

Question		Answer	Marks	Part marks and guidance	
1		46.34	3	<p>B2 for 46.33[7...] or B1 for 99 493[.836...] or 144 266[.0625]</p> <p>If 0 scored SC1 for <i>their</i> answer to more than 4 figures correctly rounded to 4 s.f.</p>	for B1 accept these numbers rot to at least integers
2		$\frac{1}{2} \times 18 \times 6.4$ $\frac{9+15}{2} \times 4.8$ oe [both answers =] 57.6 or $\frac{288}{5}$ oe	<p>M1</p> <p>M1</p> <p>A1</p>	<p>A1 dep on M1 M1</p>	<p>Allow equivalents for both M1s but it must be full and correct working and allow any correct method e.g.</p> <p>M1 for $\frac{9+15}{2} \times 4.8 = 57.6$</p> <p>M1 for $57.6 \div 9 = 6.4 = \text{height}$</p> <p>A1 for 6.4</p> <p>Condone 24 for $9 + 15$ and 9 for $\frac{1}{2} \times 18$.</p> <p>e.g. $\frac{115.2}{2}$</p>

<p>3</p>		<p>[a =] 15.6 [b =] 7.2 with correct working</p>	<p>5</p>	<p>B4 for one correct answer <u>with correct working</u> OR M1 for $\frac{a + a + b + a + 2b + 3a - b}{4} = 27$ oe M1 for $3a - b - a = 24$ oe M1 for equating coefficients of one variable for <i>their</i> linear equations M1 for correct method to eliminate one variable for <i>their</i> original linear equations If 0, M1 or M2 scored, instead award SC3 for answers 15.6 and 7.2 with no working or insufficient working If 0 or M1 scored, instead award SC2 for $a = 7.2$ and $b = 15.6$ with no working or insufficient working If 0 scored, instead award SC1 for two answers which satisfy one of the original conditions</p>	<p>“Correct working” requires evidence of at least M1M1 for the two equations and M1 for some evidence of solving them e.g. $6a + 2b = 108$ e.g. $2a - b = 24$ dependant on two linear equations e.g. $6a - 3b = 72$ or $4a - 2b = 48$ or $3a + b = 54$ dependant on two linear equations e.g. $5b = 36$ Allow one numerical error in each step of solving <i>their</i> equations A sign error is not an arithmetic error Substitution method: M1 and M1 for the two equations M1 dependant on two linear equations and for rearranging one equation to make one variable the subject e.g. $a = \frac{24+b}{2}$ M1 for substituting it into <i>their</i> other equation Trials (need to see the mean or total, and the range evaluated for each): M1 for each correct trial up to a maximum of 3 After three correct trials, correct final answers score 5</p>
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Question			Answer	Marks	Part marks and guidance	
4	(a)	(i)	$(360 - 52) \div (1 + 2 + 4)$ or better [= 44]	2	<p>M1 for $360 - 52$ or 308 or <i>their</i>$(360 - 52) \div (1 + 2 + 4)$</p> <p>Alternative method 1 : M2 for $7x = 360 - 52$ or $7x = 308$ then $x = 44$ or M1 for x, $2x$ and $4x$ or $360 - 52$ or 308</p> <p>Alternative method 2 : M2 for $52 + 44 + 2 \times 44 + 4 \times 44 = 360$ oe or M1 for $52 + 44 + 2 \times 44 + 4 \times 44$ oe</p>	<p>better includes $308 \div 7$</p> <p>Mark the work in the answer space and if blank, mark any work round the diagram</p> <p>allow any letter</p> <p>For M2 and M1 accept 88 for 2×44 and 176 for 88×2</p>
	(a)	(ii)	Correct labelled pie chart with ruled lines and sector angles 44, 88 and 176	3	<p>B2 for two additional correct sectors within tolerance or a correct unlabelled/incorrectly labelled pie chart with ruled lines or correct labelled pie chart with unruled lines or B1 for one correct sector within tolerance, ignore label</p>	<p>Use online protractor and apply an angle tolerance of $\pm 2^\circ$. For 3 marks we need only four sectors and condone one sector unlabelled. Labels must be letters not angles</p>
	(b)		270	2	<p>M1 for any correct method e.g. $\frac{39}{52} \times 360$ oe or $39 + \frac{176}{39} + \frac{88}{39} + \frac{44}{39}$</p>	<p>e.g. $\frac{360}{\frac{52}{39}}$ or $\frac{39}{52 \div 360}$ condone $\frac{52}{39} = 1.3$</p>
	(c)	(i)	Accept any correct advantage e.g. Information is immediately displayed as part of a whole	1		See appendix and mark best response as long as it is not contradictory or has an incorrect statement
	(c)	(ii)	Accept any correct disadvantage e.g. you cannot read the exact frequencies from it	1		See appendix and mark best response as long as it is not contradictory or has an incorrect statement

