

Question	Answer	Mark	Comments
2	$\frac{26}{70}$	B1	

Q	Answer	Mark	Comments
23(a)	$\frac{25}{16}$ or $1\frac{9}{16}$	B1	oe with no surds or indices
	Additional Guidance		
	Ignore an incorrect conversion of $\frac{25}{16}$ to a mixed number		
	$\frac{5\sqrt{5}\sqrt{5}}{16}$ or $\frac{5^2}{16}$		B0
Q	Answer	Mark	Comments
23(b)	$4 + 2\sqrt{3} + 2\sqrt{3} + (\sqrt{3})^2$ or $4 + 4\sqrt{3} + (\sqrt{3})^2$ or $7 + 4\sqrt{3}$	M1	oe 4 terms with at least 3 correct or 3 terms with 2 correct including $4\sqrt{3}$ terms may be seen in a grid
	$7 \times 2 + 7\sqrt{3} + 2 \times 4\sqrt{3} + 4\sqrt{3} \times \sqrt{3}$ or $8 + 8\sqrt{3} + 6 + 4\sqrt{3} + 4 \times 3 + 3\sqrt{3}$ or $14 + 7\sqrt{3} + 8\sqrt{3} + 12$ or $8 + 4\sqrt{3} + 4\sqrt{3} + 6 + 4\sqrt{3} + 6 + 6 + 3\sqrt{3}$	M1dep	oe full expansion with correct multiplication of their 2, 3 or 4 terms by $(2 + \sqrt{3})$ terms may be seen in a grid
	$8 + 4\sqrt{3} + 4\sqrt{3} + 6 + 4\sqrt{3} + 6 + 6 + 3\sqrt{3}$ and $26 + 15\sqrt{3}$ or $14 + 7\sqrt{3} + 8\sqrt{3} + 12$ and $26 + 15\sqrt{3}$	A1	oe with full expansion terms may be seen in a grid condone $15\sqrt{3} + 26$
	Additional Guidance		
	Remember that the answer is given in the question		
	3 may be seen as $(\sqrt{3})^2$ for M1 only		
	Condone missing brackets if multiplications are correct		

Q	Answer	Mark	Comments
20	$a = -3$	B1	
	8 or (their $-3)^2 - 1$ correctly evaluated	B1ft	
	4 or their $8 \div 2$ correctly evaluated	B1ft	
	Additional Guidance		
	$a = -3$ $b = -10$ $c = -5$		B1B0B1ft

Q	Answer	Mark	Comments
7a	Correct statement	B1	eg she used the height instead of the slant height or she used the vertical height or she used 12 (instead of 13)
	Additional Guidance		
	Check diagram		
	For 'vertical' accept anything that implies she has used the wrong height		
	Condone 'length' to mean 'height' or 'slant height'		
	12 or 13 circled on the diagram must be accompanied by a supporting statement		
	Indicates '12' in the calculation	B1	
	She should have done $\pi \times 5 \times 13$	B1	
	It should be 65π	B1	
	She used the wrong height / the (value of) l is wrong	B1	
	She hasn't used the slant height (she used the (vertical) height)	B1	
	She hasn't used the 13	B1	
	She hasn't used the 13 and should be $5 \times 12 \times 13 \times \pi$	B0	
	The multiplication used the wrong number(s)	B0	
	She hasn't used a value for π	B0	
	An incorrect statement with a correct statement eg she used 13 instead of 12 and didn't square the radius	B0	
Q	Answer	Mark	Comments
7b	$\pi \times 5 \times 5$ or 25π or $3 \times 5 \times 5$	M1	oe accept [3.14, 3.142] or $\frac{22}{7}$ for π
	75	A1	
	Additional Guidance		
	$\pi 25$		M1
Q	Answer	Mark	Comments
	'More than' indicated or implied by statement and valid reason	B1	eg valid reasons 3.14 is greater (than 3) Beth's number is bigger (than Adam's) (the correct answer is) 78.5 (with their answer to (b) less than 78.5)

