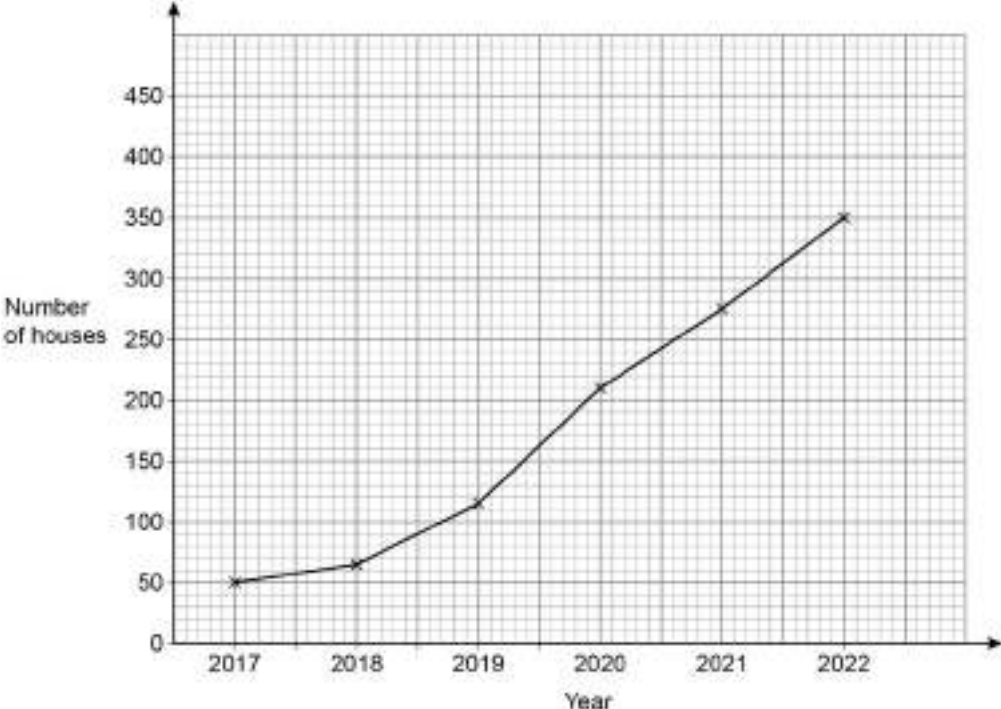
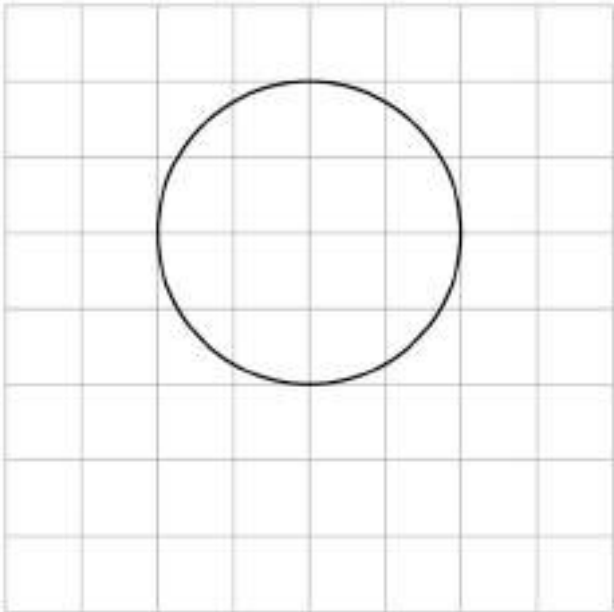
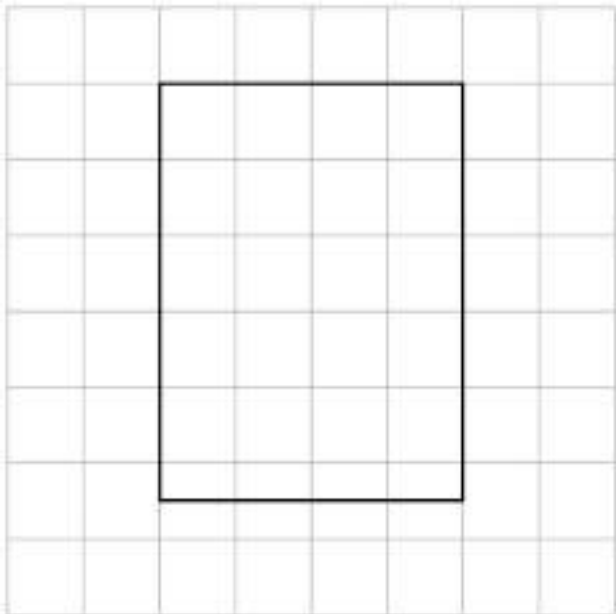


