\sin BEC =] \frac{7 \sin 56}{\text{their (b)(i)}}$ oe or M1 for $\frac{\sin 56}{\text{their (b)(i)}} = \frac{\sin BEC}{7}$ oe
4 (a) (i)	Ariven with comparable form for both shown or difference between the two fractions shown	1	Accept probabilities changed to decimals or percentages (to 2sf or better)
(ii)	$\frac{6}{15}$ oe	2	M1 for $\frac{3}{5} \times \frac{2}{3}$
(iii)	$\frac{7}{15}$ oe	3	M2 for $\frac{3}{5} \times \frac{1}{3} + \frac{2}{5} \times \frac{2}{3}$ oe $1 - \text{their (a)(ii)} - \frac{2}{5} \times \frac{1}{3}$ or M1 for $\frac{3}{5} \times \frac{1}{3}$ or $\frac{2}{5} \times \frac{2}{3}$ seen
(b) (i)	Completes tree diagram correctly	3	B2 for 5 values correct or B1 for 1 value correct
(ii)	$\frac{126}{350}$ oe $\left[\frac{9}{25} \right]$	2	M1 for $\frac{3}{5} \times \frac{6}{7} \times \frac{7}{10}$

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	(iii) $\frac{344}{350}$ oe	3	<p>M2 for $1 - \text{their } \frac{2}{5} \times \text{their } \frac{1}{7} \times \text{their } \frac{3}{10}$ oe</p> <p>or $\frac{3}{5} + \frac{2}{5} \times \frac{6}{7} + \frac{2}{5} \times \frac{1}{7} \times \frac{7}{10}$</p> <p>M1 for $\text{their } \frac{2}{5} \times \text{their } \frac{1}{7} \times \text{their } \frac{3}{10}$ oe</p> <p>or identifies the 7 routes</p> <p>or attempt to add 7 probabilities with at least 5 correct</p> <p>$\frac{9}{25} + \frac{27}{175} + \frac{3}{50} + \frac{9}{350} + \frac{6}{25} + \frac{18}{175} + \frac{1}{25}$ oe</p>
5	<p>(a) (i) $\begin{pmatrix} 0 & -4 \\ 4 & 0 \end{pmatrix}$</p> <p>(ii) $\begin{pmatrix} -1 & 1 \\ 1 & -1 \end{pmatrix}$</p> <p>(iii) $\begin{pmatrix} -1 & 0 \\ 0 & -1 \end{pmatrix}$</p> <p>(iv) $\begin{pmatrix} -13 \\ 5 \end{pmatrix}$</p> <p>(b) $\begin{pmatrix} 1 & 2 \\ 0 & 1 \end{pmatrix}$</p>	<p>1</p> <p>1</p> <p>2</p> <p>2</p> <p>3</p>	<p>B1 for three correct elements</p> <p>B1 for either correct in this form</p> <p>M1 for understanding to find the inverse of Q</p> <p>and M1 for $\det = 1$ or for $k \begin{pmatrix} 1 & 2 \\ 0 & 1 \end{pmatrix} k \neq 0$</p> <p>Alternative</p> <p>$\begin{pmatrix} 1 & -2 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} a & b \\ c & d \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$</p> <p>Leading to $a - 2c = 1$ and $c = 0$ then $a = 1$</p> <p>and $b - 2d = 1$ and $d = 1$ then $b = 2$</p> <p>M2 all four equations, M1 for a pair of correct equations</p>
6	<p>(a) (i) $\frac{x^8}{3}$ final answer</p> <p>(ii) $15x^7y^3$ final answer</p> <p>(iii) $16x^8$ final answer</p>	<p>1</p> <p>2</p> <p>2</p>	<p>M1 for 2 elements correct</p> <p>M1 for $16x^k$ or kx^8</p>

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	(b)	$\sqrt{([-]7)^2 - 4.3 - 12}$ or better and $p = [-]7$ and $r = 2(3)$ oe 3.48, -1.15 cao	B1 or for $\left(x - \frac{7}{6}\right)^2$ B1 Must see $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$ or both or for $\frac{7}{6} \pm \sqrt{4 + \left(\frac{7}{6}\right)^2}$ B1B1 After B0 , SC1 for answer 3.5 and -1.1 or 3.482... and -1.149 to -1.148 seen or for 3.48, -1.15 seen or for answer -3.48 and 1.15
	(c)	$\frac{x+5}{x^2}$ or $\frac{1}{x} + \frac{5}{x^2}$ final answer nfw	3 B1 for $(x+5)(x-5)$ and B1 for $x^2(x-5)$
7	(a)	$\frac{1}{2} \times 8 \times 8 \times \sin 56$ oe 26.52 to 26.53	M1 or $[\frac{1}{2} \times 2] 8 \sin 28 \times 8 \cos 28$ or $[\frac{1}{2} \times 2] \times 7.06... \times 3.75...$ A1
	(b) (i)	72.[0] or 71.87 to 72.0	3 M2 for $26.5 / (\pi \times 6.5^2) \times 360$ oe or M1 for $\frac{x}{360} \times \pi \times 6.5^2 = 26.5$ or better
	(ii)	21.1 or 21.2 or 21.14 to 21.17	3 M2 for $\frac{\text{their (b)(i)}}{360} \times \pi \times 2 \times 6.5 + 2 \times 6.5$ oe or M1 for $\frac{\text{their (b)(i)}}{360} \times \pi \times 2 \times 6.5$ oe or $\frac{\text{their (a)}}{0.5 \times 6.5}$
	(c) (i)	$\frac{30}{360} \times \pi \times r^2 - \frac{1}{2} \times r^2 \times \sin 30$ oe $\frac{1}{12} \times \pi \times r^2 - \frac{1}{4} \times r^2$ $\frac{1}{4} r^2 \left(\frac{1}{3} \pi - 1 \right)$	M2 M1 for $\frac{30}{360} \times \pi \times r^2$ or $\frac{1}{2} \times r^2 \times \sin 30$ A1
	(ii)	20.6 or 20.7 or 20.55 to 20.71	A1 Dep on M2 A1 and no errors seen 3 M2 for $[r^2 =] \frac{5}{\frac{1}{4} \left(\frac{1}{3} \pi - 1 \right)}$ or M1 for one correct rearrangement step to r from $\frac{1}{4} r^2 \left(\frac{1}{3} \pi - 1 \right) = 5$

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8	(a) (i)	(1, 2)	1+1	
	(ii)	$y = 3x - 1$ cao final answer	3	M1 for gradient = $\frac{8-4}{3-1}$ oe and M1 for substituting (3, 8) or (-1, -4) into <i>their</i> $y = 3x + c$ or for finding y -intercept is -1
	(b) (i)	$(x + 5)(x - 2)$ isw solutions	2	SC1 for $(x + a)(x + b)$ where $ab = -10$ or $a + b = 3$
	(ii)	$[a =] \quad -5$ $[b =] \quad 2$ $[c =] \quad -10$	3FT	B1FT for each of <i>their</i> 5 and <i>their</i> -2 from (b)(i) and B1 for $c = -10$
	(iii)	$x = -1.5$	1FT	FT $x = (\text{their } (a + b))/2$
	(c)	Inverted parabola x -axis intercepts at -2 and 9 y -axis intercept at 18	B1 B2 B1	B1 for each After B0 allow SC1 for $(9 - x)(2 + x)$ oe
	(d) (i)	$p = 6$ $q = 43$	3	B2 for $(x + 6)^2 - 43$ or $p = 6$ or $q = 43$ or M1 for $(x + 6)^2$ or $x^2 + px + px + p^2$ and M1 for $-7 - (\text{their } 6)^2$ or $p^2 - q = -7$ or $2p = 12$
	(ii)	-43	1FT	FT - <i>their</i> q
9	(a) (i)	7	4	M2 for $\frac{16 \times 11 + 17 \times 10 + 18p + 19 \times 4 + 20 \times 8}{11 + 10 + 4 + 8 + p} = 17.7$ or better or M1 for sum of two correct products or better or for [total =] $11 + 10 + 4 + 8 + p$ and B1 for $582 + 18p = 17.7 (33 + p)$
	(ii)	17	1FT	STRICT FT median for <i>their</i> p if integer
	(b) (i)	64	2	M1 for $\frac{320}{6.4} \times 1.28$ oe
	(ii)	40	2	M1 for $\frac{320}{480} \times 60$ oe
	(iii)	1.6[0]	2FT	FT <i>their</i> (b)(i) / <i>their</i> (b)(ii) evaluated correctly to 2dp M1 for <i>their</i> (b)(i) / <i>their</i> (b)(ii) or $\frac{480}{6.4} \times 1.28 \div 60$

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(c)	9.9125 cao	5	B4 for answer 9912.5 or M1 for 25 to 35×290 to 310 oe and B1 for 32.5 used and B1 for 305 or 5 mins 5 secs used and M1 indep for any correct conversion seen m to km
10 (a) (i)	$5x + 14$ final answer	2	M1 for $5x + k$ or $kx + 14$
(ii)	14.2	3	M1 for $5x = 32 - 14$ FT <i>their</i> expression in (a)(i) A1FT for $x = 3.6$
(b)	$8a - 3b + 14 = 32.5$ or better $5a + 4b + 13.5 = 39.75$ or better Equates coefficients of either a or b $40a - 15b = 92.5$ $40a + 32b = 210$ or $32a - 12b = 74$ $15a + 12b = 78.75$ Adds or subtracts to eliminate $47b = 117.5$ $47a = 152.75$ $[a =] 3.25$ $[b =] 2.5$	B1 B1 M1 M1 A1 A1	$8a - 3b = 18.5$ $5a + 4b = 26.25$ or rearranges one of <i>their</i> equations to make a or b the subject e.g. $a = \frac{3b + 18.5}{8}$ Dep on previous method or correctly substitutes into the second equation e.g. $\frac{5(3b + 18.5)}{8} + 4b = 26.25$ After M0 scored SC1 for 2 correct values with no working or for two values that satisfy one of their original equations

MARK SCHEME for the May/June 2014 series

0580 MATHEMATICS

0580/41

Paper 4 (Extended), maximum raw mark 130

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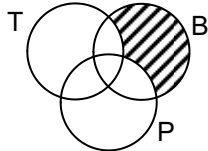
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Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

Qu		Answers	Mark	Part Marks
1	(a) (i)	$\begin{pmatrix} 6 & 4 \\ -2 & 2 \end{pmatrix}$	1	
	(ii)	Not possible	1	
	(iii)	$\begin{pmatrix} 6 & 4 \\ -2 & 2 \end{pmatrix}$	2	B1 for one row or column correct
	(iv)	$\frac{1}{5}\begin{pmatrix} 1 & -2 \\ 1 & 3 \end{pmatrix}$ oe isw	2	B1 for $\frac{1}{5}\begin{pmatrix} a & c \\ b & d \end{pmatrix}$ seen or $k\begin{pmatrix} 1 & -2 \\ 1 & 3 \end{pmatrix}$ seen
	(b)	1 column in C and 2 rows in D	1	Any clear indication
	(c)	Enlargement [Factor] 2 [Centre] (0, 0) oe	1 1 1	
2	(a)	8	2	M1 for $12 \div 1.5$ oe
	(b)	[Distance =] 36 their $36 \div 3 [= 12]$ oe	B1 M1	
	(c)	200	2	M1 for $12 \times 1000 \div 60$ oe e.g. $36000 \div 180$
	(d)	Horizontal line at 36 to 13 45 (their 13 45, 36) joined to (16 42, 0)	1 1FT	
3	(a)	62 705	2	M1 for $75246 \div 6$ soi by 12 541 or 75246×5
	(b)	10.9 or 10.88...	3	M2 for $\frac{(150675 - 135890)}{135890} \times 100$ oe or M1 for correct fraction soi by 0.1088... or $\frac{150675}{135890} \times 100$ soi by 110.88...

