

**Extended Mathematics**  
**Topic :Algebra-1**  
**Year :May 2013 -May 2024**  
**Paper - 4**

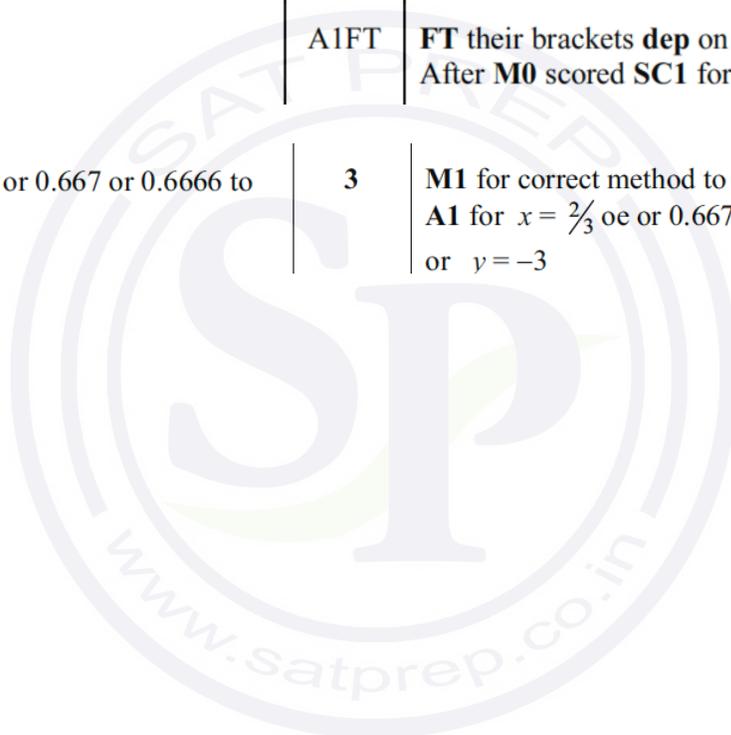
**Answers**

Question 1

(i)	4.5 or $4\frac{1}{2}$	3	<b>M2</b> for a complete correct method <b>or M1</b> for one correct step at any stage.
(ii)	$(x - 6)(x - 1)$	M2	<b>M1</b> for $(x + a)(x + b)$ where $ab = 6$ <b>or</b> $a + b = - 7$
	1, 6	A1FT	<b>FT</b> their brackets <b>dep</b> on <b>M1</b> earned After <b>M0</b> scored <b>SC1</b> for 1, 6 as answer

Question 2

$x = \frac{2}{3}$ oe or 0.667 or 0.6666 to 0.6667 $y = -3$	3	<b>M1</b> for correct method to eliminate one variable <b>A1</b> for $x = \frac{2}{3}$ oe or 0.667 or 0.6666 to 0.6667 or $y = -3$
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Question 3

(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  $25x - 4x(x-2) = 27(x-2)$ oe  $4x^2 + 27x - 25x - 8x - 54 [= 0]$ oe  $2x^2 - 3x - 27 = 0$ without error seen	M1  M1  M1dep  A1	FT <i>their</i> (b) - 4 = <i>their</i> (a) oe must be eqn in x  FT $\frac{25}{x-2} + 4 = \frac{27}{x}$ oe <b>only</b> for 2 <sup>nd</sup> and 3 <sup>rd</sup> M mark If all on one side then condone omission of '= 0'  Dep on 2 <sup>nd</sup> M1 Must see brackets expanded before this award and terms on one side of eqn  Must see $4x^2 - 6x - 54 = 0$ first
(d)	-3, 4.5	3	<b>B2</b> for $(2x-9)(x+3)$ <b>or SC1</b> for $(2x+a)(x+b)$ where $a$ and $b$ are integers and $a+2b=-3$ or $ab=-27$
(e)	6 cao	1	

Question 4

$\frac{-1 \pm \sqrt{1^2 - 4 \times 1 \times (-3)}}{2}$	2	<b>B1</b> for $\sqrt{1^2 - 4 \times 1 \times (-3)}$ or better and if in the form $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$
-2.30, 1.30 final answer	2	then <b>B1</b> for $p = -1$ and $r = 2(1)$ or better  <b>B1 B1</b> <b>SC1</b> for -2.30 and 1.30 seen or -2.3 or -2.303 to -2.302 <b>and</b> 1.3 or 1.302 to 1.303 or final answer -1.30 and 2.30

Question 5

$x^2 + 9$  final answer nfw

4

**B3** for  $4x^2 - 6x - 6x + 9 - 3x^2 + 12x$  or correct answer given and then spoilt  
**or B1** for  $4x^2 - 6x - 6x + 9$  seen **and B1** for  $-3x^2 + 12x$  or  $-(3x^2 - 12x)$  seen

Question 6

$(2x - 1)(x + 3)$  isw solving

2

**M1** for  $(2x + a)(x + b)$  where  $ab = -3$  or  $2b + a = 5$  with integers  $a$  and  $b$

Question 7

(a)  $\sqrt{(-11)^2 - 4(8)(-11)}$  or better

$p = -(-11), r = 2(8)$  or better

-0.67, 2.05 final answers

**B1**

Seen anywhere or for  $\left(x - \frac{11}{16}\right)^2$

**B1**

Must be in the form  $\frac{p + \sqrt{q}}{r}$  or  $\frac{p - \sqrt{q}}{r}$

or **B1** for  $\sqrt{\frac{11}{8} + \left(\frac{11}{16}\right)^2} + \frac{11}{16}$

**B1B1**

**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

Question 8

$\sqrt{(3)^2 - 4(2(-6))}$  or better

$p = -3$  and  $r = 2(2)$

1.14 and -2.64 cao

**B1**

or  $\left(x + \frac{3}{4}\right)^2$

**B1**

Must see  $\frac{p + \sqrt{q}}{r}$  or  $\frac{p - \sqrt{q}}{r}$  or both

Or  $-\frac{3}{4} +$  or  $-\sqrt{\frac{57}{16}}$

**B1B1**

**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



Question 10

$$\frac{-(-3) \pm \sqrt{(-3)^2 - 4 \times 2 \times -6}}{2 \times 2}$$

2.64 and -1.14 cao

- 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  
**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

Question 11

- (i)  $(x + 5)(x - 2)$  isw solutions **2** **SC1** for  $(x + a)(x + b)$  where  $ab = -10$  or  $a + b = 3$   
 (ii)  $\begin{matrix} [a =] & -5 \\ [b =] & 2 \\ [c =] & -10 \end{matrix}$  **3FT** **B1FT** for each of *their* 5 and *their* -2 from **(b)(i)**  
 and **B1** for  $c = -10$   
 (iii)  $x = -1.5$  **1FT** **FT**  $x = (\text{their } (a + b))/2$

Question 12

- (i)  $\begin{matrix} p = 6 \\ q = 43 \end{matrix}$  **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** - *their*  $q$

Question 13

$\sqrt{([-7])^2 - 4.3 - 12}$  or better  
 and  
 $p = [-7]7$  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

Question 14

(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	

Question 15

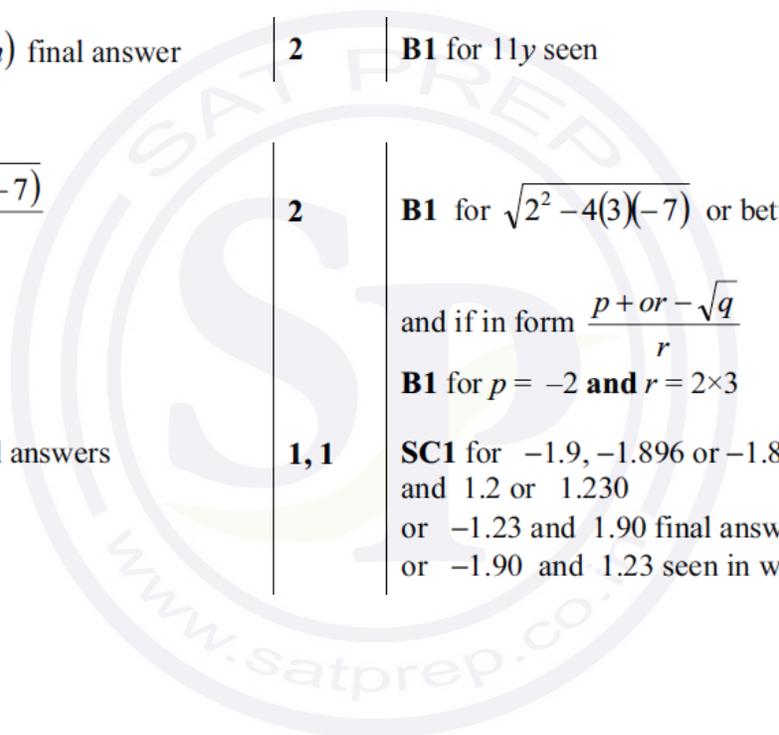
$(5x-9)(x+2)$	M2	M1 partial factorisation, e.g. $x(5x-9) + 2(5x-9)$ or SC1 for $(5x+a)(x+b)$ where $ab = -18$ or $a + 5b = 1$
$\frac{9}{5}$ oe and $-2$ final answer	B1	

Question 16

$(11y-m)(11y+m)$ final answer	2	B1 for $11y$ seen
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Question 17

$\frac{-2 \pm \sqrt{2^2 - 4(3)(-7)}}{2 \times 3}$	2	B1 for $\sqrt{2^2 - 4(3)(-7)}$ or better seen and if in form $\frac{p \text{ or } -\sqrt{q}}{r}$ 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



Question 18

<p>(i) <math>\frac{1}{2}(x+4+3x+2)(x+1)=15</math></p> <p><math>4x^2+4x+6x+6=30</math> or <math>2x^2+2x+3x+3=15</math></p> <p><math>2x^2+5x-12=0</math></p>	<p><b>M1</b></p> <p><b>M1</b></p> <p><b>A1</b></p>	<p>Allow <math>\frac{1}{2}(4x+6)(x+1)=15</math></p> <p>Dep on 1<sup>st</sup> <b>M1</b></p> <p>With no errors or omissions</p>
<p>(ii) <math>1.5</math> or <math>\frac{3}{2}, -4</math></p>	<p><b>3</b></p>	<p><b>B2</b> for <math>(2x-3)(x+4)</math> or <math>\frac{-5 \pm \sqrt{5^2 - 4(2)(-12)}}{2 \times 2}</math> or <b>SC1</b> for <math>(2x+a)(x+b)</math> where <math>a</math> and <math>b</math> are integers and <math>a+2b=5</math> or <math>ab=-12</math> or <math>\frac{\sqrt{5^2 - 4(2)(-12)}}{r}</math> or <math>\frac{p+or-\sqrt{q}}{r}</math> where <math>p=-5</math> and <math>r=2 \times 2</math></p>

Question 19

<p>(a) <math>4x-3x^2</math> or <math>x(4-3x)</math> nfw final answer</p>	<p><b>3</b></p>	<p><b>B2</b> for <math>3x^2-6x-6x^2+10x</math> or <b>M1</b> for <math>3x^2-6x</math> or <math>-6x^2+10x</math></p>
<p>(b) (i) <math>(2+y)(3w-2x)</math> oe final answer</p>	<p><b>2</b></p>	<p><b>M1</b> for <math>3w(2+y)-2x(2+y)</math> or <math>2(3w-2x)+y(3w-2x)</math></p>
<p>(ii) <math>(2x+5y)(2x-5y)</math> final answer</p>	<p><b>2</b></p>	<p><b>M1</b> for <math>(2x \pm 5y)(2x \pm 5y)</math> or <math>(2x+ky)(2x-ky)</math> or <math>(kx+5y)(kx-5y), k \neq 0</math> or <math>(2x+5)(2x-5)</math> or <math>(2+5y)(2-5y)</math></p>

Question 20

(a) (i)	$\frac{600}{x+20}$ final answer	<b>1</b>	
(ii)	$\frac{600}{x} - \text{their } \frac{600}{x+20} = 1.5$ oe	<b>M1</b>	
	$600(x+20) - 600x = 1.5x(x+20)$	<b>M1</b>	Correctly clearing, or correctly collecting into a single fraction, two fractions both with algebraic denominators, one being $\frac{600}{x}$
	or		
	$\frac{600(x+20) - 600x}{x(x+20)} [= \text{their } 1.5]$		
	$600x + 12000 - 600x = 1.5x^2 + 30x$	<b>M1</b>	Dep on previous <b>M1</b> , correctly multiplying <i>their</i> brackets <b>and</b> clearing fraction
	[ $0 = 1.5x^2 + 30x - 12000$ ]		
	$0 = x^2 + 20x - 8000$	<b>A1</b>	With no errors or omissions seen, dep on <b>M3</b>
(b)	-100, 80	<b>3</b>	<b>M2</b> for $(x+100)(x-80)$ or <b>M1</b> for $(x+a)(x+b)$ where $ab = -8000$ or $a+b = 20$
			OR <b>B1</b> for $\sqrt{20^2 - 4 \times 1 \times (-8000)}$ or better and
			<b>B1</b> 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	<b>2FT</b>	<b>FT</b> $\frac{12}{2(\text{their } 80) + 20} \times 100$ correctly evaluated to at least 3 sf <b>M1</b> for choosing and using <i>their</i> positive root

Question 21

[a = ] 64	<b>3</b>	<b>B1</b> for $2b = -16$ or $(x-8)^2$
[b = ] -8		<b>B1</b> for $a = (\text{their } b)^2$
		If <b>0</b> scored, <b>SC1</b> for $x^2 + 2bx + b^2$ soi

