Question			Answer	Marks	Part marks and guidance	
1	(a)		3	2	**B1** for 36 or 9	ignore ±
	(b)		4×10^{-5} or [0]. 000 04	2	**B1** for 2.5×10^{4} or 25 000	Condone $\frac{1}{25\,000}$ for 2 marks
2			8.25 8.35	2	**B1** for either one correct or for both correct but reversed	
3	(a)		2×2×2×3×3×7 or $2^3 \times 3^2 \times 7$ final answer	3	**B2** for 2,2,2,3,3,7 or 2^3, 3^2, 7 or for a correct expression one stage short of the correct answer e.g. $2^3 \times 9 \times 7$ or **B1** for two of 2,3,7 identified	allow "." for "×" and condone 2^3 3^2 7 for **3** marks for **B1** and **B2** allow factor tables and trees
	(b)		2520	2	**M1** for factors of 180 = 2,2,3,3,5 oe or seen as factor tables and trees If **0** scored then **SC1** for 2520*n* e.g. 90 720	accept any correct method
4			128	2	**M1** for $12(4) + \frac{1}{2}(10)(4)^2$ or **B1** for 48 or 80	
5			34.5	3	**M2** for 38.64 ÷ 1.12 oe or **B1** for 1.12 or 112	

Question			Answer	Marks	Part marks and guidance	
6			214	5	**B4** for 214.2 or 214.24 to 214.26 OR **B1** for 60 marked or used as width of the rectangle or distance from B to the corner AND **M2** for ¼ × π × 120 soi by 30π, 94.2 or 94.24 to 94.26 or **M1** for π × 120 soi by 376.8 to 377.1 or ½π × 120 soi by 188.4 to 188.56 AND **M1** for 2 × *their* 60 + *their*30π AND **B1** for their final answer written to more than 3 figs correctly rounded to 3 s.f. <u>to a max. of **4** marks</u>	Accept 120 + 30π for **B4** Allow eg r = 60 for **B1**

Question			Answer	Marks	Part marks and guidance	
7	(a)		135	2	**B1** for angle 45	e.g. 45 marked at ACB or ABC, 180 – 45, 90 + 45
	(b)		209 to 209.1	4	**M2** for $\tan^{-1}$ (45÷25) or $\tan^{-1}$ (25÷45) soi by 61, 60.94 to 60.95 or 29[.1] , 29.05... or **M1** for tan [=] 45÷25 or tan [=] 25÷45 AND **M1** for 270 – *their angle*ABD or 180 + *their angleADB*	Accept longer methods but they must get to the equivalent point to gain credit e.g. if they find the hypotenuse, they score **M0** until they start to use sin or cos. Can be implied by *their* answer
8	(a)		4 points accurately plotted	2	**B1** for 2 or 3 points accurately plotted	condone missing or incorrect lines

Question			Answer	Marks	Part marks and guidance	
	(b)		Here are 4 different categories , • Compares the number of people in the whole of 2015 to the whole of 2016 (e.g. there were more people shopping in 2016) • Compares same seasons in 2015 with seasons in 2016 (e.g there were more in Jul–Sept 2016 than in 2015) • Compares seasons within the same year (e.g in 2016 there were more customers in the summer months) • Compares increases / decreases in the number of customers, referring to gradients (e.g the biggest change was between Jul–Sept and Oct-Dec) Do not allow comparisons that only refer to the shape of the graph (e.g, it goes up and down again or it peaks in Jul–Sept) 1 mark for each acceptable comment - for 2 marks they must come from different categories	**2**	**B1** for 1 correct comment	If they make 3 comments mark the best 2. It is possible to cover 2 categories in one comment for 2 marks