Q	Answer	Mark	Comments
1	0.3	B2	B1 $\frac{3}{10}$ or $\frac{1}{10/3}$ or $\left(\frac{10}{3}\right)^{-1}$ or $\frac{1}{3.33...}$ or $-0.3$
	<b>Additional Guidance</b>		
	$-\frac{3}{10}$		B0

Q	Answer	Mark	Comments
2(a)	Plots at least 2 points correctly	M1	$\pm \frac{1}{2}$ square
	Fully correct with all points joined by single straight lines	A1	$\pm \frac{1}{2}$ square
	Additional Guidance		
	Mark intention		
	Ignore other points plotted and any lines of best fit		
	Points may be implied by the position of the line		
			M1A1

Q	Answer	Mark	Comments
2(b)	[360, 500]	B1	
	<b>Additional Guidance</b>		
	An interval given entirely in range eg 425 – 440		B1
	An interval given not entirely in range eg 340 – 430		B0

Q	Answer	Mark	Comments
3(a)	Circle with diameter 4 cm	B2	diameter $\pm 5$ mm B1 for any circle or $40 \div 10$ or 4 or (radius =) 2
	<b>Additional Guidance</b>		
	 <p>Can be anywhere on the grid</p>		B2
	Mark intention		
	Check stem and part (b) for evidence of 4 or 2		
	4 or 2 cannot be implied from a diagram for B1		

Q	Answer	Mark	Comments
3(b)	Rectangle with horizontal sides 4 cm and vertical sides 5.5 cm	B2	$\pm 2$ mm B1 for any rectangle or $40 \div 10$ or 4 <b>and</b> $55 \div 10$ or 5.5 SC2 for correct answers in (a) and (b) reversed (award 0 in (a) and 2 in (b))
	<b>Additional Guidance</b>		
	 <p>Can be anywhere on the grid</p>		B2
	Mark intention		
	Do not accept curved corners on any rectangle		
	Check stem and part (a) for evidence of 4 and 5.5		
	4 and 5.5 cannot be implied from a diagram for B1		

Q	Answer	Mark	Comments
4	<b>Alternative method 1: Compares lower bound with cost of 6 drinks</b>		
	$12 - 0.5(0)$ or $11.5(0)$	M1	oe eg $1200 - 50$ allow mixed units eg $12 - 50$
	$1.89 \times 6$ or $11.34$	M1	oe eg $189 \times 6$
	$11.5(0)$ and $11.34$	A1	oe eg 1150 and 1134 units must be consistent
	<b>Alternative method 2: Compares rounded cost of drinks with 12</b>		
	$1.89 \times 6$ or $11.34$	M1	oe eg $189 \times 6$
	11.34 rounds to 11	M1dep	oe eg $11.34 \rightarrow 11$
	11.34 rounds to 11 and 11 is less than 12	A1	oe units must be consistent
	<b>Alternative method 3: Uses lower bound to work out cost or number of drinks</b>		
	$12 - 0.5(0)$ or $11.5(0)$	M1	oe eg $1200 - 50$ allow mixed units eg $12 - 50$
	their $11.5(0) \div 6$ or $[1.91, 1.92]$ or their $11.5(0) \div 1.89$ or $[6.08, 6.1]$	M1	oe eg $1150 \div 6$ or $[191, 192]$ their $11.5(0)$ must be $[11, 11.99]$
	$11.5(0) \div 6$ and $[1.91, 1.92]$ or $11.5(0) \div 1.89$ and $[6.08, 6.1]$	A1	oe eg $1150 \div 6$ and $[191, 192]$ units must be consistent
	<b>Additional Guidance</b>		
	Ignore any use of upper bound		
	Condone inconsistent notation eg 11.50 and £11.34p		M1M1A1
	11.34 rounds to 11 not 12 so she will have enough		M1M1A1
	11.34 rounds to 11 so she will have enough		M1M1A0