Question 22

$$5x = 75 \text{ or } 5x + 48 = 123$$

15

**B2** | **M1** for  $x + (x + 12) + 3(x + 12) = 123$  oe

**B1**

Question 23

(i) 1.8 oe

(ii)  $\sqrt{7^2 - 4 \times 3 \times (-5)}$  or better nfw

and

$$\frac{-7 + \sqrt{q}}{2(3)} \text{ or } \frac{-7 - \sqrt{q}}{2(3)} \text{ oe}$$

-2.91 and 0.57 final ans cao

3

**M1** for  $21 - x = 4(x + 3)$  or better

**B1** for  $[\pm]5x = k$  or  $kx = [\pm]9$

**B1**

or for  $\left(x + \frac{7}{6}\right)^2$

**B1**

or for  $-\frac{7}{6} \pm \sqrt{\frac{5}{3} + \left(\frac{7}{6}\right)^2}$

**B1B1**

**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

Question 24

83 nfw

4

**B3** for  $17x = 1411$  or  $17x = 14.11$  oe

in form  $ax = b$  or final answer of 0.83

or

**B2** for  $6x + 11x - 55 = 1356$  oe

or  $6x + 11x - [0.]55 = 13[.]56$

or

**M1** for  $6x + 11(x - [0.0]5) = 13[.]56$

Question 25

$\frac{1}{3}$  oe nfw

4

**M1** for  $y(y + 3)$  oe or  $\frac{1}{2}(2y + 1)(y + 1)$  oe

and

**B2** for

$2y^2 + 6y = 2y^2 + 2y + y + 1$  oe or better

or

**B1** for  $(2y + 1)(y + 1) = 2y^2 + 2y + y + 1$  soi

Question 26

25 nfw

- 4** **M1** for  $\frac{4[.]80}{w-1}$  or  $\frac{7[.]80}{2w-11}$   
**M1** for  $\frac{4[.]80}{w-1} = \frac{7[.]80}{2w-11}$  oe  
**M1** for  $480(2w-11) = 780(w-1)$  oe  
or  
ALT  
**M1** for  $n(w-1) = 4[.]80$  or  $n(2w-11) = 7[.]80$   
**M1** for  $2wn - 11n = 7[.]80$   
 $2wn - 2n = 9[.]60$  oe  
**M1** for  $9n = 180$  oe or better  
or  
ALT  
**M1** for  $n(w-1) = 4[.]80$  or  $n(2w-11) = 7[.]80$   
**M1** for  $\frac{4[.]80 + n}{n} = \frac{7[.]80 + 11n}{2n}$   
**M1** for  $9n = 180$  oe or better

Question 27

$$\frac{1}{2}u(3u-2) = 2.5$$

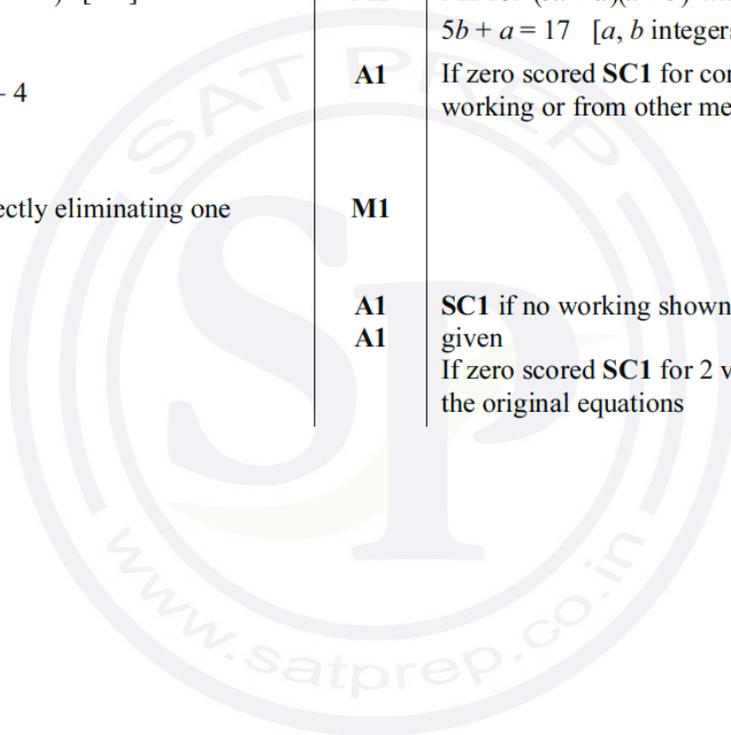
One further correct step leading to  
 $3u^2 - 2u - 5 = 0$  with no errors

$$(3u-5)(u+1)$$

- M1** First step must involve  $\frac{1}{2}u(3u-2)$   
**A1**  
**2** **SC1** for  $(3u+a)(u+b)$   
where  $ab = -5$  or  $a+3b = -2$  [ $a, b$  integers]

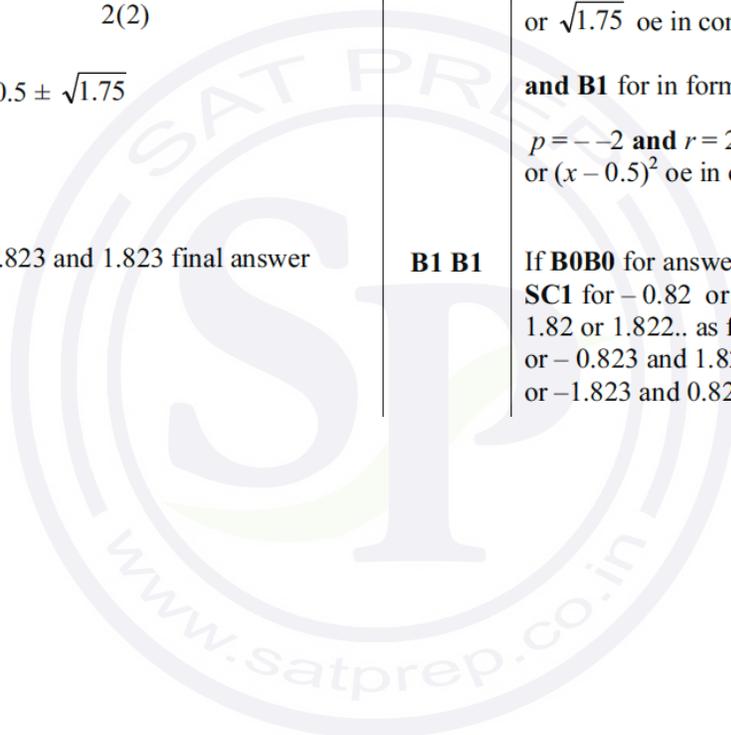
Question 28

(a) (i)	$4x(3x+13) - 2x(4x - \{3x-9\}) = 24$	<b>M1</b>	
	oe		
	$12x^2 + 52x - 2x^2 - 18x$	<b>M1</b>	Correct removal of all <i>their</i> brackets Dep on two <b>areas</b> added or subtracted
	$5x^2 + 17x - 12 = 0$	<b>A1</b>	with no errors or omissions seen and at least one more line of working showing collection of like terms or division by 2
(ii)	$(5x - 3)(x + 4) [= 0]$	<b>M2</b>	<b>M1</b> for $(5x + a)(x + b)$ where $ab = -12$ or $5b + a = 17$ [ $a, b$ integers]
	$\frac{3}{5}$ oe, $-4$	<b>A1</b>	If zero scored <b>SC1</b> for correct answers with no working or from other methods.
(b)	For correctly eliminating one variable	<b>M1</b>	
	$x = 3$	<b>A1</b>	<b>SC1</b> if no working shown, but 2 correct answers given
	$y = -7$	<b>A1</b>	If zero scored <b>SC1</b> for 2 values satisfying one of the original equations



Question 29

(a)	$(x - 5)(x + 2)$ final answer	2	<b>B1</b> for $(x - 5)(x + 2)$ seen and then spoiled or <b>M1</b> 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 $x^2 + 2x + 3x + 3 = 3x^2 + 3x$	<b>M2</b>	<b>M1</b> for $x(x + 2) + 3(x + 1)$ or better seen Allow recovery of omitted brackets for M marks but not A mark
	$0 = 2x^2 - 2x - 3$	<b>A1</b>	Brackets expanded correctly and/or no errors or omission of brackets seen
(ii)	$\frac{[-2] \pm \sqrt{([-2]^2 - 4(2)(-3))}}{2(2)}$	<b>B2</b>	<b>B1</b> for $\sqrt{([-2]^2 - 4(2)(-3))}$ or $\sqrt{28}$
	or $0.5 \pm \sqrt{1.75}$		or $\sqrt{1.75}$ oe in completion of square
	-0.823 and 1.823 final answer	<b>B1 B1</b>	<b>and B1</b> for in form $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$ , $p = -2$ <b>and</b> $r = 2(2)$ or better or $(x - 0.5)^2$ oe in completion of square
			If <b>B0B0</b> for answers, <b>SC1</b> 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



Question 30

<p><b>(a) (i)</b> <math>\frac{12}{x-1} - \frac{10}{x} = 0.5</math> oe</p> <p><math>12x - 10(x-1) = 0.5x(x-1)</math> or better</p> <p>Brackets expanded</p> <p><math>x^2 - 5x - 20 = 0</math> with no errors or omissions seen</p>	<p><b>M2</b></p> <p><b>M1</b></p> <p><b>A1</b></p>	<p><b>M1</b> for <math>\frac{12}{x-1}</math> or <math>\frac{10}{x}</math></p> <p><b>FT</b> <math>\frac{10}{x} - \frac{12}{x-1} = 0.5</math> only</p> <p>Dep on <b>M3</b> and brackets expanded</p>
<p><b>(ii)</b> <math>\sqrt{(-5)^2 - 4(1)(-20)}</math> or better</p> <p><math>p = -(-5), r = 2(1)</math> or better</p> <p>-2.62, 7.62 final answers</p> <p><b>(iii)</b> 1 [ hr] 49 [mins]</p> <p><b>(b) (i)</b> 2.5</p> <p><b>(ii)</b> 1312.5 final answer</p>	<p><b>B1</b></p> <p><b>B1</b></p> <p><b>B1B1</b></p> <p><b>2FT</b></p> <p><b>1</b></p> <p><b>3</b></p>	<p>Seen anywhere or <math>(x - \frac{5}{2})^2</math> oe</p> <p>Must be in the form <math>\frac{p + \sqrt{q}}{r}</math> or <math>\frac{p - \sqrt{q}}{r}</math></p> <p>or for <math>\frac{5}{2} + \sqrt{\left(\frac{5}{2}\right)^2 + 20}</math> or <math>\frac{5}{2} - \sqrt{\left(\frac{5}{2}\right)^2 + 20}</math></p> <p><b>SC1</b> 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</p> <p><b>FT</b> <math>12 \div (\text{their +ve root} - 1)</math> or <math>0.5 + 10 \div (\text{their } 7.62)</math> in hrs and mins, rounded to nearest min</p> <p><b>M1</b> for <math>12 \div (\text{their +ve root} - 1)</math> or <math>0.5 + 10 \div (\text{their } 7.62)</math></p> <p><b>M2</b> for any complete correct method e.g <math>25 \times 10 \div 2 + 45 \times 25 + 5 \times 25 \div 2</math></p> <p><b>M1</b> for any correct method for a relevant area under the graph</p>

Question 31

<p><b>(i)</b> <math>(y-6)(x+3)</math> final answer</p>	<p><b>2</b></p>	<p><b>M1</b> for <math>y(x+3) - 6(3+x)</math> or <math>x(y-6) + 3(y-6)</math></p>
<p><b>(ii)</b> <math>8(x+3y)(x-3y)</math> final answer</p>	<p><b>3</b></p>	<p><b>M2</b> for <math>2(2x+6y)(2x-6y)</math> or <math>(8x+24y)(x-3y)</math> or <math>(8x-24y)(x+3y)</math> or <math>4(2x-6y)(x+3y)</math> or <math>4(2x+6y)(x-3y)</math> or <math>(4x-12y)(2x+6y)</math> or <math>(4x+12y)(2x-6y)</math> or <b>M1</b> for <math>8(x^2-9y^2)</math> or <math>(x+3y)(x-3y)</math></p>

Question 32

$$\sqrt{(-8)^2 - 4(5)(-25)} \text{ or better}$$

$$p = -(-8) \text{ and } r = 5 \times 2 \text{ oe}$$

-1.57 and 3.17

Question 33

$$(y - 10)(y + 3) \text{ seen}$$

10 and -3 final answers

**B1** or for  $\left(x - \frac{4}{5}\right)^2$  oe

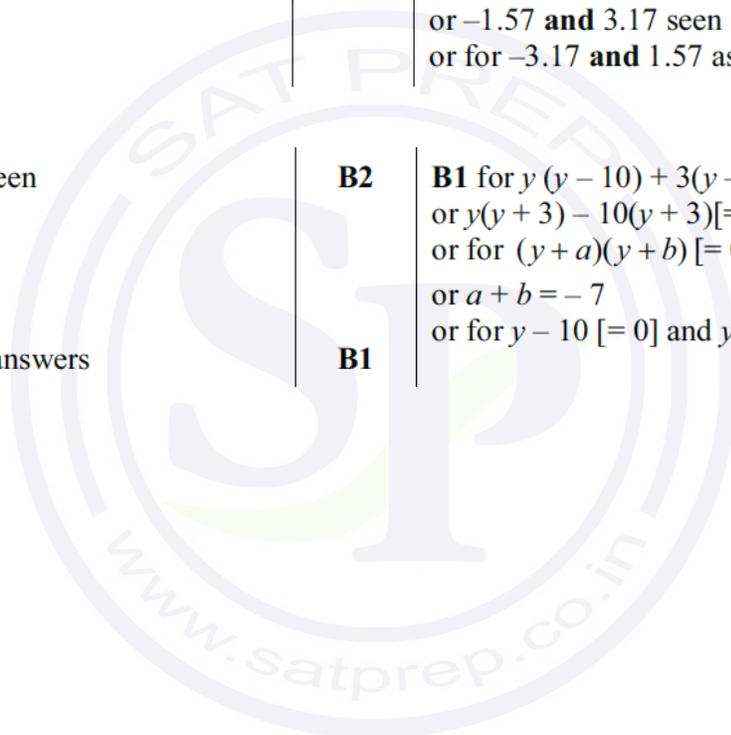
**B1** must see  $\frac{p + \sqrt{q}}{r}$  or  $\frac{p - \sqrt{q}}{r}$  or both

or for  $\frac{4}{5} + \sqrt{\left(\frac{4}{5}\right)^2 + 5}$  or  $\frac{4}{5} - \sqrt{\left(\frac{4}{5}\right)^2 + 5}$

