

Question			Answer	Marks	Part marks and guidance	
1			8×10^7 final answer	2	M1 for ans figs 8 or for ans $k \times 10^7$ where $0 < k < 10$	
2	(a)		$6a^{11}$	3	B2 for answer ka^{11} or $\frac{6a^{13}}{a^2}$ or $6 \times a^6 \times a^5$ or $6 \times a^8 \times a^3$ shown in working OR B1 for answer $6a^k$ or ka^{13} or for $3a^8 \times 2a^3$ or $3a^6 \times 2a^5$ shown in working	
	(b)		2.5 or $2\frac{1}{2}$ or $\frac{5}{2}$	3	M1 for correct first step e.g. $6x - 10 = 5$ M1 for $6x = 5 + 10$ FT <i>their</i> first step or for FT <i>their</i> $ax = b$ to $x = \frac{b}{a}$	Do not accept $\frac{15}{6}$ as final answer but allow to imply M1M1 Embedded answer scores M2 max where $\frac{b}{a}$ is a simplified fraction (improper or mixed number) or an integer e.g. M1 for $6x = 1$ leading to $x = \frac{1}{6}$
3	(a)		40	3	M2 for $\frac{1.68 - 1.20}{1.20} [\times 100]$ oe Or M1 for $\frac{1.68}{1.20}$ oe or for $1.68 - 1.20$ oe	eg $\frac{48}{1.20}$ or $\frac{48}{120}$ or 0.4 For M1 accept $168 - 120$ oe eg 48 M1 implied by 1.4 or 140
	(b)		450	3	M2 for $360 \div 0.8$ oe or B1 for $0.8[0]$ oe seen or for 360 associated with 80% isw	For B1 0.8 oe seen allow fraction but not just for 80%

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4	(a)		7	3	B2 for 6.5 or $6\frac{1}{2}$ oe or M1 for $\frac{their (106-80)}{4}$ oe	For M1 accept attempted repeated subtraction from 106 to 80 or from 26 to 0 or repeated addition of 4 from 80 to 106 or from 0 to 26 condone 1 error At least 4 correct additions or subtractions needed soi FT one error
	(b)		Fewer days oe	1		e.g. smaller, less, days would be shorter, would decrease, ignore reference to numbers of days if lower
5	(a)		Four points correctly plotted	2	B1 for 2 or 3 correct plots	Mark in 70% zoom, use overlay, points inside or touching circles
	(b)		Negative	1		Do not accept description of relationship
			Strong	1		Accept moderate, medium etc, but not weak
	(c)		Point at (4, 3.4) indicated only	1		
	(d)		Ruled line of best fit and answer FT <i>their</i> line ± 100	2	B1 for ruled line of best fit or for answer FT <i>their</i> line with negative gradient	Use overlay for LOBF, ruled line should be as long as the zone and should not cross the longer sides of the zone Not for e.g. 6.4 thousand

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	(e)		Only have data on cars up to 12 years old oe or Equation of line of best fit would give a negative value or zero oe	1		e.g. the trend may not continue It would give a negative cost Outside range of data provided oe The price would be below zero The price would be zero oe See AG Do not accept 16 is not on the graph The graph does not go to 16 Ignore incorrect statements
6	(a)		$\frac{3}{7}, \frac{3}{7}, \frac{4}{7}, \frac{3}{7}$ correctly placed	2	M1 for 2 or 3 probabilities correctly placed	Accept equivalent fractions, decimals or %s (3 figures needed for dec or %)
	(b)		$\frac{16}{49}$ oe	2	M1 for $\frac{4}{7} \times \frac{4}{7}$ oe	isw cancelling/conversion to other forms