Q	Answer	Mark	Comments
5	$2m + 4$ or $2 \times m + 4$	B2	oe B1 $2m$ or $m^2$ or $200m + 400$ or $km + 4$ with $k$ an integer, $k \neq 0$ or $2$
	<b>Additional Guidance</b>		
	Ignore any attempt to substitute a value for $m$ after $2m$ seen for B1		
	Condone $m^2 + 4$ (not testing simplification)		B2
	Accept use of another letter for $m$ other than $c$ eg1 $2x + 4$ eg2 $2c + 4$		B2 B0
	Condone inclusion of £ sign for B1 eg1 $£2m + 4$ eg2 $£2m$		B1 B1

Q	Answer	Mark	Comments
6	<b>Alternative method 1: Cost of six shirts</b>		
	$19(.00) \times 3$ or $57(.00)$	M1	oe shop A
	$12.4(0) \times 0.25$ or $3.1(0)$ or $1 - 0.25$ or $0.75$	M1	oe shop B implied by $9.3(0)$
	$(12.4(0) - \text{their } 3.1(0)) \times 6$ or $12.4(0) \times \text{their } 0.75 \times 6$ or $9.3(0) \times 6$ or $55.8(0)$	M1dep	oe shop B dep on 2nd M
	$37.4(0) \times 1.5$ or $56.1(0)$	M1	oe shop C
	B and $57(.00)$ and $55.8(0)$ and $56.1(0)$	A1	
	<b>Alternative method 2: Cost per shirt</b>		
	$19(.00) \div 2$ or $9.5(0)$	M1	oe shop A
	$12.4(0) \times 0.25$ or $3.1(0)$ or $1 - 0.25$ or $0.75$	M1	oe shop B implied by $9.3(0)$
	$12.4(0) - \text{their } 3.1(0)$ or $12.4(0) \times \text{their } 0.75$ or $9.3(0)$	M1dep	oe shop B dep on 2nd M
	$37.4(0) \times 1.5 \div 6$ or $9.35$	M1	oe shop C
	B and $9.5(0)$ and $9.3(0)$ and $9.35$	A1	

**Additional Guidance is on the next page**

6 cont	Additional Guidance																							
	Use the scheme which favours the student																							
	Comparable costs for different quantities of shirts																							
	<table><tr><td>Shop</td><td>Cost of 1</td><td>Cost of 2</td><td>Cost of 3</td><td>Cost of 6</td></tr><tr><td>A</td><td>9.5(0)</td><td>19(.00)</td><td>28.5(0)</td><td>57(.00)</td></tr><tr><td>B</td><td>9.3(0)</td><td>18.6(0)</td><td>27.9(0)</td><td>55.8(0)</td></tr><tr><td>C</td><td>9.35</td><td>18.7(0)</td><td>28.05</td><td>56.1(0)</td></tr></table>	Shop	Cost of 1	Cost of 2	Cost of 3	Cost of 6	A	9.5(0)	19(.00)	28.5(0)	57(.00)	B	9.3(0)	18.6(0)	27.9(0)	55.8(0)	C	9.35	18.7(0)	28.05	56.1(0)			
Shop	Cost of 1	Cost of 2	Cost of 3	Cost of 6																				
A	9.5(0)	19(.00)	28.5(0)	57(.00)																				
B	9.3(0)	18.6(0)	27.9(0)	55.8(0)																				
C	9.35	18.7(0)	28.05	56.1(0)																				