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Qu		Answers	Mark	Part Marks
	(c)	127 000	3	M2 for $135\,890 \div 1.07$ oe or M1 for 135 890 associated with 107%
	(d) (i)	59 112 to 59 113 or 59 100 or 59 110 or 59 119 to 59 120 or 59 100 nfw	3	M2 for $\pi \times 21 \times (30^2 - 2^2)$ oe Or M1 for $\pi \times 21 \times 30^2$ or $\pi \times 21 \times 2^2$
	(ii) (a)	0.0125	1	
	(b)	7580 or 7582 or 7581 or 7583 nfw	4	M1 for $21 \times 29.7 \times \text{their } 0.0125$ [=7.796 or 7.8[0]] and M1 for <i>their</i> (d)(i) $\div (21 \times 29.7 \times \text{their } 0.0125)$ A1 for 7580 to 7583.2 (non integer) If 0 then SC1 for <i>their</i> (d)(i) $\div (21 \times 29.7 \times 0.125)$
4	(a)	4 – x correctly placed 5 – x correctly placed 7 correctly placed	1 1 1	SC3 for 1, 2 and 7 all correctly placed instead of expressions in x
	(b)	$4 + 11 + (6 - x) + x + 9 + (4 - x) + (5 - x) + 7 = 40$ oe $46 - 2x = 40$ nfw $x = 3$	M1 A1 B1	FT from their Venn diagram, condone omission of one subset Must be in the form $a + bx = c$, ie each side simplified, or better
	(c) (i)	$\frac{9}{40}$ or 0.225 or 22.5%	1	ISW cancelling or conversion after correct answer seen
	(ii)	2	1FT	FT from their Venn diagram and their x provided $n(B \cap P \cap T') \neq 5$
	(iii)	15	1FT	FT from their Venn diagram
	(iv)	25	1FT	FT from their Venn diagram
	(v)	4	1	
	(d)	Correct region shaded. 	1	

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Qu		Answers	Mark	Part Marks
5	(a)	[0]44 to [0]48	1	
	(b)	12.6 to 13.2	2	B1 for 8.4 to 8.8 seen
	(c)	340	1	
	(d)	1 : 150 000	2	M1 for $\times 100\,000$ soi
	(e)	Arcs for perp bisector of <i>SL</i>	1	Two pairs of correct arcs
		Ruled perp bisector of <i>SL</i>	1	Within tolerance of overlay
		Arcs for bisector of angle <i>PSL</i>	1	Marks on <i>PS</i> and <i>SL</i> plus one pair of correct arcs
		Ruled bisector of angle <i>PSL</i>	1	Within tolerance of overlay
		B marked within accuracy	1	Within tolerance of overlay Dep on two correct bisectors drawn
	(f)	3.375	2	M1 for 1.5×1.5^2 or $(2/3)^2$ seen
6	(a) (i)	0.6 oe	2	M1 for $0.2 + 0.4$
	(ii)	1500	1	
	(iii)	0.03 oe	2	M1 for 0.1×0.3
	(b)	$\frac{112}{132}$ oe $\frac{28}{33} = 0.848[4\dots]$	3	M2 for $1 - \frac{5}{12} \times \frac{4}{11}$ or $\frac{7}{12} \times \frac{5}{11} + \frac{5}{12} \times \frac{7}{11} + \frac{7}{12} \times \frac{6}{11}$ or $\frac{7}{12} + \frac{5}{12} \times \frac{7}{11}$ or M1 for addition of any two of $\frac{7}{12} \times \frac{5}{11}$, $\frac{5}{12} \times \frac{7}{11}$, $\frac{7}{12} \times \frac{6}{11}$ or sum of 3 products with an error in the numerator of one product or for $\frac{5}{12} \times \frac{4}{11}$ identified

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Qu		Answers	Mark	Part Marks
7	(a) (i)	Image: $(-4, -3), (-4, -1), (-3, -1)$	2	SC1 for translation $\begin{pmatrix} -5 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ -4 \end{pmatrix}$
	(ii)	Image: $(1, -1), (3, -1), (3, -2)$	2	SC1 for rotation about the origin but 90° anticlockwise
	(b) (i)	Image: $(2, 1), (2, 3), (4, 3)$	3	B2 for 2 correct vertices plotted or SC2 for 3 vertices shown in working or SC1 for 2 vertices shown in working or M1 $\begin{pmatrix} 2 & 0 \\ 0 & 1 \end{pmatrix} \times \begin{pmatrix} 1 & 1 & 2 \\ 1 & 3 & 3 \end{pmatrix}$
	(ii)	Stretch	1	
		[factor] 2	1	
		Invariant line y -axis oe	1	Accept $x = 0$, stays the same
8	(a)	2.125 and 2.375	2	B1 for one correct value
	(b)	Correct curve	B4	B3FT for 11 correct plots or B2FT for 9 or 10 correct plots or B1FT for 7 or 8 correct plots
	(c)	Ruled tangent at $x = 2$	B1	No daylight at $x = 2$. Consider point of contact as midpoint between two vertices of daylight, this must be between $x = 1.8$ and 2.2
		Gradient from 7.8 to 10.2	2	Dep on B1 awarded Allow integer/integer or a mixed number if within range or M1 dep for $(\text{change in } y) \div (\text{change in } x)$ Dependent on any tangent drawn or close attempt at a tangent at <u>any</u> point Must see correct or implied calculation from a drawn tangent
	(d)	0 and -1.75 to -1.65 and 1.65 to 1.75	2	B1 for two correct values
	(e)	-1.2 to $-0.8 < k < 2.8$ to 3.2	2	B1 for each correct or SC1 for reversed answers

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Qu		Answers	Mark	Part Marks
9	(a) (i)	37.5 to 38.5	1	
	(ii)	19.5 to 20.5 nfw	2	B1 for [LQ =] 23.5 to 24 or [UQ =] 43.5 to 44
	(iii)	43	2	B1 for 56 seen or horizontal line drawn at cf = 56
	(b) (i)	31.8[4...] nfw	4	M1 for midpoints soi (condone 1 error or omission) and M1 for use of $\sum ft$ with t in correct interval including both boundaries (condone 1 further error or omission) and M1 (dep on 2 nd M1) for $\sum ft \div 80$ (2547.5 \div 80)
	(ii)	Correct histogram	4	B1 for each correct block with correct width and height If B0 then SC1 for four correct f.d.s or four correct widths
10	(a) (i)	5	1	
	(ii)	$-2\frac{1}{3}$ oe	2	B1 for [h(-1) =] $\frac{1}{3}$ soi or M1 for $2(3^x) - 3$
	(iii)	$\frac{x+3}{2}$ or $\frac{x}{2} + 1.5$ as final ans	2	M1 for $y + 3 = 2x$ or $x = 2y - 3$ or $\frac{y}{2} = x - 1.5$ or better or correct reverse flowchart
	(iv)	$4x - 9$ as final answer nfw	2	M1 for $2(2x - 3) - 3$
	(v)	$(2x - 3)(x + 1) = 1 + 2(x + 1)$	M1	$(2x - 5)(x + 1) = 1$ (eliminate fractions)
		$2x^2 - 3x + 2x - 3$ or better seen	B1	$2x^2 - 5x + 2x - 5$ or better seen
		$2x^2 - 3x - 6 = 0$	A1	No errors or omissions seen

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Qu		Answers	Mark	Part Marks
	(vi)	$\frac{-(-3) \pm \sqrt{(-3)^2 - 4 \times 2 \times -6}}{2 \times 2}$	B2	B1 for $\sqrt{(-3)^2 - 4 \times 2 \times -6}$ or better [$\sqrt{57}$] and if in form $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$ B1 for $p = -(-3)$ and $r = 2 \times 2$ or better
		2.64 and – 1.14 cao	B1B1	SC1 for 2.64 and –1.14 seen in working or 2.6 and –1.1 as final ans or 2.637. and –1.137.. as final ans or –2.64 and 1.14 as final ans
	(b)	$\frac{x-1}{x+5}$ as final answer nfw	4	B3 for $(x-1)(x-2)$ and $(x+5)(x-2)$ or B2 for $(x-1)(x-2)$ or $(x+5)(x-2)$ or SC1 for $(x+a)(x+b)$ where $a+b=3$ or -3 or $ab=2$ or -10
11	(a) (i)	(– 5, 7)	1	
	(ii)	5	2	M1 for $\sqrt{(-3)^2 + 4^2}$ or better
	(b) (i)	(a) $\frac{3}{5}\mathbf{a} + \frac{2}{5}\mathbf{b}$ or $\frac{1}{5}(3\mathbf{a} + 2\mathbf{b})$ final answer	2	M1 for any correct vector path for \overrightarrow{ON}
		(b) $\frac{2}{5}\mathbf{a}$	2	M1 for any correct vector path for \overrightarrow{NY}
	(ii)	$NY = \frac{2}{5}BC$ oe	1dep	dep on (b)(i)(b) correct
		[NY] parallel to [BC]	1dep	dep on $\overrightarrow{NY} = k\mathbf{a}$, $k \neq 1$

MARK SCHEME for the May/June 2014 series

0580 MATHEMATICS

0580/42

Paper 4 (Extended), maximum raw mark 130

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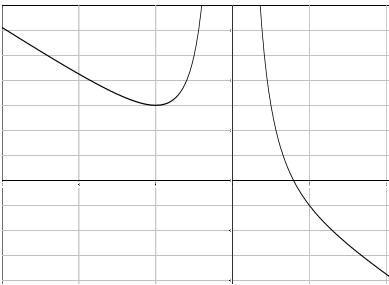
Page 2	Mark Scheme	Syllabus	Paper
	IGCSE – May/June 2014	0580	42

Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

Qu		Answers	Mark	Part Marks
1	(a)	$240 \div (5 + 7) \times 7$ [=140] oe	M2	M1 for $240 \div (5 + 7)$ or 240×7
	(b)	2 : 3 final answer	2	B1 for ratio of form $2x : 3x$ seen or SC1 for 3 : 2
	(c)	144	3	M2 for $120 + \frac{120 \times 4 \times 5}{100}$ oe or M1 for $\frac{120 \times 4 \times 5}{100}$
	(d)	89.99 cao mark final answer	3	B2 for 89.9[8...] shown but not spoiled or answer 90[.0..] nfw or M1 for $80 \times \left(\frac{104}{100}\right)^3$ oe If M1 spoiled by adding 80 or subtracting 80 then SC1 for answers 169.99 or 9.99
	(e)	4.08	3	M2 for $\frac{200 \times r \times 2}{100} = 200 \times 1.04^2 - 200$ oe or M1 for 200×1.04^2 [216.3[2]] oe or $\frac{200 \times r \times 2}{100}$ oe

Page 3	Mark Scheme	Syllabus	Paper
	IGCSE – May/June 2014	0580	42

Qu		Answers	Mark	Part Marks
2	(a)	3, 3, – 1	3	B1 B1 B1
	(b)	Complete correct curve 	5	B3FT 11 points or B2FT for 9 or 10 points or B1FT for 7 or 8 points And B1indep two separate branches not touching or crossing y-axis
	(c)	0.5 to 0.6	1	
	(d)	Correct line and 0.4 to 0.5 or no line and 0.4 to 0.5 nfw	3	Must check line - not if wrong line B2 for $y = 2x + 3$ ruled correctly or SC1 for correct freehand line or ruled line with either gradient 2 or y-intercept 3 but not $y = 3$
	(e) (i)	Tangent at $x = -1.5$	1	No daylight at $x = -1.5$. Consider point of contact as midpoint between two vertices of daylight, the midpoint must be between $x = -1.7$ and -1.3
	(ii)	– 2 to – 1	2	Dependent on tangent mark awarded Allow integer/integer if in range Or M1 for rise/run also dep on any tangent drawn or close attempt at tangent at any point Must see correct or implied calculation from a drawn tangent

Page 4	Mark Scheme	Syllabus	Paper
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Qu		Answers	Mark	Part Marks
3	(a)	86.8 or 86.83....	3	M2 for $\frac{80 \sin 55}{\sin 49}$ or M1 for $\frac{80}{\sin 49} = \frac{x}{\sin 55}$ oe
	(b)	51.2 or 51.15 to 51.16	4	M2 for $[\cos =] \frac{95^2 + 90^2 - 80^2}{2 \cdot 95 \cdot 90}$ oe or M1 for $80^2 = 95^2 + 90^2 - 2 \cdot 90 \cdot 95 \cdot \cos BCD$ A1 for $\frac{10\,725}{17\,100}$ or $\frac{143}{228}$ etc. or 0.627.....
	(c)	6700 or 6698 to 6703	3	M2 for $0.5 \times 80 \times \text{their}(a) \times \sin(180-55-49)$ oe [3368 – 3370...] [If <i>AB</i> used then <i>AB</i> = 102.8 to 103] + $0.5 \times 90 \times 95 \times \sin(\text{their}(b))$ oe [3329 – 3332] or M1 for one of these triangle area methods oe
	(d)	2180 or 2176 to 2179	3FT	FT <i>their</i> (c) $\times 0.325$ correctly evaluated to 3 sf or better M2 for <i>their</i> (c) $\times \frac{3250}{10\,000}$ or SC1 FT for figs 218 or figs 2176 to 2179

Page 5	Mark Scheme	Syllabus	Paper
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Qu		Answers	Mark	Part Marks
4	(a)	Image at $(-3, 2), (-5, 2), (-5, 4), (-3, 3)$	2	SC1 reflection in $y = -1$ or $x = k$ or 4 correct points not joined
	(b) (i)	Image at $(-2, -4), (-6, -4), (-6, -8), (-2, -6)$	2	SC1 other enlargement of scale factor -2, correct size and correct orientation or 4 correct points not joined
	(ii)	$\begin{pmatrix} -2 & 0 \\ 0 & -2 \end{pmatrix}$	2	SC1 for $\begin{pmatrix} k & 0 \\ 0 & k \end{pmatrix}$, k may be algebraic or numeric but not 0 or 1
	(c) (i)	Image at $(1, 4), (3, 4), (3, 8), (1, 6)$	2	SC1 for trapezium with vertices at $(1, 6)$ and $(3, 8)$ or correct stretch with y -axis invariant or 4 correct points not joined
	(ii)	$\begin{pmatrix} 1 & 0 \\ 0 & 2 \end{pmatrix}$	2	SC1 for $\begin{pmatrix} 1 & 0 \\ 0 & k \end{pmatrix}$ k may be algebraic or numeric but not 0 or 1 or for $\begin{pmatrix} 2 & 0 \\ 0 & 1 \end{pmatrix}$
	(iii)	$\frac{1}{2}\begin{pmatrix} 2 & 0 \\ 0 & 1 \end{pmatrix}$ oe isw	2FT	FT inverse of their (c)(ii) (algebraic or numeric) B1FT their (c)(ii) for $\frac{1}{2}\begin{pmatrix} a & c \\ b & d \end{pmatrix}$ or $P \begin{pmatrix} 2 & 0 \\ 0 & 1 \end{pmatrix}$ ie FT their correct fraction or their transposed matrix FT for 2 and 1 mark dependent on $\det \neq 0$
	(iv)	Stretch, [factor] $\frac{1}{2}$, invariant [line] x -axis oe	3	B1 B1 B1 each independent cao