**B1B1** **SC1** for final answers -1.6 or -1.574 to -1.575 **and** 3.2 or 3.174 to 3.175 or -1.57 **and** 3.17 seen in working or for -3.17 **and** 1.57 as final ans

**B2** **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  $y + 3 [= 0]$

**B1**



Question 34

(a) (i)	$[y = ] \frac{1}{2}(80 - 2x)$ $A = \text{their } \frac{1}{2}(80 - 2x) \times x \text{ oe}$ $A = 40x - x^2 \text{ and } x^2 - 40x + A = 0$	<b>M1</b>	40 - x is enough
		<b>M1</b>	
		<b>A1</b>	No errors or omissions
(ii)	$(x - 30)(x - 10)$	<b>B2</b>	<b>B1</b> for $x(x - 30) - 10(x - 30) [= 0]$ or $x(x - 10) - 30(x - 10) [= 0]$ or <b>SC1</b> for $(x + a)(x + b)$ where $ab = 300$ or $a + b = -40$
	30, 10	<b>B1</b>	
(iii)	$\sqrt{(-40)^2 - 4(1)(200)}$ or better	<b>B1</b>	or for $(x - 20)^2$
	$p = -40$ and $r = 2(1)$	<b>B1</b>	Must see $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$ or both or for $20 \pm \sqrt{200}$
	5.86 34.14	<b>B1</b> <b>B1</b>	If B0, <b>SC1</b> for 5.9 or 5.857 to 5.858 <b>and</b> 34.1 or 34.14... or 5.86 <b>and</b> 34.14 seen in working or -5.86 <b>and</b> -34.14 as final answers
(b) (i)	$\frac{200}{x} - \frac{200}{x + 10}$ $\frac{200(x + 10) - 200x}{x(x + 10)} = \frac{2000}{x(x + 10)}$	<b>M2</b>	or <b>M1</b> for $\frac{200}{x}$ or $\frac{200}{x + 10}$ soi
		<b>A1</b>	No errors or omissions
(ii)	16 [min] 40 [s]	<b>3</b>	<b>B2</b> for 0.27̇ or 0.278 or 0.2777 to 0.2778 or $\frac{5}{18}$ [h] oe or 16.6̇ or 16.7 or 16.66 to 16.67 or $\frac{50}{3}$ [min] or <b>M1</b> for $2000 \div 80(80 + 10)$ or $\frac{200}{80} - \frac{200}{90}$

Question 35

2.25 oe | 2 | **M1** for  $8x + 4x = 22 + 5$  or better

Question 36

$(x - 7)(x + 3)$  final answer | 2 | **M1** for  $x(x + 3) - 7(x + 3)$  or  $x(x - 7) + 3(x - 7)$

Question 37

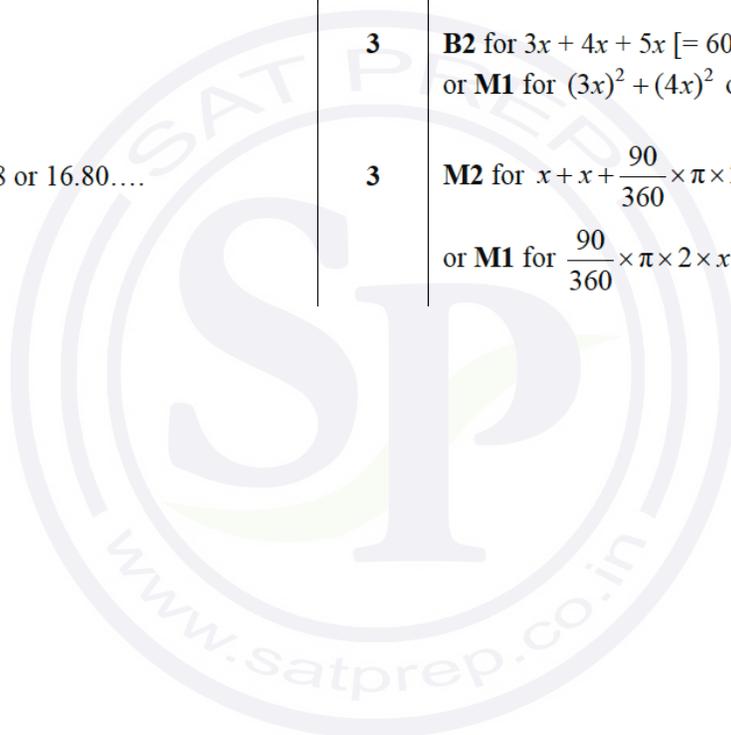
$(x - 7)(x + 3)$  final answer | 2 | **M1** for  $x(x + 3) - 7(x + 3)$  or  $x(x - 7) + 3(x - 7)$

Question 38

(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

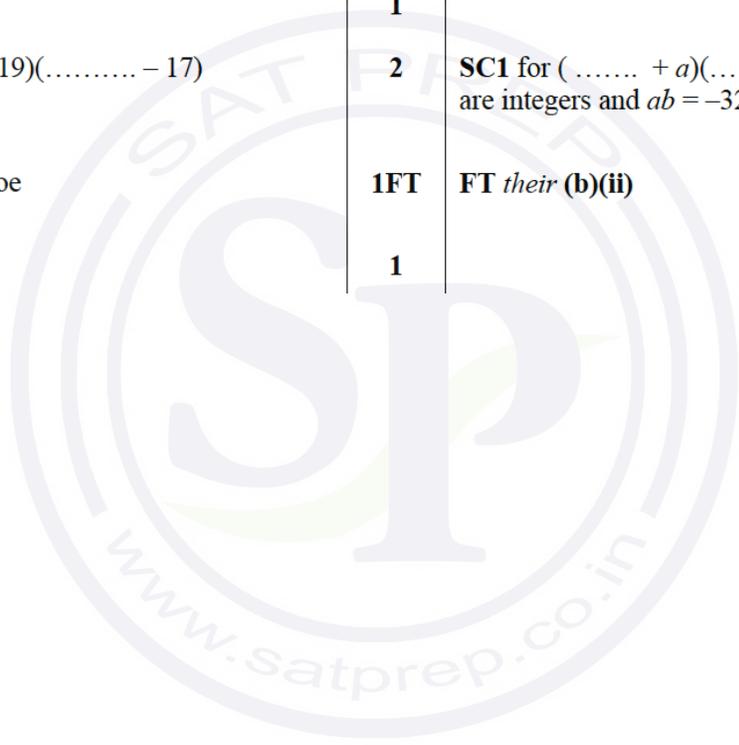


Question 39

(i)	$\frac{1000}{x(x+1)} \text{ final answer}$	3	<b>M1</b> for $1000(x+1) - 1000x$ <b>M1</b> for denominator $x(x+1)$
(ii)	$\frac{1000}{x} - \frac{1000}{x+1} = 4.5[0] \text{ oe}$ <p>or <math>\frac{1000}{x(x+1)} = 4.5</math></p> $1000 = 4.5x(x+1)$ $4.5x^2 + 4.5x - 1000 = 0$ $9x^2 + 9x - 2000 = 0$	<b>M1</b>  <b>M1dep</b>  <b>A1</b>	Allow <i>their</i> <b>(b)(i)</b> for first <b>M1</b> 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)	$\frac{-9 \pm \sqrt{9^2 - 4(9)(-2000)}}{2(9)}$ <p>– 15.42 14.42</p>	2   <b>B1</b> <b>B1</b>	<b>B1</b> for $\sqrt{9^2 - 4(9)(-2000)}$  If in form $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$ then <b>B1</b> for $p = -9$ and $r = 2(9)$  <b>SC1</b> for answers – 15.4 or – 15.42 to – 15.41 <b>and</b> 14.4 or 14.41 to 14.42 or for – 14.42 <b>and</b> 15.42 or – 15.42 <b>and</b> 14.42 seen but not final answer  <b>Answers without working only score B1, B1 or SC1</b>

Question 40

<p>(a)</p>	$\frac{323}{x} + \frac{323}{x+2} = 36$ <p>oe three term equation</p> $323(x+2) + 323x = 36x(x+2)$ <p>oe</p> $\text{or } \frac{323x + 646 + 323x}{x(x+2)} = 36$ <p>oe</p> $36x^2 - 574x - 646 = 0$ $18x^2 - 287x - 323 = 0$	<p><b>B2</b></p> <p><b>M1</b></p> <p><b>A1</b></p> <p><b>1</b></p> <p><b>2</b></p> <p><b>1FT</b></p> <p><b>1</b></p>	<p><b>B1</b> for <math>\frac{323}{x}</math> seen oe or <math>\frac{323}{x+2}</math> seen oe</p> <p>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</p> <p>answer reached without any omissions or errors with at least one intermediate line with brackets expanded after M1</p> <p><b>SC1</b> for <math>(\dots + a)(\dots + b)</math> where <math>a, b</math> are integers and <math>ab = -323</math> or <math>a + 18b = -287</math></p> <p><b>FT</b> <i>their</i> <b>(b)(ii)</b></p>
	<p>(b) (i) 17, 19</p> <p>(ii) <math>(\dots + 19)(\dots - 17)</math></p> <p>(iii) <math>17, -\frac{19}{18}</math> oe</p>		<p>11 cao</p>



Question 41

(a) (i)	$(3x-1)(x+4)$	2	<b>M1</b> 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	<b>M2</b>	<b>M1</b> 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	<b>B1</b>	or for other correct relevant 2 bracket
			expansion if alt method used
	$4x - 16 - 4x - 22 = 2x^2 - 8x + 11x - 44$	<b>A1</b>	correct solution reached with all brackets
	$2x^2 + 3x - 6 = 0$		expanded and no errors or omissions seen
(ii)	$\frac{-3 \pm \sqrt{(3)^2 - 4(2)(-6)}}{2 \times 2}$	2	<b>B1</b> for $\sqrt{(3)^2 - 4(2)(-6)}$ or better
			or $\left(x + \frac{3}{4}\right)^2$ oe
			and <b>B1</b> 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	<b>B1B1</b>	<b>SC1</b> for $-2.6$ or $-2.637\dots$ and $1.1$ or
			$1.137\dots$
			or $-2.64$ and $1.14$ seen in working
			or $2.64$ and $-1.14$ as final answers

Question 42

$[a =] 36$

$[b =] -6$

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

Question 43

$$[x =] -5$$

$$[y =] 7$$

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

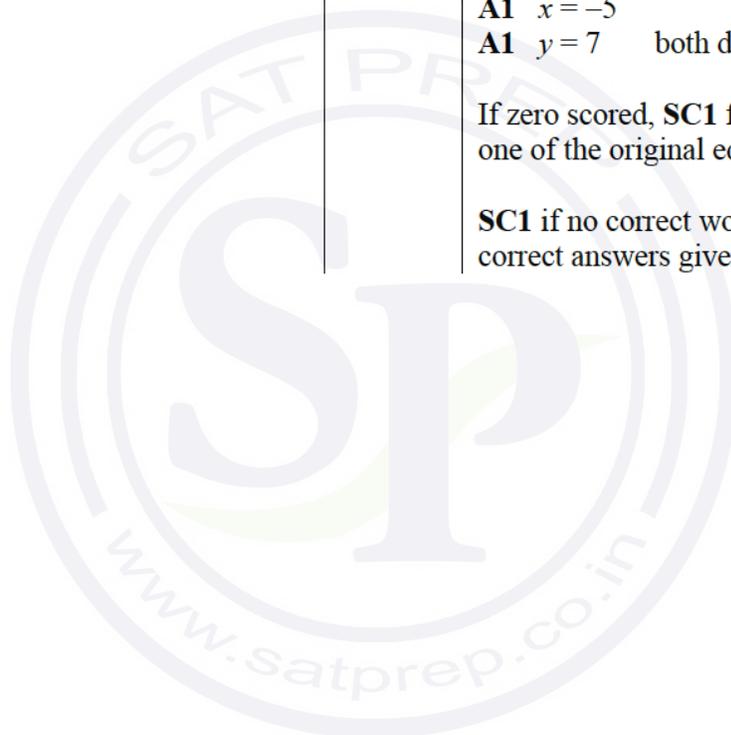
**M1** for correct method to eliminate one variable

**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



Question 44

(a)(i)	$4.5$ or $4\frac{1}{2}$ or $\frac{9}{2}$ final answer	<b>3</b>	<b>M2</b> for $[2](4x + 7) = [2](6x - 2)$ oe or <b>M1</b> for $2(2x + 6) + 2(2x + 1)$ oe or $4(3x - 1)$ oe or <b>M1</b> for correctly reaching $ax = b$ from <i>their</i> linear equation
(a)(ii)	$(2x + 6)(2x + 1) = (3x - 1)^2$	<b>M1</b>	May be seen in different stages
	$5x^2 - 20x - 5 [= 0]$ oe	<b>B3</b>	<b>B1</b> for $4x^2 + 2x + 12x + 6$ or better <b>B1</b> for $9x^2 - 3x - 3x + 1$ or better
	$\frac{-(-20) \pm \sqrt{(-20)^2 - 4(5)(-5)}}{2(5)}$ oe	<b>M2</b>	<b>FT</b> their 3 term quadratic provided formula used or complete the square <b>M1</b> for $\sqrt{(-20)^2 - 4(5)(-5)}$ oe or if in form $\frac{-(-20) + \sqrt{q}}{2(5)}$ or $\frac{-(-20) - \sqrt{q}}{2(5)}$ <b>FT</b> $\pm$ <i>their</i> quadratic or for completing the square <b>M2</b> for $2 \pm \sqrt{1 + 2^2}$ or <b>M1</b> for $(x - 2)^2$
	$4.24$ or $4.236\dots$ cao	<b>B1</b>	
(b)(i)	$(x + 5)(x - 1)$ final answer	<b>2</b>	<b>B1</b> for $x(x - 1) + 5(x - 1)$ or $x(x + 5) - [1](x + 5)$ or for $(x + a)(x + b)$ where $ab = -5$ or $a + b = 4$
(b)(ii)	$5(x + 1) - 8x = x(x + 1)$ or $5x + 5 - 8x = x^2 + x$	<b>M2</b>	Could be seen in different stages <b>M1</b> for $5(x + 1) - 8x$ seen or for common denominator of $x(x + 1)$ for LHS or both sides soi

