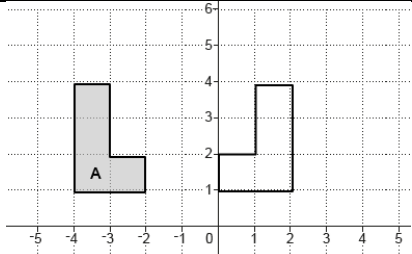
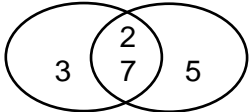
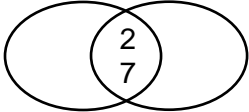


Question		Answer	Marks	Part marks and guidance	
1	(a)	Translation $\begin{pmatrix} 5 \\ -6 \end{pmatrix}$	1 1		Marks spoilt if extra transformations Do not accept coordinates, with a fraction bar or in words
	(b)		2	B1 for correct orientation but wrong location or for correct reflection but in $y = -1$	
2		12	3	B2 for 8 [batches] or M1 for at least 2 ratios or pairs equivalent to 3:5 or $16 \div (5 - 3)$	e.g. 8×1.5 Allow decimals e.g. 1:1.6 to 1.7 or 0.6:1 6:10, 9:15, 12:20, 15:25, 18:30, 21:35, 24:40, 27:45, ... Does not need to contain ratio symbol
3		276 000	2	M1 for $23\,000 \times 12$ oe If 0 scored, SC1 for 299 000 as final answer	
4	(a)	$0.3 + 0.75 [= 1.05]$ is greater than 1	1		Condone additional statements that do not contradict See appendix Condone 100% for 1

Question		Answer	Marks	Part marks and guidance	
	(b)	Correct tree diagram	3	<p>B1 for $P(\text{draw}) = 0.15$</p> <p>B1 for two correctly placed sets of three branches with win/draw/lose labels</p> <p>B1 for 0.3, <i>their</i> 0.15 and 0.55 correctly placed on all branches</p>	<p>May be on diagram or in a calculation e.g. $0.3 + 0.55 + 0.15 = 1$ oe</p> <p>Ignore probabilities Accept e.g. W/D/L as labels</p> <p>Condone omission of <i>their</i> 0.15 on printed branches</p>
	(c)	[0].165 oe	2	M1 for $[0].3 \times [0].55$	oe may be $\frac{33}{200}$ or equivalent fraction or 16.5%
5	(a)	$4.36[35] \times 10^9$ or 4.364×10^9 or 4.4×10^9	3	<p>B2 for 4 363 500 000 or 4 400 000 000 oe</p> <p>or</p> <p>M1 for 29.09 \times figs 15 soi by figs 436</p>	oe is other correct answers not in standard form eg 43.635×10^8
	(b)	0.52[2...]	2	M1 for $78\,340\,000 \div$ figs 15 soi by figs 52	
6	(a)	Positive	1		Ignore comments about strength but not that contradict e.g strong positive decrease
	(b) (i)	Clear indication of the point at (27, 25)	1		
	(ii)	Hot day [with] few visitors or Outlier	1		See Appendix

Question		Answer	Marks	Part marks and guidance	
	(c)	Ruled line of best fit 52 to 78	B1 B1		Overlay is a guide only; <i>their</i> line must be between or through (15, 40) to (17.5, 40) and (22.5, 80) to (25, 80) If more than one line, mark the worst unless one clearly chosen e.g. vertical line from 21 to the line $\frac{1}{2}$ square tolerance
7	(a)	Method must include dimensions (accept 6^2 for 6×6 and 6^3 for $6 \times 6 \times 6$ and 12^2 for 12×12) $4 \times (6 \times 12) + 2 \times (12 \times 12)$ or $4 \times 2 \times (6 \times 6) + 2 \times 4 \times (6 \times 6)$ or $8 \times (6 \times 6) + 8 \times (6 \times 6)$ or $4 \times 6 \times (6 \times 6) - 8 \times (6 \times 6)$ or $24 \times (6 \times 6) - 8 \times (6 \times 6)$ or $16 \times (6 \times 6)$ [=576]	2	M1 for full method for surface area $4 \times 72 + 2 \times 144$ or $4 \times 2 \times 36 + 2 \times 4 \times 36$ or $8 \times 36 + 8 \times 36$ or $24 \times 36 - 8 \times 36$ oe or 16×36	Brackets do not need to be shown 0 for $288 + 288$ $864 - 288$ $4 \times 6 \times 4 \times 6$ 24×24

