Extended Mathematics
Topic :Graph
Year :May 2013 -May 2024
Paper - 2
Answers

Question 1

15	4	**M2** for $\frac{1}{2}\times 40\times(26+19)$ oe or **M1** for one valid area calculation **Indep M1** for ÷ 60 **SC3** for answer 900

Question 2

(a)	2.8 oe	1	
(b)	700	3	**M2** for ½(20 + 30) × 28 oe or **M1** for a correct area statement

Question 3

$y = 2x - 1$	3	**B2** for $y = mx - 1$ or $y = 2x + c$ or $2x - 1$ or **B1** for gradient = 2, **B1** for $c = -1$ or **SC1** for $\frac{6}{3}$ or $\frac{5--1}{3[-0]}$

Question 4

Any two of (20, 8) (–4, 0) (12, 24)	2	**B1** for one correct

Question 5

(a) (1.5, 12.5) oe	2	**B1** for either coordinate
(b) $y = 3x + 8$ oe	3	**B2** for $y = mx + 8$ or $y = 3x + c$ or $3x + 8$ or **B1** for gradient (or m) = 3 and **B1** for $c = 8$ If 0 scored, **SC1** for 23 = *their* $m \times 5 + c$ or for 2 = *their* $m \times -2 + c$ or for 12.5 = *their* $m \times 1.5 + c$
(c) Most common methods: Correctly substituting P (3, 17) into $y = 3x + 8$ Showing the gradient of AP or $BP = 3$ Other methods possible.	1	

Question 6

$y = -0.5x + 11.5$ oe	**3**	**B2** for $y = -0.5x + k$ oe or $y = kx + 11.5$, $k \neq 0$ oe or $-0.5x + 11.5$ oe or **B1** for gradient = –0.5 oe and **B1** for y-intercept = 11.5 oe If zero scored then, **SC1** for $9 = \textit{their } m \times 5 + c$ or $13 = \textit{their } m \times -3 + c$

Question 7

$y = \frac{2}{3}x - 2$ oe	**4**	**B1** for (9, 4) and **M2** for $y = kx - 2\ (k \neq 0)$ or $y = \frac{2}{3}x + k\ (k \neq 0)$ or $\frac{2}{3}x - 2$ or **M1** for $y = \frac{2}{3}x$ or $\frac{2}{3}x + k\ \ (k \neq 0)$

Question 8

(a)	(0, 5)	**1**
(b)	– 1	**1**

Question 9

(a)	5	**3**	**M2** for $\frac{u \times 10}{2} + 2u \times 10 = 125$ oe or **M1** for evidence that area represents distance e.g. $\frac{u \times 10}{2}$, $2u \times 10$ or $3u \times 10$
(b)	2	**1FT**	**FT** 10 ÷ *their u* correctly evaluated

Question 10

(a)	0.4 or $\frac{2}{5}$	**1**	
(b)	1430	**3**	**M2** for correct, complete, area statement e.g. $120 \times 10 + \frac{1}{2} \times 20 \times 8 + \frac{1}{2} \times 30 \times 10$ oe or **M1** for one area calculation e.g. 10×120 or $\frac{1}{2} \times 20 \times 8$ or $\frac{1}{2} \times 30 \times 10$
(c)	11.9 or 11.91 to 11.92	**1FT**	*their* **(b)** ÷ 120

Question 11

(a)	[y =] $2x + 3$ cao	**3**	**M2** for correct unsimplified equation or **B1** for gradient = (11 – 3) ÷ (4 – 0) or better and **B1** for $c = 3$
(b)	$-\frac{1}{2}$ oe	**1FT**	–1 ÷ *their m*

Question 12

13.6 or 13.60...	**3**	**M2** for $\sqrt{(-4-7)^2 + (6-(-2))^2}$ oe or **M1** for $(-4-7)$ oe or $(6-(-2))$ oe

Question 13

$2n^2 + 3$ oe final answer	**2**	**M1** for a quadratic expression as final answer or $2n^2 + 3$ oe in working

