

Question	Working	Answer	Mark	Notes
8 (a)		15, 15, 16, x, 22	3	M1 for a list of 5 numbers where the mode is 15 or the median is 16 or the range is 7
				M1 for a list of 5 numbers with two of: the mode is 15 the median is 16 the range is 7
				A1 where x is 17, 18, 19, 20 or 21 (numbers can be in any order)
(b)	$8 \times 104 [= 832]$ or $5 \times 89 [= 445]$		3	M1 for the total weight of the 8 letters or the total weight of the 5 letters
	$8 \times 104 - 5 \times 89$ oe eg “832” – “445” [= 387]			M1 for the total weight of the 3 letters
		129		A1 cao
(c)	<u>cm square (5ss by 5ss)</u> $1 \times 3 + 3 \times 4$ cm squares = 75 or 15 cm squares = 75 or 1 cm square = 5 parcels oe <u>small squares (ss)</u> 75 lines of 5 ss = 75 or $5 \times 15 + 15 \times 20$ ss = 75 or 375 ss = 75 or 5 ss = 1 parcel oe		5	M1 for showing frequency is related to area by a correct calculation or a correct value for area and frequency or a correct value on FD axis (1 cm vertically is FD 5) this may come from $1 \times 15x + 3 \times 20x = 75$ oe eg $1 \times 3x + 3 \times 4x = 75$ Implied by a frequency of 20 or 15 or 60 or 30 or 20 seen Any fd / frequency may be seen in the correct place on the histogram
	<u>using FD</u> eg $2 \times 10 + 75 + 2 \times 15 + 4 \times 5 [= 145]$ $2 \times 20 + 2 \times 15 + 4 \times 5 [= 90]$ <u>cm square (5ss by 5ss)</u> eg $14 \times “5” + 75 [= 145]$ or $29 \times “5” [= 145]$ oe or $18 \times “5” [= 90]$ <u>small squares (ss)</u> eg $\frac{100 + 75 + 300 + 150 + 100}{5} [= 145]$ $\frac{200 + 150 + 100}{5} [= 90]$			M1 implies the previous method mark for a correct method to find the total number of parcels or a correct method to find the number of parcels greater than 4 kg Also allow correct method to find the number of parcels less than 4 kg eg $2 \times 10 + 1 \times 15 + 1 \times 20 [= 55]$ oe
	$\frac{90}{145}$ or $\frac{18}{29}$ or “0.62(06...)” oe			M1 implies both previous method marks for a correct first probability Only ft numbers from correct working Also allow the correct probability for a parcel being less than 4 kg eg $\frac{55}{145}$ or $\frac{11}{29}$ or 0.37(93...)

	$\frac{90}{145} \times \frac{90-1}{145-1}$ oe			M1 A correct product Allow $\left(\frac{90}{145}\right)^2 = \frac{324}{841} \approx 0.385$ Condone $2 \times \frac{90}{145} \times \frac{90-1}{145-1}$ and $2 \times \left(\frac{90}{145}\right)^2$
		$\frac{89}{232}$		A1 oe eg 0.38(36...) [decimal or % 2sf or better] Allow 0.38 – 0.3853
	<i>cas for each part</i>			<b><i>Total 11 marks</i></b>

