

Question	Answer	Mark	Comments
8(a)	Alternative method 1 – Using gradients		
	Gradient of $y = 3x + 7$ is 3 and $y = 3x + 4$ and gradient of $2y - 6x = 8$ is 3 or $6 \div 2$	B3	May come from using points on line eg using (0, 7) and (1, 10) and $\frac{10 - 7}{1 - 0} = 3$ or correct calculation for gradient from points on line $2y - 6x = 8$ eg using (0, 4) and (1, 7) and $\frac{7 - 4}{1 - 0} = 3$ B2 for $y = 3x + 4$ and lines have same gradient or $y = 3x + 4$ and gradient of $2y - 6x = 8$ is 3 or $6 \div 2$ or gradient of $y = 3x + 7$ is 3 and $y = 3x + 4$ B1 for gradient of $y = 3x + 7$ is 3 or $y = 3x + 4$ or gradient of $2y - 6x = 8$ is 3 or $6 \div 2$
	Alternative method 2 – Using coordinates and distances		
	Chooses a value for x and correctly evaluates the y value for both lines	M1	eg (0, 7) and (0, 4)
	Chooses a different value for x and correctly evaluates the y value for both lines	M1dep	eg (1, 10) and (1, 7)
	States that y values are a constant distance apart so parallel	A1	oe

Continues on next page

8(a)	Alternative method 3 – Using simultaneous equations		
	$y = 3x + 4$ or $y - 3x = 4$ or $2y = 6x + 14$ or $2y - 6x = 14$	M1	oe Equates coefficients in any form
	Any attempt to eliminate both variables from their equations	M1dep	
	States simultaneous equations have no (real) solution and concludes parallel	A1	
	Additional Guidance		
	To award A mark on Alternative method 2, the working must be seen		
	$y = 3x + 4$ and lines have gradient of 3		B2

o(a) cont	$y = 3x + 7$ and lines have gradient of 3x	--
	$y = 3x + 4$ and 3x identified in both equations	B2
	Both lines have gradient 3x	B1
	$y = 3x + 7$, gradient 3 and $y = 3x + 8$, gradient 3 (error in rearrangement)	B1
	$y = 3x + 8$, gradient 3 (error in rearrangement)	B0
	Parallel as both have same gradient	B0
	$2(3x + 7) - 6x = 8$ $6x + 14 - 6x = 8$ $14 = 8$	M1 M1
	$y = 3x + 7$ and $y = \frac{8 + 6x}{2}$ are equated coefficients, Alternative method 3	M1

Question	Answer	Mark	Comments
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8(b)	$3 \times -5 + 7$ or $-15 + 7$ or -8 or $(-5, -8)$ or $(-6 - 7) \div 3$ or $-4.33...$ or $y = 3x + 9$	M1	Use a point on $y = 3x + 7$ with $(-5, -6)$ to compare gradient to 3 eg Gradient from $(-5, -6)$ to $(0, 7)$ is 2.6
	Above and -8 or Above and -4.33 or Above and $y = 3x + 9$	A1	oe Above and eg Gradient from $(-5, -6)$ to $(0, 7)$ is 2.6
	Additional Guidance		
	Do not ignore incorrect statements eg -6 is less than -8 so above		M1A0
	$(0, 7)$, $(-1, 4)$, $(-2, 1)$, $(-3, -2)$, $(-4, -5)$, $(-5, -8)$ and ticks below		M1A0

Q	Answer	Mark	Comments
21(a)	Alternative method 1		
	$\frac{4}{3}\pi r^3 = \pi r^2 h$	M1	
	$\frac{4}{3}r = h$ or $4r = 3h$	M1dep	oe equation with π and r^2 cancelled
	3 : 4 with M2 awarded	A1	oe ratio eg $\frac{3}{4} : 1$ or $1 : \frac{4}{3}$ accept 1.33 or better for $\frac{4}{3}$
	Alternative method 2		
	$\frac{4}{3}\pi r^3 = \pi r^2 h$ or substitution of the same value of r into $\frac{4}{3}\pi r^3$ and $\pi r^2 h$	M1	the substitution must be shown
	Substitution of the same value of r into $\frac{4}{3}\pi r^3$ and $\pi r^2 h$ and correct value of h for their value of r	A1	the substitution must be shown their h should be exactly $\frac{4}{3} \times$ their r eg $r = 2$ and $h = \frac{8}{3}$ (oe fraction) do not allow rounded values
	3 : 4 with M1A1 awarded	A1	oe ratio eg $\frac{3}{4} : 1$ or $1 : \frac{4}{3}$ accept 1.33 or better for $\frac{4}{3}$
Additional Guidance			
Accept $h : r = 4 : 3$ for final mark with M2 or M1A1 awarded			