Question 14

(a)	12.5 oe	**2**	**M1** for 45 × 1000 ÷ 60 ÷ 60 oe
(b)	1.25 oe	**1FT**	**FT** *their* **(a)** ÷ 10
(c)	312.5 oe	**3FT**	**FT** for 25 × *their* **(a)** **M2** for 20 × *their* 12.5 + 0.5 × 10 × *their* 12.5 oe or **M1** for one correct relevant area calculation or **SC2** for final answer 1125

Question 15

(a)	2 cao	**2**	**M1** for rise/run attempted e.g. 4/2 or other correct method for finding gradient or **SC1** for $y = 2x - 1$ as answer
(b)	$y = 2x + 6$ oe	**2FT**	**FT** for $y = \textit{their(a)}x + 6$ **B1** for $y = mx + 6$ ($m \neq 0$ or 2) or $y = 2x$ [+ k] or $y = \textit{their(a)}x$ [+ k] ($k \neq 6$) or for answer $2x + 6$ or answer $\textit{their(a)}x + 6$

Question 16

$y = -\frac{3}{7}x + 11$ oe	**6**	**B2** for gradient = $-\frac{3}{7}$ **or M1** for [gradient =] $\frac{15-1}{10-4}$ oe **or** for the negative reciprocal of *their* gradient **and** **B2** for [midpoint of AB =] (7, 8) or **B1** for (7, k) or (k, 8) **and M1** for substitution of *their* midpoint or (4, 1) or (10, 15) into a linear equation

Question 17

(a)	Correct tangent	**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 $x = 0.8$ and $x = 1.2$
	$2.1 \leqslant \text{grad} \leqslant 3.9$	**2**	dep on **B1** **M1** for $\frac{\textit{rise}}{\textit{run}}$ also dep on any tangent drawn or close attempt at tangent at any point Must see correct or implied calculation from a drawn tangent
(b)	(–2, 8)	**1**	

Question 18

$y = 2x$ oe	**3**	**M1** for $\frac{1-3}{12-8}$ oe **M1** for perpendicular gradient × *their* $\frac{1-3}{12-8} = -1$ oe If zero scored, **SC1** for answer $y = kx$ $k \neq 2$ or 0

Question 19

(a)	*A*	**1**	
(b)	A ruled line joining (65, 23) to (80, 28)	**1**	

Question 20

(a)	(7 , 1)	**1**	
(b)	-1.25 or $-\frac{5}{4}$ or $-1\frac{1}{4}$	**2**	**M1** for rise/run
(c)	$y=\frac{4}{5}x+2$ oe	**3**	**B2** for $\frac{4}{5}x+2$ **or** $y=\frac{-1}{their\,(\mathbf{b})}x+2$ oe or **M1** for $-\frac{1}{their\,(\mathbf{b})}$ oe or **B1** for $\frac{4}{5}x$ seen or $[y=]\,mx+2$ $(m\neq 0)$

Question 21

(a)	$[y=]-2x+3$	**3**	**B2** for $[y=]-2x+c$ or **M1** for rise/run and **B1** for $[y=]\,kx+3$, $k\neq 0$ or $c=3$
(b)	$y=\frac{1}{2}x-\frac{5}{2}$ oe final answer	**3**	**M1** for gradient $=-\frac{1}{their\text{ gradient in }\mathbf{(a)}}$ or gradient = 0.5 oe **M1** for substitution of (3, −1) into *their* $y = mx + c$ oe

Question 22

(a)	0.25 or $\frac{1}{4}$	**1**	
(b)	0.45	**3**	**B2** for 450 or **M2** for $\frac{1}{2}\times 60\times 15\div 1000$ or **M1** for $\frac{1}{2}\times 60\times 15$ If 0 scored **SC1** for correct conversion of their distance in metres to kilometres

Question 23

3000		**3**	**M2** for $12.5\times\frac{1}{2}(200+280)$ oe or **M1** for part area