Page 6	Mark Scheme	Syllabus	Paper
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Qu		Answers	Mark	Part Marks
5	(a) (i)	2412 to 2413....	B2	Must be at least 4 figures shown M1 for $\pi \times 8^2 \times 12$ oe
	(ii)	2.41[0]	B1	
	(b)	1 min 24 s	4	B3 for 83.76 to 83.8[0] or 84 or 1.396 to 1.397 or 1.4 or 1 min 23.76 to 1 min 23.8 seen or M2 for $\frac{1}{3}\pi \times 4^2 \times 10 \div 2$ [80/3 π] or M1 for $\frac{1}{3}\pi \times 4^2 \times 10$ [160/3 π or 167.5 to 167.6]
	(c)	14	3	M1 for $\frac{2410}{\frac{1}{3}\pi \times 4^2 \times 10}$ or $\frac{2410}{\text{their cone vol from part (b)}}$ A1 for 14.3 to 14.4....
6	(a) (i)	[x =] 21, [y =] 42	2	B1 B1
	(ii)	3.79 or 3.8[0] or 3.792 to 3.802	2	M1 for $\frac{3.31}{TQ} = \frac{8.23}{9.43}$ oe or $\frac{\sin 21 \text{ or } \sin \text{their } x}{TQ} = \frac{\sin 117}{9.43}$ oe
	(b)	40	4	B3 for angle between <i>HE</i> and tangent = 25 or GFH = 40 or EGH = 25 and angle <i>EHG</i> = 115 (accept 90 and 25 at <i>H</i> for 115) B2 for angle <i>EGH</i> = 25 or angle <i>EHG</i> = 115 (accept 90 and 25 at <i>H</i> for 115) B1 for angle <i>FEG</i> = 25 or angle <i>EFG</i> = 65
	(c)	38	5	B4 for angle <i>ADC</i> = 104 or M4 for $x + 14 + 20 + x + 70 = 180$ or better or B3 for angle <i>OBA</i> = 20 and angle <i>OBC</i> = 56 or angle <i>CBA</i> = 76 or reflex angle <i>AOC</i> = 208 or B2 for angle <i>OAB</i> or <i>OBA</i> = 20 and angle <i>ACB</i> = 70 or obtuse angle <i>AOC</i> = 152 or angle <i>BOC</i> = 68 or B1 for angle <i>OAB</i> or <i>OBA</i> = 20 or angle <i>ACB</i> = 70

Page 7	Mark Scheme	Syllabus	Paper
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Qu		Answers	Mark	Part Marks
7	(a) (i)	$(100 - 70) \times 0.4 [= 12]$ or better	1	Accept $\frac{24}{78} \times 39$ oe
	(ii)	60.9 or 60.89... nfw	5	B1 for 3 or 4 correct extra frequencies 3, 6, 10, 8 soi M1 for at least 4 of mid-interval values 15, 40, 55, 65, 85 soi M1 for Σfx where x is any value in each interval allow <i>their</i> frequencies provided integers and they must be shown $[3 \times 15 + 6 \times 40 + 10 \times 55 + 8 \times 65 + 12 \times 85]$ [2375] M1 (dependent on second M1) for $\div 39$ or $\div (3 + 6 + 10 + 8 + 12)$
	(b)	60.5	3	M2 for $20 \times 70 - 19 \times 70.5$ oe or M1 for either 20×70 or 19×70.5
8	(a) (i)	$\frac{600}{x}$	1	Not $x = \frac{600}{x}$
	(ii)	$\frac{600}{x+1}$	1	Not $x = \frac{600}{x+1}$
	(b) (i)	$\frac{600}{x} - \frac{600}{x+1} = 20$ oe	M1FT	FT <i>their</i> (a)(i) – <i>their</i> (a)(ii) = 20 oe If M0 , SC1FT for <i>their</i> (a)(ii) – <i>their</i> (a)(i) = 20 oe
		$600(x+1) - 600x = 20x(x+1)$ or better	A1	May still be over common denominator and can be implied by third line. Allow recovery if bracket omitted
		$600x + 600 - 600x = 20x^2 + 20x$ $0 = 20x^2 + 20x - 600$ $x^2 + x - 30 = 0$	A1	Dep on M1A1 and conclusion reached with at least one of the interim lines and without any errors or omissions

Page 8	Mark Scheme	Syllabus	Paper
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Qu		Answers	Mark	Part Marks
	(ii)	$x = 5$	B3	B2 for $(x + 6)(x - 5) [= 0]$ oe or SC1 for $(x + a)(x + b)$ where $ab = -30$ or $a + b = 1$ or B2 for $\frac{-1 + \text{or} - \sqrt{1^2 - 4.1. - 30}}{2.1}$ or $\sqrt{30 + \left(\frac{1}{2}\right)^2} - \frac{1}{2}$ or B1 for $\frac{-1 + \text{or} - \sqrt{q}}{2.1}$ or $\sqrt{1^2 - 4.1 - 30}$ or $\left(x + \frac{1}{2}\right)^2$
		100	B1FT	FT $600 \div (\text{their } x + 1)$ if $x > 0$ correctly evaluated
9	(a)	$\frac{1}{4}, \frac{9}{10}, \frac{1}{3}, \frac{2}{3}$	3	B1 for $\frac{1}{4}$ B1 for $\frac{9}{10}$ B1 for $\frac{1}{3}$ and $\frac{2}{3}$
	(b)	45	1	
	(c)	$\frac{3}{40}$ oe	2	M1 for $\frac{3}{4} \times \frac{1}{10}$ oe
	(d)	$\frac{101}{120}$ oe	3	M2 for $\frac{3}{4} \times \frac{9}{10} + \frac{1}{4} \times \frac{2}{3}$ only or $1 - \text{their (c)} - \frac{1}{4} \times \frac{1}{3}$ only or M1 for $\frac{3}{4} \times \frac{9}{10}$ or $\frac{1}{4} \times \frac{2}{3}$ or their (c) + $\frac{1}{4} \times \frac{1}{3}$
	(e)	$\frac{781}{1024}$ oe	2	M1 for $1 - \left(\frac{3}{4}\right)^5$ oe

Page 9	Mark Scheme	Syllabus	Paper
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Qu		Answers	Mark	Part Marks
10	(a)	2	2	B1 for $g\left(\frac{1}{2}\right) = \frac{1}{2}$ soi or $[fg=] \frac{1}{1-x}$
	(b)	$1 - x$	1	Accept equivalents e.g. $-(x - 1)$
	(c)	$x^2 - 2x + 2$	3	M1 for $(1 - x)^2 + 1$ B1 for $[(1 - x)^2 =] 1 - x - x + x^2$ or better
	(d)	-6	1	
	(e)	$\sqrt{(-3)^2 - 4(1)(1)}$ or better	B1	or for $\left(x - \frac{3}{2}\right)^2$
	(f)	$p = -(-3)$ and $r = 2 \times 1$ oe 0.38, 2.62 $f(x)$ and $g(x)$	B1 B1B1 1	Must see $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$ or both or for $\frac{3}{2} + or - \sqrt{\left(\frac{3}{2}\right)^2 - 1}$ SC1 for answers 0.4 and 2.6 or 0.3819 to 0.3820 and 2.618... or 0.38 and 2.62 seen in working or for -0.38 and -2.62 as final ans Accept f and g or $1/x$ and $1 - x$

Page 10	Mark Scheme	Syllabus	Paper
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Qu	Answers	Mark	Part Marks
11	$\frac{1}{3}$ $\frac{72}{360}$ oe $\frac{1}{4}$ $\frac{1}{6}$ $\frac{\pi-2}{\pi}$ or $1-\frac{2}{\pi}$ or 0.363 or 0.3630 to 0.3635	1 1 2 2 4	<p>Allow equivalent decimal throughout (3sf or better where necessary)</p> <p>M1 for $\left(\frac{1}{2}\right)^2$ or $(2)^2$ or $1^2 : 2^2$ or $2^2 : 1^2$ oe seen</p> <p>M1 for $[X = 6 \times] 0.5 \times l^2 \times \sin 60$ or $[X = 6 \times] 0.5 \times l^2 \times \sin 120$ Or recognition that the area of the obtuse-angled triangle shaded is equal to the area of one of the 6 equilateral triangles from the centre</p> <p>If fraction given as answer, check if it falls into range B1 for [sector=] $\frac{1}{4}\pi r^2$ oe B1 for [triangle=] $\frac{1}{2}r^2$ oe M1dep for $\frac{\text{their sector} - \text{their triangle}}{\text{their sector}}$ dep on B1B1 earned</p>

MARK SCHEME for the May/June 2014 series

0580 MATHEMATICS

0580/43

Paper 4 (Extended), maximum raw mark 130

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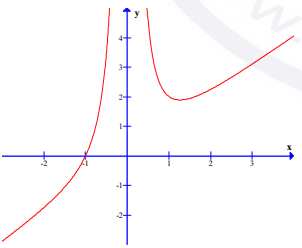
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soi	seen or implied

Qu		Answers	Mark	Part Marks
1	(a)	62100[.00] Final answer	2	B1 for 62 074[. 35] or 62 070
	(b)	39300	3	M2 for $45\,981 \div 1.17$ oe or M1 for 45 981 associated with 117 [%]
	(c)	20436	2	M1 for $45\,981 \div (3+4+2)$ or $45\,981 \times 4$
	(d)	4	3	M2 for $\frac{1.5 \times 1000}{330}$ oe or M1 for figs 4545... or 455
	(e)	25545	2	M1 for $45\,981 \times \frac{5}{9}$
2	(a)	$10 < x \leq 25$ $25 < x \leq 30$ $30 < x \leq 35$ $35 < x \leq 50$ $50 < x \leq 60$	2	5 correct B1 for 3 or 4 correct or SC1 for all correct but in the form 10 to 25 or 10 – 25
		13 33 19 [4] 15 6	3	B2 for 4 correct or B1 for 3 correct
	(b)	25.1[0] or 25.13 to 25.14 nfw	4	M1 for mid-values soi, condone one error or omission 5 17.5 27.5 32.5 42.5 55 soi and M1 for $\sum fx$ for any x in intervals including boundaries, but all fx must be integers, condone one further error or omission and M1 dep for $\sum fx \div 90$ Dep on 2nd M mark earned

Page 3	Mark Scheme	Syllabus	Paper
	IGCSE – May/June 2014	0580	43

Qu		Answers	Mark	Part Marks
3	(a) (i)	72[.0] or 71.98 to 71.99 nfw	3	M2 for $[\sin P =] \frac{97}{\frac{1}{2} \times 12 \times 17}$ oe or M1 for implicit version
	(ii)	16.2 or 16.18 to 16.19 nfw	4	M2 for $6^2 + 17^2 - 2 \times 6 \times 17 \times \cos(\text{their } 72)$ or M1 for implicit form and A1 for $[XR^2 =] 261.8$ to 262
	(b)	7.61 or 7.612... nfw	4	M3 for $[a =] 9.4 \times \sin 37 \div \cos 42$ oe or $[a =] 9.4 \sin 37 / \sin(90 - 42)$ or M2 for $[a =]$ their height $\div \cos 42$ oe or $\frac{a}{\sin 37} = \frac{9.4}{\sin(90 - 42)}$ oe or M1 for their height $\div a = \cos 42$ or for $[\text{their height} =] 9.4 \times \sin 37$ oe or B1 for 48° correctly used or seen in correct position on diagram
	(c)	50 130	1 1	
4	(a)	0, 4.5, 3.11[1...]	3	B1, B1, B1
	(b)	Complete correct curve with minimum below $y = 2$ 	5	B3 FT for 9 points correctly plotted B2 FT for 7 or 8 points correctly plotted or B1 FT 5 or 6 points correctly plotted and B1 indep two separate branches not touching or cutting y-axis
	(c)	- 0.5 to - 0.6 0.6 to 0.7 2.8 to 2.9	1 1 1	if 0 SC1 for $y = 3$ indicated
	(d)	Correct line or no line and - 0.7 to - 0.6 nfw	3	Must check line - not if wrong line B2 for $y = 1 - x$ ruled correctly or SC1 for ruled line with either gradient -1 or y-intercept 1 but not line $y = 1$ or correct freehand line

Page 5	Mark Scheme	Syllabus	Paper
	IGCSE – May/June 2014	0580	43

Qu		Answers	Mark	Part Marks
6	(a) (i)	$\frac{1}{6}$	1	
	(ii)	$\frac{4}{6}$ oe	1	
	(iii)	$\frac{2}{6}$ oe	1	
	(b)	$\frac{16}{36}$ oe	3	M2 $\frac{2}{6} \times \frac{4}{6} + \frac{4}{6} \times \frac{2}{6}$ only oe or M1 for one of $\frac{2}{6} \times \frac{4}{6}$ or $\frac{4}{6} \times \frac{2}{6}$ soi by $\frac{2}{9}$
	(c)	$\frac{48}{360}$ oe	3	M2 for $\frac{4}{6} \times \frac{3}{5} \times \frac{2}{4} \times \frac{2}{3}$ only oe or M1 for denominators 6, 5, 4, 3 soi in product of four fractions
7	(a) (i)	148	1	
	(ii)	122	2	B1 for 58 seen at <i>A</i> or 32 seen at <i>Y</i>
	(iii)	148	1	
	(iv)	106 nfww	3	B1 for [sum of interior angles =] 720 and M1 for $\frac{1}{2} \{(their\ 720) - (p+q+t+90)\}$
	(b) (i)	63	2	B1 for angle <i>RPS</i> = 27 or 90 at <i>P</i> or at <i>S</i> seen or stated
	(ii)	54	2	B1 for <i>their</i> <i>x</i> or 63 or letter <i>x</i> at <i>Q</i> seen or state