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7			173.4[0]	6	M1 for evidence at some stage of intention to find the total ticket cost of 2 adults + 1 child (e.g. soi by 200 or 170) AND M2 for complete method to reduce any valid ticket price or combination by 15% (eg full attempt at 85% or 100% – 15%) isw or M1 for complete method to find 15% of a valid ticket price or combination isw AND M2 for complete method to increase <i>their ticket cost</i> by 2% or M1 for complete method to find 2% of <i>their ticket cost</i>	This may be at the start or later if calculating individual ticket prices and payments even if errors in the prices Working with just an individual ticket price will be M2M2max) Valid ticket price combinations are e.g. 40, 80, 120, 160, 200 “Complete method” means it would lead to a correct answer if not for arithmetic slips. M2 may be implied by e.g. 170, 34, 68, 102, 136 M1 may be implied by e.g. 30, 6, 12, 18, 24 May be from an original “valid ticket price or combination” or from a calculated sale price. The 2% increase and 15% decrease can be done in either order but if the 15% decrease is done first with the original price the 2% increase must be done with <i>their</i> sale price and vice versa

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8			10	5	B4 for $\frac{120}{11}$ oe or for $\frac{110}{30}$ oe and $\frac{121}{30}$ oe or B3 for $\frac{110}{30}$ oe or $\frac{121}{30}$ oe OR B2 for $\frac{11}{30}$ oe or M1 for $\frac{1}{6} + \frac{1}{5}$ or for $\frac{5}{30}$ and $\frac{6}{30}$ seen M1 for $4 \div \text{their } \left(\frac{1}{6} + \frac{1}{5}\right)$ oe	For B4 accept 10.9... or 3.66 to 3.67 and 4.03... For B3 accept 3.66 to 3.67 or 4.03... 0.366 to 0.367 or 36.6% to 36.7% For M1 intention to add the fractions eg use of 0.16 to 0.17 + 0.2 oe percentages e.g. $4 \div (0.16 \text{ to } 0.17 + 0.2)$ oe NB can score B2 M1 or M1M1
9	(a)		1 : 5	2	B1 for $[1]k : 5k$ with both values numeric	e.g. B1 for 0.2 : 1, 30: 150
	(b)		30 , 75 , 75 and 30, 30, 120	4	B3 for 30, 75, 75 or 30, 30, 120 or B2 for $p = 30$ or M1 for $180 \div (1 + 5)$ FT <i>their</i> (a) If 0 scored, SC2 for 150, 15, 15	Accept each set in any order Could be on diagram
10	(a)		0.16̇ final answer	2	B1 for 0.16....	Accept unambiguous alternate notation for the recurring decimal e.g. B1 for 0.166, 0.168, 0.16̇

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	(b)		She is correct oe OR She is not correct oe AND 7 [and] 45 and 14 [and] 90 or 14 [and] 90 and 14k [and] 90k shown	4	B3 for $\frac{7}{45}$ and $\frac{14}{90}$ or for $\frac{14}{90}$ and $\frac{14k}{90k}$ or B2 for $\frac{14}{90}$ oe fraction or M1 for 1.5... [$\times 10^n$] and 15.5... [$\times 10^n$] seen	For 4 marks there must be no incorrect fractions shown Accept yes for she is correct and no for she is not correct Where k is a positive integer For B2 and B3 accept as pairs of values instead of fractions Where n is an integer e.g. allow M1 for 0.15... and 1.5... or for 15.5.. and 155.5...
11	(a)		$10\sqrt{2}$ final answer	2	B1 for $2\sqrt{50}$ or $5\sqrt{8}$ or for correct answer seen then spoiled	
	(b)		2	1		
12	(a)		$\frac{x+2}{3}$ or $\frac{x}{3} + \frac{2}{3}$ final answer	2	M1 for $y + 2 = 3x$ or $x + 2 = 3y$ or for $x = 3y - 2$ or for $[x =] \frac{y+2}{3}$ If 0 scored, SC1 for answer $y = \frac{x}{2} - 7$	For 2 marks, condone answer $y = \frac{x+2}{3}$ Allow M1 for correct reverse flowchart with arrows reversed $\longleftarrow \div 3 \longleftarrow + 2 \longleftarrow$