7c	Additional Guidance	
	If calculations are used, the outcomes must be correct	
	Accept 78 or 79 for 78.5 unless from incorrect working	
	'Less than' indicated	B0
	Do not penalise use of the same incorrect formula in (b) and (c) eg $3 \times 10 = 30$ in (b) and $3.14 \times 10 = 31.4$ in (c) with 'More than' ticked	B1
	Ignore a non-contradictory reason with a correct reason eg 3.14 is bigger than 3 and nearer the true value of pi	B1
	Acceptable reasons	
	Adam has rounded (pi) down / Adam only used 3	B1
	There is an extra 0.14 to multiply by	B1
	Her number has decimal places	B1
	Her number is to more significant figures	B1
	Non-acceptable reasons	
	3.14 will give a bigger answer / 3.14 is more accurate	B0

Q	Answer	Mark	Comments
3	$\begin{pmatrix} 3 \\ -7 \end{pmatrix}$	B1	
	Additional Guidance		
	Condone + sign and/or fraction line eg $\begin{pmatrix} +3 \\ -7 \end{pmatrix}$		B1
	$(3, -7)$		B0

Q	Answer	Mark	Comments
1	$(12^2 =) 144$ or $(\sqrt{36} =) 6$ or $(\frac{1}{3} \times \sqrt{36} =) 2$	M1	implied by correct answer accept $(\sqrt{36} =) \pm 6$ or $(\frac{1}{3} \times \sqrt{36} =) \pm 2$
	$(12^2 =) 144$ and $(\frac{1}{3} \times \sqrt{36} =) 2$	M1dep	implied by correct answer $144 \times \frac{1}{2}$ or $\frac{432}{6}$ oe fraction implies M1M1 accept $(\frac{1}{3} \times \sqrt{36} =) \pm 2$
	72	A1	accept ± 72 SC2 288
	Additional Guidance		
	-72 only		M1M1A0
	Condone missing brackets if recovered eg $12^2 \div \frac{1}{3} \times 6$ with answer 72		M1M1A1
	$\frac{144}{\frac{1}{3} \times 6}$ with no further correct work		M1M0A0
	Using a decimal for $\frac{1}{3}$ must be recovered		

Q	Answer	Mark	Comment
15	$6x^2 + 8x - 15x - 20$ or $6x^2 - 7x - 20$	M1	allow 4 terms with 3 correct or $6x^2 - 7x + k$, where k is a non-zero number
	$-11x^2 + 22x$ or $5x^2 - 15x - 5$	M1	
	$6x^2 + 8x - 15x - 20$ or $6x^2 - 7x - 20$ and $-11x^2 + 22x$ and $5x^2 - 15x - 5$	A1	
	$6x^2 + 8x - 15x - 20$ or $6x^2 - 7x - 20$ and $-11x^2 + 22x$ and $5x^2 - 15x - 5$ and -25	A1	
	Additional Guidance		
	Allow terms seen in a grid		
	Sign errors cannot be recovered		
	Ignore equating the expression to zero		

Q	Answer	Mark	Comment
14	Explanation that the ratio and graph do not match	B1	eg This is the graph of $y = 2x$, not $y = \frac{1}{2}x$ This is the graph of $x : y = 1 : 2$ It should go through (3, 1.5)
	Explanation that the domain of the graph is incorrect	B1	eg The graph goes from $x = 0$, not $x = -3$
	Additional Guidance		
	3 : 6 is 1 : 2		B1
	(3, 6) doesn't work		B1
	The gradient is 2, not $\frac{1}{2}$		B1
	He got x and y mixed up		B1
	His graph is not going up in the ratio 2 : 1		B0
	The gradient is 2		B0
	He didn't follow the ratio		B0
	The graph doesn't have negative numbers		B1
	There are no minuses		B1
	It doesn't go from -3 to 3		B1
	The axes should be the same length		B0

Q	Answer	Mark	Comments
6	Definitely true Cannot be true Might be true	B3	B1 for each any clear indication
	Additional Guidance		
	Only a cross in a row, mark the cross		
	A tick and cross(es) in a row – mark the tick		
	More than one tick in a row scores B0 for that row		