Page 6	Mark Scheme	Syllabus	Paper
	IGCSE – May/June 2014	0580	43

Qu		Answers	Mark	Part Marks
8	(a) (i)	$7 \times 2 + (2x - 3)(x + 4) = 2(x + 4)$	M1	Allow if bracket[s] omitted but recovers
		$2x^2 + 8x - 3x - 12$ or better seen	B1	
		$2x^2 + 3x - 6 = 0$	A1	with no errors seen and brackets correctly expanded on both sides and no omission of brackets
		(ii) $\sqrt{(3)^2 - 4(2(-6))}$ or better $p = -3$ and $r = 2(2)$	B1	or $\left(x + \frac{3}{4}\right)^2$
	(b)	1.14 and -2.64 cao	B1	Must see $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$ or both
		$\pi \times x^2 + \pi \times x \times 3x$	B1B1	Or $-\frac{3}{4} +$ or $-\sqrt{\frac{57}{16}}$
		$4[\pi]x^2 = [\pi]r^2$	SC1	for 1.1 and -2.6 final answer or 1.137 and -2.637 final answer or 1.14 and -2.64 seen in working or for -1.14 and 2.64 as final ans
		$2x = r$	M2	or M1 for $\pi \times x \times 3x$
9	(a)	$4 - 6x$ final answer	M1	Dep on M2
	(b)	$9x - 8$ final answer	A1	with no errors seen
	(c)	$\frac{1}{27}$ final answer	1	
	(d)	$\frac{4-x}{3}$ oe final answer	2	M1 for $4 - 3(4 - 3x)$ seen
	(e)	$\frac{4}{3}$ or $1\frac{1}{3}$ or 1.33 or better	3	M2 for 3^{-3} soi by final answer 0.037037... to 3sf or better or M1 for $[g(-1) =] 3$ soi
			2	M1 for a correct first step $3x = 4 - y$ oe or $x = 4 - 3y$ or $\frac{y}{3} = \frac{4}{3} - x$
			3	M2 for $3x - 4 = 0$ or better or M1 for $3^{-(4-3x)}$

Page 7	Mark Scheme	Syllabus	Paper
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Qu		Answers	Mark	Part Marks
10	(a)	$[r =] 2.30[9\dots]$	3	B2 for $[r =] 2.31$ or M2 for $4 \tan 30$ or M1 for $\frac{r}{4} = \tan 30$
	(b)	333 or 332.5 to 332.6	4	M3 for $0.5 \times 8 \times 8 \times \sin 60 \times 12$ oe or M2 for $0.5 \times 8 \times 8 \times \sin 60$ oe or M1 for <i>their</i> triangle area $\times 12$ shown dep on ' $\frac{1}{2}$ ' used within <i>their</i> area of triangle method
	(c) (i)	30	3	M2 for $12 \div 0.4$ or $120 \div 4$ or SC1 for figs 3
	(ii)	6.65 or 6.647 to 6.648[...]	2	M1 for $\pi \times 2.3^2 \times 0.4$ or SC1 for $\pi \times 2.3^2 \times 4$ soi by 66.5 or 66.47 to 66.48[...]
	(iii)	40[.0] or 40.1 or 40.0 to 40.2 nfw	3	M2 for $100 - \frac{\text{their}(c)(i) \times \text{their}(c)(ii)}{\text{their}(b)} \times 100$ or $\frac{\text{their}(b) - \text{their}(c)(i) \times \text{their}(c)(ii)}{\text{their}(b)} \times 100$ or M1 for $\frac{\text{their}(c)(i) \times \text{their}(c)(ii)}{\text{their}(b)} \times 100$ or $\frac{\text{their}(b) - \text{their}(c)(i) \times \text{their}(c)(ii)}{\text{their}(b)}$
11	(a)	$\frac{1}{8} \quad \frac{1}{16} \quad \frac{1}{32}$	2	B1 for 2 correct
		$\frac{1}{2^{n-1}}$ oe	2	SC1 for $\frac{1}{2^n}$ oe
		$2^{-3} \quad 2^{-4} \quad 2^{-5}$	1	
		2^{1-n} or $2^{-(n-1)}$	1	
	(b) (i)	64 256 1024	1	
		$2^6 \quad 2^8 \quad 2^{10}$	1	
	(ii)	$2^{2(n-1)}$ or 2^{2n-2}	1	
	(c)	16384	2	B1 for $n = 8$

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0580/41

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art	anything rounding to
soi	seen or implied

Qu	Answers	Mark	Part Marks
1	(a) (i) $\frac{2}{5}$ cao	1	
	(ii) 3 : 2 cao	1	
	(b) (i) 1.22	2	M1 for $86.38 - 28 \times 1.56$
	(ii) 1.3 [0] nfw	3	M2 for $1.56 \div 1.2$ oe or M1 for $1.56 = 120\%$ soi
	(c) 33.6[0]	2	M1 for $(667 - 314.2) \div 10.5$ oe
2	(a) 3 correct lines on grid (0, 0) to (40, 5) (40, 5) to (100, 5) (100, 5) to (120, 0)	2	Allow good freehand SC1FT for 2 lines correct, FT from an incorrect line
	(b) $\frac{5}{40}$ oe	1	
	(c) 3.75	4	M2 for $0.5 \times 40 \times 5 + 60 \times 5 + 0.5 \times 20 \times 5$ oe [450] or M1 for evidence of a relevant area = distance and M1dep <i>their</i> area (or distance) $\div 120$

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Qu	Answers	Mark	Part Marks
3	(a) (i) 204 or 204.2 to 204.23	2	M1 for $\pi \times 5 \times 13$ implied by answer in range 204.1 to 204.3
	(ii) 12 cao	3	M2 for $\sqrt{13^2 - 5^2}$ or states 5, 12, 13 triangle or M1 for $13^2 = 5^2 + h^2$ or better
	(iii) 314 or 314.1 to 314.2	2	M1 for $\frac{1}{3} \times \pi \times 5^2 \times \text{their (a) (ii)}$ implied by answer in range 314 to 314.3
	(iv) 3.14×10^{-4} or 3.141 to 3.142×10^{-4}	2FT	FT $\text{their (a) (iii)} \div 100^3$ correctly evaluated and given in standard form to 3 sig figs or better or M1 FT for $\text{their (a) (iii)} \div 100^3$ or SC1 for conversion of their m^3 into standard form only if negative power
	(b) 138 or 138.3 to 138.5	4	M3 for $\frac{10\pi}{26\pi} \times 360$ oe or $\frac{\pi \times 5 \times 13 \text{ or their (a) (i)}}{\pi \times 13^2} \times 360$ oe or M2 for a correct fraction without $\times 360$ or M1 for $\pi \times 2 \times 13$ oe [81.6 to 81.8] seen or $\pi \times 13^2$ oe [530.6 to 531.2] seen
4	(a) 45.[0] or 45.01 to 45.02 nfw	4	M2 for $55^2 + 70^2 - 2.55.70 \cos 40$ or M1 for correct implicit equation A1 for 2026.
	(b) 84.9 or 84.90 to 84.92	4	B1 for angle BDC = 40 soi M2 for $\frac{70 \sin(\text{their } 40)}{\sin 32}$ or M1 for correct implicit equation
	(c) (i) 4060 or 4063 to 4064 nfw	3	M2 for $\frac{1}{2} (55 \times 70 \sin 40) + \frac{1}{2} (70 \times \text{their (b)} \sin (180 - \text{their } 40 - 32))$ oe or M1 for correct method for one of the triangle areas
	(ii) 1020 or 1015 to 1016	2FT	FT $\text{their (c) (i)} \div 4$ oe correctly evaluated or M1 $\text{their (c) (i)} \div \text{figs } 4$ oe
	(d) 35.4 or 35.35... nfw	2	M1 for $\sin 40 = \frac{\text{distance}}{55}$ or better or for $\frac{1}{2} (55 \times 70 \sin 40) = (70 \times \text{distance}) \div 2$ or better

Page 4	Mark Scheme	Syllabus	Paper
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Qu	Answers	Mark	Part Marks
5	(a) (i) Correct reflection to (4, 8) (2, 9) (4, 9)	2	SC1 for reflection in line $x = 5$ or reflection in $y = k$ Ignore additional triangles
	(ii) Correct rotation to (4, 2), (4, 3) (6, 3)	2	SC1 for rotation 180° with incorrect centre Ignore additional triangles
	(iii) Shear, x-axis oe invariant, [factor] 2	3	B1 each (independent)
	(iv) $\begin{pmatrix} 1 & 2 \\ 0 & 1 \end{pmatrix}$	2FT	FT <i>their</i> shear factor B1FT for one correct column or row in 2 by 2 matrix but not identity matrix or SC1FT for $\begin{pmatrix} 1 & 0 \\ 2 & 1 \end{pmatrix}$
	(b) (i) $\mathbf{p} + 2\mathbf{s}$ final answer	2	M1 for recognising \overrightarrow{OQ} as position vector soi
	(ii) $\mathbf{s} + \frac{1}{2}\mathbf{p}$ final answer	2	B1 for $\mathbf{s} + k\mathbf{p}$ or $k\mathbf{s} + \frac{1}{2}\mathbf{p}$ or correct route ($k \neq 0$)
	(c) parallel and $OQ = 2SR$ oe	1	
6	(a) (i) 1.4 to 1.6	1	
	(ii) 1.15 to 1.25	1	
	(iii) -1	1	
	(iv) -2.25 to -2.1 -0.9 to -0.75 2.2 to 2.35	3	B2 for 2 correct or B1 for one correct or B1 for $y = x$ drawn ruled to cut curve 3 times
	(b) (i) -15	2	B1 for $[h(3) =] 8$ seen or M1 for $1 - 2(x^2 - 1)$ or better
	(ii) $\frac{1-x}{2}$ or $\frac{1}{2} - \frac{x}{2}$ oe final answer	2	M1 for $2x = 1 - y$ or $x = 1 - 2y$ or better
	(iii) -2, 2	3	M1 for $x^2 - 1 = 3$ or better B1 for one answer
	(iv) $\frac{1}{8}$ oe nfww	3	M2 for $8x = 1$ or $8x - 1 = 0$ or M1 for $1 - 2(3x) [= 2x]$

Page 5	Mark Scheme	Syllabus	Paper
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Qu	Answers	Mark	Part Marks
7	(a) 24.7 or 24.66 to 24.67	4	M1 for midpoints soi (condone 1 error or omission) (5, 15, 25, 35, 45, 55) and M1 for use of $\sum fx$ with x in correct interval including both boundaries (condone 1 further error or omission) and M1 (dependent on second M) for $\sum fx \div 120$
	(b) (i) 50, 90, 114	2	B1 for 2 correct
	(ii) Correct curve or ruled polygon	3	Ignore section to left of $t = 10$ B1 for 6 correct horizontal plots and B1FT for 6 correct vertical plots If 0 scored SC1 for 5 out of 6 correct plots and B1FT for curve or polygon through at least 5 of <i>their</i> points dep on an increasing curve/polygon that reaches 120 vertically
	(iii) 21.5 to 23 15 to 16.5 24 to 26	4	B1 B1 B2 or B1 for 72 or 72.6 seen
	(c) (i) 50, 30	2	B1 each
	(ii) Correct histogram	3FT	B1 for blocks of widths 0 – 20, 30 – 60 (no gaps) B1FT for block of height 2.5 or <i>their</i> $50 \div 20$ and B1FT for block of height 1 or <i>their</i> $30 \div 30$

Page 6	Mark Scheme	Syllabus	Paper
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Qu	Answers	Mark	Part Marks
8	(a) $\sqrt{(-11)^2 - 4(8)(-11)}$ or better $p = -(-11), r = 2(8)$ or better – 0.67, 2.05 final answers	B1 B1 B1B1	Seen anywhere or for $\left(x - \frac{11}{16}\right)^2$ Must be in the form $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$ or B1 for $\sqrt{\frac{11}{8} + \left(\frac{11}{16}\right)^2} + \frac{11}{16}$ SC1 for – 0.7 or – 0.672 to – 0.671 and 2.0 or 2.046 to 2.047 or answers 0.67 and – 2.05
	(b) 132	3	M1 for $y = k\sqrt{x}$ oe or $\sqrt{x} = ky$ oe A1 for $k = 6$ oe or better or for $k = 0.1666$ to 0.167 [$k = 6$ implies M1A1] oe
	(c) 20 with supporting algebraic working	6	B2 for $\frac{x}{2.5} + \frac{x - 14.5}{0.5} = 19$ oe or B1 for $\frac{x}{2.5}$ or $\frac{x - 14.5}{.5}$ M1dep on B2 for first completed correct move to clear both fractions M1 for second completed correct move to collect terms in x to a single term M1 for third completed correct move to collect numeric term[s] leading to $ax = b$ SC1 for 20 with no algebraic working
9	(a) $y = 2$ oe $y = 2x$ oe $y = -\frac{1}{2}x + 5$ oe	1 2 2	M1 for $y = kx, k \neq 0$ or gradient 2 soi M1 for gradient $-\frac{1}{2}$ soi or $y = kx + 5$ oe or $x + 2y = k, k \neq 0$ oe If L^2 and L^3 both correct but interchanged then SC3
	(b) $y \geq 2$ oe $y \leq 2x$ oe $y \leq -\frac{1}{2}x + 5$ oe	3	B1 for each correct inequality, allow in any order After 0 scored, SC1 for all inequalities reversed
	(c) (i) 4 [bushes], 3 [trees]	2	M1 for any correct trial using integer coordinates in region or $30x + 200y = 720$ seen
	(ii) 2 [bushes], 4 [trees] 860	2 1	M1 for any correct trial using integer coordinates in region

Page 7	Mark Scheme	Syllabus	Paper
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Qu	Answers	Mark	Part Marks
10	(a) (i) $1 + 2 + 3 + 4 + 5 = 15$	1	
	(ii) Correct substitution equating to sum e.g. $\frac{2(2+1)}{k} = 3$ and $k = 2$ stated with no errors seen	2	M1 for using a value of n in $\frac{n(n+1)}{k}$ e.g. $\frac{2(2+1)}{k} = 3$ or for a verification using $k = 2$ e.g. $\frac{2(2+1)}{2} = 3$
	(iii) 1830	1	
	(iv) 30	2	M1 for $\frac{n(n+1)}{2} = 465$ or better
	(v) $n - 8$	1	
	(b) (i) 225, 15	2	B1 either
	(ii) $\frac{n^2(n+1)^2}{4}$ oe	1	
	(iii) 36100	2	M1 for $\frac{19^2(19+1)^2}{4}$ oe or 190^2