Q	Answer	Mark	Comments
7(a)	$912 \div 15.2$ or 60	M1	oe implied by 62
	$912 \div (\text{their } 60 + 2)$ or $912 \div 62$ or [14.7, 14.71]	M1dep	oe
	[14.7, 14.71] : 1 or 15 : 1 with M2 awarded	A1	oe eg $\frac{456}{31} : 1$
	Additional Guidance		
	M1 may be awarded for correct work, with no answer or incorrect answer, even if this is seen amongst multiple attempts		
	Do not allow misreads for 15.2		



Q	Answer	Mark	Comments
7(b)	Valid explanation	B1	eg she needs to round up
	<b>Additional Guidance</b>		
	She rounded down		B1
	Needs 8 (teachers)		B1
	Need (one) more		B1
	Only 70 students could go		B1
	2 students do not have a teacher		B1
	There are students without a teacher		B1
	Have groups of 8 with 9 teachers		B0
	8		B0
	Cannot have 0.2 of a teacher		B0

Q	Answer	Mark	Comments
8	$(-2, -2)$ and $(-2, 4)$ and $(4, 4)$	B4	B3 for 2 correct coordinates or the 3 correct lines drawn B2 for 1 correct coordinate or 2 correct lines drawn B1 for 1 correct line drawn
	<b>Additional Guidance</b>		
	Mark coordinates first		
	Ignore incorrect lines		

Q	Answer	Mark	Comments	
9	Two numbers which are 1 more than a multiple of 12 eg 13, 25, 37, 49, 61 ...	B2	B1 at least one number which is 1 more than a multiple of 12 with at most one other number  or  lists  (3, 5, 7, 9 ...and)  4, 7, 10, 13 ...  and 5, 9, 13, 17 ...	
	Additional Guidance			
	If the answer line is blank:  award B2 if two or more correct numbers and no incorrect numbers are clearly chosen  award B1 if one or more correct number(s) and one incorrect number are clearly chosen			

Q	Answer	Mark	Comments
10	At least one of 20, 15 and 12	M1	may be seen in table or implied by correct point or curve passing through the correct point
	Points plotted at (1, 60), (2, 30), (3, their 20), (4, their 15), (5, their 12) and (6, 10)	M1	$\pm \frac{1}{2}$ square implied by curve through these six points
	Single smooth curve through the correct points	A1	
	<b>Additional Guidance</b>		
	Ignore curve before $x = 1$ and after $x = 6$ if it is decreasing and does not touch either axis		
	Curve touches at least one axis		A0

Q	Answer	Mark	Comments
11	$4t(3 + t^2)$	B2	B1 $4(3t + t^3)$ or $2t(6 + 2t^2)$ or $2(6t + 2t^3)$ or $t(12 + 4t^2)$
	<b>Additional Guidance</b>		
	Ignore any “solutions” seen		
	Ignore any attempts to complete the square with the final answer		
	Condone $4t \times (3 + t^2)$		B2
	Condone $4t(3 + 1t^2)$		B2
	Condone $4 \times (3t + t^3)$		B1
	$(4t + 0)(3 + t^2)$		B1
	Do not ignore further incorrect algebraic simplification for B2		

Q	Answer	Mark	Comments
12	Multiplication by 1.01 or multiplication by 0.988	M1	oe eg multiplication by 0.01 followed by addition implied by 67 872 000 or multiplication by 0.012 followed by subtraction implied by 66 393 600
	$67\,200\,000 \times 1.01^6$ or $71\,334\,154(.1\dots)$ or $67\,200\,000 \times 0.988^2$ or $65\,596\,876(.8)$ or $65\,596\,877$ or $67\,200\,000 \times 1.01^6 \times 0.988^2$	M1dep	oe
	69 632 406(.5....) or 69 632 407	A1	
	69 600 000 or 69.6 million or $6.96 \times 10^7$ or $69.6 \times 10^6$	B1ft	ft any answer with >3sf correctly rounded to 3sf
	<b>Additional Guidance</b>		
	$67\,200\,000 \times 1.01 \times 6 \times 0.988 \times 2 = 804\,690\,432$ Answer 805 000 000		M1M0A0 B1ft