Question	Answer	Mark	Comments
24(a)	Alternative method 1: eliminates d		
	$4c + d = 7$ and $10c + d = 22$	M1	oe equations
	$(10 - 4)c = 22 - 7$ or $6c = 15$ or $c = 2.5$	M1dep	oe correct equation in c eg $10c + 7 - 4c = 22$
	$c = 2.5$ and $d = -3$	A1	oe fraction or mixed number for c
	Alternative method 2: eliminates c		
	$4c + d = 7$ and $10c + d = 22$	M1	
	$(10 - 4)d = 70 - 88$ or $6d = -18$ or $d = -3$	M1dep	oe correct equation in d eg $4\left(\frac{22 - d}{10}\right) + d = 7$
	$c = 2.5$ and $d = -3$	A1	oe fraction or mixed number for c
	Alternative method 3: works out the difference or the equation of the function through the points		
	(difference) $= \frac{22 - 7}{10 - 4}$ or 2.5	M1	(gradient) $= \frac{22 - 7}{10 - 4}$ or ($m =$) 2.5
	$c = 2.5$	M1dep	oe fraction or mixed number
	$c = 2.5$ and $d = -3$	A1	oe fraction or mixed number for c
Question	Answer	Mark	Comments
24(b)	$\frac{2x - 1}{2}$	B1	

Question	Answer	Mark	Comments
18(a)	Correct explanation	B1	eg 35 is more than $17 + 13$
	Additional Guidance		
	It is more than 30		B1
	AB cannot be more than $AC + BC$		B1
	$AC + BC$ only add up to 30		B1
	The triangle inequality		B1
	$17 + 13$ is only 30		B1
	$17 + 13$ is 30		B0
	It would be too long		B0

Question	Answer	Mark	Comments
18(b)	Correct explanation	B1	eg (it should be) $\frac{31}{\sin x}$
	Additional Guidance		
	x and 31 should be swapped		B1
	She has used 31 as an angle		B1
	She has used x as a length		B1
	It should be $\frac{\sin x}{31} \left(= \frac{\sin 72}{54} \right)$		B1

Question	Answer	Mark	Comments
14	$\frac{7}{x}$	B1	

Question	Answer	Mark	Comments
12	Alternative method 1		
	$\sin 30 = \frac{x}{10}$ or $(x =) 10 \sin 30$	M1	oe eg $\frac{x}{\sin 30} = \frac{10}{\sin 90}$
	$\sin 30 = 0.5$	M1	oe may be seen in a table $0.5 = \frac{x}{10}$ oe scores M1M1
	5	A1	
	Alternative method 2		
	Correct trigonometric method to show that the length of the missing side is $5\sqrt{3}$	M1	oe
	$\sqrt{(5\sqrt{3})^2 + x^2} = 10$	M1dep	oe
	5	A1	
	Additional Guidance		
	Accept use of cos 60 instead of sin 30		

Question	Answer	Mark	Comments	
6	$\frac{7}{5}$ or $1\frac{2}{5}$	B2	B1 28 and 20 or $2\frac{1}{3}$ and $1\frac{2}{3}$ oe mixed numbers or fractions with common denominator or correct unsimplified fraction or mixed number eg $\frac{14}{10}$ or $1\frac{8}{20}$ or correct simplification of a fraction where at least one of the values is 28 or 20 and the other is not 12 SC1 $\frac{5}{7}$	
			Additional Guidance	
			Allow a fractional numerator and/or denominator in a correct fraction eg $\frac{2\frac{1}{3}}{\frac{8}{12}}$ or $\frac{\frac{28}{12}}{\frac{5}{3}}$	B1
			$\frac{2.4}{1.8}$ simplified to $\frac{4}{3}$	B0
			Ignore an attempt to convert $\frac{7}{5}$ to an improper fraction eg $\frac{7}{5} = 1\frac{2}{7}$ on the answer line	B2
			7 : 5 with no working worthy of B1	B0

Q	Answer	Mark	Comments
11(a)	$\frac{13}{100}$ or 0.13 or 13%	B1	oe fraction, decimal or percentage