MARK SCHEME for the October/November 2013 series

0580 MATHEMATICS

0580/42

Paper 4 (Extended), maximum raw mark 130

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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Abbreviations

cao	correct answer only
cso	correct solution only
dep	dependent
ft	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
www	without wrong working
art	anything rounding to
soi	seen or implied

	Correct answer	Mark	Part marks
1	(a) (i) 3216 Final answer	2	M1 for $(18900 - 5500) \times 0.24$ oe
	(ii) 1307 Final answer	2FT	FT $(18900 - \text{their (a)(i)}) \div 12$ correctly evaluated M1 for $(18900 - \text{their (a)(i)}) \div 12$
	(b) 4.5[%] nfw	2	M1 for $\frac{19750.50 [-18900]}{18900} \times 100$ or $\frac{19750.50 - 18900}{18900}$
	(c) A by 31.05... or 31.04 to 31.05 or 31.[0] 31.1[0]	5	M1 for $1500 \times 4.1/100 \times 3$ [+ 1500] oe M1 for 1500×1.033^3 [- 1500] oe A1 for 1684.5 or 184.5 or 1653[.45..] or 153[.45..] and M1dep for subtraction of <i>their</i> amounts or <i>their</i> interests
2	(a) 36.9° or 36.86 to 36.87	2	M1 for $\tan[DBC] = 1.8/2.4$ oe
	(b) (i) $1.8^2 + 2.4^2$ leading to $\sqrt{9}$	2	M1 for $1.8^2 + 2.4^2$ or better
	(ii) $[\cos ABD] = \frac{6.46^2 + 3^2 - 8.6^2}{2 \times 6.46 \times 3}$ 127 or 126.8...	M2 A2	M1 for correct cos rule but implicit version A1 for -0.599...
	(c) 39.6 or 39.7 or 39.59 to 39.68	3	M2 for $\frac{1}{2} (2.4 + 8.6) \times 1.8 \times 4$ oe Or M1 for $\frac{1.8}{2} (2.4 + 8.6)$ oe soi by 9.9 to 9.92

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5	(a) 7, 11.5, 4.5	1,1,1	
	(b) Correct curve cao	5	B3FT for 10 correct plots, on correct vertical grid line and within correct 2 mm square vertically Or B2FT for 8 or 9 correct plots Or B1FT for 6 or 7 correct plots and B1 indep for two separate branches on either side of y-axis
	(c) (i) $0.69 < x < 0.81$	1	
	(ii) $-2.3 < x < -2.2$ $-0.8 < x < -0.6$ $0.35 < x < 0.5$	3	B1 for each correct After 0 scored, allow SC1 for drawing line $y = 7.5$ long enough to cross curve at least once
	(d) (i) $y = 10 - 3x$ ruled correctly $-0.55 < x < -0.45$ $0.35 < x < 0.45$	B2 B1dep B1dep	long enough to cross curve twice. B1 for ruled line gradient -3 or y intercept at 10 but not $y = 10$ Or B1 for 'correct' but freehand Dependent on at least B1 scored for line After 0 scored, SC2 for -0.5 and 0.4 [from solving equation]
	(ii) $\begin{matrix} 10 & 1 & -2 \\ \text{or } -10 & -1 & 2 \end{matrix}$	3	B2 for $2 - x - 10x^2 [= 0]$ oe Or B1 for $\frac{2}{x^2} - \frac{1}{x} - 10 = 0$ oe Correctly eliminating $-3x$ Or B1 for $2 - x - 3x^3 = 10x^2 - 3x^3$ oe Correctly clearing fractions

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6	(a) (i)	$\frac{1}{110}$	oe	2	M1 for $\frac{1}{11} \times \frac{1}{10}$
	(ii)	$\frac{6}{110}$	oe	2	M1 for $\frac{3}{11} \times \frac{2}{10}$
	(iii)	$\frac{8}{110}$	oe	2FT	FT their (a)(ii) + $\frac{2}{11} \times \frac{1}{10}$ correctly evaluated or M1 their (a)(ii) + $\frac{2}{11} \times \frac{1}{10}$
	(b) (i)	$\frac{6}{990}$	oe	2	M1 for $\frac{3}{11} \times \frac{2}{10} \times \frac{1}{9}$
	(ii)	$\frac{336}{990}$	oe	2	M1 for $\frac{8}{11} \times \frac{7}{10} \times \frac{6}{9}$
	(iii)	$\frac{198}{990}$	oe	5	M4 for $3\left(\frac{3}{11} \times \frac{2}{10} \times \frac{8}{9}\right) + 3\left(\frac{2}{11} \times \frac{1}{10} \left[\times \frac{9}{9}\right]\right)$ oe or M3 for $3\left(\frac{3}{11} \times \frac{2}{10} \times \frac{8}{9}\right)$ or $3\left(\frac{2}{11} \times \frac{1}{10} \left[\times \frac{9}{9}\right]\right)$ oe Or M1 for $\frac{3}{11} \times \frac{2}{10} \times \frac{8}{9}$ oe seen and M1 for $\frac{2}{11} \times \frac{1}{10} \left[\times \frac{9}{9}\right]$ oe seen

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7	(a) 14 10 or 2 10 pm final answer	2	M1 for (0)8 10 oe or answer 14 hours and 10 minutes or answer 2 10 [am]
	(b) 5 hours 45 minutes cao	2	M1 for 345 [mins] seen or for $805/7 \times 3$ oe or 5.75 seen
	(c) (i) 798 or 798.2 to 798.4....	2	M1 for $10712/13\frac{25}{60}$ or $10712 \div 13.4...$
	(ii) 1.82×10^5 or 1.815×10^5 to 1.816×10^5	4	B3 for 182000 or 181500 to 181600 seen or M2 for 10712000/59 oe or M1 for figs 10712/figs 59 soi by figs 182 or figs 1815 to 1816 and B1 FT for their number of litres correctly converted to standard form rounded to 3sf or better
	(d) 8600	3	M2 for $10148 \div 1.18$ oe or M1 for 10148 associated with 118[%]
8	(a) (i) -6	1	
	(ii) 2.75 oe	2	M1 for $[g(x) =] 0.5$ or $7/14$ Or $\left(\frac{7}{x+1}\right)^2 + 5\left(\frac{7}{x+1}\right)$ oe
	(b) $\frac{x-3}{4}$ or $\frac{x}{4} - \frac{3}{4}$ Final answer	2	M1 for $y-3=4x$ or better or $x=4y+3$ or better or $\frac{y}{4} = \frac{3}{4} + x$ or flowchart with -3 then $\div 4$
	(c) (i) 5	2	M1 for $4x = 23 - 3$ or $x + \frac{3}{4} = \frac{23}{4}$ or better
	(ii) $x^2 + 5x - 7 = 0$	B1	May be implied by correct values in formula
	$\frac{-5 \pm \sqrt{5^2 - 4(1)(-7)}}{2(1)}$ oe	B1 B1	B1 for $\sqrt{5^2 - 4(1)(-7)}$ or better [53] If in form $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$, B1 for -5 and 2(1) or better No recovery of full line unless seen
	1.14 and -6.14 final answers	B1 B1	Or SC1 for 1.1 or 1.140.... and -6.1 or -6.140 ... Or answers -1.14 and 6.14

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9	(a) (i) Reflection $x = -2$ oe	2	B1 for either
	(ii) Translation $\begin{pmatrix} -7 \\ 2 \end{pmatrix}$ oe	2	B1 for either
	(iii) Stretch x -axis oe invariant [factor] 3	3	B1 for each
	(b) (i) Triangle with coords at (8, 2) (7, 3) and (7, 5)	2	B1 for rotation about (6, 0) but 90° anticlockwise Or for rotation 90° clockwise around any point
	(ii) Triangle with coords at (-2, -5) (-6, -5) and (-8, -7)	2	B1 for 2 correct points or for enlargement of SF -2 any centre
	(iii) Triangle with coords at (1, -1) (4, -6) and (3, -5)	2	B1 for 2 correct points or coordinates of 2 points shown
	(c) $\begin{pmatrix} 1 & 0 \\ -2 & 1 \end{pmatrix}$	2	B1 for one row or one column correct but not identity matrix. Or SC1 for $\begin{pmatrix} 1 & -2 \\ 0 & 1 \end{pmatrix}$
10	(a) 48 and 57, $9n + 3$ oe	1 2	B1 for $9n + k$ oe
	(b) 56 and 50, $86 - 6n$ oe	1 2	B1 for $k - 6n$ oe
	(c) 125 and 216, n^3 oe	1 1	
	(d) 130 and 222 $n^3 + n$ oe	1 1FT	FT <i>their</i> (c) + n dep on expression in n in (c)

MARK SCHEME for the October/November 2013 series

0580 MATHEMATICS

0580/43

Paper 4 (Extended), maximum raw mark 130

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Abbreviations

cao	correct answer only
cso	correct solution only
dep	dependent
ft	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
www	without wrong working
art	anything rounding to
soi	seen or implied

Qu.	Answers	Mark	Part Marks
1	(a) (i) 45	2	M1 for $5 \times 63 \div 7$
	(ii) 20	2	M1 for $5 \times 56 \div 14$
	(iii) 23.4 or 23.38 to 23.41	3	M2 for $\frac{13 \times 4.9 - 48.8}{13 \times 4.9} \times 100$ or $\frac{4.9 - 48.8 \div 13}{4.9} \times 100$ Or M1 for $\frac{13 \times 4.9 - 48.8}{13 \times 4.9}$ or $\frac{48.8}{13 \times 4.9} \times 100$ or 76.6[...]
	(b) 128	4	Using fractions (percentages / decimals): M1 for $\frac{3}{4} \times \frac{3}{8} \left[= \frac{9}{32} \right]$ or $\frac{75}{100} \times 37.5 [= 28.125\%]$ A1 for $\frac{9}{32}$ or 28.125[%] M1 for $36 \div \frac{9}{32}$ oe or $36 \times \frac{100}{28.125}$ oe Partial percentages M1 for (Remaining) $\frac{100 \times 36}{37.5} [= 96]$ A1 for 96 M1 for $96 \div \frac{75}{100}$ oe SC1 for 288

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2	(a)	119.94[...] nfw	3	M2 for $\frac{62 \times \sin 122}{\sin 26}$ or M1 for $\frac{AC}{\sin 122} = \frac{62}{\sin 26}$ oe SC2 for correct answer from alternative methods
	(b)	109 or 108.7 to 108.8 nfw	4	M2 for $119.9..^2 + 55^2 - 2 \times 119.9.. \times 55 \cos 65$ A1 for 11827[...] or 11834 to 11835[...] or M1 for implicit version
	(c)	1970 or 1969 to 1970.4	2	M1 for $\frac{1}{2} \times 119.9.. \times 62 \times \sin 32$
	(d)	22300 or 22310 to 22320	3	M2 for $(\text{their (c)} + 0.5 \times 55 \times 119.9.. \times \sin 65) \times 4.5$ or M1 for $\text{their (c)} + 0.5 \times 55 \times 119.9.. \times \sin 65$
3	(a)	$9 - 2x, 7 - 2x$ oe	2	B1 for each, accept in any order
	(b)	$x(9 - 2x)(7 - 2x)$ $4x^3 - 32x^2 + 63x$	M1FT A1	Correct expansion and simplification with no errors
	(c)	24 20	2	B1 for each correct value
	(d)	Correct curve	3	B2FT for 5 correct plots or B1FT for 3 or 4 correct plots
	(e)	$0.65 \text{ to } 0.75 \leq x \leq 2$ oe	2	B1 for 0.65 to 0.75 seen
	(f) (i)	36 to 37	1	
	(ii)	1.2 to 1.4	1	
4	(a)	48 and 84 66 and 66	2	B1 for each pair
	(b)	540	2	M1 for 3×180 or $(2 \times 5 - 4) \times 90$ or $5 \times (180 - 360 \div 5)$ oe
	(c)	1620	2	M1 for $7 \times 360 - \text{their } 540 - 360$
	(d) (i)	$2x + 5 + 3y - 20 + 4x - 5 + x + y - 10 = 360$ oe	1	Allow partial simplification but not $7x + 4y - 30 = 360$
	(ii)	$2x + 5 + 3y - 20 = 180$	1	
	(iii)	$[x =] 30, [y =] 45$ nfw	4	M1 for correct multiplication M1 for correct elimination A1 $x = 30$ or $y = 45$ If 0 scored SC1 for correct substitution to find the other variable
	(iv)	65, 115, 115, 65	1	Accept in any order