Question		Answer	Marks	Part marks and guidance	
	(b)	12.5 nfww	4	<p>M2 for $(2 \times 6 \times 6) + (4 \times 6 \times 24)$ oe or M1 for calculating the surface area of one or more faces of the cuboid</p> <p>AND</p> <p>M1 for $\frac{\text{their } 648}{576} [\times 100]$ oe or $\frac{(\text{their } 648) - 576}{576} [\times 100]$ oe</p> <p><u>Alternative method</u> M2 for 16 and 18 [exposed faces] or M1 for 16 or 18 [exposed faces]</p> <p>AND</p> <p>M1 for $\frac{\text{their } 18}{\text{their } 16} [\times 100]$ or $\frac{\text{their } 18 - \text{their } 16}{\text{their } 16} [\times 100]$</p>	<p>soi by $72 + 576$ or 648</p> <p>e.g. 6×6 soi by 36 6×24 soi by 144</p> <p><i>Their</i> 648 from attempt at surface area involving $6 \times (6 \text{ or } 24)$ soi by 1.125 or 112.5</p> <p>soi by 0.125 oe may be $\frac{72}{576} [\times 100]$</p> <p>soi by 1.125 or 112.5</p> <p>soi by 0.125</p>
8		57.5	4	<p>M2 for $\frac{7 \times 25}{10}$ oe soi by 17.5 or M1 for $25 \div 10$ or $10 \div 25$ or $7 \div 10$ or $10 \div 7$</p> <p>AND</p> <p>M1 for $15 + 25 + \text{their } 17.5$</p>	<p>Evidence may be seen on diagram</p> <p>Implied by 2.5 or 0.4 or 0.7 or 1.4...</p> <p><i>their</i> 17.5 from <i>their</i> valid attempt using scale factors to find AB</p>

Question	Answer	Marks	Part marks and guidance
9	7 nfw	3	<p>M2 for $6k + 3 [= 45]$</p> <p>or</p> <p>M1 for $6k$ or 2^3 soi</p> <p><u>Alternative method:</u></p> <p>M2 for $2^k = \sqrt[6]{2^{42}}$ or $2^k = 128$</p> <p>or</p> <p>M1 for $(2^k)^6 =$ any of the below $\frac{2^{45}}{2^3}$, 2^{42}, $4.398... \times 10^{12}$, $4.4[0] \times 10^{12}$</p> <p>Could be implied by manipulation of powers followed by $\div 6$</p> <p>Accept $\frac{2^{45}}{2^3}$, $4.398... \times 10^{12}$ or $4.4[0] \times 10^{12}$ in place of 2^{42}</p> <p>Do not accept $(2^k)^6 = \frac{2^{45}}{8}$</p>
10	42 and 70	3	<p>M2 for</p>  <p>or</p> <p>M1 for</p>  <p>or for 2 with 7 and 2 with 3, 5, 7</p> <p><u>Alternative method:</u></p> <p>M1 for at least four correct multiples of 14 apart from 14</p> <p>M1 for at least four correct factor pairs of 210 apart from 1 & 210</p> <p>For M2 or M1 allow 14 for 2 and 7 in the overlap</p> <p>As lists, products or factor trees etc</p> <p>Ignore errors when counting four correct 28, <u>42</u>, 56, <u>70</u>, 84, 98, ...</p> <p>2 & 105, 3 & <u>70</u>, 4 & 55, 5 & <u>42</u>, 6 & 35, 7 & 30, 10 & 21, 14 & 15</p>

Question		Answer	Marks	Part marks and guidance	
11		$2(3x - 1)(5x + 2)$	3	<p>B2 for $(6x - 2)(5x + 2)$ as final answer or for $(3x - 1)(10x + 4)$ as final answer or for $(3x - 1)(5x + 2)$ as final answer or</p> <p>M1 for two brackets which give two correct terms for $30x^2 + 2x - 4$ or for $15x^2 + x - 2$</p>	
12	(a)	0	1		

Question		Answer	Marks	Part marks and guidance	
	(b)	12.37[5] or 12.38 or 12.4 all oe and with correct working	5	<p>M3 for $\frac{(15+40) \times 18}{2}$</p> <p>or</p> <p>M2 for attempt at total area with one reading or one calculation error</p> <p>or</p> <p>M1 for one area calculation</p> <p>AND</p> <p>M1dep for <i>their</i> $495 \div 40$</p> <p>If 0 or 1 scored, instead award SC2 for answer 12.37[5] or 12.38 or 12.4 all oe with no working or insufficient working</p> <p>If 0 scored SC1 for 495 with no working or insufficient working</p>	<p>“Correct working” requires evidence of at least M3</p> <p>Areas may be found in stages e.g. M3 for $(\frac{1}{2} \times 10 \times 18) + (15 \times 18) + (\frac{1}{2} \times 15 \times 18)$ implied by $90 + 270 + 135$</p> <p>e.g. use of 16 rather than 18 throughout is one error but both triangles incorrect is two errors</p> <p>e.g. one of the above soi by 90, 270 or 135</p> <p>Dep on at least M1</p>
13	(a)	$\frac{10}{3}$ oe	3	<p>M2 for $6t - 2 = 18$ oe</p> <p>or</p> <p>M1 for $6t - 2$ or $18 + 2$ or 20</p>	<p>3.33[3...] or unsimplified, e.g. $20/6$</p> <p>e.g. $6 = 20/t$</p>
	(b)	[x =] $4(y - 3)$ oe	2	<p>M1 for $y = \frac{x}{4} + 3$ or better</p> <p>or for correct reverse flowchart with arrows reversed $\longleftarrow \times 4 \longleftarrow - 3 \longleftarrow$</p>	