Question 45

(i)	$x(x - 25) = 2200$	<b>1</b>	and no errors seen
(ii)	$\frac{-(-25) \pm \sqrt{(-25)^2 - 4(1)(-2200)}}{2(1)}$ or better	<b>B2</b>	<b>B1</b> for $\sqrt{(-25)^2 - 4(1)(-2200)}$ or better or for $\left(x - \frac{25}{2}\right)^2$ oe  or <b>B1</b> for $\frac{-(-25) + \sqrt{q}}{2(1)}$ or $\frac{-(-25) - \sqrt{q}}{2(1)}$ or both or for $\frac{25}{2} +$ or $-\sqrt{\left(\frac{25}{2}\right)^2 + 2200}$
	-36.04 and 61.04 final answer	<b>B1,B1</b>	If <b>B0B0, SC1</b> for values in ranges -36.042 to -36.041 <b>and</b> 61.041 to 61.042 seen or for answers -36[.0] or -36.042 to -36.041 <b>and</b> 61[.0] or 61.041 to 61.042 or -36.04 <b>and</b> 61.04 seen in working or for -61.04 <b>and</b> 36.04 as final ans

Question 46

(a)(i)	$-7x + 55$ final answer	<b>2</b>	<b>M1</b> for $8x + 20$ or $-15x + 35$ or answer $-7x + k$ or $kx + 55$
(a)(ii)	$x^2 - 14x + 49$ final answer	<b>2</b>	<b>M1</b> for 3 of $x^2 - 7x - 7x + 49$
(b)(i)	-18	<b>3</b>	<b>M1</b> for a correct first step ie correctly multiplying by 3 or correctly dividing by 2 or for correctly subtracting 5 <b>M1</b> for correctly reaching $ax = b$ from <i>their</i> first step
(b)(ii)	15	<b>3</b>	<b>M2</b> for $6x - 4x = 21 + 9$ oe or <b>M1</b> for $6x - 21$ or correct division by 3 or for correctly reaching $ax = b$ from <i>their</i> first step
(b)(iii)	5 and -5	<b>3</b>	<b>B2</b> for 5 or -5 or <b>M1</b> for $[x^2 = ] (74 + 1) \div 3$ or better

Question 47

9(a)	$\frac{10}{x-0.5}$ oe final answer	<b>1</b>	Accept $\frac{20}{2x-1}$
(b)(i)	$\frac{10}{x-0.5} - \frac{10}{x} = 0.25$ oe	<b>M1</b>	<b>FT</b> <i>their (a)</i>
	$10x - 10(x - 0.5) = 0.25x(x - 0.5)$ oe	<b>M1</b>	Clears algebraic denominators or collects as a single fraction <b>FT</b> <i>their</i> algebraic fractions dep on two fractions with algebraic denominators
	$10x - 10x + 5 = 0.25x^2 - 0.125x$ or better	<b>B1</b>	Expands brackets
	$2x^2 - x - 40 = 0$	<b>A1</b>	Dep on <b>M1M1B1</b> and no errors seen
b)(ii)	$\frac{- -1 \pm \sqrt{(-1)^2 - 4 \times 2 \times -40}}{2 \times 2}$ oe	<b>B2</b>	<b>B1</b> for $\sqrt{(-1)^2 - 4(2)(-40)}$ or better or <b>B1</b> 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	<b>B1 B1</b>	<b>SC1</b> for -4.229... <b>and</b> 4.729... or for -4.23 <b>and</b> 4.73 seen in working or for -4.73 <b>and</b> 4.23 as final answer or for -4.2 or -4.22 <b>and</b> 4.7 or 4.72 as final answer
b)(iii)	2 [hours] 7 [minutes]	<b>3</b>	<b>B2</b> for 2.11 or 2.114 to 2.115 or 126.8 to 126.9 or 127 or <b>M1</b> for $10 \div$ <i>their</i> positive root from <b>(b)(ii)</b>

Question 48

343

**1**

Question 49

$2(x-3)(x+3)$  final answer

**2**

**M1** for  $(2x+6)(x-3)$  or  $(2x-6)(x+3)$  or  $(x-3)(x+3)$

Question 50

3(a)(i)	$7a + 9p = 354$ oe final answer	<b>1</b>	
3(a)(ii)	$[a = ] 21$ $[p = ] 23$	<b>3</b>	<b>M1</b> for correctly eliminating one variable <b>A1</b> for $a = 21$ <b>A1</b> for $p = 23$
3(b)(i)	$\frac{2}{x}$	<b>1</b>	
b(ii)(a)	$\frac{2}{x} + \frac{3}{x-1} = 2$	<b>M1</b>	
	$2(x-1) + 3x = 2x(x-1)$ oe	<b>M1dep</b>	Both sides of the equation could be over $x(x-1)$ at this stage Dep on <b>M1</b> or 3 term equation with fractions but one sign error
	$2x - 2 + 3x = 2x^2 - 2x$ oe $2x^2 - 7x + 2 = 0$	<b>A1</b>	Answer reached with one correctly expanded line seen and no errors seen
b(ii)(b)	$\sqrt{(-7)^2 - 4(2)(2)}$	<b>B1</b>	or for $\left(x - \frac{7}{4}\right)^2$
	$\frac{-7 + \sqrt{q}}{2 \times 2}$ or $\frac{-7 - \sqrt{q}}{2 \times 2}$	<b>B1</b>	or for $\frac{7}{4} + \text{or} - \sqrt{-1 + \left(\frac{7}{4}\right)^2}$
	3.19 only	<b>B2</b>	<b>B1</b> 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 51

(i)	$(x-5)(x+5)$ final answer	<b>1</b>	
(ii)	$\frac{x-5}{x-7}$ nfwf final answer	<b>3</b>	<b>M2</b> for $(x-7)(x+5)$ or <b>M1</b> for $x(x+5) - 7(x+5)$ or $x(x-7) + 5(x-7)$ or $(x+a)(x+b)$ where $a+b = -2$ or $ab = -35$

Question 52

5(a)	15.6[0]	<b>4</b>	<b>B3</b> for $20900x = 326040$ or better or <b>M2</b> for $18500x + 2400(x - 2.5[0]) = 320040$ or <b>M1</b> for $18500x$ or $2400(x - 2.5[0])$
(b)(i)	$(y+12)(y-7)$ final answer	<b>2</b>	<b>B1</b> for $(y+a)(y+b)$ where $ab = -84$ or $a+b=5$ or $y(y+12)-7(y+12)$ or $y(y-7)+12(y-7)$
b)(ii)	38 cao	<b>3</b>	<b>B2</b> for $y=7$ or <b>M1</b> for $y(y+5) = 84$ oe
(c)(i)	$168(m-0.75) + 207m = 100m(m-0.75)$ oe OR $207 = 100m - 168 - 75 + \frac{126}{m}$	<b>M2</b>	May be all over common denominator <b>M1</b> for $\frac{168}{m}$ or $\frac{207}{m-0.75}$ used
(c)(ii)	at least one interim line leading to $50m^2 - 225m + 63 = 0$ $(10m-3)(5m-21)$ 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	<b>A1</b> <b>B2</b>	No errors or omissions <b>M1</b> 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 <b>M1</b> 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 <b>M1</b> for $\left(m - \frac{225}{100}\right)^2$ oe
	4.2[0] cao	<b>B1</b>	

Question 53

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

Question 54

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  $\frac{310}{(5 \times \text{their } x - 9)}$

Alt method using simultaneous eqns

**M1** for  $5xw - 9w = 310$

**and**  $3xw + 7w = 310$

**M1** for equating coefficients of  $xw$

**M1** for subtraction to eliminate term in  $xw$

Question 55

(i)  $(2n + m)(m - 3)$  final answer

(ii)  $(2y - 9)(2y + 9)$  final answer

(iii)  $(t - 4)(t - 2)$  final answer

**2** **M1** for  $m(2n + m) - 3(2n + m)$  or  
 $2n(m - 3) + m(m - 3)$

**1**

**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  $ab = +8$

Question 56

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

Question 57

(i)	$3m - 4(m + 4) = 6m(m + 4)$	<b>M1</b>	or $\frac{3m - 4(m + 4)}{m(m + 4)} [= 6]$ oe
	$3m - 4m - 16 = 6m^2 + 24m$	<b>M1</b>	removes brackets correctly
	$6m^2 + 25m + 16 = 0$	<b>A1</b>	with no errors or omissions
(ii)	$\frac{-25 \pm \sqrt{(25)^2 - 4(6)(16)}}{2 \times 6}$	<b>2</b>	<b>B1</b> for $\sqrt{(25)^2 - 4(6)(16)}$ or better
	or		or <b>B1</b> for $\left(m + \frac{25}{12}\right)^2$
	$\frac{-25}{12} \pm \sqrt{\left(\frac{25}{12}\right)^2 - \frac{16}{6}}$		and if in form $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$
	$-0.79$ and $-3.38$	<b>2</b>	<b>B1</b> for $p = -25$ and $r = 2(6)$
	final ans cao		<b>SC1</b> for $-0.8$ and $-3.4$ or for $-0.78$ and $-3.37$ or $-0.789\dots$ and $-3.377\dots$ or $0.79$ and $3.38$ or $-0.79$ and $-3.38$ seen in working

Question 58

(a)	$\frac{1}{2} \times 4(x - 1) \times (2x + 5) [\sin 90] = 30$	<b>M1</b>	
	oe		
	$8x^2 - 8x + 20x - 20$ or better	<b>B1</b>	correct expansion of brackets
	Completion to $2x^2 + 3x - 20 = 0$	<b>A1</b>	with no errors or omissions seen
(b)	$(2x - 5)(x + 4)$	<b>M2</b>	Allow <b>M2</b> for e.g. $2x(x + 4) - 5(x + 4)$ then $2x - 5 [= 0]$ and $x + 4 [= 0]$
			<b>M1</b> 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	<b>B1</b>	

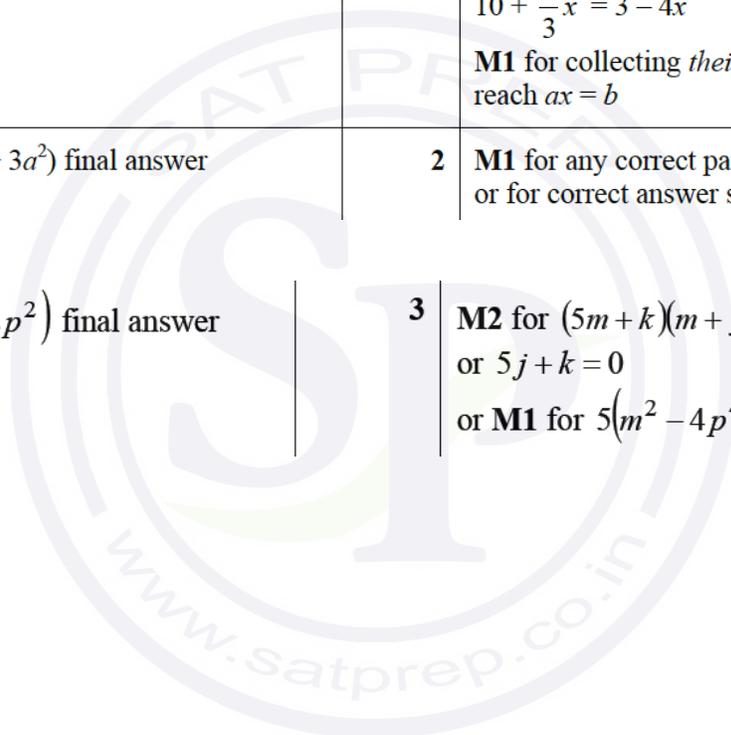
(c)	11.7 or 11.66 ... or 11.67	3	<b>M2dep</b> for $(4(\text{their } 2.5 - 1))^2 + (2 \times \text{their } 2.5 + 5)^2$ or <b>M1dep</b> for $4(\text{their } 2.5 - 1)$ or $2 \times \text{their } 2.5 + 5$ OR <b>B1</b> for $\sqrt{20x^2 - 12x + 41}$ and <b>M1dep</b> for substituting $x = \text{their } 2.5$ into $\sqrt{20x^2 - 12x + 41}$ at any stage
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Question 59

(a)	-1.5	3	<b>M1</b> for $30 + 2x = 9 - 12x$ or $10 + \frac{2}{3}x = 3 - 4x$ <b>M1</b> for collecting <i>their</i> terms correctly to reach $ax = b$
(b)	$6ab^2(2b + 3a^2)$ final answer	2	<b>M1</b> for any correct partial factorisation seen or for correct answer seen

Question 60

$5(m - 2p^2)(m + 2p^2)$ final answer	3	<b>M2</b> for $(5m + k)(m + j)$ where $kj = -20p^4$ or $5j + k = 0$ or <b>M1</b> for $5(m^2 - 4p^4)$ seen
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Question 61