Q	Answer	Mark	Comments
11(b)	$\frac{59}{100}$ or 0.59 or 59%	B1	oe fraction, decimal or percentage SC1 answers 13 in (a) and 59 in (b) or $\frac{13}{x}$ in (a) and $\frac{59}{x}$ in (b) where x is an integer ≥ 59

Q	Answer	Mark	Comments
11(c)	$\frac{89}{100}$ or 0.89 or 89%	B1	oe fraction, decimal or percentage SC1 answers 13 in (a) and 89 in (c) or $\frac{13}{x}$ in (a) and $\frac{89}{x}$ in (c), where x is an integer ≥ 89 or answers 59 in (b) and 89 in (c) or $\frac{59}{x}$ in (b) and $\frac{89}{x}$ in (c), where x is an integer ≥ 89
			Additional Guidance
			13 in (a) and 59 in (b) and 89 in (c) scores 0, SC1, SC1

20	Alternative method 1		
	angle $QPR = 27$	M1	may be seen on diagram
	angle $XPS = \frac{180 - 50}{2}$ or 65	M1	may be seen on diagram
	angle $QPR = 27$ and angle $XPS = 65$ and angle $QPS = 92$ and angle in a semicircle is a right angle	A1	oe accept $92 \neq 90$
	all reasons for angle facts: angles in same segment (are equal) and angle sum of triangle (is 180) and base angles of isosceles triangle (are equal)	A1	oe oe oe
20 cont	Alternative method 2		
	angle $SXR = 180 - 50$ or 130 and angle $XRS = 180 - \text{their } 130 - 27$ and angle $PQS = \text{their } 23$	M1	may be seen on diagram angle $XRS = 23$
	angle $XSP = \frac{180 - 50}{2}$ or 65	M1	may be seen on diagram
	angle $SXR = 130$ and angle $XRS = 23$ and angle $PQS = 23$ and $XSP = 65$ and angle $QPS = 92$ and angle in a semicircle is a right angle	A1	oe accept $92 \neq 90$
	all reasons for angle facts: angles on a straight line (add up to 180) and angle sum of triangle (is 180) and angles in same segment (are equal)	A1	oe oe oe

	and base angles of isosceles triangle (are equal)		oe
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15(a)	C and 'lowest median'	B2	oe B1 C
	Additional Guidance		
	If the value of the median is given it must be 4 for B2		
	Accept midpoint oe for median		
	Do not accept mean for median		
	Only accept average for median if the value of 4 is also given		
	Accept mention of the lowest lower quartile with correct mention of the median for B2, but do not accept mention of any extra statistical measure as part of their justification		
15(b)	B and 'lowest interquartile range' or B and 'lowest range'	B2	oe B1 B
	Additional Guidance		
	If the value of the interquartile range is given it must be 2 for B2 If the value of the range is given it must be 5 for B2		
	For B2, do not accept non-statistical reasons, eg 'the narrowest box'		
	For B2, do not accept mention of any extra statistical measure as part of their justification		

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Question	Answer	Mark	Comments
15	Alternative method 1		
	$0.25 + 0.15 + 0.3$ or 0.7	M1	oe eg $1 - 0.05 - 0.05 - 0.2$
	their 0.7×200	M1dep	oe implied by $\frac{140}{200}$
	140	A1	
	Alternative method 2		
	0.25×200 or 50 or 0.15×200 or 30 or 0.3×200 or 60	M1	oe
	$0.25 \times 200 + 0.15 \times 200 + 0.3 \times 200$ or $50 + 30 + 60$	M1dep	oe implied by $\frac{140}{200}$
	140	A1	
	Alternative method 3		
	$(0.05 + 0.05 + 0.2) \times 200$ or $2 \times 0.05 \times 200 + 0.2 \times 200$ or $2 \times 10 + 40$ or 60	M1	oe
	$200 - \text{their } 60$	M1dep	oe implied by $\frac{140}{200}$
	140	A1	
	Additional Guidance		
	Ignore attempt to simplify $\frac{140}{200}$	M1M1A0	
	$\frac{140}{200}$ and 140 both on answer line	M1M1A0	
	Do not allow a misread of any probability		
16	5 : 6	B1	
17	$\frac{x}{\sin 42^\circ} = \frac{15}{\sin 104^\circ}$	B1	