Question		Answer	Marks	Part marks and guidance	
5		Any unambiguous indication of correct pack (5 kg) with three accurate comparable figures	3	<p>Allow any correct comparison e.g.(converting all to 1 kg)</p> <p>B2 for three accurate comparable figures or B1 for two accurate comparable figures</p> <p>OR</p> <p>M1 for one correct appropriate calculation e.g. $7.70 \div 0.7$ oe or $32.40 \div 3$ oe</p>	<p>See appendix for other calculations and values</p> <p>Mark <i>their</i> figures at the most accurate</p>

Question		Answer	Marks	Part marks and guidance	
6		32 nfww	4	<p>B2 for 11.25 M1 for $360 \div$ <i>their</i> 11.25 seen OR B1 for 15<i>a</i> and <i>a</i> or 16<i>a</i> M1 for $15a + a = 180$ oe M1 for $360 \div$ <i>their</i> 11.25 seen</p> <p>Alternative method 1: M2 for $15 \times 360 = 180(n - 2)$ or better or M1 for $\frac{180(n-2)}{n} = 15 \times \frac{360}{n}$ and M1 for $180n = 5400 + 360$ oe</p> <p>Alternative method 2: Use of trials by choosing a value for <i>n</i>. M1 for each correct trial up to a maximum of M3 for using <u>two</u> of these [exterior angle] = $\frac{360}{n}$ (formula A) [interior angle] = $\frac{180(n-2)}{n}$ (formula B) interior + exterior = 180 and for checking that interior = 15 × exterior</p> <p>if 0 scored SC1 for one of formula A or B seen or used</p>	<p><i>a</i> = exterior angle and allow any consistent single letter</p> <p>B1 M1 implied by $16a = 180$ or $\frac{180}{15+1}$ oe</p> <p>Alternative for number of sides: e.g. M1 for $\frac{180(n-2)}{n} = 180 -$ <i>their</i> 11.25</p> <p>If they get 32 from any number of trials they score 4 marks. Trials can be seen from a calculation or a list.</p> <p>see appendix for likely results</p>

Question		Answer	Marks	Part marks and guidance	
7		$[2^{-2} =] [0].25$ $[2 \times 10^{-2} =] [0].02$ $2 \times 10^{-2}, 0.2, 2^{-2}$	M2 B1	M1 for each accept answer in alternate form e.g fractions or decimals	Alternative methods: eg M2 for finding $\frac{1}{5}, \frac{1}{4}, \frac{1}{50}$ or 20[%], 25[%], 2[%] or other comparable forms or M1 for two of these
8		14 with correct working	5	B4 for answer 0.14 with correct working or for answer 86 with correct working OR B3 for answer 0.86 with correct working OR M4 for any correct calculation that would lead to 0.14 or 86 e.g. $1 - \frac{1.161}{1.35}$ or $\frac{135-116.1}{135}$ oe OR M3 for any correct calculation that would lead to 0.86 e.g. $\frac{1.161}{1.35}$ or $\frac{116.1}{1350}$ oe OR M2 for 1.35 and 1.161 or 135 and 116.1 OR B1 for 1.35 or 135 or 1350 If 0 or 1 scored, instead award SC3 for answer 14 with no working or insufficient working If 0 or 1 scored, instead award SC2 for answer 0.14 or 86 with no working or insufficient working If 0 scored, instead award SC1 for answer 0.86 with no working or insufficient working	“Correct working” requires evidence of at least M2 Ignore % written on answer line and ignore $\times 100$ and units when awarding M marks. Allow any correct method. M4 includes $1 - \frac{1.161}{1350}$ or $\frac{116.1}{1350} \times 100$ or $\frac{1.35-1.161}{1.35}$ or $\frac{1.161}{1.35} \times 100$ M3 includes $\frac{116.1}{135}$ M2 includes 1350 and 1161 or $1.35 - 1.161$ or $1.161 - 1.35$ or ± 0.189 or $[1]35 - [1]16.1$ or $1.161 - 1.35$ or ± 18.9 B1 includes 1.161 or 116.1 or 1161 Alternative method : e.g. trials needs M2 to award 5 marks, evidence of at least 2 trials seen or M1 for each correct trial up to M3 , see appendix for figures