Q	Answer	Mark	Comments
21(b)	$(\pi)(3r)^2(2h)$ or $3^2 \times 2$	M1	oe ft their formula for a cylinder from part (a) in the form $k\pi r^2 h$ with k as a positive constant
	18	A1	
	Additional Guidance		
	Answer 18 from choosing values for r and h eg $\pi \times 3^2 \times 4 = 36\pi$ and $\pi \times 9^2 \times 8 = 648\pi$ and $648\pi \div 36\pi = 18$		M1A1
	Answer 18 from rounding a decimal		M0A0

Q	Answer	Mark	Comments
15(a)	Correct method for finding the difference between the x or y coordinates for line AC	M1	may be on diagram eg $9 - -7$ or 16 or $3 - -5$ or 8
	Correct method for finding the difference between the x or y coordinates for line AB or line BC	M1dep	may be on diagram eg $16 \div (1 + 3)$ or 4 or $8 \div (1 + 3)$ or 2 or $16 \times \frac{3}{(1+3)}$ or 12 or $8 \times \frac{3}{(1+3)}$ or 6
	$(-3, 5)$	A1	
	Additional Guidance		
	Up to M2 may be awarded for correct work, with no or incorrect answer, even if this is seen amongst multiple attempts		
	Condone any missing minus signs if absolute values for the differences are correct		
	$(-3, \dots)$ or $(\dots, 5)$		M1M1A0
Q	Answer	Mark	Comments
15(b)	$(m_1 =) \frac{-7-9}{3--5}$ or $(m_1 =) \frac{9--7}{-5-3}$ or -2	M1	gradient of AC
	$-1 \div \text{their } -2$ or $\frac{1}{2}$	M1	gradient of line perpendicular to AC their -2 must be identified as a gradient $\frac{1}{2}$ implies M1M1
	$-7 = \text{their } \frac{1}{2} \times 3 + c$ or $(c =) -8.5$ or $y - -7 = \text{their } \frac{1}{2}(x - 3)$	M1dep	oe condone any letter for c dep on 2nd M1
	$y = \frac{1}{2}x - 8.5$	A1	oe eg $2y = x - 17$
	Additional Guidance		
	Check part (a) for working for part (b)		

Q	Answer	Mark	Comments
11	$0.5 \times \pi \times 45$ or $0.5 \times [141, 141.4]$ or $[70.5, 70.7]$ or $0.5 \times \pi \times 45 + 75$ or $[145.5, 145.7]$	M1	oe eg 22.5π
	$(0.5 \times \pi \times 45 + 75) \div 18$ or their $[145.5, 145.7] \div 18$	M1	oe their $[145.5, 145.7]$ can be any value
	8.08(...) or 8.09(...)	A1	may be implied by 8.1
	8.1	B1ft	ft any answer seen with greater than 2 sf SC2 3.9
	Additional Guidance		
	Up to M2 may be awarded for correct work, with no or incorrect answer, even if this is seen amongst multiple attempts, B1ft may also be awarded		
	$\frac{120}{18} = 6.67$ answer 6.7		M0M1A0B1ft
	$\frac{120}{18} = 6.7$		M0M1A0B0ft
	$0.5 \times \pi \times 45$ and $70.7 \div 18 = 3.93$ answer 3.9		M1M1A0B1ft
	SC2 for an answer of 3.9 without working is when 75 is not used		