Question 24

(a)	$y = 2x + 4$	**3**	**B2** for $2x + 4$ or $y = 2x + c$ or $y = mx + 4$ or **B1** for $2x + c$ or for $kx + 4$ or **M1** for rise/run
(b)	$y=-\frac{1}{2}x+\frac{3}{2}$ oe	**4**	**B1** for (–1, 2) **M1** for the gradient $-\frac{1}{2}$ oe or $\frac{-1}{\textit{their } 2}$ oe **M1** for substituting *their* (–1, 2) into *their* $y = mx + c$ oe

Question 25

(a)	0.8 or $\frac{4}{5}$	**1**	
(b)	1180	**3**	**M2** for $(0.5 \times 16 \times 20) + (0.5 \times 4 \times 30) + (80 \times 12)$ oe or **M1** for part area

Question 26

$k - 3$ or $-3 + k$	**3**	**M1** for $5=\frac{23-8}{k-x}$ oe **M1** for $5(k - x) = 23 - 8$ or better e.g. $[x =] k-\frac{23-8}{5}$

Question 27

132	**3**	**M2** for $\frac{1}{2}(7 + 15)\times12$ or **M1** for any correct area

Question 28

Diagonal line from (0, 0) to (30, 12)	**1**	
and Horizontal line from (30, 12) to (70, 12)	**1FT**	**FT** for horizontal line from (30, *k*) to (70, *k*) where *k* is *their* 12

Question 29

(a)	25	**2**	**M1** for $\frac{90\times1000}{60\times60}$ oe
(b)	1.25	**1**	**FT** $\frac{\textit{their}\textbf{(a)}}{20}$ correctly evaluated
(c)	1250	**2**	**2FT** for *their* **(a)** × 50 correctly evaluated or **M1** for one area e.g. ½(40 + 60) × 25, 25 × 40, ½ × 25 × 20 ½(40 + 60) × 90, 90 × 40, ½ × 90 × 20 ½(40 + 60) × *their* 25, *their* 25 × 40, ½ × *their* 25 × 20

Question 30

(a)	$[y=]-\frac{2}{5}x+3$ or $[y=]-0.4x+3$ final answer	**4**	**B2** for [gradient of perpendicular =] $-\frac{2}{5}$ oe or **M1** for [gradient =] $\frac{24-9}{22-16}$ or $-\frac{22-16}{24-9}$ **M1** for substituting (5, 1) into $y = \textit{their}\ mx + c$
(b)	(20, 19)	**2**	**M1** for $\frac{2}{3}(22-16)+16$ or $\frac{2}{3}(24-9)+9$ oe or **SC1** for answer (18, 14)

Question 31

30	**3**	**M2** for ½ (8 + 2) × v [= 150] oe or **M1** for ½ × 6 × v or 2 × v oe

Question 32

(a)	78.7 or 78.69…	**3**	**M2** for tan = $\frac{5}{2-1}$ oe or **M1** for use of tangent oe
(b)	$[y=]-\frac{1}{3}x+12$ final answer	**3**	**M1** for gradient = $-\frac{1}{3}$ **M1** for substituting (6, 10) into $y = \textit{their}\ mx + c$

Question 33

'(a)	2200	**3**	**M2** for $\frac{1}{2}(90+130)\times 20$ or $\frac{1}{2}(10\times 20)+(90\times 20)+\frac{1}{2}(30\times 20)$ or **M1** for one area
'(b)	16.9 or 16.92…	**1**	**FT** *their* **(a)** ÷ 130

Question 34

(a)	1.2	**1**	
(b)	45	**3**	**M2** for $\frac{1}{2}\times 10\times 12+12(T-10)[=480]$ oe or **M1** for one relevant area OR **M1** for $480-\frac{1}{2}\times 10\times 12$ implied by 420 **M1** for $\frac{420}{12}$ [+ 10]

Question 35

$-2x+5$	**4**	**M1** for $\frac{7-2}{9--1}$ oe **M1** for gradient of perpendicular = $\frac{-1}{\textit{their}\ 0.5}$ **M1** for (1, 3) correctly substituted into *their* $y=-2x+c$

Question 36

$\left(2w, \frac{r+t}{2}\right)$ final answer	**2**	**B1** for $2w$ oe nfww or $\frac{r+t}{2}$ oe