Question	Answer	Mark	Comments
25(a)	(gradient of $OP = \frac{8-0}{4-0}$	M1	oe eg (gradient of $OP = \frac{8}{4}$
	(gradient of $OP = 2$ or $\frac{2}{1}$ and $-1 \div 2 = -\frac{1}{2}$ or $2 \times -\frac{1}{2} = -1$ with M1 seen	A1	oe accept 'negative reciprocal, so $-\frac{1}{2}$ ', or 'product of gradients is -1 , so $-\frac{1}{2}$ ', oe comment
	Additional Guidance		
	$4 \div 8 = \frac{1}{2}$ but slope is negative, so $-\frac{1}{2}$		M0A0
	Do not accept a gradient including x eg $\frac{8}{4} = 2$, so gradient of $OP = 2x$, product of gradients is -1 , so $-\frac{1}{2}x$		M1A0
Question	Answer	Mark	Comments

25(b)	Alternative method 1: $y = -\frac{1}{2}x + c$ and substitutes 8 and 4		
	$8 = -\frac{1}{2} \times 4 + c$ or $(c =) 10$	M1	oe implied by $y = -\frac{1}{2}x + 10$
	$0 = -\frac{1}{2}x + \text{their } 10$ or $(x =) 20$	M1dep	oe
	their $20^2 + \text{their } 10^2$ or 500 or $\sqrt{500}$	M1dep	oe eg $2\sqrt{125}$ dep on M2
	$10\sqrt{5}$	A1	accept $a = 10$ with $\sqrt{500}$ seen
	Alternative method 2: uses the formula for a line and substitutes $x = 0$ and $y = 0$		
	$y - 8 = -\frac{1}{2}(x - 4)$ and substitutes $x = 0$ or $y = 0$ or $(x =) 20$ or $(y =) 10$	M1	oe equation eg $x + 2y = 20$
	$y - 8 = -\frac{1}{2}(x - 4)$ and substitutes $x = 0$ and substitutes $y = 0$ or $(x =) 20$ and $(y =) 10$	M1	oe equation eg $x + 2y = 20$
	their $20^2 + \text{their } 10^2$ or 500 or $\sqrt{500}$	M1dep	oe eg $2\sqrt{125}$ dep on M2
	$10\sqrt{5}$	A1	accept $a = 10$ with $\sqrt{500}$ seen
	The mark scheme for question 25(b) continues on the next page		
Question	Answer	Mark	Comments

25(b) (cont)	Alternative method 3: uses formula for gradient with points A and B		
	$\frac{8-0}{4-x} = -\frac{1}{2}$ or $(x =) 20$	M1	oe correct method to work out the x -coordinate of point A
	$\frac{y-8}{0-4} = -\frac{1}{2}$ or $(y =) 10$	M1	oe correct method to work out the y -coordinate of point B
	their $20^2 + \text{their } 10^2$ or 500 or $\sqrt{500}$	M1dep	oe eg $2\sqrt{125}$ dep on M2
	$10\sqrt{5}$	A1	accept $a = 10$ with $\sqrt{500}$ seen
	Additional Guidance		
	Check the diagram and 25(a) for possible correct working or values eg 1 20 marked on axis at A eg 2 10 marked on axis at B	M1 M1	
	On alternative method 2, if using $y - 8 = -\frac{1}{2}(x - 4)$, they must substitute $x = 0$ or $y = 0$ for M1 and both separately for M1M1		
	On alternative method 2, incorrect rearrangement of $y - 8 = -\frac{1}{2}(x - 4)$ can score up to 3 marks eg $y - 8 = -\frac{1}{2}(x - 4)$, $2y - 8 = -x - 4$, when $y = 0$, $x = 4$, when $x = 0$, $y = 2$, $\sqrt{4^2 + 2^2} = \sqrt{20}$		M1M1M1