Q	Answer	Mark	Comments
5	$3 + 2$ or 5 and $5\frac{1}{2} + 3\frac{1}{2}$ or 9 or $5\frac{1}{2} - 3$ or $2\frac{1}{2}$ and $3\frac{1}{2} - 2$ or $1\frac{1}{2}$ or 4	M1	oe eg $180 + 120$ or 300 and $330 + 210$ or 540 implied by $5\frac{1}{2} + 3\frac{1}{2} - 3 - 2$
	$\frac{9-5}{5}$ or $\frac{2\frac{1}{2} + 1\frac{1}{2}}{3+2}$ or $\frac{4}{5}$ or 0.8 or $\frac{5\frac{1}{2} + 3\frac{1}{2}}{3+2} (\times 100)$ or $\frac{9}{5} (\times 100)$ or $1.8 (\times 100)$ or 180	M1dep	oe eg $\frac{5\frac{1}{2} + 3\frac{1}{2} - 3 - 2}{3+2}$ eg $\frac{540 - 300}{300}$ or $\frac{240}{300}$ or $1.8 - 1$
	80	A1	
	Additional Guidance		
	Allow working fully in minutes but units must be consistent in a single calculation eg 2 h 30 and 1 h 30 eg $3 + 2 = 5$ and $330 + 210 = 540$ eg $3 + 120$ and $330 + 3\frac{1}{2}$ unless recovered		M1 M1 M0
	$3 + 2 = 6$, $5\frac{1}{2} + 3\frac{1}{2} = 9$, $9 - 6 = 3$, $3 = 50\%$		M1M1A0
	$3 + 2 = 6$, $5\frac{1}{2} + 3\frac{1}{2} = 9$, answer 50% (3 is implied)		M1M1A0
	$9 - 6 = 3$, $3 = 50\%$ (no method shown for 6)		M0M0A0

24	$\frac{4}{3}\pi(2x)^3$ or $\frac{1}{3}\pi(3x)^2h$	M1	oe
	$\frac{4}{3}\pi(2x)^3 = \frac{1}{3}\pi(3x)^2h$ or $\frac{4}{3}\pi 8x^3 = \frac{1}{3}\pi 9x^2h$	M1dep	oe Sets up equation
	$32x = 9h$ or $x = \frac{9}{32}h$ or $h = \frac{32}{9}x$ or $\frac{32}{3}r = 9h$ or $r = \frac{27}{32}h$ or $h = \frac{32}{27}r$ or $27h = 32r$ or $\frac{27}{32}h : h$ or $3x : \frac{32}{9}x$ or $\frac{27}{32} : 1$ or $3 : \frac{32}{9}$ or $0.84... : 1$ or $3 : 3.55...$	M1dep	oe linear equation or ratio
	27 : 32	A1	
	Additional Guidance		
	32 : 27		M1M1M1A0
	Note $\frac{4}{3}\pi(2)^3 = [33.49, 33.52]$ $\frac{1}{3}\pi(3)^2h = [9.42h, 9.43h]$		

12	Graph should be a curve	B1	oe eg
	Should not be straight lines		
		Not a curve	
	Not smooth		
	Too straight		
	Need more points plotted		
Additional Guidance			

Question	Answer	Mark	Comments
7	Any correct value	M1	11, 23, 37, 53, 71, 91, 113, 137, 163
	Selects 91 as the only incorrect value with no errors in values given	A1	oe eg stops at 91
	91 and 13 (is a factor) or 91 and 7 (is a factor) or 91 and 13×7	A1	oe eg $91 \div 7 = 13$
	Additional Guidance		
	Ignore incorrect evaluations for first mark		
	Ignore all values for n greater than 9		
	Do not allow 11 within a list of prime numbers eg 2, 3, 5, 7, 11...		
	Error in list eg <u>12</u> , 23, 37, 53, 71, 91, 113, 137, 163 with 12 and 91 selected as not prime (not valid as incorrect)		M1A0A0
	Error in list eg <u>12</u> , 23, 37, 53, 71, 91, 113, 137, 163 with only 91 selected as not prime (not valid as incorrect conclusion from their list)		M1A0A0
	$9^2 + 9 + 1 = 91$ is incorrect working		M0A0A0

Question	Answer	Mark	Comments
1	up	B1	
	Additional Guidance		
2	$\frac{5}{2}$	B1	
	Additional Guidance		
3	$8n - 5$	B1	
	Additional Guidance		
4	120	B1	
	Additional Guidance		
5	109.5 in the correct position	B1	oe
	110.5 in the correct position	B1	oe Allow 110.49 answers reversed score B0B1
	Additional Guidance		
	110.4999...		B1
	110.4999		B0

