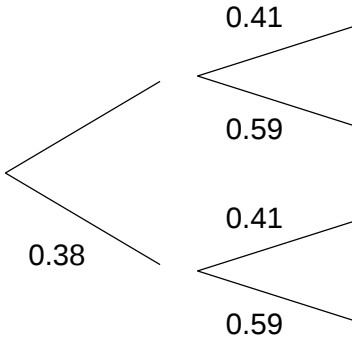


Question			Answer	Marks	Part marks and guidance	
1	(a)		Points plotted at (21, 18) and (7, 8)	1		Tolerance ± 1 mm
	(b)		1 : 3	3	B2 for 3 : 9 oe or answer 3 : 1 or B1 for 3 [dancers] or 9 [dancers] identified If 0 scored then SC1 for 4 : 8 seen and simplified to 1 : 2	NOT from 4 : 12 May be on graph 4 : 12 simplified to 1 : 3 scores 0
	(c)		The wedges at the front look bigger than those at the back oe	1		Comments should refer to the 3D nature of the pie chart e.g. It's tilted, slanted, seen from an angle etc. Ignore all references to missing angles, not being joined, etc. Mark the best bit unless contradicted

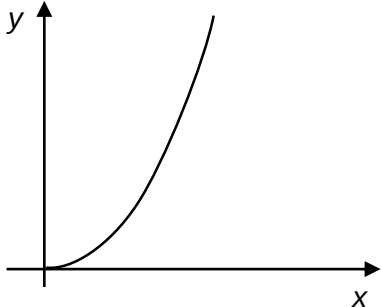
Question			Answer	Marks	Part marks and guidance
2	(a)		47.5	4	B1 for at least four of 10, 30, 45, 55, 70 M1 FT for Σmf where m is a value within each group $10 \times 5 + 30 \times 8 + 45 \times 37 + 55 \times 47 + 70 \times 3$ soi by $50 + 240 + 1665 + 2585 + 210$ or 4750 M1 FT dep on M1 for <i>their</i> $4750 \div \text{their } (5+8+37+47+3)$ May be implied by four correct products or 4750 FT their “midpoints” seen. M1 may be implied by Lower: $0+160+1480+2350+180$ (4180) Upper: $100+320+1850+2820+240$ (5330) Allow one error in calculation. Expect 100
	(b)		Exact speeds for each vehicle are not recorded oe	1	Do not accept, “Because the mid-point is used” or comments on the method used. Accept e.g.: Specific speeds not given or We don’t know the speeds The exact speed isn’t given

Question			Answer	Marks	Part marks and guidance	
3			1.3×10^{14}	5	B4 for 1.30×10^{14} or $1.29[6\dots] \times 10^{14}$ or 130 000 000 000 000 as final answers or B3 for 1.3×10^n ($n \neq 0$) or $1.29[6\dots] \times 10^{14}$ written in full or M3 for $3500 \div (2.7 \times 10^{-11})$ oe or B2 for $1.29[6\dots] \times 10^n$ ($n \neq 0$) or figs 13 OR M1 for figs 35 $\div$ figs 27 soi by figs 129[6...] B1 for 3500 or 2.7×10^{-14} oe or 3.5×10^3 seen	For 5 marks and M marks, condone use of correctly rounded values in correct calculations E.g. 129 600 000 000 000 0.000 000 000 000 027
4			$(4.7) \leq (x) < (4.8)$	2	B1 for each symbol	