(a)(i)	$\frac{72}{m}$	<b>1</b>	
(a)(ii)	$\frac{72}{m+0.9}$	<b>1</b>	
9 (b)	$\frac{72}{m} - \frac{72}{m+0.9} = 4$ oe	<b>M1</b>	<b>FT</b> their (a)(i) and (a)(ii) if expressions in $m$
	$72(m+0.9) - 72m = 4m(m+0.9)$ oe	<b>M1</b>	<b>Dependent</b> on <b>M1</b> and <b>correct</b> fractions
	$[72m - 72m] + 64.8 = 4m^2 + 3.6m$ oe nfww	<b>A1</b>	
	Correct completion to $10m^2 + 9m - 162 = 0$	<b>A1</b>	
(c)(i)	3.6 and -4.5 final answer	<b>3</b>	<b>B2</b> for $(2m+9)(5m-18)$ or $\frac{-9 \pm \sqrt{(9)^2 - 4(10)(-162)}}{2 \times 10}$ or better or <b>B1</b> for $(am+b)(cm+d)$ where $ac = 10$ and either $bd = -162$ or $ad + bc = 9$ or for $\sqrt{(9)^2 - 4(10)(-162)}$ or better or $\frac{-9 \pm \sqrt{q}}{2(10)}$ or better
(c)(ii)	20	<b>1</b>	

Question 62

$$x = 7$$

$$y = -3$$

**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

Question 63

$$-10$$

**2** **M1** for  $-17 - 3 = 7x - 5x$  oe or better

Question 64

(a)	$x^2 + 4x - 21$ final answer	2	<b>B1</b> for three of $x^2, +7x, -3x, -21$
5(b)(i)	$5q^2(3p^2 - 5q)$ final answer	2	<b>B1</b> 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
i(b)(ii)	$(2g + 5k)(2f + 3h)$ final answer	2	<b>B1</b> for $2g(2f + 3h) + 5k(2f + 3h)$ or $2f(2g + 5k) + 3h(2g + 5k)$ or for correct answer seen
(b)(iii)	$(9k + m)(9k - m)$ final answer	2	<b>M1</b> for $(9 + m)(9 - m)$ or for correct answer seen

Question 65

)(i)	$(2x + 3)(x - 1) - (x + 1)(x - 2) = 62$	<b>M1</b>	
	$2x^2 + 3x - 2x - 3$ oe or $x^2 + x - 2x - 2$ oe	<b>B1</b>	
	$x^2 + 2x - 63 = 0$	<b>A1</b>	Established with no errors or omissions
(ii)	$(x + 9)(x - 7)$	2	<b>B1</b> for $(x + a)(x + b)$ where $ab = -63$ or $a + b = 2$ or for $x(x - 7) + 9(x - 7)$ or for $x(x + 9) - 7(x + 9)$
(iii)	20	2	<b>FT</b> $2 \times$ their positive root + 6 <b>M1</b> for substituting their positive root into four lengths or for stating $2x + 6$

Question 66

$x + 1 - 2x = 3x(x + 1)$	<b>M2</b>	<b>M1</b> 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	<b>A1</b>	
$[x =] \frac{-4 \pm \sqrt{4^2 - 4 \times 3 \times (-1)}}{2 \times 3}$	<b>B2</b>	<b>B1FT</b> for $\sqrt{4^2 - 4 \times 3 \times (-1)}$ or better or for $\left(x + \frac{2}{3}\right)^2$ <b>B1FT</b> 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	<b>B2</b>	<b>B1</b> for each or <b>B1</b> for -1.548 to -1.549 <b>and</b> 0.215... or for -1.55 <b>and</b> 0.22 seen in working or for -0.22 <b>and</b> 1.55 as final answer or for -1.5 or -1.54 <b>and</b> 0.2 or 0.21 as final answer

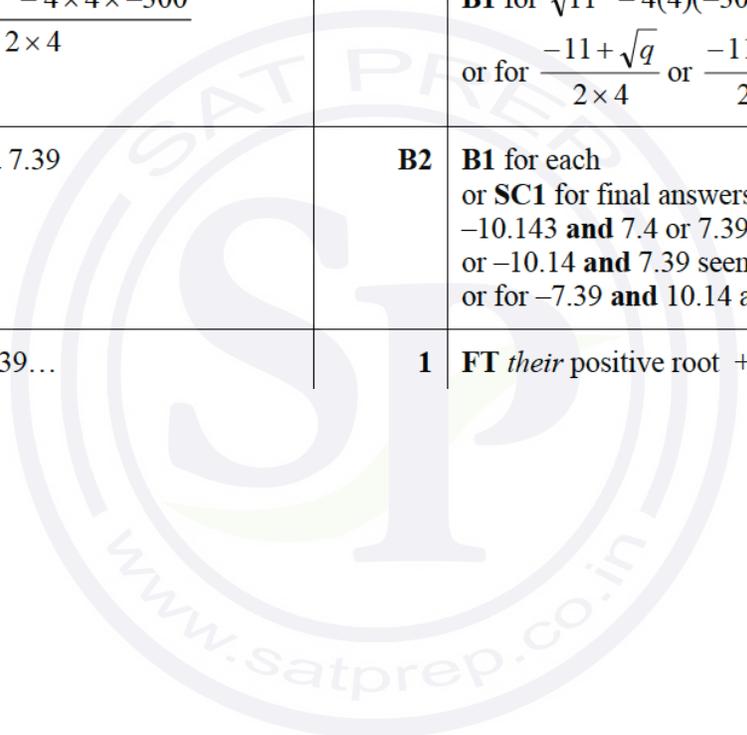
Question 67

(a)(i)	$2a + a + 2b + 3b + 10 = 180$ leading to $3a + 5b = 170$ without error or omission	<b>1</b>
(a)(ii)	$8a + 3a + 2b + b + 50 + 4b - 2a = 360$ leading to $9a + 7b = 310$ without error or omission	<b>1</b>
(a)(iii)	Correct method to eliminate one variable	<b>M1</b>
	$[a =]15$ $[b =]25$	<b>A2</b> <b>A1</b> for each correct value If 0 scored, <b>SC1</b> for two values that satisfy one of the equations or for two correct answers with no/incorrect working
(iv)	30	<b>1</b>

(b)	$-1.5$ or $-1\frac{1}{2}$ or $-\frac{3}{2}$	2	<b>M1</b> for $6x = -12 + 3$ or better
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Question 68

(i)	$\frac{1}{2}(x+4)(4x-5)\sin 30 = 70$	<b>M1</b>	
	$4x^2 + 16x - 5x - 20 = 280$	<b>M2</b>	<b>Dep on M1</b> <b>B1</b> for $4x^2 + 16x - 5x - 20$ or better
	Leading to $4x^2 + 11x - 300 = 0$	<b>A1</b>	with no errors or omissions seen
(ii)	$\frac{-11 \pm \sqrt{11^2 - 4 \times 4 \times -300}}{2 \times 4}$	<b>B2</b>	<b>B1</b> 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 $7.39$	<b>B2</b>	<b>B1</b> for each or <b>SC1</b> for final answers $-10.1$ or $-10.144$ to $-10.143$ <b>and</b> $7.4$ or $7.393$ to $7.394$ or $-10.14$ <b>and</b> $7.39$ seen in working or for $-7.39$ <b>and</b> $10.14$ as final answer
(iii)	$11.4$ or $11.39\dots$	1	<b>FT</b> <i>their</i> positive root + 4



Question 69

(a)	9	3	<p><b>M2</b> for <math>0.42x + 0.42 = 4.2</math> oe or better</p> <p>or <b>M1</b> for <math>0.21x + 0.21(x + 2)</math> oe [= 420 or 4.20]</p> <p>or for <math>21x + 21(x + 2)</math> oe [= 420 or 4.20]</p> <p>or for <math>420 \div 21</math> oe [=20]</p>
(b)	$5r + p = 245$	<b>B1</b>	
	$2r + 3p = 215$	<b>B1</b>	
	45	3	<p>Finds <math>p</math></p> <p><b>M1</b> for correctly equating coefficients of <math>r</math></p> <p><b>M1</b> for correct method to eliminate <math>r</math></p> <p>OR</p> <p><b>M1</b> for correctly making <math>r</math> the subject of one of <i>their</i> equations</p> <p><b>M1</b> for correctly substituting <i>their</i> correct <math>r</math> to form an equation in <math>p</math></p> <p>OR</p> <p>Finds <math>r</math> first</p> <p><b>M1</b> for correctly eliminating <math>p</math> from <i>their</i> equations</p> <p><b>M1</b> for correctly substituting <i>their</i> value of <math>r</math> to find <math>p</math></p>
(c)(i)	$\frac{12}{x} + \frac{6}{x-1} [= 5]$	<b>M1</b>	
	$12(x-1) + 6x = 5x(x-1)$	<b>M1</b>	<b>Dependent</b> 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	<b>A1</b>	
(c)(ii)	$(5x-3)(x-4)$ final answer	2	<p><b>B1</b> for <math>(5x+a)(x+b)</math> with <math>ab = 12</math> or <math>a + 5b = -23</math></p> <p>or for <math>5x(x-4) - 3(x-4)</math> or <math>x(5x-3) - 4(5x-3)</math></p>
(c)(iii)	$\frac{3}{5}$ oe and 4	1	<b>FT</b> from their two brackets in (c)(ii)
(c)(iv)	3 cao	1	

Question 70

$$2y^3 - 3y^2 - 23y + 12 \text{ final answer}$$

- 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

Question 71

(a)	$(4x-5)(x+3) + (x+1)(x-3) = 342$ or $2x(4x-5) - (3x-6)(x-3) = 342$	<b>M2</b>	<b>M1</b> 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	<b>M2</b>	<b>M1</b> for each
	$5x^2 + 5x - 18 = 342$ leading to $x^2 + x - 72 = 0$	<b>A1</b>	no errors or omission
(b)	$(x+9)(x-8)$	<b>M2</b>	<b>B1</b> for $(x+a)(x+b)$ where $ab = -72$ or $a+b = 1$ and $a, b$ are integers
	8, -9	<b>B1</b>	
(c)	86	<b>2</b>	<b>FT</b> for $12 \times \text{their } x - 10$ ( $x$ positive) <b>B1</b> for any one of 27, 11, 16 seen or for $2x + 2x + 4x - 5 + 4x - 5$ oe or better soi
(d)	22.2 or 22.16 to 22.17	<b>2</b>	<b>M1</b> for $\tan = \frac{11}{27}$ or $\frac{\text{their } x + 3}{4 \times \text{their } x - 5}$

Question 72

$$x = -0.75 \text{ oe}$$

- 3** **M1** for  $15(2x+5) = 14(3-x)$   
**B1** for  $30x + 75 = 42 - 14x$  or better

Question 73

$3x^2 - 16x - 35 [= 0]$ or $3y^2 - 8y - 51 [= 0]$	<b>M3</b>	<b>M1</b> for $x^2 + 2(4-x)^2 = 67$ or $(4-y)^2 + 2y^2 = 67$ seen <b>B1</b> for $16 - 8x + x^2$ or $16 - 8y + y^2$
$(3x + 5)(x - 7) [= 0]$ or $(3y - 17)(y + 3) [= 0]$	<b>M1</b>	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
$x = 7, y = -3$  $x = -\frac{5}{3}, y = 5\frac{2}{3}$	<b>B2</b>	<b>B1</b> 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

Question 74

(a)(ii)	$x + 4 = [\pm] 5$ -9 and 1	<b>M1</b>	<b>FT</b> <i>their</i> (a)(i)
9(b)	$[b = ] 7$ $[c = ] -3$	<b>3</b>	<b>B1</b> for $[b = ] 7$ <b>M1</b> for $b^2 - 4c = 61$

Question 75

(i)	$2a - 3b$ final answer	<b>2</b>	<b>B1</b> for answer $2a + kb$ or $ka - 3b$ or for $2a - 3b$ seen in working
(ii)	$\frac{3}{4}$	<b>2</b>	<b>B1</b> for $\frac{45x}{60x}$ oe single fraction

Question 76

(i)	-5	<b>1</b>	
(ii)	-0.25 or $-\frac{1}{4}$	<b>3</b>	<b>M1</b> for $20 - 12x = 23$ or for $5 - 3x = \frac{23}{4}$ <b>M1</b> for correct completion to $ax = b$ FT <i>their</i> first step

Question 77

$6x^2 - 7xy - 5y^2$	<b>2</b>	<b>M1</b> for 3 terms out of 4 from $6x^2 - 10xy + 3xy - 5y^2$
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Question 78

(i)	$3y(2y - 5x)$	2	<b>B1</b> for $3(2y^2 - 5xy)$ or $y(6y - 15x)$ or for the correct answer seen and then spoiled
(ii)	$(y - 3x)(y + 3x)$	2	<b>B1</b> for $(y + 3)(y - 3)$

Question 79

(a)	1.48	3	<b>B2</b> for $7x + 2 = 12.36$ or better or <b>M1</b> for $3x + 2(2x + 1) [= 12.36]$ or better
(b)	1.75 or $1\frac{3}{4}$	3	<b>B2</b> for $18x - 14x = 7$ or better or <b>M1</b> for $18x = 7(2x + 1)$
(c)	[0].8 oe	3	<b>B2</b> for $4(2x + 1) = 13x$ or <b>M1</b> for $\frac{4}{x} = \frac{13}{2x + 1}$ oe or correct equation to find number of cakes
(d)	$\frac{20}{x} + \frac{10}{2x + 1} = 45$ oe	<b>M2</b>	<b>B1</b> for $\frac{20}{x}$ seen or $\frac{10}{2x + 1}$ seen
	$90x^2 - 5x - 20 [= 0]$ oe	<b>B2</b>	<b>B1</b> 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	<b>M2</b>	<b>FT</b> <i>their</i> 3-term quadratic <b>M1</b> 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	<b>B1</b>	

Question 80

$ab(3a - b)$ final answer	2	<b>B1</b> for $a(3ab - b^2)$ or $b(3a^2 - ab)$ or $ab(3a - b)$ seen
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Question 81

$2x^3 + 5x^2 - 23x + 10$ final answer	3	<b>B2</b> for correct expansion of three brackets unsimplified  <b>B1</b> for correct expansion of two brackets with at least 3 terms correct
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Question 82