Question		Answer	Marks	Part marks and guidance	
9		<p>Correct statement with supporting working yes/correct oe and e.g. 1533 with 1532 or 0.667[1]... oe with 0.666... oe or $\frac{511}{766} - \frac{2}{3} > 0$ or $\frac{511}{766}$ and 510.6</p>	5	<p>B4 for 1533 and 1532 OR M1 for $\frac{1638}{9+3+2}$ [$\times 9$] or better M1 for $\frac{660}{8+1+2}$ [$\times 8$] or better M1 for <i>their</i>1053 + <i>their</i>480 or 1638 + 660 M1 for $\frac{\textit{their} 1533}{\textit{their} 2298}$ or for <i>their</i> 2298 $\times \frac{2}{3}$ or 1532 for those that sum the columns (i.e 17 : 4 : 4); M1 for $\frac{1638+660}{\textit{their}(17+4+4)}$ [$\times 17$] or better or $\frac{\textit{their} 17}{\textit{their}(17+4+4)}$ M1 for $\frac{\textit{their} 1562.64}{\textit{their} 2298}$ or for <i>their</i> 2298 $\times \frac{2}{3}$ or 1532 or $\frac{2}{3}$ [$\times 25$] M1 for 0.68 and 0.66... or 1562[.64]/1563 and 1532</p>	<p>implied by 117 or 1053 implied by 60 or 480 implied by 1533 or 2298 implied by 0.667[1]... oe or $\frac{511}{766}$ implied by 91.92 or 1562.64 or $\frac{17}{25}$ or 0.68 implied by 0.68 oe or 1532 or 16.6.. or 0.66... or 0.6 allow 17 and 16.6 to 16.7</p>
10		<p>The formula should be $y = kx$ [not the one they use] $y = 4.5x$ or $y = \frac{9}{2} x$ oe</p>	<p>1 2</p>	<p>M1 for $y = kx$ or better e.g. $9 = k \times 2$</p>	<p>See appendix Allow any letter for k can be awarded in the first statement</p>

Question		Answer	Marks	Part marks and guidance	
11	(a)	Correct tree diagram	2	B1 for 0.4 on missing branch in task 1 B1 for $1 - x$ on both missing branches in task 2	If there is more than one answer on any branch, choose the one on the dotted line first
	(b)	They are independent oe	1		Pick the best comment, see appendix
	(c)	0.36	4	<p>M2 for $0.6(1 - x) + 0.4x = 0.528$ or better or M1 for $0.6(1 - x) + 0.4x$ or better M1 for rearranging <i>their</i> linear equation, $kx + a = b$, to make kx the subject ($0 < k$)</p> <p>OR</p> <p>M2 for $1 - 0.6x - 0.4(1 - x) = 0.528$ or better or M1 for $1 - 0.6x - 0.4(1 - x)$ or better M1 for rearranging <i>their</i> linear equation, $kx + a = b$, to make kx the subject ($0 < k$)</p> <p>OR</p> <p>FT <i>their</i> (a) if not correct for up to 3 marks e.g. if in (a) $1 - x$ is replaced with e.g. 0.4 then M2 for $0.6 \times 0.4 + 0.4x = 0.528$ or better or M1 for $0.6 \times 0.4 + 0.4x$ or better M1 for rearranging <i>their</i> linear equation, $kx + a = b$, to make kx the subject ($0 < k$)</p> <p>If 0 scored SC1 for any 2 branches correctly written down and added e.g. $0.6(1 - x) + 0.4(1 - x)$</p>	<p>e.g. M2 for $0.6 - 0.2x = 0.528$ e.g. M1 for $0.6 - 0.2x$ e.g. $0.6 - 0.528 = 0.2x$ or better allow similar equations involving $1 - 0.528$ e.g. $0.6x + 0.4(1 - x) = 0.472$</p> <p>e.g. $0.6 - 0.528 = 0.2x$ or better</p> <p>e.g. $0.4x = 0.528 - 0.6 \times 0.4$ or better</p> <p>alternative method using trials M1 for each correct trial up to M3 and the correct answer from trials scores 4 marks, see appendix</p> <p>exactly two branches</p>