Q	Answer	Mark	Comments
25	Alternative method 1 – multiplies $(x - 3)(x + 2)$ first		
	$x^2 - 3x + 2x - 6$ or $x^2 - x - 6$	M1	four terms with at least three correct implied by $x^2 - x \pm k$ where k is a non-zero constant
	$x^3 - 3x^2 + 2x^2 - 6x + 5x^2 - 15x + 10x - 30$ or $x^3 - x^2 - 6x + 5x^2 - 5x - 30$	M1dep	full expansion with correct multiplication of their 3 or 4 terms by x and 5
	$x^3 + 4x^2 - 11x - 30$	A1	
	Alternative method 2 – multiplies $(x - 3)(x + 5)$ first		
	$x^2 - 3x + 5x - 15$ or $x^2 + 2x - 15$	M1	four terms with at least three correct implied by $x^2 + 2x \pm k$ where k is a non-zero constant
	$x^3 - 3x^2 + 5x^2 - 15x + 2x^2 - 6x + 10x - 30$ or $x^3 + 2x^2 - 15x + 2x^2 + 4x - 30$	M1dep	full expansion with correct multiplication of their 3 or 4 terms by x and 2
	$x^3 + 4x^2 - 11x - 30$	A1	
	Alternative method 3 – multiplies $(x + 2)(x + 5)$ first		
	$x^2 + 2x + 5x + 10$ or $x^2 + 7x + 10$	M1	four terms with at least three correct implied by $x^2 + 7x \pm k$ where k is a non-zero constant
	$x^3 + 2x^2 + 5x^2 + 10x - 3x^2 - 6x - 15x - 30$ or $x^3 + 7x^2 + 10x - 3x^2 - 21x - 30$	M1dep	full expansion with correct multiplication of their 3 or 4 terms by x and -3
	$x^3 + 4x^2 - 11x - 30$	A1	
	Additional Guidance		
	Do not ignore further incorrect simplification or attempt to solve after correct answer seen		

Q	Answer	Mark	Comments
14	Alternative method 1		
	13.2×0.9 or 11.88	M1	oe
	$13.2(0) \div 1.1$ or 12	M1	oe
	11.88 and 12 and No	A1	
	Alternative method 2		
	1.1 or 0.9 seen	M1	
	1.1×0.9 or 0.99	M1dep	
	0.99 and No	A1	oe 1% decrease and No
	Alternative method 3		
	13.2×0.9 or 11.88	M1	
	their 11.88×1.1 or 13.068	M1dep	
	13.068 and No	A1	accept 13.07 or 13.06
	Additional Guidance		
	$12 \times 1.1 = 13.20$, $13.2 \times 0.9 = 11.88$ and No		M1M1A1
	$13.2 \times 1.1 = 14.52$, $14.52 \times 0.9 = 13.068$ and No		M0M0A0

27	$\frac{10}{30}$ and $\frac{9}{31}$ seen or $\frac{1}{3}$ and $\frac{9}{31}$ seen	M1	oe accept 0.33... and 0.29...
	$\frac{10}{30} \times \frac{9}{31} \times \frac{8}{32}$ or $\frac{1}{3} \times \frac{9}{31} \times \frac{1}{4}$	M1dep	oe accept 0.33... and 0.29... and 0.25
	$\frac{3}{124}$ or [0.0239, 0.0242]	A1	oe eg $\frac{720}{29\,760}$
	Additional Guidance		
	Fractions do not have to be in simplest form		
	$\frac{10}{30} \times \frac{9}{31} \times \frac{8}{32} \times \frac{7}{33}$		M1M0
	$\frac{10}{30} + \frac{9}{31} + \frac{8}{32}$		M1M0

Answer: (-3/4 3)

Question	Answer	Mark	Comments
15	$4(x + 3)$	B1	
	Additional Guidance		
16	$(-\frac{3}{4}, 3)$	B1	
	Additional Guidance		
17	$7 \times 5 (\times 9)$ or $(100 - 30) \div 2 (\times 9)$ or $35 (\times 9)$ or $99 \div 11$ or 9 or $4 \times 5 \times 4 \times 5$	M1	First two digits of Method A Last two digits of Method A Complete for Method B
	315 or 400	A1	
	315 and 400 with Method B identified	A1	Method B can be implied by choosing 400
	Additional Guidance		
	315 and 400 and B with no working		M1A1A1
	315 and 400 with 400 circled		M1A1A1
	Beware $40 \times 10 = 400$ (for Method A) is incorrect working		