Q	Answer	Mark	Comment
26	$(P(3) =) \frac{1}{6}$ or $(P(1, 2) =) \text{ or } (P(2, 1) =)$ $\frac{1}{6} \times \frac{1}{6} \text{ or } \frac{1}{36}$	M1	oe 3 on first roll or 1 on first roll and 2 on second or 2 on first roll and 1 on second
	$\frac{1}{6} \text{ and } \frac{1}{6} \times \frac{1}{6}$ or $\frac{1}{6} \text{ and } \frac{1}{36}$ or $\frac{1}{6} \times \frac{1}{6} \times 2$ or $\frac{1}{36} \times 2$ or $\frac{2}{6} \times \frac{1}{6} \text{ or } \frac{2}{36}$	M1dep	oe
	$\frac{1}{6} + \frac{1}{6} \times \frac{1}{6} \times 2 \text{ or } \frac{1}{6} + \frac{2}{36}$	M1dep	oe
	$\frac{2}{9} \text{ or } \frac{8}{36} \text{ or } \frac{4}{18}$	A1	oe fraction, decimal or percentage
	Additional Guidance		
	For the first and second marks, do not allow $\frac{1}{6}$ seen only as part of a multiplication string, but do allow it seen only in an addition		
	For the first and second marks, do not allow $\frac{1}{6} \times \frac{1}{6} (\times 2)$ or $\frac{2}{6} \times \frac{1}{6}$ seen only as part of a longer multiplication string or in $1 - (\frac{1}{6} \times \frac{1}{6})$, but do allow them seen only in an addition		
	Allow working in decimals rounded correctly to at least 2 dp for M marks, but answer must be given correctly as $0.\dot{2}$ or $22.\dot{2}\%$		
	Ignore an incorrect simplification or conversion of a correct value		M1M1M1A1

Q	Answer	Mark	Comment
24(a)	$\left(\frac{6}{a} = \right) \frac{24}{4a}$ or converts both fractions to a common denominator or correct unsimplified fraction eg $\frac{26}{8a}$ or $\frac{13a}{4a^2}$ or $\frac{3.25}{a}$	M1	oe eg $\frac{48}{8a}$ and $\frac{22}{8a}$ or $\frac{24a}{4a^2}$ and $\frac{11a}{4a^2}$
	$\frac{13}{4a}$	A1	
	Additional Guidance		
	Do not ignore further work eg $\frac{13}{4a}$ followed by answer $\frac{3.25}{a}$		M1A0
	Allow a division sign rather than a fraction line for M1 only eg $26 \div 8a$ eg $13 \div 4a$		M1A0 M1A0
Q	Answer	Mark	Comment
24(b)	$y(y - 3)$	M1	
	$(y + 7)(y + 3)$	M1	
	$(y + 3)(y - 3)$	M1	
	$y(y + 7)$ or $y^2 + 7y$	A1	SC1 $y^4 - 3y^3 + 10y^3 - 30y^2 + 21y^2 - 63y$ or $y^4 + 7y^3 - 9y^2 - 63y$
	Additional Guidance		
	$y(y + 7)$ or $y^2 + 7y$ with no other working		M1M1M1A1
	Answer $\frac{y(y+7)}{1}$ or $\frac{y^2+7y}{1}$		M1M1M1A0
	Ignore the consistent use of a different variable within a factorisation		
	Award SC1 only if there are no correct factorisations eg correct factorisation to $(y + 7)(y + 3)$ and correct expansion to $y^4 - 3y^3 + 10y^3 - 30y^2 + 21y^2 - 63y$		M1 only