Question		Answer	Marks	Part marks and guidance	
12	(a)	96	3	B1 for angle SRQ = 180 – 62 or SRQ = 118 B1 for angle RSQ = 48 B1 for angle ROQ = 2 × <i>their</i> 48 to maximum of B2	could be marked on the diagram, see appendix for alternative methods
	(b)	Method 1 using angle EFH : <i>angle</i> DEF = <i>angle</i> EFH <i>because</i> alternate [angle] <i>angle</i> EDF = <i>angle</i> EFH <i>because</i> alternate segment [thm.] <i>therefore angle</i> DEF = <i>angle</i> EDF or “they have two angles equal” oe	B1 B1 B1dep	Method 2 using angle DFG : <i>angle</i> EDF = <i>angle</i> DFG <i>because</i> alternate [angle] <i>angle</i> DEF = <i>angle</i> DFG <i>because</i> alternate segment [theorem] dep on B2 awarded If 0 scored SC1 for two sets of angles linked with incorrect/missing reasons e.g. DEF = EFH and EDF = EFH or EDF = DFG and DEF = DFG	If extra statements mark the best two BOD ‘alternating’ but not ‘Z-angles’ BOD ‘alt. seg.’ Note : Angles may be written the other way round e.g. EDF is the same as FDE and they can say <i>angle</i> DFG = <i>angle</i> EDF and in marking you must use either method 1 or method 2 not both
13	(a)	$\frac{x+3}{5}$ or $\frac{x}{5} + \frac{3}{5}$ oe	2	B1 for $x + 3$ written in the correct place on the diagram or in the working space or B1 for answer $\frac{x}{5} + 3$ oe or $\frac{x-3}{5}$ oe or $5(x + 3)$ oe or correct answer using a different variable	$(x + 3) \div 5$ scores 2 marks $x + 3 \div 5$ scores 1 marks
	(b)	$\times 15 + 27$	4	B3 for $15x$ and $+27$ or B2 for $\times 15$ or $+27$ in the correct place or M2 for $5 \times (3(x + 2)) [- 3]$ or better or M1 for $3(x + 2)$ or better	B3 may be seen on the diagram or as an expression Note: the variable x can be any letter for the B and M marks

Question	Answer	Marks	Part marks and guidance
14	2219.9... or 2220 with correct working	6	<p>“Correct working” requires evidence of at least M2 or M1 M1 Accept answers in the range 2217 to 2226. Accept any correct method.</p> <p>M2 for $\cos [\dots] = \frac{72-52}{52}$ oe or M1 for $72 - 52$ or 20</p> <p>and</p> <p>M2 for $\frac{1}{2} \times 52 \times 52 \times \sin$ <i>their</i> $134.76\dots$ oe or M1 for $\sqrt{52^2 - (\textit{their}20)^2}$ oe or 48 and M1 for $\frac{1}{2} \times \textit{their}96 \times \textit{their}20$ oe</p> <p>and</p> <p>M1 for $\frac{\textit{their angle AOB}}{360} \times \pi \times 52^2$ or B1 for $\pi \times 52^2$</p> <p>If 0, 1 or 2 scored award SC3 for the correct answer with insufficient working If 0 or 1 scored award SC2 for 3179.918... or 5314.718.. rot to at least an integer with insufficient working</p> <p>M2 implied by 67.38... or 134.76... rot to at least an integer e.g. 67, 67.3, 67.4, 67.38, 134, equivalent method includes $\cos [\dots] = \frac{52^2+52^2-96^2}{2 \times 52 \times 52}$ condone with 72 instead of 96</p> <p>M2 for finding the area of the triangle OAB implied by 960 <i>their</i> 134.76... must come from a correct attempt to find angle AOB and condone using $AB = 72$ for M2 and M1 including $\sqrt{52^2 - 36^2}$ for M1</p> <p>M1 implied by 3176 to 3186 or B1 implied by 2704π, 8490 to 8496</p> <p>alternative method using major sector: M2 for angle as before implied by 225, 225.2, 225.23 or 225.24 M2 for area of triangle as before or M1 for the third side e.g. 48</p> <p>M1 for $[\frac{\textit{their reflex angle AOB}}{360}] \times \pi \times 52^2$ or 5314.718..</p>