Q	Answer	Mark	Comments
13	<b>Alternative method 1</b>		
	$4 \times 3 (\div 2)$ or $12 (\div 2)$ or 6 or correct list of all possible combinations or all possible qualifying combinations $(5,10)$ $(5,20)$ $5,50$ $(10,5)$ $10,20$ $10,50$ $(20,5)$ $20,10$ $20,50$ $50,5$ $50,10$ $50,20$ or $(5,10)$ $(5,20)$ $5,50$ $10,20$ $10,50$ $20,50$	M1	number of possible combinations  may be implied by the correct total for each combination
	$\frac{4}{6}$ or $\frac{8}{12}$	A1	oe fraction, decimal or percentage with M1 awarded
	<b>Alternative method 2</b>		
	$\frac{1}{4} \times \frac{1}{3}$ or $\frac{1}{12}$ and $\frac{1}{4} \times \frac{2}{3} (\times 2)$ or $\frac{2}{12} (\times 2)$ or $\frac{4}{12}$ and $\frac{1}{4} (\times 1)$ or $\frac{3}{12}$	M1	picking £5 first  picking £10 first or £20 first  picking £50 first oe probabilities
	$\frac{4}{6}$ or $\frac{8}{12}$	A1	oe fraction, decimal or percentage with M1 awarded
	<b>Additional Guidance</b>		
	Decimals or percentages should be rounded or truncated to 2dp or better		
	In Alt 1, combinations may be seen in a grid, table or other diagram		
	In Alt 1, do not accept repeat combinations or incorrect combinations for M1		

Q	Answer	Mark	Comments
14(a)	0.85 (Pass) and 0.15 (Fail) for Section A	B1	oe fractions, decimals or percentages
	0.22 (Fail) on top branch for Section B and 0.64 (Pass) and 0.36 (Fail) on bottom branches for Section B	B1	oe fractions, decimals or percentages

Q	Answer	Mark	Comments
14(b)	<b>Alternative method 1</b>		
	their $0.85 \times 0.78$ or 0.663 or their $0.85 \times 0.22$ or 0.187 or their $0.15 \times 0.64$ or 0.096 or their $0.15 \times 0.36$ or 0.054	M1	oe ft their tree diagram provided all probabilities are $> 0$ and $< 1$
	1 – their 0.663 or their $0.187 + 0.096 + 0.054$ or their $0.187 + 0.15$ or 0.337	M1dep	oe their 0.663, their 0.187, their 0.096 and their 0.054 must be from correct methods
	their $0.337 \times 0.4$ or 0.1348 or their $0.337 \times 5000$ or 1685	M1dep	oe fraction, decimal or percentage dep on M2
	674	A1ft	ft their tree diagram provided all probabilities are $> 0$ and $< 1$

Mark scheme continues on the next page

Q	Answer	Mark	Comments
<b>14(b) cont</b>	<b>Alternative method 2</b>		
	their $0.85 \times \text{their } 0.78 \times 5000$ or 3315 or their $0.85 \times \text{their } 0.22 \times 5000$ or 935 or their $0.15 \times \text{their } 0.64 \times 5000$ or 480 or their $0.15 \times \text{their } 0.36 \times 5000$ or 270 or their $0.15 \times 5000$ or 750	M2	M1 their $0.85 \times 5000$ or 4250  implied by 374  implied by 192  implied by 108  ft their tree diagram provided all probabilities are $> 0$ and $< 1$
	5000 – their 3315 or their 935 + their 480 + their 270 or their 935 + their 750 or 1685 or 374 and 192 and 108	M1dep	dep on M2
	674	A1ft	ft their tree diagram provided all probabilities are $> 0$ and $< 1$
	<b>Additional Guidance</b>		
	Working for part (b) may be seen in part (a)		