Question		Answer	Marks	Part marks and guidance	
14	(a)	55 nfww	3	<p>M2 for $[(40 \times 3) - (10 \times 3)] \div 2$ oe implied by 45 or for $[(40 \times 3) - 10] \div 2$ oe or M1 for 40×3 implied by 120</p> <p><u>Alternative method:</u> M2 for $40 + (40 - 10) \div 2$ or M1 for $(40 - 10) \div 2$</p>	
	(b)	[0].25 oe	3	<p>B1 for $y = \frac{k}{x^3}$ oe soi by $16 = \frac{k}{2^3}$ or $k = 128$</p> <p>M1 for $y = \frac{\text{their } k}{8^3}$</p> <p>OR</p> <p>M2 for $2^3 \times 16 = 8^3 \times y$ or $16 \div (\frac{8}{2})^3$</p>	
15	(a)	<p>[gradient =] $(4.5 - 3) \div (3 - 0)$ oe</p> <p>$y = (\text{their } 0.5)x + c$ or $y = mx + 3$ or $y - y_1 = \text{their } 0.5(x - x_1)$ or $y - 4.5 = m(x - 3)$ or $y - 3 = m(x - 0)$</p> <p>$y = 0.5x + 3$ or $y - 4.5 = 0.5(x - 3)$ oe or $y - 3 = 0.5(x - 0)$ oe AND $2y = x + 6$</p>	<p>1</p> <p>1</p> <p>1</p>	<p>Must show a correct calculation of the gradient</p> <p>This can be $y = 0.5x + 3$ or $\frac{y-3}{x-0} = \text{their } 0.5$ oe or $y - 4.5 = 0.5(x - 3)$ oe</p> <p>If 0 scored SC1 for verification of A and B</p>	Working backwards scores 0

Question		Answer	Marks	Part marks and guidance
	(b)	$x \leq 3$ oe $x + y > 3$ oe $2y \leq x + 6$ oe	5	<p>B2 for $x \leq 3$ oe or B1 for $x = 3$ oe or $x < 3$ oe or SC1 for $x \geq 3$ oe or for $0 \leq x \leq 3$</p> <p>AND</p> <p>B2 for $x + y > 3$ oe or B1 for $x + y = 3$ oe or SC1 for $x + y \geq 3$ oe</p> <p>AND</p> <p>B1 for $2y \leq x + 6$</p>

Question			Answer	Marks	Part marks and guidance	
16			11 [hours] 35 [mins] with correct working	5	<p>B4 for answers 11 [hours] 34 [mins] or 11 [hours] 34.5[...] to 34.8 [mins], with correct working</p> <p>OR</p> <p>B1 for 9550 B1 for 825 M1 for $(9550 \text{ to } 9650) \div (815 \text{ to } 825)$ M1 for <i>their</i> $0.57... \times 60$ oe</p> <p>If 0, 1 or 2 scored, instead award SC3 for answer 11 [hours] 35 [mins] with no working or insufficient working</p> <p>If 0 or 1 scored, instead award SC2 for answer 11 [hours] 34 [mins] or 11 [hours] 34.5[...] to 34.8 [mins] with no working or insufficient working</p> <p>If 0 scored, instead award SC1 for 11.57[...] or 11.58 with no working or insufficient working</p>	<p>“Correct working” requires evidence of at least B1B1M1</p> <p>Allow 824.9[9...] for 825 With no contradictory choice With no contradictory choice Do not imply this first M1 mark. <i>their</i> 0.57 following from distance \div speed implied by 11.57 to 11.85</p>
17	(a)	(i)	20	1		
		(ii)	25	1		