Question			Answer	Marks	Part marks and guidance	
9	(a)		24 31	5	**M1** for 3X + 2Y = 134 oe **M1** for 2X + 5Y = 203 oe **M1** for multiplying both equations by scalars to equate coefficients of one variable (allow one arithmetic error) **M1** for correct method to eliminate one variable (allow one arithmetic error) if **M4** not scored award **B3** for one correct answer	allow any correct method e.g. substitution **M1** for rearranging one equation to make X or Y the subject, $X = \frac{134 - 2Y}{3}$ **M1** for substitution of *their* expression in the other equation
	(b)		Any correct comment relating to distance	1		See appendix
10	(a)		4200	1		
	(b)		3948 = 4200*r* oe 3948 ÷ 4200 = 0.94	B1 B1		Can be implied by e.g. second statement
	(c)		[0].4[0] × 4200 or 1680 4200 × ([0].94)^{15} or 1660[**.** …] 1660[**.** …] and1680 oe	M1 M1 A1	accept any correct method e.g. **M1** for 4200 × 0.94^{15} or 1660[**.** …] **M1** for 1660[**.** …] ÷ 4200 [×100] implied by .395[…] or 39.5 to 39.6 **A1** for 60.4 to 60.5[…] or 39.5 to 39.6 with a suitable comment	Alternatives: **M2** for 0.94^{15} = .395[…] **A1** for 60.4 to 60.5[…]

Question			Answer	Marks	Part marks and guidance	
11	(a)		Correct translation	2	**B1** for a correct horizontal translation or a correct vertical translation	Condone freehand, points must be joined for **2** marks, **B1** if all correct and not joined
	(b)	(i)	rotation (0,0) oe 90° [anticlockwise] oe	1 1	if **0** scored **M1** for the triangle/dots on the grid correctly rotated twice for centre allow origin and O and for angle allow e.g. -270°, 270° clockwise	Double transformation can only score **M1**
		(ii)	Rotation (0,0) oe 180°	1 1 1	if **0** scored **M1** for the triangle /dots on the grid correctly reflected twice or **SC2** for "rotation (0,0) oe, 90°" written twice for centre allow origin and O	Allow enlargement (0,0) [sf=] -1 for **3** marks Other double transformations can only score **M1**
12			55 soi by 25 80 – *their*55 soi 25 [0].3[0] × 80 soi 24 25 and 24 so yes oe	B1 M1 M1 A1	condone if written on graph or *their* 25 ÷ 80 or 31[%] or 31.2 to 31.3[%] 31[%] or 31.2 to 31.3[%][and 30] so yes **A1dep** on both **M1**s and **A1FT** follow through from *their* 55	accept any correct method e.g **B1** for 55 **M2** for [0].7 × 80 soi 56 or **M1** for [0].3 × 80 soi 24 **A1** for 55 and 56 so yes

Question			Answer	Marks	Part marks and guidance	
13	(a)		[0].4, [0].3 and [0].8 oe in the correct places	1		Accept equivalent fractions or percentages with % sign in each part and **FT their tree diagram only if (a) scores 0 marks**
	(b)		[0].4 or $\frac{2}{5}$ oe	1	**FT** *their* tree diagram	accept 40%: condone $\frac{4}{1}$, penalise wrong form once eg 4 : 10, 4 in 10
	(c)		[0].7 or $\frac{7}{10}$ oe	1		accept 70%
	(d)		[0].08 or $\frac{2}{25}$ oe	2	FT *their* tree diagram for **2** marks **M1** for *their*[0].4 × [0].2	accept 8% and working may be in the tree
	(e)		[0].82 or $\frac{41}{50}$ oe	3	FT *their* tree diagram for **3** marks **M2** for 1 – [0].6 × *their* [0].3 or [0].6 × [0].7 + *their* [0].4 × *their* [0].8 + *their* [0].4 × [0].2 oe soi or **M1** for [0].6 × *their* [0].3 or two of [0].6 × [0].7, *their* [0].4 × *their* [0].8, *their* [0].4 × [0].2 oe soi	accept any correct method and working may be in tree implied by 1 - [0].18 implied by [0].42 + [0].32 + [0].08 implied by [0].18 implied by two of [0].42, [0].32, [0].08