Q	Answer	Mark	Comments
11(a)	8 or 10	M1	8 may be implied by 2^2 or 4
	8 and 10 and $\frac{1}{40}$ or 0.025	A1	8 may be implied by 2^2 or 4 accept 0.03 with $\frac{1}{40}$ or 0.025 seen
	Additional Guidance		
	Do not allow exact calculations for M1A1 eg $4.113 = 4$ and $10.21 = 10$ and $\frac{1}{40}$		M1A0
	$\frac{1}{40}$ or 0.025 with 8 or 10 seen (8 may be implied by 2^2 or 4)		M1A0
	$\frac{1}{40}$ or 0.025 without 8 or 10 seen (8 may be implied by 2^2 or 4)		M0A0
Q	Answer	Mark	Comments
11(b)	Valid explanation	B1	eg both numbers have been rounded down
	Additional Guidance		
	Ignore irrelevant reasons alongside a correct reason, unless contradictory		
	Ignore a calculation using exact values alongside a correct reason eg 0.025 is greater than 0.0238... and both numbers rounded down		B1
	0.025 is greater than 0.0238...		B0
	The denominator is smaller		B1
	The denominator using the exact values is bigger		B1
	(Decimals) rounded down		B1
	Because 8.34 is more than 8 and 10.21 is more than 10		B1
	One is divided by less (with answer more)		B1
	Estimating rounds the numbers down which makes the denominator less		B1
	Estimating rounds the numbers down which makes it less		B0
	Because it rounds up		B0
	Because she rounded each number to one significant figure		B0
	The numbers get rounded up so more than the exact value		B0
	Rounded up when estimating		B0
	Removing the decimals makes the number bigger		B0

25	Alternative method 1		
	Correct method to work out any viable distance, eg $\frac{1}{2} \times \frac{5}{60} \times 102$ or 4.25 or $102 \times \frac{40}{60}$ or 68 or $\frac{1}{2}(102 + 96) \times \frac{15}{60}$ or $96 \times \frac{15}{60}$ and $\frac{1}{2} \times 6 \times \frac{15}{60}$ or 24 and 0.75 or 24.75 or $\frac{1}{2}\left(\frac{40}{60} + \frac{45}{60}\right) \times 102$ or 72.25	M1	first section second section third section first and second sections
	Correct method to work out all parts of distance, eg $\frac{1}{2} \times \frac{5}{60} \times 102$ or 4.25 and $102 \times \frac{40}{60}$ or 68 and $\frac{1}{2}(102 + 96) \times \frac{15}{60}$ or 24.75	M1dep	97 scores M1M1
	130 – their whole distance or 130 – 97	M1dep	eg 130 – their 4.25 – their 68 – their 24.75 dep on M2
	33	A1	

Mark scheme for Question 25 continues on the next page

	Alternative method 2		
	Correct method to work out 60 × any viable distance, eg $\frac{1}{2} \times 5 \times 102$ or 255 or 102×40 or 4080 or $\frac{1}{2}(102 + 96) \times 15$ or 96×15 and $\frac{1}{2} \times 6 \times 15$ or 1440 and 45 or 1485 or $\frac{1}{2}(40 + 45) \times 102$ or 7225	M1	first section second section third section first and second sections

25 cont	$\frac{1}{2}(40 + 45) \times 102$ or 4335		
	Correct method to work out $60 \times$ all parts of distance, eg $\frac{1}{2} \times 5 \times 102$ or 255 and 102×40 or 4080 and $\frac{1}{2}(102 + 96) \times 15$ or 1485	M1dep	5820 implies M1M1
	130 – their whole distance or $130 - \frac{5820}{60}$ or $130 - 97$	M1dep	eg $130 - \frac{\text{their } 255 + \text{their } 4080 + \text{their } 1485}{60}$ dep on M2
	33	A1	
	Additional Guidance		
	Accept fractions used as decimals correct to 2 dp or better		