Question		Answer	Marks	Part marks and guidance	
5	(a)	$180 \div 3.5 \times 11.2 = 576$ or $180 \div 3.5 = 51.4[\dots]$ and $576 \div 11.2 = 51.4[\dots]$ or $576 \div 180 = 3.2$ and $11.2 \div 3.5 = 3.2$	3	M2 for $180 \div 3.5 \times 11.2$ or $180 \div 3.5$ and $576 \div 11.2$ or $576 \div 180$ and $11.2 \div 3.5$ or M1 for $180 \div 3.5$ soi $51.4[\dots]$ or $576 \div 11.2$ soi $51.4[\dots]$ or $576 \div 180$ soi 3.2 or $11.2 \div 3.5$ soi 3.2	For M marks allow figs used eg M2 for $18 \div 350 \times 112$ If in two stages: For full marks, condone premature rounding if accurate and answer is stated as 576. E.g. 3 marks for $180 \div 3.5 = 51.4$ and $51.4 \times 11.2 [= 575.68 \text{ or } 575.7] = \mathbf{576 \text{ (required)}}$ eg M2 for $180 \div 3.5 = 51.5$ and $51.5 \times 11.2 = 576$ Accept equivalent methods eg divisions inverted or correct use of lengths in other units.
	(b)	No oe and correct explanation	2	B1 for $180 \div k \times 11.2$ where $k > 3.5$ leading to answer < 576 or $[180 \div 3.5 =] 51.4\dots$ and $180 \div k, k > 3.5$ leading to answer $< 51.4(\dots)$ or Each cm on the map will be worth fewer km in real life oe	For full marks, clear conclusion and an explanation earning B1 is needed $[180 \div 3.5 =]$ may be referred to in (a)
	(c)	7500 cao	2	M1 for figs $18 \div$ figs 24 soi figs 75	If units included in answer max M1

Question			Answer	Marks	Part marks and guidance	
6			375	4	M3 for $1025 \div (5k + 15k + 21k) \times 15k$ oe or M2 for $1025 \div (5k + 15k + 21k)$ oe or M1 for two ratios with a common number of cashews implied by $5k$ (almonds) and $21k$ (peanuts) seen, $k > 0$ or for $5 : 15 [: 21]$ or $[5 :] 15 : 21$ or 41 seen	M3 implied by 125, 375, 525 with 375 not selected
7	(a)		9	2	M1 for 15×0.62 , possibly soi by 9.3 If 0 scored, then SC1 for 15×0.41 leading to 6 as final answer	Condone "9 or 10" as final answer for 2 marks if correct working is shown.
	(b)	(i)		2	B1 for 0.38 and at least one 0.59 seen on correct branches	

Question			Answer	Marks	Part marks and guidance	
		(ii)	0.5216 or $\frac{326}{625}$	3	M2FT for $(0.62 \times \text{their } 0.59) + (\text{their } 0.38 \times 0.41)$ oe or M1FT for $(0.62 \times \text{their } 0.59)$ soi by 0.3658 oe or $(\text{their } 0.38 \times 0.41)$ soi by 0.1558 oe	Condone 0.52 or 0.522 as final answer provided nfwv
8	(a)	(i)	2	2	M1 for 'rise' ÷ 'run' e.g. $8 \div 4$	
		(ii)	0	1		
	(b)		150	4	M3 for complete area $\left[\frac{4 \times 8}{2} + (10 \times 8) + \frac{(8 + 10) \times 6}{2} \right]$ or M2 for two areas $\frac{4 \times 8}{2}$ oe, (10×8) oe, or $\frac{(8 + 10) \times 6}{2}$ oe or M1 for one area $\frac{4 \times 8}{2}$ oe, (10×8) oe, or $\frac{(8 + 10) \times 6}{2}$ oe	For M2 combining a triangle and a rectangle into a trapezium $\frac{(14 + 10) \times 8}{2}$ counts as "two areas" Look for answers of 16, 80 and 54. Allow M marks for calculations from other suitable splitting of the areas

Question			Answer	Marks	Part marks and guidance	
9	(a)		A	1		
	(b)		C	1		
10				2	B1 for a generally increasing graph through (0, 0) or for correct shape not through (0, 0)	Condone straight line with positive gradient through (0,0) for B1

Question			Answer	Marks	Part marks and guidance		
11			12 nfw	5	B1 for 5x and x soi and M1 for 6x = 180 oe and A1 for x = 30 and M1 for $[n =] \frac{360}{their\ 30}$ <u>Alternative</u> M1 for $xn = 360$ oe and M1 for $5xn = 180(n - 2)$ oe and M1 for $5 \times 360 = 180(n - 2)$ oe and M1 for $10 = n - 2$ <u>Alternative</u> M2 for use of two of 		