Question 37

(a)	(4.5, – 1)	**2**	**B1** for each
(b)	$[y=]\frac{5}{8}x+\frac{7}{4}$	**4**	**M1** for $\frac{-5-3}{7-2}$ oe **M1** for $-1/$ *their* $-\frac{8}{5}$ **M1** for $3 = 2\times$ *their* gradient $+ c$ oe

Question 38

(a)	$1\frac{2}{3}$ or 1.67 or 1.666 to 1.667	**1**	
(b)	1062.5	**3**	**M2** for $\frac{25}{2}(50+35)$ oe or **M1** for one area

Question 30

(a)	(0, –8)	**1**	
(b)	3	**1**	

Question 40

(a)	$y = 2x - 3$ oe	**3**	**B2** for $2x - 3$ or $y = theirm\ x - 3$ or $y = 2x + c$ or **M1** for $\frac{9-(-3)}{6-0}$ oe or $9 = 6m - 3$ oe or **B1** for $2x$ seen or $[y =]mx - 3$ $m \neq 0$
(b)	$y = -\frac{1}{2}x + 2$ oe	**2**	**FT** *their* **(a)** $y = -\frac{1}{their\ m}x + 2$ **B1** for gradient $-\frac{1}{2}$, gradient **FT** *their* **(a)** or for $y = mx + 2$ $m \neq 0$

Question 41

(a)	2	**1**	
(b)	1300	**3**	**M2** for $\frac{20}{2} \times (60+70)$ oe or **M1** for any relevant area

Question 42

(a)	0.3 or $\frac{3}{10}$	**1**	

(b)	760	3	**M2** for correct complete area statement e.g. $70 \times 10 + \frac{1}{2} \times 20 \times 6$ oe or **M1** for one of these area calculations 70×10, $\frac{1}{2} \times 20 \times 6$, 50×10 or $\frac{1}{2} \times (16 + 10) \times 20$

Question 43

2.75 oe	3	**M2** for $6 - -5 = 2(3k - k)$ oe or better or **M1** for $\frac{6 - -5}{3k - k}$ oe If 0 scored, **SC1** for -2.75 oe as answer

Question 44

7.62 or 7.615 to 7.616	3	**M2** for $\sqrt{(9-2)^2 + (4-1)^2}$ oe or **M1** for $(9-2)^2 + (4-1)^2$ oe or 58

Question 45

$-\frac{2}{5}$ or -0.4	2	**M1** for gradient = $\frac{5}{2}$ oe soi

Question 46

(a)	Tangent ruled at $t = 24$	**B1**	
	-0.7 to -0.3	**B2**	**B2** dep on correct tangent or close attempt at tangent **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.
(b)	acceleration or deceleration oe	**1**	
(c)	68	**2**	**M1** for $(22 - 5) \times 4$

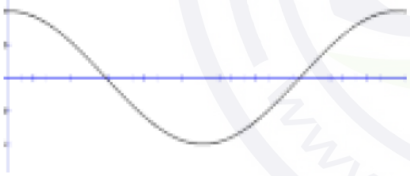
Question 47

Gradient = $\frac{5}{4}$ oe	**M1**	**M** marks can be in any order
$y = k - \frac{4}{5}x$ oe and gradient = $-\frac{4}{5}$ oe	**M1**	
Use of product of gradients is -1 oe	**M1**	

Question 48

380	**5**	**B2** for time = 8, implied by 23 on t-axis or **M1** for $\frac{20}{t} = 2.5$ or $\frac{20}{t-15} = 2.5$ or $\frac{0-20}{t-15} = -2.5$ oe **M2** for $\frac{1}{2}$(*their* 23 + 15) × 20 or $20 \times 15 + \frac{1}{2} \times$ *their* 8 × 20 oe or **M1** for any relevant area found

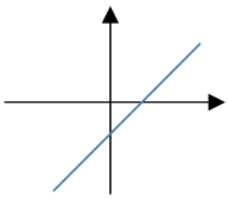
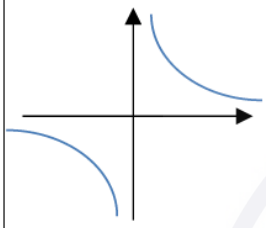
Question 49