Question		Answer	Marks	Part marks and guidance	
	(b)	Box plot drawn with: Lowest = 25 Lower Quartile = 45 Median = 60 Upper quartile = 65 Highest = 75	3	B2 for 4 or 5 correct markers or B1 for 3 correct markers	If more than 5 markers, mark the worst 5 Award the markers even if not correctly representing the information
	(c)	Calculation/reasoning/use of figures Correct interpretation	1 1dep		See Appendix
18	(a)	(10, 0)	1		
	(b)	$-\sqrt{91}$	3	B2 for $\sqrt{91}$ or -9.539[...] or -9.54 or B1 for 9.539[...] or 9.54 or M1 for $9 + y^2 = 100$ oe	\pm answers treat as choice

Question	Answer	Marks	Part marks and guidance
(c)	$(\sqrt{2}, 7\sqrt{2})$ and $(-\sqrt{2}, -7\sqrt{2})$ with correct working	5	<p>B4 for $(\sqrt{2}, 7\sqrt{2})$ with correct working or $(-\sqrt{2}, -7\sqrt{2})$ with correct working</p> <p>or</p> <p>M2 for $x^2 + (7x)^2 = 100$ oe A1 for $[x = \pm] \sqrt{2}$</p> <p>or</p> <p>M1 for $7x$ seen</p> <p>If 0 or 1 or 2 scored, instead award SC3 for answer $(\sqrt{2}, 7\sqrt{2})$ and $(-\sqrt{2}, -7\sqrt{2})$ with no working or insufficient working</p> <p>If 0 or M1 scored, instead award SC2 for answer $(\sqrt{2}, 7\sqrt{2})$ or $(-\sqrt{2}, -7\sqrt{2})$ or for $(\frac{5\sqrt{2}}{2}, \frac{35\sqrt{2}}{2})$ and $(-\frac{5\sqrt{2}}{2}, -\frac{35\sqrt{2}}{2})$ with no working or insufficient working</p> <p>If 0 scored, instead award SC1 for $[x = \pm] \sqrt{2}$ or for $(\frac{5\sqrt{2}}{2}, \frac{35\sqrt{2}}{2})$ or $(-\frac{5\sqrt{2}}{2}, -\frac{35\sqrt{2}}{2})$ with no working</p> <p>“Correct working” requires evidence of at least M2 Allow $\sqrt{98}$ for $7\sqrt{2}$</p> <p>Condone for M1 if seen as $x^2 + 7x^2 = 100$</p>

Question	Answer	Marks	Part marks and guidance
19	Accept answers that round to 25.7 with correct working	6	<p>“Correct working” requires evidence of at least M1 AND M2</p> <p>(17.386...)</p> <p>M2 for $\frac{9 \times \sin 30}{\sin 15}$ oe or M1 for $\frac{9}{\sin 15} = \frac{[\dots]}{\sin 30}$ oe</p> <p>AND</p> <p>M3 for correct cos rule with cos as the subject $\frac{13^2 + (\text{their } 17.386\dots)^2 - 8^2}{2 \times 13 \times (\text{their } 17.386\dots)}$ oe or M2 for the above (M3) with one error or wrong angle selected or for $8^2 = 13^2 + (\text{their } 17.386\dots)^2 - 2 \times 13 \times (\text{their } 17.386\dots) \times \cos[\dots]$ or M1 for the above (M2) with one error or wrong angle selected</p> <p>If 0 or 1 or 2 scored, instead award SC3 for 25.7 (or an answer rounding to 25.7) with no working or insufficient working</p> <p>If 0 or 1 scored, instead award SC2 for 0.898 to 0.902 with no working or insufficient working</p> <p>If 0 scored, instead award SC1 for [QS =] 17.3 to 17.4 with no working</p> <p>(0.900...)</p> <p>e.g. for $\frac{8^2 + (\text{their } 17.386\dots)^2 - 13^2}{2 \times 8 \times (\text{their } 17.386\dots)}$</p> <p>e.g. for $13^2 = 8^2 + (\text{their } 17.386\dots)^2 - 2 \times 8 \times (\text{their } 17.386\dots) \times \cos[\dots]$</p>

Question		Answer	Marks	Part marks and guidance	
20		$\frac{24x+5}{3x+5}$ final answer	4	<p>M3 for $\frac{30x+50-6x-45}{[3x+5]}$ soi by $\frac{24x+5}{[3x+5]}$</p> <p>or</p> <p>M2 for $\frac{30x+50-(6x+45)}{[3x+5]}$ or $\frac{10(3x+5)-6x-45}{[3x+5]}$</p> <p>or</p> <p>M1 for $10(3x+5)$</p>	<p>Max M3 if answer spoiled by further incorrect algebraic manipulation (eg. incorrect cancelling of terms)</p> <p>Allow full marks for a correct equivalent answer as a single fraction</p> <p>e.g. $\frac{48x+10}{6x+10}$</p>