Question	Answer	Marks	Part marks and guidance	
12	7.17 to 7.18 or 7.2 nfww	6	M3 for $x^2 - 3x - 30 = 0$ or M2 for $\frac{6}{2}(10 + x) = x^2$ oe or M1 for $\frac{6}{2}(10 + x)$ oe AND M2FT for $\frac{3 + \sqrt{(-3)^2 - 4 \times (-30)}}{2}$ or better or 7.17 to 7.18 and -4.18 to -4.17 or M1FT for either formula with at most two errors	Condone missing brackets for M1 FT from <i>their</i> 3 term quadratic Allow M2FT for $\frac{3 \pm \sqrt{(-3)^2 - 4 \times (-30)}}{2}$ or better Alternative by completing the square: M2FT for $1.5 + \sqrt{32.25}$ or $1.5 \pm \sqrt{32.25}$ or 7.17 to 7.18 and -4.18 to -4.17 or M1FT for $(x - 1.5)^2 - 32.25$
13	$8\pi + t\pi + 16 - 2t$ oe including unsimplified expressions	3	B2 for two of $\frac{16\pi}{2}$ oe, $\frac{2t\pi}{2}$ oe, or $16 - 2t$ oe seen or B1 for one of $\frac{16\pi}{2}$ oe, $\frac{2t\pi}{2}$ oe, or $16 - 2t$ oe seen	Mark final answer Equivalent simplified expressions include: $\pi(8 + t) + 16 - 2t$ or $t(\pi - 2) + 8(\pi + 2)$ Penalise use of 3.14 once e.g. 25.1... and 3.14t scores B1

Question			Answer	Marks	Part marks and guidance	
14	(a)		$x = 0.191919\dots$ $100x = 19.191919\dots$ $99x = 19$ $x = \frac{19}{99}$	3	M1 for $100x = 19.191919\dots$ and M1 for $100x - x = 19.191919\dots - 0.191919\dots$ or better	For full marks, clear step by step process must be evident Apply marks in a similar way to other methods e.g. M1 and M1 for $10000x - 100x = 1919.1919\dots - 19.1919\dots$
	(b)		0.19 $\div 10$ or "divide by 10" 0.19 $\div 10$ 0.19	1 1 dep	Dependent on first mark	Answer only scores 0
15			2.2667 and 2.3882	3	B2 for 2.2667 or for $2.2666\dots$ or $\frac{34}{15}$ and 2.388... or M1 for $\frac{2^3}{30} + 2$ soi by 2.2666... or 2.266... or $\frac{34}{15}$	For 3 marks, answers must be on answer line or correctly identified as x_2 and x_3

Question	Answer	Marks	Part marks and guidance	
16	There could be £301 e.g. because $2635 \div 8.745 = 301[.3\dots]$	3	M2 for a calculation of $(2625 \text{ to } 2635) \div (8.745 \text{ to } 8.755)$ oe correctly evaluated to an answer of 301(....) or for a calculation of $(2632.245 \text{ to } 2635) \div 301$ oe correctly evaluated to an answer of 8.745 to 8.755 or for a calculation of $301 \times (8.745 \text{ to } 8.7541528\dots)$ oe correctly evaluated to an answer of 2625 to 2635 or M1 for any further calculation of $(2625 \text{ to } 2635) \div (8.745 \text{ to } 8.755)$ or $(2625 \text{ to } 2635) \div 301$ or $301 \times (8.745 \text{ to } 8.755)$ but not $2625 \div 8.755$ or $2630 \div 8.75$ or B1 for 2635, 2.635, 8.745 or 8745 seen	For full marks, their conclusion must follow from a relevant calculation which shows that 301 is a possible answer (either use of 301 and two weights in range, or an answer of more than 301 rounded down, and not an answer of less than 301 rounded up) Calculations may be done in grams as shown, or converted to kg. Common calculations for at least M2 include: $2635 \div 8.75 = 301.1(\dots)$ $2635 \div 8.745 = 301.3(\dots)$ Common calculations scoring only M1 include: $2625 \div 8.75 (= 300)$ $2630 \div 8.745 = 300.7(\dots)$

Question			Answer	Marks	Part marks and guidance	
17			$(\sqrt{6}, 2\sqrt{6})$ and $(-\sqrt{6}, -2\sqrt{6})$	5	B4 for $(x =) \pm \sqrt{6}$ or one intersection or M3 for $x^2 = 6$ or M2 for $x^2 + 4x^2 = 30$ or $5x^2 = 30$ or M1 for $x^2 + (2x)^2$	Condone missing brackets for M1
18	(a)			3	B1 for general shape B1 for max at +2, minimum at 0 B1 for max at $x = 0, 360, 720$	Starting at max above the x axis, and completing at least one full cycle For full marks, it must be a curve and have correct curvature
	(b)		The maximum value of $\cos x + 1$ is 2 and 2.7 is greater than 2 oe	1		More 'work' may be correctly done before an equivalent conclusion, e.g. $\cos x = 1.7$, and max value of $\cos x$ is 1 and 1.7 is greater than 1.