(a)	Correct sketch 	**2**	Needs all three features for 2 marks: • Correct curve shape • Maximum at (0, 1) and at (360, 1) and minimum at (180, −1) • Passing through (90, 0) and (270, 0) only **B1** for two correct features
(b)	75.5 or 75.52… and 284.4 to 284.5	**3**	**B2** for one correct or **M1** for cos $x = \frac{1}{4}$ oe If 0 scored, **SC1** for two answers with a sum of 360

Question 50

$[y =] -\frac{1}{6}x + \frac{11}{2}$ oe	**4**	**M1** for [gradient of AB =] $\frac{5--7}{3-1}$ oe **M1** for [gradient of perpendicular =] $-\frac{1}{\textit{their}\ \text{grad}\ AB}$ **M1** for substituting (3, 5) in *their* linear equation

Question 51

)(a)	Correct sketch 	**1**	Line with positive gradient and negative y intercept
(b)	Correct sketch 	**2**	**B1** for only one branch or attempt at correct shape

Question 52

(a)	0.3 oe	**1**	
(b)	3060	**3**	**M2** for $\frac{1}{2}(300+210)\times 12$ oe or **M1** for one correct part area

Question 53

990	**3**	**M2** for correct complete area statement e.g. $\frac{1}{2} \times 30 \times (6 + 12) + 60 \times 12$ oe or **M1** for one area calculation

Question 54

(a)	$\frac{5}{12}$ or 0.417 or 0.4166 to 0.4167	**1**	
(b)	32.5	**4**	**M3** for $\frac{1}{2}(v+v+10)\times 24+\frac{1}{2}\times 16(v+10)=1240$ oe OR **M2** for $\frac{1}{2}(v+v+10)\times 24$ oe and $\frac{1}{2}\times 16(v+10)$ oe or **M1** for one area expression **M1** for correctly solving *their* $(av + b = 1240)$ oe $(a \neq 0, b \neq 0)$

Question 55

(a)	5	**1**	
(b)	$(-\frac{12}{5}$ oe, 0)	**2**	**M1** for $5x + 12 = 0$
(c)	$-\frac{1}{5}$ oe	**1**	**FT** $-\frac{1}{their(a)}$

Question 56

(2.4, 1.8) oe	**5**	**M1** for [gradient =] $-1 \div \frac{1}{3}$ oe **M1** for substituting (2, 3) into $y = (\textit{their } m)x + c$ oe **M1** for $\frac{1}{3}x+1=\textit{their}\left(mx+c\right)$ with *their* $m \neq \frac{1}{3}$ **M1** for substituting *their* x-coord into either equation to find y or for substituting *their* y-coord into either equation to find x

Question 57

(a)	$4 - 2x$	**2**	**B1** for 4 or $-2x$
(b)	(2, 10)	**2**	**B1** for x-coordinate of 2 or **M1** for *their* $4 - 2x = 0$

Question 58

'(a)	0.1 or $\frac{1}{10}$	**1**	
'(b)	90	**3**	**M2** for $\frac{1}{2}\times10\times2+10\times2+\frac{1}{2}(2+4)\times20$ oe or **M1** for one area calculation or indicated on diagram

Question 59

(a)	0.3	**1**	
(b)	360	**3**	**M2** for correct complete area statement e.g. $18 \times 60 + \frac{1}{2} \times 40 \times (18 + 6) - 12 \times 100$ or $\frac{1}{2} \times 6 \times (60 + 80) - \frac{1}{2} \times 6 \times 20$ or for answer 420 or **M1** for one area calculation

Question 60

2	**2**	**M1** for $y = \frac{5 - 4x}{8}$ oe or better

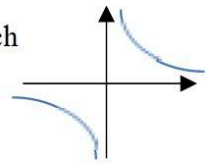
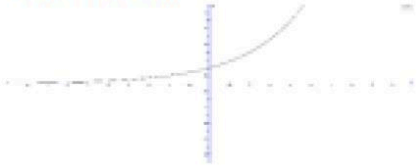
Question 61