Q	Answer	Mark	Comments
15	All 3 correct matches	B3	B1 for each correct match
	<b>Additional Guidance</b>		
	<div> <div>Equation</div> <div>What happens when the value of <math>x</math> is doubled</div> <div> <div> <math>y = \frac{1}{x^2}</math> </div> <div> <math>y = 8x</math> </div> <div> <math>y = \frac{10}{x}</math> </div> <div> <math>y = 3x^2</math> </div> </div> <div> <div>The value of <math>y</math> is doubled</div> <div>The value of <math>y</math> is divided by 4</div> <div>It is not possible to say what happens to the value of <math>y</math></div> <div>The value of <math>y</math> is multiplied by 4</div> <div>The value of <math>y</math> is halved</div> </div> </div>		B3
	Equation matched to more than one statement is choice for that equation		



Q	Answer	Mark	Comments
16	$y^2 = \frac{x}{2} + 1$	M1	
	$y^2 - 1 = \frac{x}{2}$ or $1 - y^2 = -\frac{x}{2}$ or $2y^2 = x + 2$ or $2y^2 - 2$ or $2(y^2 - 1)$	M1dep	
	$x = 2y^2 - 2$ or $x = 2(y^2 - 1)$	A1	
	<b>Additional Guidance</b>		
	$x = 2y^2 - 2$ in working with $2y^2 - 2$ on answer line		M1M1A1

Q	Answer	Mark	Comments
17	<b>Alternative method 1</b>		
	$d \propto t^2$ or $d = kt^2$ or $20 = k \times 2^2$ or $k = 20 \div 4$	M1	oe equation
	$d = 5t^2$ or $k = 5$	M1dep	oe equation
	$(t =) \sqrt{300 \div \text{their } 5}$ or $(t =) \sqrt{60}$	M1dep	oe eg $(t =) 2\sqrt{15}$ dep on M2
	[7.7, 7.75]	A1	
	<b>Alternative method 2</b>		
	$d \propto t^2$ or $kd = t^2$ or $k \times 20 = 2^2$ or $k = 4 \div 20$	M1	oe equation
	$0.2d = t^2$ or $k = 0.2$	M1dep	oe equation
	$(t =) \sqrt{\text{their } 0.2 \times 300}$ or $(t =) \sqrt{60}$	M1dep	oe eg $(t =) 2\sqrt{15}$ dep on M2
	[7.7, 7.75]	A1	
	<b>Additional Guidance</b>		
	Allow consistent use of other letters		
	$d \propto kt^2$ is M0 unless recovered		

Q	Answer	Mark	Comments
18	$6 \div 5$ or 1.2 or $15 \div 10$ or 1.5 or $9 \div 10$ or 0.9 or $10 \div 25$ or 0.4	M1	one correct frequency density  implied by a correct bar
	At least 3 of 1.2 and 1.5 and 0.9 and 0.4	M1dep	
	At least 3 correct bars with correct linear scale on the vertical axis	M1dep	dep on M2
	Fully correct histogram with linear scale on the vertical axis	A1	

Q	Answer	Mark	Comments
19	$\frac{x}{\sin 35} = \frac{54}{\sin 117}$	M1	oe equation accept [0.57, 0.574] for sin 35 accept [0.89, 0.8911] for sin 117
	$(x =) \frac{54 \sin 35}{\sin 117}$	M1dep	oe accept [0.57, 0.574] for sin 35 accept [0.89, 0.8911] for sin 117
	[34.5, 34.83] and correct sine rule equation seen	A1	accept 35 with M2 awarded

Q	Answer	Mark	Comments
20	$(3x + 5)(x + 6)$	B2	B1 $(3x + a)(x + b)$ where $a + 3b = 23$ or $ab = 30$
	<b>Additional Guidance</b>		
	B1 may be awarded for correct work, with no answer or incorrect answer, even if this is seen amongst multiple attempts		
	Condone missing final bracket for B2 or B1		
	Ignore any attempt to 'solve' eg $(3x + 5)(x + 6)$ in working lines with $-\frac{5}{3}$ and $-6$ on answer line		B2
	Allow use of fractions or decimals for B1 eg $(3x + 2.5)(x + 12)$		B1