Question			Answer	Marks	Part marks and guidance	
14			92 or 92.28 to 92.6	6	**M3** for correct explicit cos rule to find angle A in ADE with cos as subject. [cos A =] $\frac{28^2 + 41^2 - 22^2}{2 \times 28 \times 41}$ oe soi or **M2** for correct implicit form of the cos rule to find angle A $22^2 = 28^2 + 41^2 - 2\times28\times41\times\cos A$ or **M1** for either of the above forms with only one error AND **M2** for correct sine rule e.g. $\frac{64 \times \sin 72}{\sin theirA}$ oe soi or **M1** for $\frac{64}{\sin theirA} = \frac{[...]}{\sin 72}$ oe if **0** scored **SC1** for explicit form of cos rule to find angle D or E in ADE e.g. [cos D =] $\frac{28^2 + 22^2 - 41^2}{2 \times 28 \times 22}$	accept any correct method implied by [A=] 30.3 to 30.4

Question			Answer	Marks	Part marks and guidance	
15	(a)		14 – 15	1		
	(b)		30 from graph Starting with *their* 30 (using mph) *These method marks could be awarded in any order* × 60^2 soi ÷ 1000 soi ÷ 1.6 soi 67.5 so yes	B1 M1 M1 M1 A1	 Starting with 60 (using m/s) *These method marks could be awarded in any order* **M1** × 1.6 soi by 96 **M1** × 1000 soi **M1** ÷ 60^2 soi **B1** for 30 from graph **A1** for 26.6 to 26.7 and 30 so yes	accept any correct method e.g. (using km/hr) **M1** for 60 × 1.6 soi by 96 **B1** for 30 from graph Starting with *their 30* *These method marks could be awarded in any order* **M1** × 60^2 soi **M1** ÷ 1000 soi **A1** for 96 and 108 so yes
	(c)		Attempt at a tangent drawn at $t = 7$ 4.0 to 4.5 oe	B1 B2	 **M1** for an attempt at speed ÷ time, could be on the graph e.g. 30 ÷ 10 or *their* (a) ÷ 7 soi 2.07… or 2.14..	Accept answer as a fraction and tolerance on reading from graph ± ½ small square Gradient for M1 could be from a chord. Ignore any negative sign
	(d)		$v = kt^2$ where $0.25 \leq k \leq 0.33$	3	**SC2** for $v \propto kt^2$ where $0.25 \leq k \leq 0.33$ or **B1** for $v = kt^2$ AND **M1** for $30 = k(10)^2$ or FT *their* reading from the graph for values of v and t or **B1** for $0.25 \leq k \leq 0.33$	Condone use of other letters especially *s* for speed Can be implied by eg $30 = k(10)^2$ k could be a fraction e.g. $\frac{15}{49}$
	(e)		any correct comment e.g. graph only valid/information only available up to 10 secs or car will eventually reach max. speed	1		See appendix

Question			Answer	Marks	Part marks and guidance	
16			$(x - 5)^2$ final answer −9 final answer	1 2	 **FT** *their* $(x - 5)^2$ final answer	
17			circle centre (0, 0) oe and radius 3	1 1	condone circular accept origin or O for (0,0)	
18	(a)		$(2x - 3)(x + 4)$ oe 1.5 oe and −4	2 1	**M1** for any two factors that give two correct terms when expanded Correct or **FT** *their* two factors	If they use another method then award **B1** for both answers correct.
	(b)		[0].72 −1.39	3	**M2** for one correct answer or $\frac{-2 \pm \sqrt{2^2 - 4 \times 3 \times -3}}{2 \times 3}$ or better or **M1** for this formula with at most two errors if **0** scored allow **SC1** for answers [0].720… or [0].721 and –1.38…..	for completing the square **M1** for $(x + \frac{1}{3})^2 - \frac{10}{9}$ **M1** for $\sqrt{\frac{10}{9}} - \frac{1}{3}$
19	(a)		$\frac{n^2}{n+1}$	2	**B1** for n^2 or $n + 1$	
	(b)		[a =] 3 [*b* =] 1 [*c* =] - 2	4	**B2** for [a =] 3 or **M1** for second differences = 6 and **M1** for revised differences of -1 0 1 2 or **B1** for *b* or *c* correct	accept any correct method see notes

Question			Answer	Marks	Part marks and guidance	
20			evidence of finding the area under the graph	M1	**M1** for evidence of any correct method to find the area under the graph e.g. counting squares (numbers or dots in squares) or use of triangles, trapeziums or rectangles	
			15 to 22	B1		accept answer as a fraction