24	Enlargement	B1	
	Scale factor ($\times$) $-\frac{1}{2}$	B1	oe
	Centre (1, -1)	B1	
	Additional Guidance		
	Enlarge ($\times$) $-\frac{1}{2}$ (1, -1)	B1B1B1	
	'Reduces' or 'gets smaller' or 'shrinks'	1st B0	
	Do not accept $\div \left(-\frac{1}{2}\right)$ for scale factor	2nd B0	
	Centre 1, -1	3rd B0	
	Combined transformation given	B0B0B0	

27	$10^2 + 10^2$ or 200	$5^2 + 5^2$ or 50	M1	oe
	$\sqrt{\text{their } 200}$ or $10\sqrt{2}$ or [14, 14.2]	$\sqrt{\text{their } 50}$ or $5\sqrt{2}$ or [7, 7.1]	M1dep	oe
	$\tan 68 = \frac{h}{\text{their } 7.1}$		M1dep	
	their 7.1 $\times$ $\tan 68$ or [17.3, 17.6]		M1dep	
	$\frac{1}{3} \times 10 \times 10 \times \text{their } [17.3, 17.6]$		M1dep	
	[576, 587] or 590		A1	
	Additional Guidance			

Question	Answer	Mark	Comments
19	65	B1	
	Alternate segment (theorem)	B1dep	
	Additional Guidance		
	65 alternative segment (theorem)		B1 B0
	65 alternate angles		B1 B0
20	3rd box indicated	B1	
	Additional Guidance		
21	3^8 or 3^9 or y^6 or $2 \times 3^4 \times y^3 \times 2 \times 3^4 \times y^3$ or $3 \times 2 \times 3^4 \times y^3 \times 2 \times 3^4 \times y^3$	M1	78 732 or 19 683
	$2^2 \times 3^8 \times y^6$ or $3 \times 2^2 \times 3^8 \times y^6$ or 2^2 and 3^9 and y^6 or $2^a \times 3^b \times y^c$ with two powers correct	M1dep	$2^2 \times 19\,683y^6$ $78\,732y^6$
	$2^2 \times 3^9 \times y^6$	A1	Must be in index form Do not ignore fw
	Additional Guidance		
	$2^2 \times 3^8 \times y^6$		M1 M1 A0
	$2^2 + 3^9 \times y^6$		M1 M1 A0
	$2^2 + 3^8 + y^6$		M1 M0 A0

Question	Answer	Mark	Comments
19	65	B1	
	Alternate segment (theorem)	B1dep	
	Additional Guidance		
	65 alternative segment (theorem)		B1 B0
	65 alternate angles		B1 B0
20	3rd box indicated	B1	
	Additional Guidance		
21	3^8 or 3^9 or y^6 or $2 \times 3^4 \times y^3 \times 2 \times 3^4 \times y^3$ or $3 \times 2 \times 3^4 \times y^3 \times 2 \times 3^4 \times y^3$	M1	78 732 or 19 683
	$2^2 \times 3^8 \times y^6$ or $3 \times 2^2 \times 3^8 \times y^6$ or 2^2 and 3^9 and y^6 or $2^a \times 3^b \times y^c$ with two powers correct	M1dep	$2^2 \times 19\,683y^6$ $78\,732y^6$
	$2^2 \times 3^9 \times y^6$	A1	Must be in index form Do not ignore fw
	Additional Guidance		
	$2^2 \times 3^8 \times y^6$		M1 M1 A0
	$2^2 + 3^9 \times y^6$		M1 M1 A0
	$2^2 + 3^8 + y^6$		M1 M0 A0

Question	Answer	Mark	Comments
19	65	B1	
	Alternate segment (theorem)	B1dep	
	Additional Guidance		
	65 alternative segment (theorem)		B1 B0
	65 alternate angles		B1 B0
20	3rd box indicated	B1	
	Additional Guidance		
21	3^8 or 3^9 or y^6 or $2 \times 3^4 \times y^3 \times 2 \times 3^4 \times y^3$ or $3 \times 2 \times 3^4 \times y^3 \times 2 \times 3^4 \times y^3$	M1	78 732 or 19 683
	$2^2 \times 3^8 \times y^6$ or $3 \times 2^2 \times 3^8 \times y^6$ or 2^2 and 3^9 and y^6 or $2^a \times 3^b \times y^c$ with two powers correct	M1dep	$2^2 \times 19\,683y^6$ $78\,732y^6$
	$2^2 \times 3^9 \times y^6$	A1	Must be in index form Do not ignore fw
	Additional Guidance		
	$2^2 \times 3^8 \times y^6$		M1 M1 A0
	$2^2 + 3^9 \times y^6$		M1 M1 A0
	$2^2 + 3^8 + y^6$		M1 M0 A0