Question			Answer	Marks	Part marks and guidance	
	(b)		-5	5	M3 for $2(3x - 2 + 7) = 4x$ oe or $\frac{2x-7+2}{3} = x$ oe or M2 for $2(3x - 2 + 7)$ oe seen or $\frac{2x-7+2}{3}$ oe seen or M1 for $3x - 2$ or $3x + 5$ oe seen or $2x - 7$ or $2x - 5$ oe seen M1dep for correct rearrangement of <i>their</i> eqn with at least 2 terms in x to $ax + b = 0$ or better	For method marks, condone inclusion of multiplication signs Method must be seen in working space for part (b) If brackets omitted then allow recovery for method For M3 eg $2x - 7 = 3x - 2$ M1dep on at least M1 earned previously e.g. $2(3x - 2) + 7 [= 4x]$ scores M1 and then can earn M1 dep if they then correctly rearrange to $ax = b$
13			It should be a curve with increasing gradient oe It should go through (0, 1)	1 1		Accept alternate forms e.g. correct sketch See AG Incorrect statements treat as choice. Incomplete statements ignore

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14			Angle BEA = angle CED and [vertically] opposite Angle DAB = angle ADC and alternate Angle ABC = angle DCB and alternate [Triangle ABE is similar to triangle CDE] [corresponding] angles are equal oe	M2	For M2 only two of the three statements and reasons are required M1 for one pair of angles with a reason	Allow any unambiguous labelling for angles e.g. ABC or ABE or B, but not E Accept 3 rd angle in triangle oe for reason with final angle Condone spelling e.g. alternating but not alternative
				A1	With no errors or incorrect statements seen If 0 scored, SC1 for at least two correct pairs of angles identified with no / incorrect reasons	For oe allow e.g. AAA Condone identified on diagram for SC1

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15			$\frac{x}{360} \times \pi \times 6^2$ or $\frac{[\pi \times] 6^2}{[\pi \times] 6}$ or shows	M1	Accept 36 for 6^2	x = angle AOX , condone any variable used For M1 may be seen in stages
			$\pi \times 6^2$ and $\frac{1}{6}$ oe			e.g. M1 for $36 \pi \div 6$
			$\frac{x}{360} [\times \pi] \times 6^2 = 6[\pi]$ or $360 \div 6$	M1dep	Dep on previous M1	
			[x =] 60	A1		Must earn M1M1 before awarding A1
			$\frac{AX}{6} = \sin 60$ oe	M1	Dep on $0 < \text{their } 60 < 90$ Accept use of cos 30 or cos 60 and Pythagoras' or sine rule with 90	Do not accept assumption that OX = 3 without any evidence
			$AX = 6 \times \frac{\sqrt{3}}{2} = 3\sqrt{3}$ or $\frac{3\sqrt{3}}{6} = \frac{AX}{6}$, $AX = 3\sqrt{3}$	M2	or M1 for $\sin 60 = \frac{\sqrt{3}}{2}$ or $\cos 30 = \frac{\sqrt{3}}{2}$ To award 6 marks, there must be no errors seen	Beware circular methods using $3\sqrt{3}$ leading to 60, this can only score M1 maximum for $\sin 60 = \frac{\sqrt{3}}{2}$ but ignore circular methods if alongside a correct method

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16	(a)		[Angle DCB =] $180 - 112$	M1	Must show the subtraction	Must not be associated with wrong angle
			[Opposite angles in a] <u>cyclic quadrilateral</u> [are supplementary] oe	M1		Do not accept any incorrect statement e.g. opposite angles in a cyclic quad are equal, angles of a cyclic quad = 180. Condone issues with spelling provided clear
			[Angle BCO =] $68 - 33 = 35$	M1	Must show the subtraction	Must not be associated with wrong angle If [angle BCO =] $180 - 112 - 33$ is shown this implies first M1 and third M1
			$y = 35$ and [triangle BOC =] isosceles with no incorrect statement	M1		For M1 must mention isosceles with $y = 35$ stated not just shown on the diagram
16	(b)		55 Angles in triangle [BOC sum to 180] oe	B1 M1	Accept [triangle BOC =] isosceles	Accept triangle and 180 without 'angle'
			<u>Angle at circumference</u> is <u>half</u> angle at <u>centre</u> oe	M1		Must use correct terminology, angle, circumference, half oe (or double oe), centre. Accept arc for circumference If more than 2 reasons given then treat each extra reason as choice
17	(a)		$(x + 4)^2 - 13$ final answer	3	B1 for $(x + 4)^2$ B2FT for [+] 3 – <i>their</i> $(a)^2$ after $(x + \text{their } a)^2$ correctly evaluated or B1 for [+] 3 – <i>their</i> a^2 shown If 0 scored, SC2 for final answer $(x + 4) - 13$	FT can be implied eg $(x + 2)^2 - 1$ gets B2FT