(i)	$200\left(1 + \frac{r}{100}\right)^2 = 206.46$ oe	<b>M1</b>	
	$1 + \frac{2r}{100} + \frac{r^2}{100^2}$ oe	<b>M1</b>	
	$r^2 + 200r - 323 = 0$	<b>A1</b>	<p>Correct solution reached with no errors or omissions seen</p> <p>If 0 scored, <b>SC1</b> for <math>200(n)^2 = 206.46</math></p>
(ii)	$\frac{-200 + \sqrt{200^2 - 4(1)(-323)}}{2 \times 1}$	<b>B2</b>	<p><b>B1</b> for <math>\sqrt{200^2 - 4(1)(-323)}</math> or <math>(r + 100)^2</math></p> <p><b>B1</b> for <math>\frac{-200 + \sqrt{q}}{2 \times 1}</math> or <math>r = \sqrt{323 + 100^2} - 100</math></p> <p>OR</p> <p><b>B2</b> for <math>100\left(\sqrt{\frac{206.46}{200}} - 1\right)</math></p> <p>or <b>B1</b> for <math>\sqrt{\frac{206.46}{200}}</math></p>
	1.60 cao final answer	<b>B1</b>	

Question 83

(a)	$\frac{48}{x}$ final answer	<b>1</b>	Accept $48 \div x$
(b)	$their(a) - \frac{60}{x+2} = 4$ oe	<b>M1</b>	FT <i>their</i> (a) provided expression in $x$
	$48(x+2) - 60x = 4x(x+2)$ oe	<b>M2</b>	<b>FT</b> <i>their</i> 3 term eqn with algebraic denominators, $x$ and $x+2$ , for M2 or M1  <b>M1</b> 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 $x^2 + 5x - 24 = 0$	<b>A1</b>	With brackets expanded and no errors or omissions seen
(c)	$(x-3)(x+8)$	<b>B2</b>	<b>B1</b> 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 $-8$	<b>B1</b>	
(d)	12	<b>1</b>	

Question 84

(a)(i)	$(5a-b)(m+2p)$ final answer	<b>2</b>	<b>M1</b> for $5a(m+2p) - b(m+2p)$ or $m(5a-b) + 2p(5a-b)$ or <b>B1</b> for correct answer seen
(a)(ii)	$5(k+g)(3k+3g-4)$ final answer	<b>2</b>	<b>M1</b> for correct partial factorisation by 5 or $(k+g)$ isw eg $5(3k^2 + 6kg + 3g^2 - 4k - 4g)$ or $5(3(k+g)^2 - 4(k+g))$ or $(k+g)(15(k+g) - 20)$ or $(5k+5g)(3k+3g-4)$ or <b>B1</b> for correct answer seen
(a)(iii)	$(2x-y^2)(2x+y^2)$ final answer	<b>2</b>	<b>M1</b> for answer in form $(a+b)(a-b)$ or <b>B1</b> for correct answer seen

(b)	$3x^3 - 10x^2 - x + 12$ final answer	3	<b>B2</b> for correct unsimplified expansion or simplified expression with 3 terms correct in a 4-term expression of required form  or <b>B1</b> for correct expansion of two of the brackets with at least 3 terms correct
(c)	[a =] 11 [b =] 121	2	<b>B1</b> for each

Question 71

(a)	[x =] 7 [y =] 3	2	<b>B1</b> for each
(b)	[x =] 0, [y =] 2  [x =] -3, [y =] 5	4	<b>B3</b> for $x = 0$ and $x = -3$ or <b>B2</b> for $x^2 + 3x = 0$ or <b>M1</b> for $2 - x = x^2 + 2x + 2$ If 0 scored award <b>B1</b> for $x = 0, y = 2$ or $x = -3, y = 5$ from no/incorrect working  ALTERNATIVE  <b>B3</b> for $y = 2$ and $y = 5$ or <b>B2</b> for $y^2 - 7y + 10 = 0$ or <b>M1</b> for $y = (2 - y)^2 + 2(2 - y) + 2$ If 0 scored award <b>B1</b> for $x = 0, y = 2$ or $x = -3, y = 5$ from no/incorrect working

Question 72

(a)(i)	-1	2	<b>M1</b> for $3 \times 2^2 - 13$ oe
(a)(ii)	$[\pm] \sqrt{\frac{y-t}{p}}$ oe final answer	3	<b>M1</b> for correct rearrangement to isolate $x^2$ term <b>M1</b> for correct division by $p$ <b>M1</b> 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
(b)(i)	$(5x - 4)(3x + 2)$ oe final answer	2	<b>B1</b> 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
(b)(ii)	$\frac{4}{5}$ oe and $-\frac{2}{3}$ oe	1	<b>FT</b> a factorised quadratic

(c)	$x(x+4y)(x-4y)$ final answer	3	<b>B2</b> 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 <b>B1</b> for $x(x^2 - 16y^2)$ oe or $(x + 4y)(x - 4y)$
(d)	$\frac{1-2a}{x}$ oe final answer	4	<b>B2</b> for $(2x - 1)(1 - 2a)$ oe or <b>B1</b> for $2x - 1 - 2a(2x - 1)$ or $2x(1 - 2a) - (1 - 2a)$ <b>B1</b> for $x(2x - 1)$

Question 73

$\frac{x+5}{x+4}$ final answer	3	<b>B1</b> for $(x-5)(x+5)$ <b>B1</b> for $(x-5)(x+4)$
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Question 74

(a)	Correctly eliminate one variable	<b>M1</b>	
	$p = 3$ $q = -1$	<b>A2</b> <b>A1</b> for each If <b>M0</b> , <b>SC1</b> for 2 values satisfying one of original equations If 0 scored <b>SC1</b> for correct answers with no working	
(b)	$1\frac{1}{11}$ or $\frac{12}{11}$ 1.09 or 1.090 to 1.091	2	<b>M1</b> for $\frac{3x}{12} + \frac{8x}{12} = 1$ or better
(c)(i)	$-2 < x \leq 3$	3	<b>B2</b> for $-2 < x$ or $x \leq 3$ or <b>M1</b> for $-8 + 2 < 3x$ or $3x \leq 7 + 2$
(c)(ii)	-1, 0, 1, 2, 3	1	<b>FT</b> dep on -ve and +ve values in <i>their</i> <b>(c)(i)</b>
(d)	$4a(4-a)$ final answer	2	<b>B1</b> for any correct partial factorisation
(e)(i)	$\frac{2b}{3a}$ final answer	2	<b>M1</b> for $\frac{1}{2a} \times \frac{4b}{3}$ or better
(e)(ii)	$\frac{x-2}{x-1}$ final answer nfw	2	<b>B1</b> for $2(x-1) - x$ oe seen.

Question 75

(a)	$x^3 + 2x^2 - 5x - 6$ final answer	3	<b>B2</b> for correct expansion of three brackets unsimplified or for simplified expression of correct form with 3 out of 4 terms correct  or <b>B1</b> for correct expansion of 2 of the 3 given brackets with at least 3 terms out of four correct
(b)	$\frac{Mc}{M-2f}$ or $\frac{-Mc}{2f-M}$ final answer	4	<b>M1</b> for clearing $g - c$ from denominator e.g. $M(g - c) = 2fg$ <b>M1</b> for correctly isolating terms in $g$ in numerator on one side <b>M1</b> for correctly factorising or simplifying, to single term in $g$ in an equation <b>M1</b> for correctly dividing by bracket to final answer
(c)	$\frac{4x}{x+4}$ final answer	3	<b>B1</b> for $4x(x-4)$ <b>B1</b> for $(x+4)(x-4)$

Question 76

(a)	$5b - 2a$ final answer	2	<b>B1</b> for $5b$ or $-2a$ in final answer or for $5b - 2a$ seen
(b)	$6x - 23$ final answer nfw	2	<b>M1</b> for $4x - 20$ or $-3 + 2x$
(c)	$\frac{35-x}{2x(x-5)}$ or $\frac{35-x}{2x^2-10x}$ oe final answer nfw	3	<b>B1</b> for $3(2x) - 7(x-5)$ or better isw <b>B1</b> for $2x(x-5)$ as common denominator isw, allow expanded
(d)	$-5$	3	<b>M1</b> for $13 - 4x = 18 - 3x$ oe or $\frac{-4x}{3} + x = 6 - \frac{13}{3}$ oe <b>M1FT</b> for $-4x + 3x = 18 - 13$ oe or for $\frac{-x}{3} = \frac{5}{3}$
(e)	$[x =] \frac{5p}{y+10}$ oe final answer	4	<b>M1</b> for correctly clearing the $x$ from the denominator <b>M1</b> for correctly expanding the brackets or (dealing with the 5 correctly throughout) <b>M1</b> for correctly isolating terms in $x$ <b>M1</b> for correctly factorising and dividing by the bracket  Max 3 marks if answer is incorrect

Question 77

(a)	$\frac{1}{2}$ or 0.5 oe	2	<b>M1</b> for $10 - 3 = 11p + 3p$ oe or better
(b)	$[m =] \frac{2k}{c^2 - g}$ oe final answer	3	<b>M1</b> for correctly isolating $m$ terms <b>M1</b> for correctly factorising <b>M1</b> for dividing by a bracket with two terms to the final answer Maximum mark <b>M2</b> if final answer incorrect
(c)	0 4.5 oe	5	<b>B4</b> for $2x^2 - 9x [= 0]$ or $9x - 2x^2 [= 0]$ or better OR <b>M2</b> for $(2x + 3) + 4(x - 3) = (x - 3)(2x + 3)$ or better or <b>M1</b> for $(2x + 3) + 4(x - 3)$ seen oe or common denominator $(x - 3)(2x + 3)$ oe <b>B1</b> for $2x^2 - 6x + 3x - 9$ or better seen
(d)	$y^2 - 10y + 21 [= 0]$ or $x^2 - 4x - 12 [= 0]$	<b>M2</b>	<b>M1</b> 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 $(x + 2)(x - 6) [= 0]$	<b>M1</b>	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
	$x = -2$ $y = 7$  $x = 6$ $y = 3$	<b>B2</b>	<b>B1</b> for $x = -2, x = 6$ or for $y = 7, y = 3$ or for one correct pair of $x$ and $y$ values
(e)	$2x^3 + x^2 - 54x + 72$ final answer	3	<b>B2</b> correct expansion of three brackets unsimplified or for final answer of correct form with 3 out of 4 terms correct  or <b>B1</b> correct expansion of two brackets with at least three terms out of four correct

Question 78

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

### Question 79

$$\frac{-8 \pm \sqrt{8^2 - 4(3)(-20)}}{2 \times 3}$$

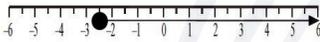
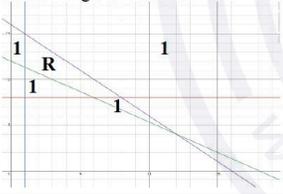
or  $\frac{-8}{2 \times 3} \pm \sqrt{\frac{8^2}{4 \times 3^2} - \frac{(-20)}{3}}$   
or better

- 4.24, 1.57 final answers

**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

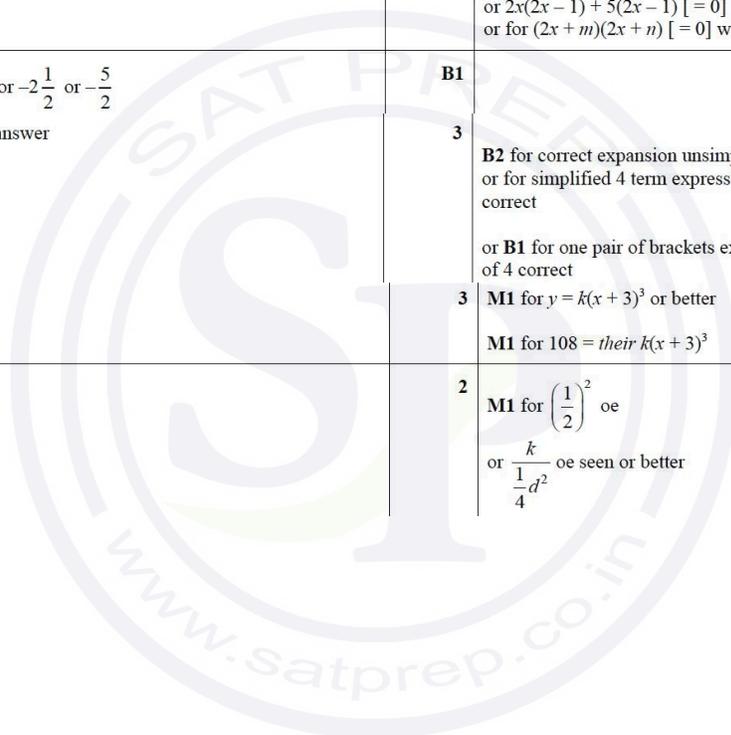
**B2** **B1** for each  
If **B0, SC1** for answers - 4.2 or -4.23 or -4.240 to - 4.239 **and** 1.6 or 1.572 to 1.573  
or - 4.24 **and** 1.57 seen in working  
or for -1.57 and 4.24 as final answer

### Question 80

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

### Question 81

(a)	$-1.5$ or $-1\frac{1}{2}$ or $-\frac{3}{2}$	2	M1 for $4x = 9 - 15$ or $x + \frac{15}{4} = \frac{9}{4}$
(b)	$(a - 3)(a + 3)$ final answer	1	
(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
(d)	$n + 1$ final answer	2	M1 for $5 \times 5^n$ or $5^{n+1}$ seen
(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 $n + m = 4$
(g)	$\frac{1}{2}$ or $0.5$ and $-2.5$ or $-2\frac{1}{2}$ or $-\frac{5}{2}$ $2x^3 + 7x^2 - 9$ final answer	B1 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
(f)(i)	7	3	M1 for $y = k(x + 3)^3$ or better  M1 for $108 = \text{their } k(x + 3)^3$
(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