Question	Answer	Mark	Comments
14(a)	$6 + 5 + 2x + x + 2 = 31$ or $3x + 13 = 31$ or $3x = 18$ or $\frac{5+2x}{31}$ or $\frac{5+2x}{3x+13}$	M1	oe equation $6 + 5 + 2(6) + 6 + 2 = 31$ (embedded answer)
	$(x =) 6$	A1	
	$\frac{17}{31}$ or 0.548... or 0.55 or 54.8...% or 55%	A1ft	ft $\frac{5 + \text{their } 2x}{31}$ and M1 A0 or ft $\frac{23 - \text{their } x}{31}$ and M1 A0
	Additional Guidance		
	$x = 6$, answer $\frac{12}{31}$ or answer $\frac{12}{31}$ alone (implied $x = 6$)		M1A1A0
	$3x = 18$, $x = 5$, answer $\frac{15}{31}$ or $\frac{18}{31}$		M1A0A1ft
14(b)	$\frac{5}{11}$ or 0.45... or 45.(...)%	B1	oe
	Additional Guidance		
15	$2xy$	B1	
	Additional Guidance		
16	36	B1	
	Additional Guidance		

27	Alternative method 1 – completing the square		
	$(x + \frac{1}{2})^2 + \dots$	M1	
	$(x + \frac{1}{2})^2 - (\frac{1}{2})^2 + 1$ or $(x + \frac{1}{2})^2 - \frac{1}{4} + 1$ or $(x + \frac{1}{2})^2 + \frac{3}{4}$	A1	oe
	$(x + \frac{1}{2})^2 \geq 0$ and $\frac{3}{4} > 0$ and always positive	A1	oe
	Alternative method 2 – real roots		
	$\frac{-1 \pm \sqrt{1^2 - 4 \times 1 \times 1}}{2 \times 1}$ or a correct sketch showing a quadratic curve with turning point above the x -axis	M1	oe
	States no values on x -axis	A1	oe
	States no values on x -axis and (minimum value $\Rightarrow$) $\frac{3}{4}$	A1	oe
	Alternative method 3 – Calculus		
	$2x + 1 = 0$	M1	
27 cont	$x = -\frac{1}{2}$	A1	
	(minimum value $\Rightarrow$) $\frac{3}{4}$	A1	
Alternative method 4 – Explanation method			
27 cont	If $x \geq 0$, $x^2 \geq 0$ and $x \geq 0$ ($1 > 0$) so $x^2 + x + 1 > 0$ and If $-1 < x < 0$ $x^2 > 0$ and $x + 1 > 0$ so $x^2 + x + 1 > 0$ and If $x \leq -1$ $x^2 > x$ and $x^2 + x > 0$ so $x^2 + x + 1 > 0$	B3	Accept $x > 0$ for $x \geq 0$ B2 for two correct statements B1 for one correct statement

	M0A0A0	
	Additional Guidance	
	Calculating pairs of coordinates alone	M0A0A0

Question	Answer	Mark	Comments
14	y is directly proportional to $\frac{1}{x}$	B1	
	Additional Guidance		
15(a)	8	B1	
	Additional Guidance		
15(b)	3	B1	Accept -3
	Additional Guidance		