Q	Answer	Mark	Comments
13	$2w = \frac{4}{5} \times 15$ or $2w = \frac{60}{5}$ or $2w = 12$ or $\frac{2w}{15} = \frac{12}{15}$ or $\frac{w}{3} = \frac{2}{1}$ or $\frac{w}{2} = \frac{3}{1}$ or $\frac{w}{15} = \frac{4}{5} \div 2$ or $\frac{w}{15} = \frac{2}{5}$ or $2w \times 5 = 4 \times 15$ or $10w = 60$ or $\frac{4}{5} \div \frac{2}{15}$	M1	oe in the form $aw = n$ where a is an integer and n is an integer, fraction or decimal oe in the form $\frac{bw}{x} = \frac{c}{x}$ where x is a common denominator oe calculation
	6	A1	
	Additional Guidance		
	Embedded answer 6 eg $\frac{2 \times 6}{15} = \frac{4}{5}$		M1A0

Question	Answer	Mark	Comments
1	250×0.85	B1	
2	$x = 0$	B1	
3	(6, 7)	B1	
4	$16x^4$	B1	
5(a)	Says that the wrong line has been given or says that for the given reflection the image would be in the second quadrant (may be implied by sketch) or says that the given line is vertical or gives the coordinates of at least one image point under the given reflection or says that after the given reflection, a rotation 180° (centre $(-1, -1)$) or an enlargement, scale factor -1 (centre $(-1, -1)$) is needed	B1	eg the line should be $y = -1$ eg the triangle would move to the other side of the y-axis eg $x = -1$ is vertical eg (1, 1) would move to $(-3, 1)$ (1, 3) would move to $(-3, 3)$ (4, 1) would move to $(-6, 1)$
Additional Guidance for this question is on the next page			

Q	Answer	Mark	Comments
27	(Total time =) $\frac{30}{a} + \frac{30}{b}$	M1	oe eg $\frac{30b}{ab} + \frac{30a}{ab}$ or $\frac{30(b+a)}{ab}$
	correct expression for total distance ÷ total time	M1dep	eg $(30 + 30) \div \left(\frac{30}{a} + \frac{30}{b}\right)$ or $60 \div \frac{30(b+a)}{ab}$ or $60 \times \frac{ab}{30(b+a)}$
	$60 \times \frac{ab}{30(a+b)} = \frac{2ab}{a+b}$	A1	condone $b + a$ for $a + b$ condone $30a + 30b$ for $30(a + b)$
	Additional Guidance		
	Students can gain M1M1 if they incorrectly simplify a correct expression for total time before forming the division eg $\frac{30}{a} + \frac{30}{b} = \frac{60}{a+b}$ followed by $60 \div \frac{60}{a+b}$		M1M1A0
	Allow correct cancellation of 60 and 30 at any stage of the working		

Q	Answer	Mark	Comments
23	Alternative method 1 – subtracting powers of 10 algebraically		
	Denotes the given recurring decimal by a letter and multiplies by one of 10, 100, etc	M1	eg $10x = 1.33\dots$ or $100x = 13.3\dots$
	Denotes the given recurring decimal by a letter and multiplies by one or two of 10, 100, etc and subtracts accordingly	M1dep	eg $10x - x = 1.333\dots - 0.1333\dots$ or $9x = 1.2$ or $\frac{1.2}{9}$ or $100x - x = 13.333\dots - 0.1333\dots$ or $99x = 13.2$ or $\frac{13.2}{99}$ or $100x - 10x = 13.333\dots - 1.333\dots$ or $90x = 12$ or $\frac{12}{90}$
	$\frac{2}{15}$	A1	
	Alternative method 2 – subtracting powers of 10 numerically		
	Multiplies the given decimal by one of 10, 100, etc	M1	eg $0.\dot{1}\dot{3} \times 10 = 1.\dot{3}$
	Multiplies the given decimal by one or two of 10, 100, etc and subtracts appropriately in fraction form	M1dep	eg $0.\dot{1}\dot{3} \times 100 = 13.\dot{3}$ and $0.\dot{1}\dot{3} \times 10 = 1.\dot{3}$ and $\frac{13.3 - 1.3}{100 - 10}$ or $\frac{12}{90}$
	$\frac{2}{15}$	A1	