$[a =] -1$ $[b =] 5$ $[c =] 1$ $[d =] 4$	**2**	**B1** for two or three correct or **SC1** for $[a =] x \geqslant -1$ $[b =] x \leqslant 5$ $[c =] y \geqslant 1$ $[d =] y \leqslant 4$

Question 62

(0, 5) $\left(\frac{4}{3}, \frac{103}{27}\right)$ oe	**5**	**B2** for $3x^2 - 4x$ or **B1** for $3x^2$ or $-4x$ **M1** for *their* derivative = 0 oe or $\frac{dy}{dx} =$ **B1** for $[x =] 0$ and $\frac{4}{3}$ or for 1 correct coordinate pair

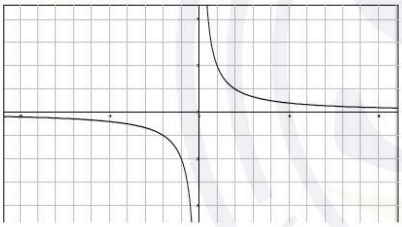
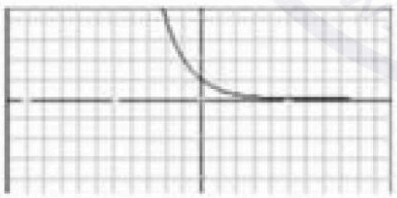
Question 63

(a)	Correct sketch 	**2**	**B1** for one correct branch or attempt at correct shape
(b)	Correct sketch 	**2**	**B1** for correct shape but crossing x-axis or correct shape but just in one quadrant

Question 64

0 and 4 final answer	**4**	**B3** for $5x^3(x-4)$ or better or **B2** for $5x^4 - 20x^3$ or **B1** for $5x^4$ or $-20x^3$

Question 65

(a)	Correct sketch 	**2**	**B1** for one correct branch or attempt at correct shape
(b)	Correct sketch 	**2**	**B1** for correct shape but crossing x-axis or for correct shape but just drawn in one quadrant

Question 66

12	**1**	
144	**2**	**FT** $12 \times$ *their V* **M1** for any relevant area **FT** *their V*

Question 67

$-\frac{3}{4}$ or -0.75	**2**	**M1** for $y=\frac{4x-5}{3}$ or better or for $\frac{-1}{\textit{their gradient}}$

Question 68

(a)	8.94 or 8.944…	**3**	**M2** for $\sqrt{(9-5)^2+(-1-7)^2}$ oe or **M1** for $(9-5)^2+(-1-7)^2$ oe
(b)	$y = -2x + 17$ oe final answer	**3**	**B2** for answer $-2x + 17$ OR **M1** for $\frac{-1-7}{9-5}$ oe **M1** for correct substitution of (5, 7) or (9, –1) into $y = \textit{their } mx + c$ oe

Question 69

(a)	$-\frac{3}{4}$ or -0.75	**2**	**M1** for correct rise over run or **B1** for answer $\frac{3}{4}$ oe
(b)	$[y=]-\frac{3}{4}x+2$ oe	**2**	**FT** $[y=]\textit{their}$ **(a)**$x+2$ oe **B1** for $[y=]\textit{their}$ **(a)**$x+c$ or $[y=]mx+2$.
(c)	$[y=]\frac{4}{3}x-23$ oe	**3**	**M1** for gradient $\frac{-1}{\textit{their}}$ **(a)** **M1** for (12, – 7) substituted into $y=\textit{their } mx+c$

Question 70

(a)	(7, – 1)	**2**	**B1** for each
(b)	8.94 or 8.944…	**3**	**M2** for $\sqrt{(9-5)^2+(3--5)^2}$ oe or **M1** for $(9-5)^2+(3--5)^2$ oe

Question 71

$[y =]\ 12x - 26$ final answer	**3**	**M1** for $\frac{10 - -2}{3 - 2}$ oe **M1** for correct substitution of (2, –2) or (3, 10) into $y = (their\ m)x + c$ oe