Question 82

(a)(i)	$x(3x + 4) + 2(x - 1) [= 20]$	<b>M1</b>	Correct expression with brackets unexpanded
	Leading to $3x^2 + 6x - 22 = 0$ with no errors or omissions	<b>A1</b>	Must see equated to 20 and brackets expanded first to award A1
(a)(ii)	$\frac{-6 \pm \sqrt{6^2 - 4(3)(-22)}}{2.3} \text{ oe}$ or for $= -1 \pm \sqrt{1 + \frac{22}{3}} \text{ oe}$	<b>B2</b>	<b>B1</b> for $\sqrt{6^2 - 4(3)(-22)}$ or $\frac{-6 + \text{or} - \sqrt{k}}{2.3}$ or $(x + 1)^2 = k \text{ oe}$
	-3.887 and 1.887 cao	<b>B2</b>	<b>B1</b> 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
(a)(iii)	5.77 or 5.773 to 5.774	<b>1</b>	<b>FTdep</b> 2(positive $x + 1$ ) evaluated to 3 sig. fig. or more, dep on $x > 1$
(b)	$y^2 + 3y - 40 [= 0] \text{ oe}$	<b>B4</b>	Oe 3 term quadratic <b>M3</b> for $15y - 20(y - 2) = y(y - 2) \text{ oe}$ Or <b>M2</b> for $\frac{15}{y - 2} - \frac{20}{y} = 1 \text{ oe}$ Or <b>M1</b> for $H(y - 2) = 15$ or $hy = 20 \text{ soi}$
	$(y + 8)(y - 5) [= 0] \text{ oe}$	<b>B2</b>	<b>Strict FT</b> a three term quadratic <b>B1FT</b> 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	<b>B1</b>	

Question 83

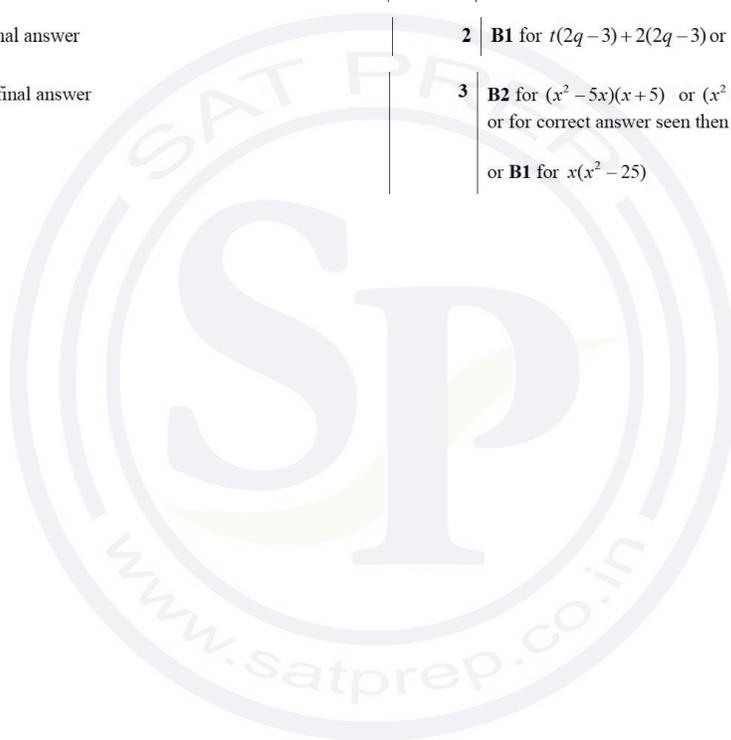
<p>i(a)</p> <p>(b)(i)</p>	<p><math>-2 &lt; x \leq 4</math> oe</p> <p><math>-3 \leq x &lt; 3</math> final answer</p>	<p><b>1</b></p> <p><b>3</b> <b>M2</b> for <math>-3 \leq x &lt; k</math> or for <math>k \leq x &lt; 3</math>  or for <math>-6 \leq 2x &lt; 6</math>  or for <math>-\frac{3}{2} - \frac{3}{2} \leq x &lt; \frac{9}{2} - \frac{3}{2}</math>  or <b>M1</b> for <math>-3 - 3 \leq 2x &lt; 9 - 3</math>  or for <math>-\frac{3}{2} \leq x + \frac{3}{2} &lt; \frac{9}{2}</math>  After 0 scored SC1 for <math>-3 \leq x</math> or for <math>x &lt; 3</math></p>
<p>(b)(ii)</p>	<p><math>-3, -2, -1, 0, 1, 2</math> final answer</p>	<p><b>2</b> <b>FT</b> <i>their (i)</i> as long as negative and positive values  <b>B1FT</b> for one error or omission</p>
<p>(c)(i)</p>	<p><math>\frac{36}{17}</math> oe</p>	<p><b>4</b> <b>B3</b> for <math>-15x - 2x = 5 + 4 - 45</math> or better  OR  <b>B2</b> for <math>45 - 15x - 2x - 4 = 5</math> oe  OR  <b>M1</b> for correct removal of fraction  or  <b>M1</b> for correct removal of brackets</p>
<p>(c)(ii)</p>	<p><math>-8</math></p>	<p><b>3</b> <b>B2</b> for <math>5x - 3x = 9 - 25</math> or better  or <b>M1</b> for <math>5(x + 5) = 3(x + 3)</math> oe or better</p>

Question 84

<p>(a)</p> <p>(b)</p>	<p>54</p> <p><math>2x^2 + 13x - 85 [= 0]</math></p>	<p><b>2</b></p> <p><b>M1</b> for <math>\frac{1}{2} \times 12 \times 9</math></p> <p><b>B3</b></p> <p><b>M1</b> for <math>\frac{1}{2}(2x+3)(x+5) [= 50]</math> oe</p> <p><b>B1</b> for <math>2x^2 + 10x + 3x + 15</math></p>
	<p><math>\frac{-13 \pm \sqrt{13^2 - 4(2)(-85)}}{2(2)}</math> oe</p> <p>or <math>-\frac{13}{4} \pm \sqrt{\frac{85}{2} + \left(\frac{13}{4}\right)^2}</math> oe</p>	<p><b>M2</b></p> <p><b>M1</b> for <math>\sqrt{13^2 - 4 \times 2 \times -85}</math> oe</p> <p>or for <math>\frac{-13 \text{ or } -\sqrt{p}}{2(2)}</math> oe</p> <p>or for <math>[2] \left(x + \frac{13}{4}\right)^2</math></p>
	<p>4.03 cao</p>	<p><b>B1</b></p>

### Question 85

(a)	$6p^4 - 13p^2 + 6$ final answer	2	<b>B1</b> for three of $6p^4 - 9p^2 - 4p^2 + 6$ seen
(b)(i)	175	2	<b>M1</b> for $\frac{1}{2}(20+30) \times 7$ oe
(b)(ii)	$\frac{2s-ut}{t}$ or $\frac{2s}{t} - u$ final answer	3	<p><b>B2</b> for correct answer but unsimplified            e.g. <math>\frac{s+t}{0.5} - u</math>, <math>\frac{s}{\frac{1}{2}t} - u</math>, <math>\frac{s}{0.5t} - u</math></p> <p><b>OR</b>  <b>M1</b> for correct multiplication by 2 or division by 0.5  <b>M1</b> for correctly rearranging terms to isolate term in v</p> <p><b>M1</b> for correct division by <math>t</math>            Max 2 marks if final answer incorrect</p>
(c)(i)	$(2q-3)(t+2)$ final answer	2	<b>B1</b> for $t(2q-3) + 2(2q-3)$ or $2q(t+2) - 3(t+2)$
(c)(ii)	$x(x+5)(x-5)$ final answer	3	<p><b>B2</b> for <math>(x^2-5x)(x+5)</math> or <math>(x^2+5x)(x-5)</math>            or for correct answer seen then spoiled</p> <p>or <b>B1</b> for <math>x(x^2-25)</math></p>



Question 86

(a)	$4x + 3(x + 27) = 194.75$ or $4x + 3x + 81 = 194.75$	<b>M1</b>	
	16.25 cao	<b>B2</b>	<b>M1</b> for $7x = k$ where $k < 194.75$ or <b>B1</b> for answer 16.3
(b)	$x^2 - 20x - 69 [= 0]$ oe or $y^2 + 116y - 861 [= 0]$ oe	<b>M2</b>	<b>M1</b> 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
	$(x + 3)(x - 23) [= 0]$ oe or $(y - 7)(y + 123) [= 0]$ oe	<b>M1</b>	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	<b>B2</b>	<b>B1</b> for one correct pair or two correct $x$ values or two correct $y$ values
(c)	$2\pi x \times 6x + 2\pi x^2$ or $2\pi x(6x + x)$	<b>M2</b>	or <b>M1</b> for $2\pi x \times 6x$ or $2\pi x^2$
	<i>Their</i> $(2\pi x \times 6x + 2\pi x^2) = 4\pi r^2$	<b>M1</b>	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 $r^2 = \frac{7}{2}x^2$	<b>A1</b>	with no error seen

Question 87

$5x^2 + 4x - 20 [= 0]$ oe or $5y^2 - 78y + 221 [= 0]$ oe	<b>M2</b>	<b>M1</b> for $7 - 2x = 5x^2 + 2x - 13$ oe seen or $y = 5\left(\frac{7-y}{2}\right)^2 + 2\left(\frac{7-y}{2}\right) - 13$ oe seen
$\frac{-4 \pm \sqrt{(4)^2 - 4(5)(-20)}}{2(5)}$ oe or $-\frac{4}{10} \pm \sqrt{4 + \left(\frac{4}{10}\right)^2}$ oe	<b>M2</b>	<b>FT</b> <i>their</i> 3-term quadratic or <b>M1</b> for $\sqrt{(4)^2 - 4(5)(-20)}$ or better or for $\frac{-4 + \sqrt{q}}{2 \times 5}$ or $\frac{-4 - \sqrt{q}}{2 \times 5}$ or for $\left(x + \frac{4}{10}\right)^2$ oe
$x = 1.64$ $y = 3.72$ and $x = -2.44$ $y = 11.88$	<b>B2</b>	<b>B1</b> for one correct pair or both $x$ -values correct or both $y$ -values correct

Question 88

(a)(i)	$3(3y-1)(3y+1)$ final answer	<b>3</b>	<b>B2</b> for $(9y-3)(3y+1)$ or $(3y-1)(9y+3)$ or or <b>M1</b> for $3(9y^2-1)$ or [...] $(3y-1)(3y+1)$ if 0 scored <b>SC1</b> for an otherwise correctly completely factorised expression but with fractions within the brackets
(a)(ii)	$(2-p)(m+k)$ final answer	<b>2</b>	<b>M1</b> for $2(m+k) - p(m+k)$ or $m(2-p) + k(2-p)$
(b)	$-\frac{1}{2}$ oe nfw	<b>5</b>	<b>B4</b> $-8x = +4$ oe nfw or <b>B3</b> for $\frac{x^2 - 8x - 5}{(x-1)(x+1)} = 1$ or better OR <b>B2</b> $x^2 - 8x - 5$ or <b>M1</b> for $(x-1)(x-1) - 6(x+1)$ or better <b>B1</b> $(x-1)(x+1)$ as full denominator or on the right hand side

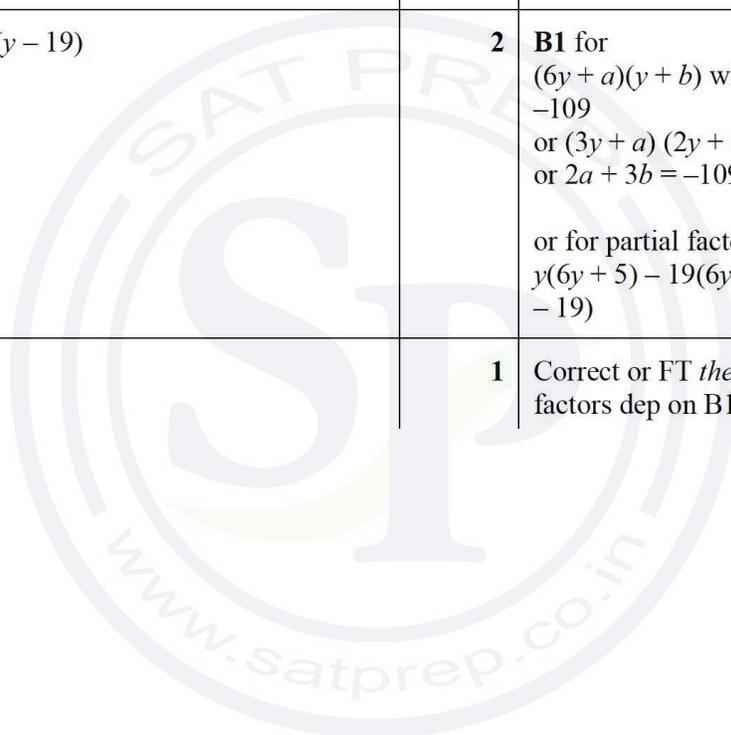
<p>(c)</p> $\frac{-(-3) \pm \sqrt{(-3)^2 - 4(4)(-2)}}{2 \times 4} \text{ oe}$ <p>or</p> $\frac{3}{8} \pm \sqrt{\left(\frac{3}{8}\right)^2 + \frac{2}{4}} \text{ oe}$	<p><b>M2</b></p>	<p><b>M1</b> for <math>\sqrt{(-3)^2 - 4(4)(-2)}</math></p> <p>or for <math>\frac{-(-3) + \sqrt{q}}{2(4)}</math> or <math>\frac{-(-3) - \sqrt{q}}{2(4)}</math></p> <p>or for <math>[4] \left(x - \frac{3}{8}\right)^2</math></p>
<p>-0.43 and 1.18 final ans cao</p>	<p><b>A2</b></p>	<p><b>B1</b> for each</p> <p><b>SC1</b> 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</p>
<p>(d)</p> $k = \frac{4m}{1 - pm} \text{ or } k = \frac{-4m}{pm - 1}$ <p>final answer</p>	<p><b>4</b></p>	<p><b>M1</b> for clearing fractions</p> <p><b>M1</b> for collecting terms in <math>k</math></p> <p><b>M1</b> for factorising</p> <p><b>M1</b> for dividing by bracket</p> <p>Maximum 3 marks if answer incorrect</p>