Question	Answer	Marks	Part marks and guidance	
19	32.2 to 32.3	6	M2 for $x^2 - 10x + 19 = 0$ oe or M1 for $9^2 = 10^2 + x^2 - 2 \times 10 \times x \times \cos 60$ AND M1FT for $\frac{10 \pm \sqrt{10^2 - 4 \times 1 \times 19}}{2}$ A1 for $x = 7.45$ or $5 + \sqrt{6}$ AND M1 for $\frac{1}{2} \times 10 \times \text{their } 7.45 \times \sin 60$ oe <u>Alternative</u> M1 for $\frac{\sin 60}{9} = \frac{\sin B}{10}$ oe M1 for $\sin B = \frac{10}{9} \sin 60$ or better A1 for $B = 74.2(\dots)$ AND M1 for $A = 180 - 60 - \text{their } 74.2$ so by 45.8 AND M1 for $\frac{1}{2} \times 9 \times 10 \times \text{their } \sin 45.8$	Accept 32 after full correct method Use of cosine rule FT their quadratic = 0 <u>Alternative:</u> M1 for $(x - 5)^2 - 6 = 0$ Ignore 2.55 or $5 - \sqrt{6}$ <i>Their 7.45 should be from cosine rule followed by quadratic (not from measuring etc.)</i> Use of sine rule Isolates $\sin B$ <i>Their 45.8 should be from sine rule followed by $180 - \text{their sine rule answer}$ (not from measuring etc.)</i>

Question			Answer	Marks	Part marks and guidance	
20	(a)		eg. $\begin{pmatrix} 1 \\ 1 \end{pmatrix}$ and $\begin{pmatrix} 3 \\ 2 \end{pmatrix}$	3	B2 for one correct answer or M1 for any multiple of $\begin{pmatrix} 2 \\ 1 \end{pmatrix}$ seen	Other correct answers include: $\begin{pmatrix} 5 \\ 3 \end{pmatrix}, \begin{pmatrix} -1 \\ 0 \end{pmatrix}, \begin{pmatrix} -3 \\ -1 \end{pmatrix}, \begin{pmatrix} -7 \\ -3 \end{pmatrix}, \begin{pmatrix} -9 \\ -4 \end{pmatrix}, \begin{pmatrix} -11 \\ -5 \end{pmatrix},$ $\begin{pmatrix} -13 \\ -6 \end{pmatrix}$ and $\begin{pmatrix} -15 \\ -7 \end{pmatrix}$
	(b)		$m = -2, n = 4$	5	B1 for $\begin{pmatrix} 4m \\ m \end{pmatrix}$ or $\begin{pmatrix} 5n \\ 2n \end{pmatrix}$ soi and M1 for $4m + 5n = 12$ or $m + 2n = 6$ and M1 for multiplication by scalar(s) to equate coefficients in m or n or reduction to one variable by substitution e.g. $4(6 - 2n) + 5n = 12$ and M1 for elimination or simplification to $3m = -6$ or $3n = 12$ oe	

Question			Answer	Marks	Part marks and guidance	
21			5 nfww and after $\frac{5(x+5)(x-7)}{(x+5)(x-7)}$ seen	6	B1 for $(x+5)(x-7)$ or $x^2 + 5x - 7x - 35$ or better seen as a common denominator of the first two fractions AND B3 for numerator $5x^2 - 10x - 175$ or B2 for numerator $5x^2 - 10x + 125$ or M1 for $5x(x-7)$ and $25(x+5)$ AND M1 for $5(x^2 - 2x - 35)$ or $(5x + 25)(x - 7)$ or $(x + 5)(5x - 35)$ or $5(x + 5)(x - 7)$	Condone missing final bracket. Condone numerators written without any denominators or with an incorrect common denominator