Question 23 continues on the next page

23 cont	Alternative method 3 – splitting into a known fraction and a recurring decimal		
	Splits into 0.1 and $0.0\dot{3}$ and uses a correct first step from alt 1 or alt 2 with $0.0\dot{3}$	M1	eg $10x = 0.33\dots$ or $0.0\dot{3} \times 100 = 3.33\dots$ 0.1 does not need to be seen separately at this stage
	Correct method to evaluate $0.0\dot{3}$ as a fraction and addition to $\frac{1}{10}$ or $\frac{1}{30} + \frac{1}{10}$ or $\frac{4}{30}$	M1dep	oe fraction

	$\frac{2}{15}$	A1	
	Additional Guidance		
	Condone decimals within fractions up to M2 eg $\frac{1.2}{9}$		M2
	Equals signs may be implied throughout		
	Subtraction signs must be seen or the results correct		
	Recurring decimals should be denoted by correct notation or at least two of the recurring digits followed by at least two dots. However, condone missing dots if the result is, or would be, correct eg condone $13.3 - 1.3 = 100x - 10x$		

Q	Answer	Mark	Comments
19	$4 \times 3 \times 2 (\times 1) \times 2$ or $5 \times 4 \times 3 \times 2 (\times 1) \times \frac{2}{5}$ or $120 \times \frac{2}{5}$	M1	oe
	48	A1	SC1 12 or 24 or 72 or 120
	Additional Guidance		
	12 is the number of possible 5-digit numbers ending in two odd digits		
	24 is the number of possible 5-digit numbers ending in 7 or the number of possible 5-digit numbers ending in 9		
	72 is the number of possible 5-digit even numbers		
	120 is the number of possible 5-digit numbers		
	Ignore any listing of possible numbers		

Q	Answer	Mark	Comments
13(a)	$(y =) ax + b$ and $(y =) ax + 2a + b$	B2	any letter for x other than a or b or y B1 $(y =) ax + b$ or $(y =) a(x + 2) + b$ or $(y =) ax + 2a + b$ or substitution of two values for x with a difference of 2 and correct working to show that the output increases by $2a$ eg substituting $x = 3$ and $x = 5$ to get $3a + b$ and $5a + b$
	Additional Guidance		
	Allow xa for ax throughout		
	Do not allow $a \times x + b$ for $ax + b$ unless recovered		
	Allow, eg $(x + 2) \times a + b$ for $a(x + 2) + b$		
	Do not allow missing brackets unless recovered eg do not allow $x + 2 \times a$ for $a(x + 2)$		
	Do not accept written answers without the necessary algebra eg The input has increased by 2 and will then be multiplied by a , so the output will increase by $2a$		B0
	Ignore further non-contradictory work if B2 awarded		
Q	Answer	Mark	Comments
13(b)	Alternative method 1 – using k		
	$\frac{f(6)}{f(2)} \left(= \frac{36k}{4k} \right) = 9$ or $f(3) = 9k$	M1	condone eg $k36$
	$\frac{f(6)}{f(2)} = 9$ and $f(3) = 9k$ and No	A1	condone $k9$
	Alternative method 2 – substituting a value for k		
	Identifies a value of k other than 1 and correctly evaluates $\frac{f(6)}{f(2)}$ or $f(3)$	M1	eg $k = 2$ and $\frac{f(6)}{f(2)} = 9$ or $f(3) = 18$
	Identifies a value of k other than 1 and correctly evaluates $\frac{f(6)}{f(2)}$ and $f(3)$ and No	A1	eg $k = 2$ and $\frac{f(6)}{f(2)} = 9$ and $f(3) = 18$ and No

Additional Guidance	
9k from $\frac{f(6)}{f(2)}$ is M0, but M1 can be awarded if accompanied by $f(3) = 9k$	
Do not allow 9 from $\frac{36}{4}$ (unless $\frac{36}{4}$ is from $\frac{36k}{4k}$)	
Do not allow 9 from $\frac{36k^2}{4k^2}$	
Students may correctly state that $\frac{f(6)}{f(2)}$ and $f(3)$ are (only) equal when $k = 1$ This may replace 'No' in their answer, but does not score without $9k$ and 9	
Do not allow unprocessed values, eg 6^2 , 2^2 or 3^2	