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5	(a) (i)	3.81 or 3.812 to 3.813 or 3h 49min nfw	4	M1 for midpoints soi (condone 1 error or omission and M1 for use of $\sum fx$ with x in correct interval including both boundaries (condone 1 further error or omission) and M1 (dep on 2 nd M1) for $\sum fx \div 80$ (305 \div 80)
	(ii)	Correct histogram	4	B1 for each correct block and B1 for correct widths
	(b) (i)	$\frac{2}{5}, \frac{1}{4}, \frac{3}{4}, \frac{1}{4}$ oe	2	B1 for $\frac{2}{5}$ or both $\frac{1}{4}$ s in correct place
	(ii)	$\frac{18}{20}$ nfw $\left[\frac{9}{10}\right]$	3	M2 FT for $1 - \text{their } \frac{2}{5} \times \text{their } \frac{1}{4}$ or $\frac{3}{5} \times \frac{3}{4} + \frac{3}{5} \times \text{their } \frac{1}{4} + \text{their } \frac{2}{5} \times \frac{3}{4}$ oe or M1 FT for $\text{their } \frac{2}{5} \times \text{their } \frac{1}{4}$ or $\frac{3}{5} \times \text{their } \frac{1}{4} + \text{their } \frac{2}{5} \times \frac{3}{4}$ oe
	(iii)	$\frac{27}{125}$ [0.216]	2	M1 for $\frac{3}{5} \times \frac{3}{5} \times \frac{3}{5}$
6	(a)	329.7 to 330	3	M2 for $\frac{1}{2}\pi(12^2 + 8.75^2 - 3.25^2)$ oe or M1 for $\frac{1}{2}\pi 12^2$ or $\frac{1}{2}\pi 8.75^2$ or $\frac{1}{2}\pi 3.25^2$ SC2 for answer 1318 to 1320
	(b)	2970 or 2967 to 2969.[...]	4	M3 for $\frac{1}{2}\pi(24 + 17.5 + 6.5) \times 35 + \text{their (a)}$ or M2 for $\frac{1}{2}\pi(24 + 17.5 + 6.5) \times 35$ or M1 for $\frac{1}{2}\pi \times 24$ or $\frac{1}{2}\pi \times 17.5$ or $\frac{1}{2}\pi \times 6.5$ SC3 for 3955 to 3960 dep on SC2 in (a)
	(c)	11.5 or 11.6 or 11.53 to 11.55	3FT	M1 for $\text{their (a)} \times 35$ A1 for 11500 or 11530 to 11550

Page 5	Mark Scheme	Syllabus	Paper
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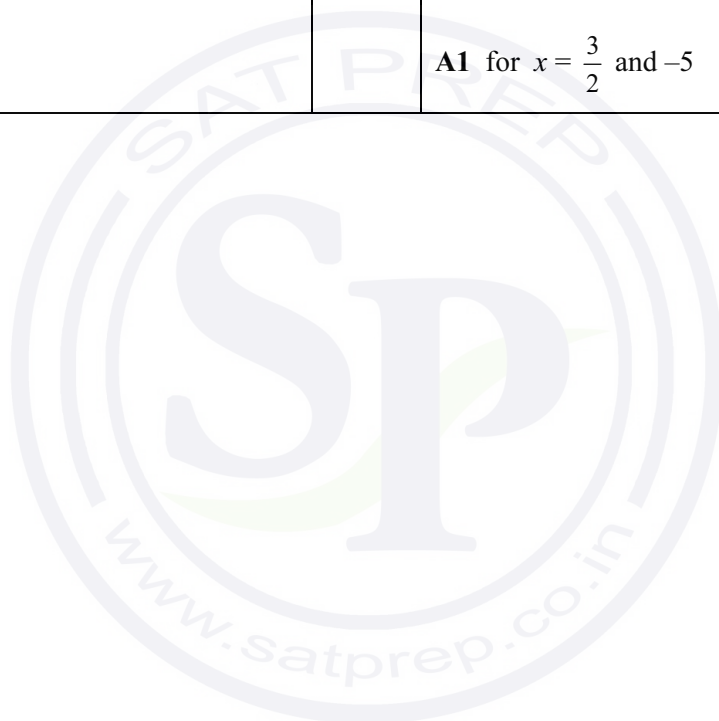
	(d) (i)	$\frac{r}{h} = \frac{20}{40}$ or $\frac{r}{20} = \frac{h}{40}$	1	Accept $20 : 40 = r : h$ leading to $40r = 20h$ [$r = h/2$] $\frac{20}{40} = \frac{1}{2}$ and $\frac{r}{h} = \frac{1}{2}$
	(ii)	35.3 or 35.31 to 35.34	3	M2 for $\sqrt[3]{\frac{\text{their } 11545 \times 12}{\pi}}$ oe or $2 \times \text{their } r$ or M1 for $\text{their } 11545 = \frac{1}{3} \times \pi \times \left(\frac{h}{2}\right)^2 \times h$ oe or $\text{their } 11545 = \frac{1}{3} \times \pi \times r^2 \times 2r$ oe
7	(a) (i)	$\frac{3}{2}$ or 1.5	2	M1 for $\frac{14 - (-4)}{8 - (-4)}$ oe
	(ii)	$y = \frac{3}{2}x + 2$ oe	2	B1 for $y = \text{their } \frac{3}{2}x + c$ o.e. or $y = mx + 2, m \neq 0$ SC1 for $\frac{3}{2}x + 2$
	(iii)	$\begin{pmatrix} 12 \\ 18 \end{pmatrix}$	1	
	(iv)	21.6 or 21.63[...]	2	M1 FT for $\text{their } 12^2 + \text{their } 18^2$ oe
(b)	(i)	(a) $3b - 4a$	1	
		(b) $\frac{1}{5}(6b - 8a)$ oe simplified	2	M1 for $\frac{1}{5}(12a + 6b) - 4a$ or $AR = AO + OR$
		(c) $6a + 3b$ oe simplified	1	
	(ii)	OR is parallel to OT	1	Dep on \overrightarrow{OT} correct
	(iii)	$\frac{9}{4}$ or 2.25	2	M1 for $\left(\frac{3}{2}\right)^2$

Page 6	Mark Scheme	Syllabus	Paper
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8	(a)	$\frac{2(s - ut)}{t^2}$ oe nfw	3	M1 for a correct rearrangement to isolate the a term and M1 for a correct multiplication by 2 and M1 for a correct division by t^2
	(b)	36.75 cao	3	M2 for $15.5 + 2.5 \times 8.5$ B1 for two of 15.5, 2.5, 8.5 seen
	(c) (i)	$\frac{16}{5}$ or better [3.2]	1	
	(ii)	11.2	4	M2 for $\frac{1}{2}(25 + 10)16$ (= 280) or M1 for appreciation of distance from area and M1 for <i>their</i> $280 \div 25$ (dep on M1)
9	(a)	15 18 $3n + 3$ or $3(n + 1)$ 6 10 25 36 $(n + 1)^2$	9	B2 for 15, 6, 25 or B1 for two correct values B3 for 18, 10, 36 or B1 for each correct value B2 for $3n + 3$ oe or M1 for $3n + k$, for any k B2 for $(n + 1)^2$ oe or M1 for a quadratic expression
	(b)	14	2	M1 for $(n + 1)(n + 2) = 240$ or better or $15 \times 16 = 240$
	(c) (i)	$\frac{1}{2} + p + q = 9$	1	
	(ii)	$[p =] 3$ $[q =] \frac{11}{2}$	5	B2 for $4p + 2q = 23$ or B1 for $\frac{1}{2} \times 2^3 + p \times 2^2 + q \times 2$ oe M1 for correct multiplication and subtraction of <i>their</i> equations A1 for $[p =] 3$ or $[q =] \frac{11}{2}$ If 0 scored then SC1 for either correct

Page 7	Mark Scheme	Syllabus	Paper
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10	(a)	$\frac{x}{x+3}$ cao	3	B1 for $(x+3)(x-3)$ B1 for $x(x-3)$
	(b)	$\frac{3}{2}$ and -5	7	M2 for $15(x+1) - 20x = 2x(x+1)$ or M1 for multiplication by one denominator only or $\frac{15(x+1) - 20x}{x(x+1)}$ and B2 for $2x^2 + 7x - 15 [= 0]$ or B1 for $15x + 15 - 20x$ or $2x^2 + 2x$ and M2 for $(2x-3)(x+5)$ or <i>their</i> correct factors or formula or M1 for $(2x+a)(x+b)$ where $ab = -15$ or $a + 2b = 7$ A1 for $x = \frac{3}{2}$ and -5



MARK SCHEME for the May/June 2013 series

0580 MATHEMATICS

0580/41

Paper 4 (Extended), maximum raw mark 130

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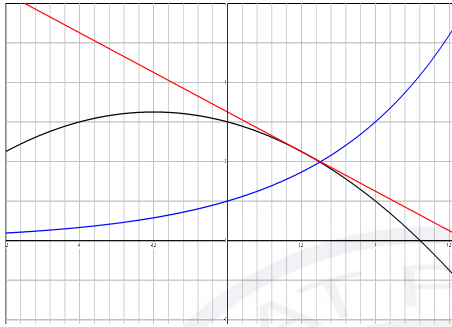
Page 2	Mark Scheme	Syllabus	Paper
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Abbreviations

cao	correct answer only
cso	correct solution only
dep	dependent
ft	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
www	without wrong working
art	anything rounding to
soi	seen or implied

Qu.	Answer	Mark	Part marks
1 (a) (i)	[0]8 15	1	
(ii)	$\frac{1.8}{27} \times 60 [= 4]$ oe	M2	M1 for $\frac{1.8}{27}$ oe [0.0667 or better]
(b) (i)	275	3	M2 for $\frac{15-4}{4} \times 100$ or $\frac{15}{4} \times 100 - 100$ oe or M1 for $\frac{15-4}{4}$ or $\frac{15}{4} \times 100$ or oe 375
(ii)	73.3[3...]	3	M2 for $\frac{1.8}{15} \times 60 [=7.2 \text{ min}]$ and $\frac{27 - \text{their } 7.2}{27} \times 100$ oe or M1 for $\frac{1.8}{15} \times 60 [=7.2 \text{ min}]$ or final answer of 26.6[6...] or 26.7
(iii)	25	2	M1 for $\frac{9}{\text{figs } 36}$ oe

Page 3	Mark Scheme	Syllabus	Paper
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Qu.	Answer	Mark	Part marks
2	(a) 3, 0.33[3...], 1	3	B1 for each correct value
	(b) Correct quadratic curve	3	B2FT for 7 correct points or B1FT for 5 or 6 correct points
	Correct exponential curve	3	B2FT for 7 correct points or B1FT for 5 or 6 correct points
			
	(c) (i) Answer in range $1.2 < x < 1.4$	1	
	(ii) Answer in range $1.2 < x < 1.35$	1	Not from a line other than $y = 4$ (± 1 mm)
	(iii) Answer in range $0.55 < x < 0.7$	1	
3	(d) Correct tangent drawn And answer in range $-2.5 < m < -1.5$	3	B1 for correct tangent at $x = 0.5$ B2 for answer in range dep on close attempt at tangent M1 for $[-] \frac{\text{rise}}{\text{run}}$ used with values soi from tangent, dep on close attempt at tangent or answer in range $1.5 < m < 2.5$ or SC1 for close attempt at tangent to exponential curve and answer in the range $1.6 < m < 2.2$
	(a) (i) 3.2	1	
	(ii) 4.2	1	
	(iii) 4.6	1	
	(iv) 196	1	
	(b) (i) 100, 46, 12	2	B1 for 2 correct
	(ii) 4	2	M1 for frequency of 60 or 140 seen in workspace

Page 4	Mark Scheme	Syllabus	Paper
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Qu.	Answer	Marks	Part marks
4	(a) Enlargement	1	
	[centre] (–3, 4)	1	Do not allow column vector for coordinates
	[scale factor] 3	1	
	(b) (i) Image at (1 5), (4, 5), (4, 6), (1, 7)	2	SC1 for translation by $\begin{pmatrix} 5 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 4 \end{pmatrix}$
	(ii) Image at (5, 1), (8, 1), (8, 3), (5, 2)	2	SC1 for reflection in $y = 2$
	(iii) Image at (–4, 3), (–1, 3), (–1, 6), (–4, 9)	2	SC1 for three correct vertices or shape with vertices at (–4, 1) and (–1, 1), (–1, 4) and (–4, 7)
	(iv) $\begin{pmatrix} 1 & 0 \\ 0 & 3 \end{pmatrix}$	2	SC1 for $\begin{pmatrix} 1 & 0 \\ 0 & k \end{pmatrix}$, $k \neq \pm 1$ or $\begin{pmatrix} 3 & 0 \\ 0 & 1 \end{pmatrix}$
5	(c) Reflection $y = x$ oe	2	B1 B1 independent
	(a) 171.25 (or 171 or 171.2 or 171.3) www	3	M1 for $5 \times 155 + 9 \times 162.5 + 18 \times 172.5 + 10 \times 185$ [= 7192.5] and M1 (dep on M1) for <i>their</i> $\Sigma fx \div 42$
	(b) $160 < x \leq 165$ oe	1	
	(c) Blocks with heights of 1.8, 1.2, 1, with correct interval widths and no gaps	4	B3 for 2 correct blocks or B2 for 1 correct block or B1 for 3 correct frequency densities or heights or 3 correct widths

Page 5	Mark Scheme	Syllabus	Paper
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Qu.	Answer	Marks	Part marks
6 (a)	31.4	3	M2 for $\frac{15.7}{\sin 30}$ or M1 for correct implicit statement
(b)	$[\sin E =] \frac{15.7 \times \sin 52}{16.5}$ 48.573...	M2 A1	M1 for correct implicit statement
(c) (i)	$[\angle ACE =] 180 - 52 - 48.57$ [= 79.43]	M1	
	$[\angle ECD =] 40.57...$	A1	
(ii)	15.3 or 15.27 to 15.281 www	4	M2 for $[(DE)^2 =] 16.5^2 + 23.4^2 - 2 \times 16.5 \times 23.4 \cos(40.6 \text{ or } 40.57)$ or M1 for full correct implicit statement A1 for 233 to 234
(d)	466 or 466.34 to 466.5	4	M1 for $0.5 \times 15.7 \times \text{their } 31.4 \sin(90 - 30)$ oe M1 for $0.5 \times 15.7 \times 16.5 \sin(128 - \text{their } 48.6 \text{ or } 48.57)$ oe M1 for $0.5 \times 16.5 \times 23.4 \sin(40.6 \text{ or } 40.57)$ oe