Question	Answer	Mark	Comments
7(a)	5.5 in the correct position	B1	oe
	6.5 in the correct position	B1	oe
	Additional Guidance		
	5.50 or $5\frac{1}{2}$ or $\frac{11}{2}$		B1
	6.50 or $6\frac{1}{2}$ or $\frac{13}{2}$		B1
7(b)	One correctly evaluated trial using (6, 6.5] + (4, 4.5) or (6, 6.5) + (4, 4.5] or two values in the ranges given that work if correctly evaluated	M1	eg $6.3 + 4.1 = 10.4$ eg 6.4, 4.2
	One correctly evaluated trial using (6, 6.5) + (4, 4.5) with an answer that rounds to 11	A1	eg $6.4 + 4.2 = 10.6$ Ignore fw
	Additional Guidance		
	$6.4 + 4.4 = 10.8 (= 11)$ do not need to show 11		M1A1
	$6.4999 + 4.4999 = 10.9998$		M1A1
	$6.5 + 4.4 = 10.9$		M1A0
	$4.5 + 6.2 = 10.7$		M1A0
	$6 + 4 = 10$		M0
	$6.5 + 4.5 = 11$		M0
	$6.4\dot{9} + 4.4\dot{9} = 11$		M0
8(a)	Could be true	B1	
	Additional Guidance		
8(b)	Must be true	B1	
	Additional Guidance		

Question	Answer	Mark	Comments
1	$\begin{pmatrix} -5 \\ -3 \end{pmatrix}$	B1	
	Additional Guidance		
2	1	B1	
	Additional Guidance		
3	$w = \frac{y}{2x}$	B1	
	Additional Guidance		
4	210°	B1	
	Additional Guidance		

Q	Answer	Mark	Comments
17	Alternative method 1 – multiplies through by 10 or common denominator of 10		
	$5(x + 8) + 2(9 - x)$ or $5x + 40 + 18 - 2x$	M1	oe numerator on the left-hand side if written as a fraction allow one error or omission in the expansion if brackets not seen eg $5x + 18 - 2x$
	$3x + 58$	A1	may be implied by eg $3x + 18 = 0$ or $3x = -18$
	their $(3x + 58) = 4 \times (\text{their } 10)$ or their $(3x + 58) = 40$ or $3x + 18 = 0$ or $3x = -18$	M1	oe allow an unsimplified expression for their $(3x + 58)$ equation may be implied by answer
	-6	A1ft	ft M1A0M1
	Alternative method 2 – collects terms with fractions		
	$\frac{x}{2} + 4 + \frac{9}{5} - \frac{x}{5}$	M1	oe eg $0.5x + 4 + 1.8 - 0.2x$ allow one error
	$\frac{3}{10}x + \frac{29}{5}$	A1	oe eg $0.3x + 5.8$
	$\frac{3}{10}x = \frac{20}{5} - \frac{29}{5}$ or $\frac{3}{10}x = -\frac{9}{5}$	M1	oe eg $0.3x = -1.8$ terms must be collected
	-6	A1ft	ft M1A0M1

Additional Guidance is on the next page

17 cont	Additional Guidance	
	Accept decimal answers for follow through correct to 1 dp or better	
	Apply the principles of alt 1 for any use of other common denominators eg common denominator of 20 (or multiplication through by 20) $10(x + 8) + 4(9 - x) = 6x + 116$ $6x + 116 = 80 \quad x = -6$	M1A1 M1A1
	An incorrect simplification of $5x + 40 + 18 - 2x$ may still gain the third and fourth marks eg $5x + 40 + 18 - 2x = 3x + 68$ followed by $3x + 68 = 40$ and $x = -\frac{28}{3}$ eg $5x + 40 + 18 - 2x = 2x + 68$ followed by $2x + 68 = 40$ and $x = -14$	M1A0M1 A1ft M1A0M1 A1ft
	An incorrect denominator may still gain the third and fourth marks $\frac{5x + 40 + 18 - 2x}{7}$ followed by $5x + 40 + 18 - 2x = 28$ and $x = -10$	M1A0M1 A1ft
	Denominator not processed	

Denominator not processed	
$3x + 58 = 4$ followed by $3x = -54$ and $x = -18$	M1A1M0A0
$(x + 8) + (9 - x) = 40$	M0A0M1A0
Two errors in the expansion but with brackets seen may go on to get the third and fourth marks $5(x + 8) + 2(9 - x) = 5x + 8 + 18 - x$	1st M1A0
Two errors in the expansion and no brackets seen, no follow through allowed $5x + 8 + 18 - x$ followed by $4x + 26 = 40$ and $x = \frac{14}{4}$	M0A0M1A0