Question 72

(a)	$[y =]\ 3x + 7$ final answer	**3**	**M1** for $\frac{31-16}{8-3}$. oe **M1** for correct substitution of (3, 16) or (8, 31) into $y = (their\ m)x + c$
(b)	–2	**1**	

Question 73

Straight line from (20, 14) to (35, 14) and straight line from (35, 14) to (45, 0)	**3**	**M1** for $210 \div 14$ soi **M1** for $14 \div 1.4$ or any line with gradient –1.4 ending at x axis

Question 74

$y = \frac{1}{5}x + 6$ oe final answer	**3**	**B2** for $y = \frac{1}{5}x + c$ oe or $\frac{1}{5}x + 6$ oe or $y = mx + 6$ oe or **B1** for [gradient =] $\frac{1}{5}$ oe or $mx + 6$

Question 75

(a)	$[y =] - 2x - 7$ final answer	**2**	**B1** for $-2x + c$ or $kx - 7$, $k \neq 0$ final answer
(b)	$y = \frac{1}{2}x[\pm 0]$ final answer	**2**	**FT** $-\frac{1}{their\ gradient\ in\ \textbf{(a)}}$ **B1** for $y = kx[\pm 0]$ oe, $k \neq 0$ or $y = their\ \frac{1}{2}x + c$ oe for any c or $their\ \frac{1}{2}x\ [\pm 0]$ oe

Question 76

(a)	5	**1**	
(b)	(0, 7)	**1**	

Question 77

D B C	**B1**	
$\frac{1}{3}$ or 0.333…	**B1**	
150	**B2**	or **M1** for $\frac{1}{2}\times 30\times 10$

Question 78

(a)	correct graph	**3**	**B1** for line from (0, 0) to (1.5, 30) **B1** for horizontal line from (*their* 1.5, *their* 30) for 0.5 hours **B1** for a line from (*their* 2, *their* 30) ending at distance 70 with a gradient of 16 Provided it fits on the grid and *their* 30 is <70
(b)	15.6 or 15.55 to 15.56 nfww	**3**	**M2** for 70 ÷ (*their* final time in hours) (final time =) $1.5 + 0.5 + \frac{70 - \textit{their}30}{16}$ or 4.5 or *their* final time from graph or **M1** for 70 ÷ any time

Question 79

(a)	1.5 or $1\frac{1}{2}$	**1**	
(b)	240	**2**	**M1** for one correct area

Question 80

$[y =]\ -\frac{1}{4}x - \frac{11}{2}$ oe	**3**	**M1** for grad $= -\frac{1}{4}$ oe soi **M1** for correct substitution shown of (–2, –5) into $y = (\textit{their } m)x + c$ oe ($\textit{their } m \neq 4$)

Question 81

(a)	2	**1**	
(b)	25.125	**4**	**M3** for $\frac{15\times30}{2}+30(k-15)[=\text{figs } 45]$ oe OR **B2** for 44 775 or 44.775 OR **M1** for $\frac{15\times30}{2}$ or $30(k-15)$ oe **B1** for 45 000 or 0.225 or 0.03

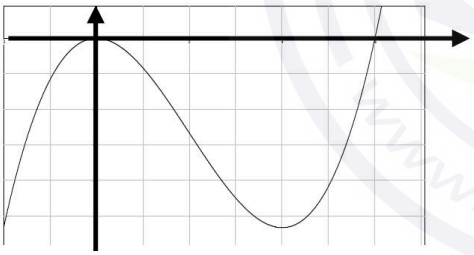
Question 82

(1, 3.5)	**2**	**B1** for each

Question 83

(a)	5	**2**	**M1** for $(0-3)(0+b)(0+2)=-30$ oe or better
(b)	(3, 0)	**1**	

Question 84

Correct sketch with maximum at origin and minimum in fourth quadrant 	**2**	**B1** for any cubic with exactly 2 distinct turning points

Question 85

(a)	2.8 oe	**1**	
(b)	175	**2**	**M1** for a correct relevant area calculation e.g. $(15-5)\times14$ or $\frac{1}{2}\times5\times14$ oe or better