Page 6	Mark Scheme	Syllabus	Paper
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Qu.	Answer	Mark	Part marks
7 (a)	6.61 (6.614...) www	6	<p>B1 for $\frac{x+2}{2x+3} = \frac{9}{16}$ oe</p> <p>M1 for $16(x+2) = 9(2x+3)$ or better</p> <p>A1 for $[x =] 2.5$</p> <p>M2 for $\sqrt{\{(2 \times \text{their } x + 3)^2 - (\text{their } x + 2)^2\}}$ or M1 for $(2 \times \text{their } x + 3)^2 - (\text{their } x + 2)^2$ or SC2 for final answer of $4\sqrt{13}$ or $\frac{7\sqrt{15}}{2}$ or better</p> <p>SC1 for final answer of $5\sqrt{7}$ or better</p>
(b) (i)	White = 8.5, red = 11	5	<p>B3 for $7w + 5(w + 2.5) = 114.5$ or for $7(r - 2.5) + 5r = 114.5$ oe</p> <p>B1 for 8.5 or 11 or SC2 for $7w + 5 \times w + 2.5 = 114.5$ leading to 9.33[3...] or SC1 for $7w + 5 \times w + 2.5 = 114.5$</p> <p>OR</p> <p>B1 for $r = w + 2.5$ oe B1 for $7w + 5r = 114.5$ oe M1 for elimination of a variable A1 for 8.5 or 11</p>
(ii) (a)	$\frac{42}{132}$ or $\frac{21}{66}$ or $\frac{14}{44}$ or $\frac{7}{22}$ (0.318 or 0.3181 to 0.3182)	2	<p>M1 for $\frac{7}{12} \times \frac{6}{11}$</p>
(ii) (b)	$\frac{70}{132}$ or $\frac{35}{66}$ (0.53[0] or 0.5303...)	3	<p>M2 for $\frac{7}{12} \times \frac{5}{11} + \frac{5}{12} \times \frac{7}{11}$ or $1 - \text{their (a)} - \frac{5}{12} \times \frac{4}{11}$ or M1 for $\frac{7}{12} \times \frac{5}{11}$ or $\frac{35}{132}$ or SC1 for $\frac{70}{144}$ oe from replacement</p>

Page 7	Mark Scheme	Syllabus	Paper
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Qu.	Answer	Mark	Part marks	
8	(a) (i)	118	2 M1 for $(3 \times 180 - 2 \times 110 - 84) [\div 2]$ or better	
	(ii)	31	1FT FT $(180 - \text{their (i)}) \div 2$	
	(iii)	22	1FT FT $84 - 2 \times \text{their (ii)}$ or $2 \times \text{their (ii)} - 40$, only if positive answer and less than 84	
	(b)	32	4 B2 for $360 - 3y = 2(4y + 4)$ oe and B1 for $11y = 352$ oe or M1 for angle at centre $= 2 \times$ angle at circumference soi	
	(c) (i)	Opposite angles [cyclic quad] add to 180	1	
	(ii)	68	3 M1 for [angle $PRS =$] $102 \div 3 \times 2$ and M1 for angle $PQS =$ angle PRS or angle $PRQ =$ angle PSQ	
	(d)	5.75	3 M2 for $6.9 \times \sqrt{\frac{5}{7.2}}$ oe or M1 for evidence of ratio of areas $=$ (ratio of sides) ² or sf = 1.2	
	9	(a)	$\frac{-1 \pm \sqrt{1^2 - 4 \times 1 \times (-3)}}{2}$ -2.30, 1.30 final answer	2 2 B1 for $\sqrt{1^2 - 4 \times 1 \times (-3)}$ or better and if in the form $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$ then B1 for $p = -1$ and $r = 2(1)$ or better B1 B1 SC1 for -2.30 and 1.30 seen or -2.3 or -2.303 to -2.302 and 1.3 or 1.302 to 1.303 or final answer -1.30 and 2.30
		(b)	4, 30, 53	3 M1 for $(2x + 7)^2 + (2x + 7) - 3$ and B1 for $(2x + 7)^2 = 4x^2 + 14x + 14x + 49$ oe

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Qu.	Answer	Mark	Part marks
(c)	$\frac{x-7}{2}$	2	M1 for $y-7=2x$ or $x=2y+7$ or -7 then $\div 2$ clearly seen in correct order with arrow or better or $\frac{y-7}{2}$
(d)	-2	1	
(e)	1.158×10^{77}	4	B3 for 1.16×10^{77} or $1.1579... \times 10^{77}$ or 1.157×10^{77} or B2 for 2^{256} seen or B1 for 2^8 seen or 256
10 (a)	50, 70	1	
	$10n$ oe	1	
	51, 71	1	
	$10n+1$ oe	1	
(b) (i)	212	1	
(ii)	$20n+12$	1	
(iii)	$20n+152$	1	
(c) (i)	$5 \times 3^2 + 6 \times 3 = 63$	1	
	and $11 + 21 + 31 = 63$		
	or $32 + 31 = 63$ or $11 + 52 = 63$	1	
(ii)	560	1	
(d)	Complete solution with no errors seen and a conclusion e.g. $5n^2 + 6n + 10(n+1) + 1$ $= 5n^2 + 6n + 10n + 10 + 1$ $= 5n^2 + 10n + 5 + 6n + 6$ $= 5n^2 + 10n + 5 + 6n + 6$ $= 5(n+1)^2 + 6(n+1)$	4	B1 for $5n^2 + 6n + 10n + 10 + 1$ or better B1 for use of $5(n+1)^2 = 5n^2 + 10n + 5$ oe at any stage B1 for use of $6n + 6 = 6(n+1)$ oe at any stage

MARK SCHEME for the May/June 2013 series

0580 MATHEMATICS

0580/42

Paper 4 (Extended), maximum raw mark 130

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Page 2	Mark Scheme	Syllabus	Paper
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Abbreviations

cao	correct answer only
cso	correct solution only
dep	dependent
ft	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
www	without wrong working
art	anything rounding to
soi	seen or implied

Qu	Answers	Mark	Part Marks
1 (a) (i)	$\frac{6}{5+6+3} \times 560$ [= 240]	2	Accept 'of' used instead of \times M1 for $560 \div (5 + 6 + 3)$
(ii)	120	1	
(b)	90	2	M1 for $\frac{3}{8} \times 240$ oe
(c) (i)	96120 final answer	2	M1 for <i>their(a)(ii)</i> $\times 75 + (560 - \textit{their (a)(ii)}) \times 198$ oe
(ii)	187.5[0] final answer	3	M2 for $\frac{198}{1+0.056}$ oe or M1 for $(100 + 5.6)[\%] = 198$ oe seen
(d)	184[.2....]	3	M2 for $\frac{36 \times 0.75 - 9.5}{9.5} \times 100$ oe or M1 for $\frac{36 \times 0.75}{9.5} \times 100$ or $36 \times 0.75 - 9.5$ [17.5] used implied by answer 84.2 or SC1 for final answer 284[.2..]
(e)	69.4 and 69[.0] cao	3	SC2 for one correct or both correct but reversed M1 for two of 10.85, 10.95, 23.65 or 23.75 seen or $2(23.7 + 10.9) + 4(0.05)$ or $2(23.7 + 10.9) - 4(0.05)$

Page 3	Mark Scheme	Syllabus	Paper
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2	(a) (i)	Translation, $\begin{pmatrix} -5 \\ 8 \end{pmatrix}$ oe	1,1	Brackets needed for vector Not $(-5, 8)$, $(-5 \ 8)$
	(ii)	correct trapezium at (2, 2) (4, 3) (4, 5) (2, 5)	2	SC1 for reflection in $x = -1$ or vertices only
	(iii)	correct trapezium at (4, 2) (5, 4) (7, 4) (7, 2)	3	M2 for 4 correct vertices on grid or in working or M1 for $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix} \begin{pmatrix} 2 & 2 & 4 & 4 \\ -4 & -7 & -7 & -5 \end{pmatrix}$ or SC1 for 3 vertices correct or complete shape in correct orientation but wrong position
	(b) (i)	Shear	1	
		x -axis (oe) invariant	1	
		2	1	
	(ii)	rectangle at $(-3, 2)$ (1, 2) (1, 8) $(-3, 8)$	2	SC1 for all vertices only or correct orientation and size, wrong position
3	(a)	0, 2, 0, -3	3	B2 for 3 correct or B1 for 2 correct
	(b)	Correct curve	B4	B3FT for 8 points B2FT for 7 or 6 points B1FT for 5 or 4 points
	(c)	$y = -1$ indicated	B1	e.g. Could be mark[s] on curve isw other lines if not clearly used
		$x = 1.3$ to 1.4 and 4.1 to 4.2	B1	
	(d) (i)	line drawn from (0, 2) to touch curve	M1	No daylight at point of contact If short, must cross at (0, 2) within $\frac{1}{2}$ small square when extended
		(2.5 to 2.75, 3 to 3.4)	A1	
	(ii)	rise/run e.g. (their $y - 2$)/their x	M1	dep on attempt at a tangent from (0, 2) in (d)(i) and uses scales correctly Can be implied from answer– check on tangent for their rise for a run of 1 ($\frac{1}{2}$ small square)
		0.4 to 0.48	A1	ww2 dep on attempt at a tangent from (0, 2) in (d)(i)

Page 4	Mark Scheme	Syllabus	Paper
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4	(a)	227 or 226.95 to 227.01	2	M1 for $\pi \times 8.5^2$
	(b)	5.35	1	
	(c)	39.0[0] to 39.0[1]	2	M1 for $\sin [MOB] = \frac{\text{their } b}{8.5}$ oe Dep on their $b < 8.5$
	(d)	30.2 or 30.3 or 30.24 to 30.27	3	M2 for $\frac{360 - 4 \times 39}{360} \times 2 \times \pi \times 8.5$ oe or M1 for $\frac{a}{360} \times 2 \times \pi \times 8.5$ oe where $0 < a < 360$ Implied by 5.78 to 5.79 or 11.5 to 11.6 or 23.14 to 23.15 or 23.1 or 23.2 or 41.83 to 41.84 or 41.8
	(e)	$AB = BC$ $TA = TC$ $TB = TB$	1 1 1	isw comments or reasons If 0 scored SC1 for “all <u>three sides</u> the same” oe [SSS] and no mention of angles
5	(a)	$\frac{27}{x}$ final answer	1	
	(b)	$\frac{25}{x-2}$ final answer	1	
	(c)	$\frac{25}{x-2} - 4 = \frac{27}{x}$ oe	M1	FT their (b) $- 4 =$ their (a) oe must be eqn in x
		$25x - 4x(x-2) = 27(x-2)$ oe	M1	FT $\frac{25}{x-2} + 4 = \frac{27}{x}$ oe <u>only</u> for 2 nd and 3 rd M mark If all on one side then condone omission of ‘= 0’
		$4x^2 + 27x - 25x - 8x - 54 [= 0]$ oe	M1dep	Dep on 2 nd M1 Must see brackets expanded before this award and terms on one side of eqn
		$2x^2 - 3x - 27 = 0$ without error seen	A1	Must see $4x^2 - 6x - 54 = 0$ first
	(d)	- 3, 4.5	3	B2 for $(2x-9)(x+3)$ or SC1 for $(2x+a)(x+b)$ where a and b are integers and $a + 2b = -3$ or $ab = -27$
	(e)	6 cao	1	

Page 5	Mark Scheme	Syllabus	Paper
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6	(a) (i)	$\frac{12^2 + 21^2 - 15^2}{2 \times 12 \times 21}$ 44.41 to 44.42	M2	M1 for $15^2 = 12^2 + 21^2 - 2.12.21\cos M$
	(ii)	88.2 or 88.15 to 88.19	A2	A1 for [cos =] 0.714 or 0.7142 to 0.7143 or $\frac{360}{504}$ oe
	(b)	7.74 or 7.736 to 7.737.... www	2 4	M1 for $0.5 \times 12 \times 21 \times \sin(44.4)$ oe B1 for 55 soi M2 $\frac{6.4}{\sin(\text{their } R)} \times \sin 82$ oe or M1 for $\frac{6.4}{\sin(\text{their } R)} = \frac{PR}{\sin 82}$ oe
7	(a) (i)	$\begin{pmatrix} 15 \\ 21 \end{pmatrix}$	1	
	(ii)	not possible oe	1	
	(iii)	(2) final answer	2	M1 for 30 – 28
	(iv)	$\begin{pmatrix} 4 & 13 \\ 0 & 0 \end{pmatrix}$	1	
	(v)	$\begin{pmatrix} -5 & -9 \\ 1 & 0 \end{pmatrix}$	2	B1 for one correct row or column
	(b)	$\frac{1}{2} \begin{pmatrix} 3 & -4 \\ -1 & 2 \end{pmatrix}$ or better isw	2	B1 for $k \begin{pmatrix} 3 & -4 \\ -1 & 2 \end{pmatrix}$ seen or implied or $\frac{1}{2} \begin{pmatrix} a & b \\ c & d \end{pmatrix}$ seen
8	(a)	hat $\frac{5}{8}, \frac{3}{8}$ scarf $\frac{2}{3}, \frac{1}{3}$ $\frac{1}{6}, \frac{5}{6}$	1 1 1	1 mark per pair in correct place
	(b) (i)	$\frac{15}{48}$ oe $\left[\frac{5}{16} \right]$	2FT	FT their $\frac{3}{8} \times \frac{5}{6}$ correctly evaluated M1 $\frac{3}{8} \times \frac{5}{6}$ FT from their tree
	(ii)	$\frac{5}{24}$	2FT	FT their $\frac{5}{8} \times \frac{1}{3}$ correctly evaluated M1 $\frac{5}{8} \times \frac{1}{3}$ FT from their tree