Q	Answer	Mark	Comments
21	$\frac{9}{24}$ or $\frac{5}{24}$	M1	oe eg 0.375 or 0.208(3...) may be seen on a diagram or embedded in a calculation
	$\frac{9}{24} \times \frac{5}{23} (\times 2)$ or $\frac{5}{24} \times \frac{9}{23} (\times 2)$ or $\frac{45}{552} (\times 2)$	M1dep	oe eg $\frac{15}{184} (\times 2)$ or 0.08(15...) ( $\times 2$ )
	$\frac{90}{552}$ or $\frac{15}{92}$ or 0.163(0...)	A1	oe fraction, decimal or percentage accept 0.16 with M2 awarded
	<b>Additional Guidance</b>		
	Ignore incorrect conversion if correct answer seen		
	A correct embedded value seen eg $\frac{11}{25} \times \frac{9}{24} \times \frac{5}{23}$ or $\frac{11}{25} \times \frac{5}{24} \times \frac{9}{23}$		M1M0A0
	$\frac{9}{24} \times \frac{5}{23} \times \frac{5}{24} \times \frac{9}{23}$		M1M0A0

Q	Answer	Mark	Comments
22	$4320 \div 3.6(0)$ or 1200 or $17.3 \times 3.6(0)$ or 62.28	M1	oe cost per cubic centimetre
	their $1200 \div 17.3$ or $4320 \div$ their 62.28 or $69.3(6....)$ or 69.4	M1dep	mass $\div$ density total cost $\div$ cost per cubic centimetre
	$(r^3 =)$ their $69.3 \times \frac{3}{4} \div \pi$ or [16.5, 16.6]	M1dep	oe dep on M2
	[2.5, 2.55]	A1	

Q	Answer	Mark	Comments
23	Constructs any equation using coordinates	M1	eg $3 = a \times b^0$ or $3 = a \times 1$ $6 = a \times b^1$ $12 = a \times b^2$ $24 = a \times b^3$ $48 = a \times b^4$
	$a = 3$ and $b = 2$	A2	A1 $a = 3$
	<b>Additional Guidance</b>		
	M1 may be awarded for correct work, with no answer or incorrect answer, even if this is seen amongst multiple attempts		
	$a = 3$ with no working		M1A1
	$b = 2$ with no working and $a \neq 3$		M0A0

Q	Answer	Mark	Comments
24	<b>Alternative method 1</b>		
	$x^2 + 4x - 4 = 3x - 2$	M1	
	$x^2 + x - 2 (= 0)$	A1	
	$(x + 2)(x - 1) (= 0)$ or $(x =) \frac{-1 \pm \sqrt{1^2 - 4 \times 1 \times -2}}{2 \times 1}$ or $(x + 0.5)^2 - 2.25 (= 0)$	M1	oe correct for their 3-term quadratic in the form $ax^2 + bx + c (= 0)$ if the quadratic formula is used with + and – separately, both must be seen correctly for this mark
	$(x =) -2$ and $(x =) 1$	A1	
	$(-2, -8)$ and $(1, 1)$	A1	SC1 for 1 correct coordinate
	<b>Alternative method 2</b>		
	$y = \left(\frac{y+2}{3}\right)^2 + 4\left(\frac{y+2}{3}\right) - 4$	M1	
	$y^2 + 7y - 8 (= 0)$	A1	
	$(y + 8)(y - 1) (= 0)$ or $(y =) \frac{-7 \pm \sqrt{7^2 - 4 \times 1 \times -8}}{2 \times 1}$ or $(y + 3.5)^2 - 20.25 (= 0)$	M1	oe correct for their 3-term quadratic in the form $ay^2 + by + c (= 0)$ if the quadratic formula is used with + and – separately, both must be seen correctly for this mark
	$(y =) -8$ and $(y =) 1$	A1	
	$(-2, -8)$ and $(1, 1)$	A1	SC1 for 1 correct coordinate
	<b>Additional Guidance</b>		
	Trial and improvement may be awarded SC1 for one correct coordinate or full marks if both coordinates are correct		