Question 89

(a)	$14x - 22$ or $2(7x - 11)$ final answer	2	<b>B1</b> for answer $kx - 22$ or $14x + c$ or for $8x - 4$ or $-18 + 6x$ or for correct answer seen in working
(b)(i)	$3xy(2x + 3)$ final answer	2	<b>M1</b> for answer $3(2x^2y + 3xy)$ or $3x(2xy + 3y)$ or $3y(2x^2 + 3x)$ or $xy(6x + 9)$ <b>B1</b> for correct answer seen and spoilt
(b)(ii)	$(2x + y)(2x - y + 4)$ final answer	3	<b>M1</b> for $(2x + y)(2x - y)$ <b>M1</b> for $4(2x + y)$ If 0 scored, SC1 for answer $4x(x + 2) + y(4 - y)$ oe
(c)(i)	$\frac{100}{x} + \frac{150}{x+10} = 4\frac{1}{3}$ oe or $150 = \left(\frac{13}{3} - \frac{100}{x}\right)(x+10)$	<b>M1</b>	
	$\frac{100(x+10) + 150x}{x(x+10)} [= \textit{their } 4\frac{1}{3}]$ or better	<b>M1</b>	
	$300x + 3000 + 450x = 13x^2 + 130x$ oe or better	<b>B1</b>	Allow correct multiples
	$13x^2 - 620x - 3000 = 0$	<b>A1</b>	With no errors or omissions
(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	<b>M2</b>	<b>M1</b> 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	<b>B1</b>	

Question 90

(a)	20	<b>2</b>	<b>M1</b> for $11x = 10(x + 2)$ oe
(b)(i)	$\frac{95}{y} + \frac{147}{y+2} = 12$	<b>M2</b>	<b>M1</b> for $\frac{95}{y}$ or $\frac{147}{y+2}$
	$95(y+2) + 147y = 12y(y+2)$ oe	<b>M1</b>	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 $6y^2 - 109y - 95 = 0$	<b>A1</b>	With all brackets shown expanded and no errors or omissions
(b)(ii)	$(6y + 5)(y - 19)$	<b>2</b>	<b>B1</b> 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 $6y(y - 19) + 5(y - 19)$
b)(iii)	19	<b>1</b>	Correct or FT <i>their</i> positive answer from factors dep on B1 earned



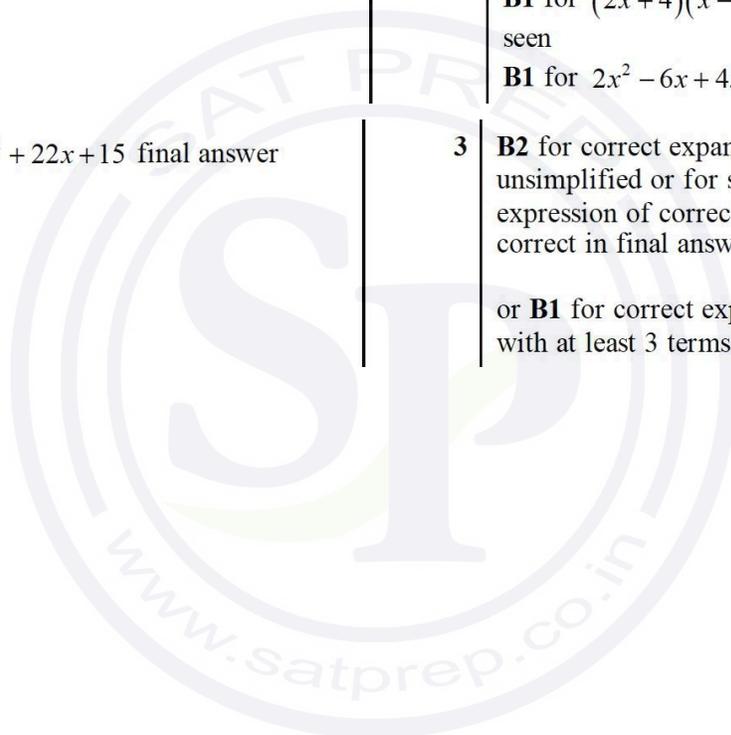
Question 91

(a)	1960	2	<b>M1</b> for $\frac{1}{2} \times 9.8 \times 20^2$ oe
(b)	1.5 or $1\frac{1}{2}$ or $\frac{3}{2}$	3	<b>M1</b> for a first correct step, e.g. $20y - 15 = 15$ or $4y - 3 = 3$ <b>M1FTdep</b> for a second correct step, e.g. $20y = 30$ or $4y = 6$ or $y - \frac{15}{20} = \frac{15}{20}$ oe
(c)	$9x - 10$ final answer	2	<b>B1</b> for $kx - 10$ or $9x + c$ or <b>M1</b> for $15x - 24$ or $-6x + 14$ or <b>B1</b> for correct answer seen and then spoiled
(d)	$\sqrt[3]{\frac{2b^2 - A}{3}}$ oe final answer	3	<b>M1</b> for isolating $3c^3$ , $3c^3 = 2b^2 - A$ oe or for $\frac{A}{3} = \frac{2b^2}{3} - c^3$ or $\frac{A}{-3} = \frac{2b^2}{-3} + c^3$ <b>M1FT</b> for isolating $c^3$ , follow through their first step dep on a 3-term expression with a $kc^3$ term <b>M1FT</b> taking the cube root to the final answer, follow through their previous step Maximum of two marks if answer incorrect
(e)	$(2q - 1)(3p - 2)$ or $(1 - 2q)(2 - 3p)$ final answer	2	<b>M1</b> for $2q(3p - 2) - [1](3p - 2)$ or $3p(2q - 1) - 2(2q - 1)$ or for correct answer seen then spoiled

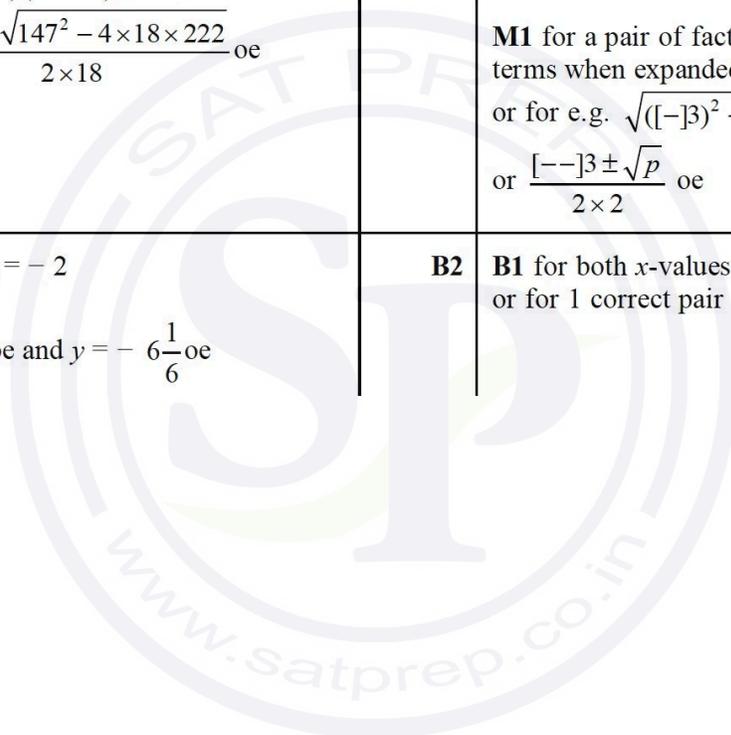
Question 92

(a)(i)	$(x - 4)(x + 3)$ final answer	2	<b>M1</b> for $(x + a)(x + b)$ where $ab = -12$ or $a + b = -1$ or for $x(x + 3) - 4(x + 3)$ or $x(x - 4) + 3(x - 4)$
(a)(ii)	$\frac{x + 4}{x + 3}$ final answer	2	<b>M1</b> for $(x - 4)(x + 4)$ seen

(b)	$3x^2 - 14x + 8$ or $(x - 4)(3x - 2)$ final answer	3	<b>M2</b> 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 <b>M1</b> for $(x - 4)(ax + b)$ or $(3x - 2)(x + c)$ or $(4x^2 - 6x - 6x + 9)$ or $\pm(x^2 + x + x + 1)$ oe
(c)	$\frac{x^2 - 3x - 12}{(x + 1)(x - 3)}$ or $\frac{x^2 - 3x - 12}{x^2 - 2x - 3}$ final answer	4	<b>B1</b> for common denominator $(x + 1)(x - 3)$ oe isw  <b>B1</b> for $(2x + 4)(x - 3) - x(x + 1)$ or better seen <b>B1</b> for $2x^2 - 6x + 4x - 12$ or $-x^2 - x$ seen
(d)	$2x^3 - 15x^2 + 22x + 15$ final answer	3	<b>B2</b> for correct expansion of three brackets unsimplified or for simplified four-term expression of correct form with 3 terms correct in final answer  or <b>B1</b> for correct expansion of two brackets with at least 3 terms out of 4 correct



(e)	$2x^2 - 3x - 77 [= 0]$ oe $(6x^2 - 9x - 231 [= 0])$ or $18y^2 + 147y + 222 [= 0]$ oe $(6y^2 + 49y + 74 [= 0])$	<b>M2</b>	<b>M1</b> 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	<b>M2</b>	<b>FT</b> <i>their</i> 3-term quadratic in $x$ or $y$ , correct factors, correct substitution into formula or for correctly completing square  <b>M1</b> 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	<b>B2</b>	<b>B1</b> for both $x$ -values or both $y$ -values or for 1 correct pair



Question 93

(a)	$\frac{1}{2}(r+5)(r+2)\sin 30 = (r+1)^2$	<b>M2</b>	<b>M1</b> for $\frac{1}{2}(r+5)(r+2)\sin 30$ oe
	$r^2 + 5r + 2r + 10$ or $r^2 + r + r + 1$ soi	<b>B1</b>	
	Leading to $3r^2 + r - 6 = 0$ with no errors or omissions	<b>A1</b>	Dependent on both expansions seen
(b)	$\frac{-1 \pm \sqrt{1^2 - 4(3)(-6)}}{2(3)}$ Or $-\frac{1}{6} \pm \sqrt{2 + \left(\frac{1}{6}\right)^2}$ oe or $\frac{1}{3} \left( -\frac{1}{2} \pm \sqrt{18 + \left(\frac{1}{2}\right)^2} \right)$ oe	<b>B2</b>	<b>B1</b> 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	<b>B1</b>	
(c)	9.028 to 9.040	<b>2</b>	<b>M1</b> for <i>(their root (greater than -1) + 1)</i> × 4

Question 94

(a)	2	<b>2</b>	<b>M1</b> for $3x + 4x = 6 + 8$ or better
(b)	$5a(2a+1)$ final answer	<b>2</b>	<b>B1</b> for $a(10a+5)$ or $5(2a^2+a)$ or $5a(2a+1)$ then spoilt
(c)	$4x(x-3)$ final answer	<b>2</b>	<b>M1</b> for $((2x-3)-3)((2x-3)+3)$ or better or for $4x^2 - 6x - 6x + 9 [-9]$ oe or better

Question 95

(c)	$3x^3 + 2x^2 - 37x + 12$ final answer	<p><b>3</b> <b>B2</b> for correct expansion of three brackets unsimplified or for simplified four-term expression of correct form with 3 terms correct</p> <p>or <b>B1</b> for correct expansion of two brackets with at least 3 terms out of 4 correct</p>
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Question 96

(i)	eliminates the fraction correctly eg $(3x + 5)(x - 2) + 7 = x(x - 2)$	<b>M1</b>
	$3x^2 + 5x - 6x - 10 + 7 = x^2 - 2x$ oe	<p><b>B2</b></p> <p><b>B1</b> for <math>3x^2 + 5x - 6x - 10 [+ 7]</math> oe seen with at least 3 terms correct</p>
	leading to $2x^2 + x - 3 = 0$	<p><b>A1</b> <b>dep</b> on M1 B2 with no errors or omissions</p>
(ii)	$(2x + 3)(x - 1)$	<p><b>M2</b> or <b>M1</b> for <math>(2x + a)(x + b)</math> where <math>ab = -3</math> or <math>2b + a = [+ ]1</math> or for partial factors <math>2x(x - 1) + 3(x - 1)</math> or <math>x(2x + 3) - [1](2x + 3)</math></p>
	-1.5 oe and +1	<b>B1</b>

Question 97

(a)(i)	80	2	<b>M1</b> for $\frac{1}{4} \times 5 \times 8^2$
(a)(ii)	5	2	<b>M1</b> for $[y^2 =] \frac{15 \times 4}{2.4}$ oe
(b)	$\frac{5x+23}{(x-1)(2x+5)}$ or $\frac{5x+23}{2x^2+3x-5}$ final answer	3	<b>B1</b> for $4(2x+5) - 3(x-1)$ oe isw <b>B1</b> for common denominator = $(x-1)(2x+5)$ oe isw
(c)	$2x^3 - 13x^2 + 8x + 48$ final answer	3	<b>B2</b> for correct expansion of 3 brackets but unsimplified or for simplified four-term expression of correct form with 3 terms correct or <b>B1</b> for correct expansion of two brackets with at least 3 terms out of 4 correct
(d)	$\frac{8x^{12}}{y^6}$ or $8x^{12}y^{-6}$ final answer	3	<b>B2</b> 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 <b>B1</b> 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 $\left(\frac{y^2}{2x^4}\right)^{-3}$