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17	(b)		U shaped parabola with minimum value indicated in 3 rd quadrant at $(-4, -13)$ and intercepts positive y – axis at 3	4	FT U-shaped parabola with turning point at <i>their</i> $(-a, -b)$ from part (a) dep on answer of form $(x + a)^2 - b$ where $a \neq 4$ and/or $b \neq 13$ B1 for U shape curve B1 for <i>their</i> curve or line intercepts positive y – axis at 3 B1 for turning point at $(-4, k)$ or FT for turning point at $(-a, k)$ dep on answer of form $(x + a)^2 - b$ in part (a) B1 for turning point at $(k, -13)$ or FT for turning point at $(k, -b)$ dep on answer of form $(x + a)^2 - b$ in part (a)	Be generous for the U shape condone broken line TP values must be shown but could be marked on axes. Mark intention Sketch takes priority when marking Accept turning point = $(-4, -13)$ written in working or in table provided no contradiction on sketch Must be stated on graph, 3 or $(0, 3)$ Do not accept just in a table If point $(-4, -13)$ only plotted on graph and no sketch then can score these final 2 marks If more than one graph drawn treat as choice

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18	$\frac{12}{132}$ oe	6	M5 for $\frac{4}{12} \times \frac{3}{11}$ or B4 for $\frac{4}{12}$ seen or B3 for train [only] = 8, train and car = 4 or B2 for train and car = 4 or M1 for $12 + 6 + 7 - 21$ oe OR B2FT for correctly completed Venn diagram with $12 - x$, x [their 4], $6 - x$, 7 correctly placed FT <i>their</i> x (can be algebraic or x is an integer $0 < x \leq 14$) or B1FT for attempt at Venn diagram with $12 - x$ or $6 - x$ or 7 correctly placed FT <i>their</i> x (can be algebraic or x is an integer $0 < x \leq 14$) M1 for $\frac{k}{n} \times \frac{k-1}{n-1}$ If 0 scored, SC1 for $\frac{k}{n} \times \frac{k}{n}$ soi	Accept dec or % equivalents (3 figures) $0.0909\dots$ or $9.09\dots\%$ isw cancelling, conversion to other forms Do not accept $\frac{2}{6}$ alone For B4 accept $\frac{1}{3}$ provided it does not come from $\frac{2}{6}$ alone For B2 and B1, condone no rectangle around Venn diagram where $k < n$ and $n < 21$ where $k < n$ and $n < 21$

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19	(a)		1.7 cao	1		Mark at most accurate i.e. do not allow $1.65 = 1.7$
	(b)	(i)	[<i>a</i>] −5 [<i>b</i>] 4	2	B1 for each or for $-5x + 4$ seen	
		(ii)	Correct line ruled on grid 1.1 or 1.2	M2 A1	Strict FT $y = \textit{their ax} + \textit{their b}$ M1 for correct y–intercept (FT <i>their b</i>) or correct gradient (FT <i>their a</i>) or for freehand or broken ‘correct’ line FT $y = \textit{their ax} + \textit{their b}$ or for at least 3 correct plots and no incorrect plots FT $y = \textit{their ax} + \textit{their b}$	For M2 line must cross curve For M2 or M1, accuracy ± 1 small square at y – intercept (extend line if necessary provided it fits on the grid) and gradient ± 1 small square vertically for a run of 1 unit horizontally Do not follow through if $a = 0$ and/or $b = 0$ Only award if M2 scored previously