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	(iii)	$\frac{13}{48}$ cao	2	M1 for <i>their</i> $\frac{3}{8} \times \frac{1}{6} + \text{their (b)(ii) soi}$
	(c)	$\frac{170}{240}$ or $\frac{85}{120}$ or $\frac{34}{48}$ or $\frac{17}{24}$ cao	3	M2 for $1 - \frac{5}{8} \times \frac{2}{3} \times \frac{7}{10}$ FT <i>their tree</i> or $\frac{3}{8} + \frac{5}{8} \times \frac{1}{3} + \frac{5}{8} \times \frac{2}{3} \times \frac{3}{10}$ oe or M1 for [“wears all” =] $\frac{5}{8} \times \frac{2}{3} \times \frac{7}{10}$ FT <i>their tree seen</i>
9	(a)	371 or 371.1...	4	M3 for $(6 \times 4 \times 12) + (2 \times 6 \times 0.5 \times 4 \times 4 \times \sin 60)$ oe or M2 for area of 1 or 2 hexagons or M1 for area of one relevant triangle or trapezium or rectangle within hexagon If 0 scored SC1 for 288 shown
	(b) (i)	1740 or 1743.6 to 1744.2	4	M3 for $\frac{12000}{4} \div (\pi \times 0.74^2)$ oe or SC2 for figs 174[3..] or 174[4..] or B1 for $\pi \times 0.74^2$ seen [1.72..] or B1 for 12000 / 4 soi by 3000
	(ii)	87 cao www 5	5	B4 for 87.39 to 87.43 or M3 for $[r =] \sqrt{\frac{\text{figs } 12}{\pi \times \text{figs } 5}}$ oe or M2 for $[r^2 =] = \frac{\text{figs } 12}{\pi \text{ figs } 5}$ oe or M1 for $\text{figs } 12 = \pi r^2 \times \text{figs } 5$
10	(a) (i)	final answer $\frac{25-8x}{20}$	2	M1 for $\frac{5 \times 5 - 4 \times 2x}{5 \times 4}$ or better seen
	(ii)	final answer $\frac{2x^2 + 5x + 9}{3(x+3)}$	3	B1 for $2x^2 + 6x - x - 3$ soi and B1 for denom $3(x+3)$ or $3x+9$ seen
	(b)	$x = \frac{2}{3}$ oe or 0.667 or 0.6666 to 0.6667 $y = -3$	3	M1 for correct method to eliminate one variable A1 for $x = \frac{2}{3}$ oe or 0.667 or 0.6666 to 0.6667 or $y = -3$

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(c)	final answer $\frac{7}{2x+3}$ www	4	<p>B1 for $7(x+3)$ in numerator and B2 for $(2x+3)(x+3)$ in denominator or SC1 for $(2x+a)(x+b)$ where a and b are integers and $a+2b=9$ or $ab=9$</p> <p>After B1 scored, SC1 for final answer $\frac{7}{2(x+1.5)}$ or $\frac{3.5}{x+1.5}$</p>
11 (a)	$3^2 + 1^2$	1	Ignore attempt to evaluate $\sqrt{10}$
(b) (i)	$\frac{\sqrt{10}}{3}$ final answer	1	
(ii)	$\frac{10}{3}$ final answer	2	<p>M1 for <i>their</i> $\frac{\sqrt{10}}{3} \times \sqrt{10}$ or <i>their</i> $\left(\frac{\sqrt{10}}{3}\right)^2 + (\sqrt{10})^2$ implied by 3.33 seen</p>
(c)	$\frac{100}{27}$ or $3\frac{19}{27}$ isw conversion or 3.7[03] to 3.7[04]	2	<p>M1 for $3 \times \left(\frac{\sqrt{10}}{3}\right)^n$ oe where n is 3 or 4 or for $[OP_4 =] \sqrt{\frac{1000}{81}}$ or for <i>their</i> (b)(ii) $\times \left(\frac{\sqrt{10}}{3}\right)^n$ where n is 1 or 2</p>
(d) (i)	18.43...	2	M1 for $\tan [P_1OP_2] = \frac{1}{3}$ oe
(ii)	18.4[3...]	1	
(iii)	20	3	<p>SC2 for 19 or M1 for $\frac{360}{18.4[3...]}$</p>

MARK SCHEME for the May/June 2013 series

0580 MATHEMATICS

0580/43

Paper 4 (Extended), maximum raw mark 130

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the May/June 2013 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.

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Abbreviations

cao	correct answer only
cso	correct solution only
dep	dependent
ft	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
www	without wrong working
art	anything rounding to
soi	seen or implied

1	(a)	2814 final answer	2	M1 for $2345 \div 5$ soi by 469 or ans = 2810
	(b)	257.95 final answer	2	M1 for 2345×0.11 oe or ans = 258
	(c) (i)	280.5[0] final answer	2	M1 for $330 \times (1 - 0.15)$ oe or ans = 281
		(ii) 375	3	M2 for $330 \div (1 - 0.12)$ oe Or M1 for $330 = (100 - 12)\%$ oe
	(d)	1605.89 or 1605.9[0]	3	M2 for $1500 \times (1 + 0.023)^3$ oe soi by 1605.898751 or $1500 \times 1.07(05\dots)$ Or M1 for $1500 \times (1 + 0.023)^2$ oe
	(e)	23.1 or 23.07 to 23.08	3	M2 for $\frac{325 - 250}{325} \times 100$ oe Or M1 for $\frac{325 - 250}{325}$ soi by 0.2307... 3sf or better or $\frac{250}{325} \times 100$ soi by 76.9...

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2	(a) (i)	Perpendicular bisector of QR ruled with 2 correct sets of arcs centred Q and R	2	B1 for correct bisector ruled
		Bisector of angle SPQ ruled with correct arcs. (Marks on PS and PQ and correct pair of arcs)	2	B1 for correct angle bisector ruled
		Compass drawn arc centre R with radius 6 cm (± 2 mm)	B2	B1 for any compass drawn arc centre R not used in any construction with no feathering
		Correct region shaded	1dep	Dependent on all B4 marks for the correct loci
	(ii)	217 to 221	1	
	(b) (i)	6360 or 6361 to 6363	2	M1 for $\pi \times 45^2$
	(ii)	165 or 164.9 to 165	2	M1 for $\frac{210}{360} \times 2\pi \times 45$
3	(a) (i)	$x \geq 5$	1	–1 once for strict inequalities in (i) to (iii)
	(ii)	$y \geq 11$	1	
	(iii)	$x + y \geq 20$	1	
	(b)	$4x + 8y \leq 160$ and divide by 4	1	If there is a final inequality it must be the given one
	(c) (i)	$x = 5$ ruled	1	Must be on correct grid line
		$y = 11$ ruled	1	Must be on correct grid line
		$x + y = 20$ ruled	2	B1 for one axis intercept correct when extended if necessary but not parallel to an axis
		$x + 2y = 40$ ruled	2	B1 for one axis intercept correct when extended if necessary but not parallel to an axis
		Correct shading of unwanted region	1dep	Dependent on 6 marks earned for the boundaries
	(ii)	29	2	M1 for $x + y$ evaluated where (x, y) is a point in their quadrilateral and x and y are integers

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4	(a)	3080	2	M1 for $\frac{1}{2} \times 7 \times 22 \times 40$
	(b)	46.2 or 46.18 to 46.2 www	4	M3 for $\sqrt{7^2 + 22^2 + 40^2}$ or M2 for $7^2 + 22^2 + 40^2$ soi by 2133 or M1 for correct Pythagoras on one face
	(c)	8.7 or 8.7 to 8.72 www	3	M2 for $\sin^{-1} \frac{7}{\text{their}(b)}$ oe or M1 for $\sin = \frac{7}{\text{their}(b)}$ oe
	(d)	217	3	M1 for $\frac{4}{3} \times \pi \times 1.5^3$ soi by 14.1 to 14.14 and M1 dep for <i>their</i> (a) \div <i>their</i> 14.14 soi by 218. Dependent on M1 earned
	(e) (i)	25.13875 final answer	2	B1 for 4.55 and 11.05 seen or 25.13875 seen and then spoiled
	(ii)	25.14	1FT	Strict FT <i>their</i> (e)(i) correct to 4s.f. if rounding is possible
5	(a)	–5.04, 1.75, 0	3	B1 for each correct value
	(b)	Fully correct curve	5	B3FT for 10 correct plots from <i>their</i> (a) B2FT for 8 or 9 correct plots or B1FT for 6 or 7 correct plots and SC1 for two branches not joined
	(c)	–1.6 to –1.5	1	
		–0.4 to –0.3	1	
		1.8 to 1.9	1	
	(d)	–2.6 to –2.5 www	1	After 0 scored, M1 for $y = 2x - 2$ drawn
		–0.4 to –0.3	1	
		1	1	
	(e)	3.25 to 4.25 with correct tangent	3	B1 for correct tangent B2 for answer in range dep on close attempt at tangent M1dep for $[-] \frac{\text{rise}}{\text{run}}$ used with values soi from tangent, dep on correct or close attempt at tangent

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6	(a)	$\frac{3}{10}$ correctly placed	1	Accept 0.3
		$\frac{6}{9}$ and $\frac{3}{9}$ correctly placed	1	Accept 0.667 or better and 0.333 or better
		$\frac{7}{9}$ and $\frac{2}{9}$ correctly placed	1	Accept 0.778 or better and 0.222 or better
	(b)	$\frac{42}{90}$ or $\frac{21}{45}$ or $\frac{14}{30}$ or $\frac{7}{15}$	3	M2 for $\frac{7}{10} \times \frac{3}{9} + \frac{3}{10} \times \frac{7}{9}$ soi by 0.467 or better or M1 for $\frac{7}{10} \times \frac{3}{9}$ or $\frac{3}{10} \times \frac{7}{9}$ soi by 0.233 or better
7	(a) (i)	Triangle at (1, 3) (1, 9) (3, 3)	2	SC1 for correct vertices not joined or triangle(1, 1) (3, 1) (1, 7)
	(ii)	$\begin{pmatrix} 1 & 0 \\ 0 & 3 \end{pmatrix}$	2	SC1 for $\begin{pmatrix} 1 & 0 \\ 0 & k \end{pmatrix}, k \neq \pm 1 \text{ or } 0$ or $\begin{pmatrix} 3 & 0 \\ 0 & 1 \end{pmatrix}$
	(b) (i)	Shear x-axis oe invariant [factor] 2	1 1 1	
	(ii)	$\begin{pmatrix} 1 & 2 \\ 0 & 1 \end{pmatrix}$	2FT	FT from <i>their</i> 2 in (b)(i) SC1 for $\begin{pmatrix} 1 & k \\ 0 & 1 \end{pmatrix}, k \neq 0$ or $\begin{pmatrix} 1 & 0 \\ 2\text{FT} & 1 \end{pmatrix}$
8	(a) (i)	27	1	
	(ii)	54	1	
	(iii)	153	1	
	(b) (i)	59.6 or 59.57... www	4	M2 for $45^2 + 32^2 - 2 \times 45 \times 32 \times \cos 100$ or M1 for implicit cos rule and A1 for 3549....
	(ii)	22.[0] or 21.99... www	3	M2 for $324 \div (\frac{1}{2} \times 32 \times \sin 67)$ or M1 for $[324 =] \frac{1}{2} \times 32 \times x \times \sin 67$
	(iii)	81[.0]	2	B1 for 2^2 or $(\frac{1}{2})^2$ oe seen or $\frac{1}{2} \times 16 \times \frac{1}{2}$ <i>their</i> (b)(ii) $\times \sin 67$

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9	(a) (i)	14	1	
	(ii)	8	1	
	(iii)	30 – <i>their</i> (ii)	1FT	
	(b)	$\frac{11}{80}$	2	SC1 for $\frac{69}{80}$
	(c)	16, 4	2	B1 for each correct value
	(d)	18.0625 rot to 3sf or better or 18.1 www	3	M1 for Σmf for m as mid values of 5, 12.5, 22.5, 35 and 45 (= 1445) and M1 dep for $\Sigma mf \div 80$, dep on M1 earned
	(e)	Correct widths with no gaps 2 nd block w = 5, fd = 2.4 3 rd block w = 15 fd = 1.2 4 th block w = 10 and fd = 1.6 5 th block w = 10 and fd = 0.4	1 1 1 1FT 1FT	Strict FT from <i>their</i> (c) Strict FT from <i>their</i> (c) After 0 scored for blocks, SC1 for 4 correct fds soi by correct heights
10	(a) (i)	4.5 or 4½	3	M2 for a complete correct method or M1 for one correct step at any stage.
	(ii)	$(x - 6)(x - 1)$	M2	M1 for $(x + a)(x + b)$ where $ab = 6$ or $a + b = -7$
		1, 6	A1FT	FT their brackets dep on M1 earned After M0 scored SC1 for 1, 6 as answer
	(iii)	6	4	B1 for $2(3x - 2) + x + 2 = 4 \times 10$ oe and B1 for correct multiplication of a bracket and M1 for correct rearrangement of their linear equation without brackets to $ax = b + c + d$ or better
	(b)	$a = 1/3$ oe, $b = 1/2$ oe	6	B1 for any one of $1 = a + b + 1/6$ oe $5 = 8a + 4b + 2/6$ oe $14 = 27a + 9b + 3/6$ oe $30 = 64a + 16b + 4/6$ oe Or any other correct equation and B1 for another of the above equations and M1 for equating one coefficient or correct rearrangement to give a or b as subject and M1 for subtracting to eliminate a or b or correct substitution for <i>their</i> a or <i>their</i> b A1 for $a = 1/3$ oe or $b = 1/2$ oe