Question		Answer	Marks	Part marks and guidance	
15	(a)	$(3x - 2)(x + 4)$ oe -4 and $\frac{2}{3}$	M2 B1FT	M1 for $(3x + a)(x + b)$ with $a + 3b = 10$ or $ab = -8$ or $3x(x + 4) - 2(x + 4)$ or $x(3x - 2) + 4(3x - 2)$ correct or FT <i>their</i> linear factors	For M2 and M1 condone the omission of the final bracket. $\frac{(3x-2)(3x+12)}{3}$ followed by $3x - 2 [= 0]$ and $x + 4 [= 0]$ scores M2 . If no products of factors shown then $3x - 2 = 0$ and $x + 4 = 0$ scores M1 . After $3x(x + 4) - 2(x + 4)$ or $x(3x - 2) + 4(3x - 2)$ followed by correct answers award M2B1 BOD Condone $0.\dot{6}$ or $0.666\dots$ or 0.67 for $\frac{2}{3}$
	(b)	$(x + 4)^2 - 5$	3	B1 for $(x + 4)^2$ B2FT <i>their</i> $(x + a)^2$ for <i>their</i> -5 If 0 scored SC2 for 'correct' answer with missing power or power written in the wrong place	e.g. $(x + 11)^2 - 110$ scores B2FT e.g. SC2 for $(x + 4) - 5$ or $(x + 4^2) - 5$
	(c) (i)	3 8	2	B1 for either 3 or 8 in the correct place	
	(c) (ii)	Translation $\begin{pmatrix} 3 \\ 8 \end{pmatrix}$	2	B1 for each correct or FT the vector from <i>their</i> answer from (c)(i)	If more than one transformation score 0
16	(a)	17.6[4...] with correct working	4	B2 for 173.5 and 9.835 or 9.8349[9..] selected or B1 for one of these or M1 for 173.5 to 174.5/174.49[9..] and 9.825 to 9.835/9.8349[9..] M1 for $(173.5 \text{ to } 174.5) \div (9.825 \text{ to } 9.835)$ If 0 or 1 scored, instead award SC2 for answer 17.6[4...] with no working or insufficient working	"Correct working" requires evidence of the selection of 173.5 and 9.835 or 9.8349[9..]
	(b)	Any viable reason e.g. lift has to speed up and slow down	1		see appendix

Question		Answer	Marks	Part marks and guidance	
17	(a)	40	1		
	(b)	25	1		
	(c)	$\frac{1}{3}$ oe	1		e.g. $\frac{25}{75}$ or 0.33[3...] or 33[.3...]%
18	(a)	162	3	<p>M2 for $\frac{1}{2} \times (\text{their7} + 20) \times \text{their12}$ oe or M1 for one relevant area e.g. $\frac{1}{2} \times \text{their8} \times \text{their12}$ or $\text{their7} \times \text{their12}$ or $\frac{1}{2} \times \text{their5} \times \text{their12}$ alternative method : M2 for $\text{their12} \times 20 - \frac{1}{2} \times \text{their8} \times \text{their12} - \frac{1}{2} \times \text{their5} \times \text{their12}$ or M1 for one relevant area e.g. $\text{their12} \times 20$ or $\frac{1}{2} \times \text{their8} \times \text{their12}$ or $\frac{1}{2} \times \text{their5} \times \text{their12}$</p>	<p>e.g. M2 for $\frac{1}{2} \times \text{their8} \times \text{their12} + \text{their7} \times \text{their12} + \frac{1}{2} \times \text{their5} \times \text{their12}$ implied by 48 + 84 + 30 implied by 240 – 48 – 30</p>
	(b) (i)	14	2	M1 for $\frac{\text{their32} - \text{their4}}{4 - 2}$ oe	Allow any two points on the line joining (2,4) and (4,32)
	(b) (ii)	Ruled tangent drawn at 3 seconds 14.0 – 16.0	B1 B2dep	B2 dep on B1 correct or FT or M1 for rise ÷ run with values substituted	Tangent – mark intention to touch the curve at 3 seconds (condone thin daylight at 3), ignore other lines, condone dotted/dashed and condone line on one side only. If tangent is ruled and <i>their</i> value is outside the range apply FT to <i>their</i> tangent use accuracy of 2 sf
	(b) (iii)	[the speed] increases oe [because] the gradient is steeper/greater oe	1		Accept any correct response, accept accelerates for increase, see appendix

Question		Answer	Marks	Part marks and guidance	
19		$\frac{\sqrt{3}+2}{\sqrt{48}-6} \times \frac{\sqrt{48}+6}{\sqrt{48}+6}$	M1		multiply by conjugate of denominator
		$\frac{\sqrt{3} \times \sqrt{48} + 6\sqrt{3} + 2\sqrt{48} + 2 \times 6}{\sqrt{48} \times \sqrt{48} + 6\sqrt{48} - 6\sqrt{48} - 6 \times 6}$	M1	may be in a separate table FT $\sqrt{48} - 6$ in both numerator and denominator	multiply out numerator giving at least three terms and denominator accept equivalents e.g. denominator as $48 - 36$ or 12
		$\sqrt{48} = 4\sqrt{3}$ soi	M1		implied by $[2\sqrt{48} =] 8\sqrt{3}$ or $14\sqrt{3}$
		Simplifying <i>their</i> fraction e.g. $\frac{24+14\sqrt{3}}{48-36}$ or better	M1dep	Dep on at least three terms in the numerator FT <i>their</i> fraction with surds	e.g. collecting like terms in numerator and in the denominator
		$\frac{12 + 7\sqrt{3}}{6}$	A1	A1 dep on M4	