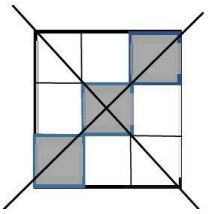
Question 86

90	**2**	**M1** for a correct area calculation e.g. 8×10 or $0.5\times2\times10$ or better

Question 87

(a)	32.5	**2**	**M1** for $\frac{65}{\textit{their time}}$ or $\frac{\textit{their distance}}{2}$
(b)	correct ruled line from (12 00, 65) to (13 18, 0)	**1**	

Question 88

(a)	2	**1**	
(b)		**2**	**B1** for one correct line and no extras or two correct lines and one extra

Question 89

(a)	(9, 7)	**2**	**B1** for each
(b)	2	**2**	**M1** for $\frac{15 - -1}{13 - 5}$ oe
(c)	$[y =] -\frac{1}{2}x + \frac{23}{2}$ oe final answer	**3**	**M1** for gradient = $-\frac{1}{\textit{their}\ \textbf{(b)}}$ oe **M1** for correct substitution of *their* **(a)** into $y = (\textit{their}\ m)x + c$ oe

Question 90

(a)	-9	**3**	**B2** for $3x^2 - 12$ isw or **B1** for $3x^2 - k$ or $kx^2 - 12$
(b)	(− 2, 16) (2, − 16)	**3**	**M1** for *their* $(3x^2 - 12) = 0$ or stating $\frac{dy}{dx} = 0$ **A1** for $x = \pm 2$ or (− 2, 16) or (2, − 16)

Question 91

(a)	0.75 and –1.25	**1**	
(b)	Correct curve	**3**	**B2 FT** for 6 or 5 correct plots or **B1 FT** for 4 or 3 correct plots
(c)	ruled line $y = 2x + 1$	**B2**	**B1** for correct equation $[y =] 2x + 1$ soi or $y = 2x + k$ or $y = kx + 1$ drawn
	−0.35 to −0.45	**B1**	

Question 92

$a = 3$ $k = 5$	**2**	**B1** for each or **M1** for $2 \times 7ax^6 + 3kx^{k-1}$ or better

Question 93

(a)	2.5 oe	**1**	
(b)	140	**2**	**M1** for a correct area e.g. 10×12, $\frac{1}{2} \times 4 \times 10$, $0.5 \times (16 + 12) \times 10$

Question 94

$y = \frac{2}{3}x + \frac{4}{3}$ final answer	**5**	**B1** for midpoint $(4, 4)$ soi **M1** for [gradient AB =] $\frac{7-1}{2-6}$ oe **M1** for [m =] $\frac{-1}{\textit{their}\text{ gradient of } AB}$ **M1** for substituting *their* midpoint into $y = (\textit{their}\ m)x + c$ dep on at least M1 earned

Question 95

2325	3	**M2** for correct method for total area e.g. $\frac{1}{2}\times 15\times(190+120)$ or **M1** for correct method for one area e.g. $\frac{1}{2}\times 20\times 15$, (140 – 20) × 15 or $\frac{1}{2}\times(190-140)\times 15$ oe

Question 96

$(4,3)$	2	**B1** for each or **M1** for $3 = 2x - 5$ or better

Question 97

$-\frac{6}{5}$ oe	2	**M1** for $\frac{1-7}{3--2}$ oe

Question 98

(a)(i)	cubic	1	
(a)(ii)	reciprocal	1	

Question 99

(a)	0.2 oe	1	
(b)	4240	3	**M2** for $\frac{1}{2}\times(210+320)\times 16$ oe or **M1** for one area correct

Question 100

$y=\frac{1}{2}x+2$ oe	2	**M1** for $\frac{6-2}{8-0}$ oe or for $y = kx + 2$

Question 101

$y = 2x$ ruled	**B1**	
$x = -0.5$ to -0.55 $x = 0.85$ to 0.9	**B2**	**B1** for –0.5 to –0.55 **B1** for 0.85 to 0.9

Question 102

(–3, 7)	**2**	**B1** for correct diagram or correct coordinates for *their* point D or for $(-3,k)$ or $(k,7)$