Question	Working	Answer	Mark	Notes
9 (a) (i)		80	1	B1 cao
(a) (ii)		correct reason	1	B1 dep on B1 in (i) for <u>Angle</u> at the <u>centre</u> is <u>2 ×</u> (double) angle at <u>circumference</u> / <u>angle at circumference</u> is <u>½</u> angle at <u>centre</u> allow the symbol for the word ‘angle’
(b)	eg “80” – 37 or 360 – “80” – 37 – (360 – 160) or 180 – “80” – 37 – (180 – 160) oe		2	M1 ft their answer to part (a)(i) A correct method to find angle <i>TPO</i>
		43		A1 cao
(c)	Throughout part (c) allow 3.1, 3.14, etc or $\frac{22}{7}$ for $\pi$ and allow any letter or symbol for $r$			
(c)	$\frac{160}{360} \times \pi \times r^2 = \frac{196}{25} \pi$ oe eg $\frac{160}{360} \times r^2 = \frac{196}{25}$		6	M1 for an equation in the form $\frac{160}{360} \times \pi \times (...r)^2 = \frac{196}{25} \pi$ or $\frac{160}{360} \times \pi \times ...r^2 = \frac{196}{25} \pi$
	$[r =] \sqrt{\frac{196\pi}{25} \div \frac{160\pi}{360}}$ oe eg $[r =] \sqrt{\frac{196}{25} \times \frac{9}{4}} \left[ = \frac{21}{5} = 4.2 \right]$			M1 implies previous M a correct calculation for the radius of the sector (slant height of cone)
	[radius of cone = ] eg $\frac{196}{25} \div "4.2" \left[ = \frac{28}{15} = 1.866... \right]$ oe eg $\frac{\frac{160}{360} \times 2\pi \times "4.2"}{2\pi} \left[ = \frac{28}{15} = 1.866... \right]$			M1 for $\frac{196}{25} \div "r"$ where “ $r$ ” is the candidate’s value for the radius of the sector. If $r$ is incorrect it must be clearly labelled and working for this method mark must be shown Condone radius of cone being labelled as $l$
	(cone height=) $\sqrt{"4.2"^2 - "1.866..."^2} \left[ = \frac{7\sqrt{65}}{15} = 3.762... \right]$			M1 dep on first and third method marks, for a correct calculation for the height of the cone Follow through candidate’s values for $r$ or $r$ and $l$ . These must be clearly labelled and working shown if they are incorrect Condone $\sqrt{"1.866..."^2 - "4.2"^2}$
	$\frac{1}{3} \times \pi \times "1.866..."^2 \times "3.762..." \left[ = 4.36(99..) \pi \right]$			M1 dependent on previous four method marks for a correct calculation for the volume where $r$ and $h$ are from correct methods NB: $\frac{1}{3} \times \pi \times "4.2"^2 \times "3.762..."$ does not get this mark
		13.7 (cm <sup>3</sup> )		
	cas			Total 10 marks

Question	Working	Answer	Mark	Notes
10 (a)		-2	1	B1 allow $x = -2$ or $x \neq -2$ <b>DO NOT</b> allow $x < -2$ or $x > -2$ or $y = -2$ or $y \neq -2$
(b)		15	1	B1 cao
(c)	$\frac{13}{x+2} = 5$ oe		2	M1 Setting $g(x) = 5$ Allow any letter for $x$
		0.6		A1 oe eg $\frac{3}{5}$
(d)	$[fg(x) = ]\left(\frac{13}{x+2}\right)^2 + 2\left(\frac{13}{x+2}\right)$ oe or $[g(24) = ] \frac{13}{24+2} [= 0.5]$ oe or $f(0.5)$ oe		2	M1 For evidence of a correct first step eg finding $fg(x)$ or sight of 0.5 (which may be embedded in their attempt at $fg(24)$ )
		1.25		A1 oe eg $\frac{5}{4}$
(e)	$\frac{13}{x^2 + 2x + 2} [= 4]$ or $\frac{13 - 2x}{x} \left[ \Rightarrow \frac{13 - 2(4)}{4} = \frac{5}{4} \right]$ or $\frac{13}{x+2} = 4 \Rightarrow x = \frac{5}{4}$		4	M1 for a correct (un simplified) expression for $gf(x)$ or for finding the inverse of $g$ or for correctly solving $g(x) = 4$ may use a different letter to $x$ eg $\frac{13}{t+2} = 4 \Rightarrow t = \frac{5}{4}$
	$4x^2 + 8x - 5 [= 0]$ oe eg $x^2 + 2x - \frac{5}{4} [= 0]$ or $x^2 + 2x = \frac{5}{4}$			M1 a correct 3TQ
				M1 dependent on the first method mark For solving their 3 term quadratic using any correct method. Method may be implied by answers of 0.5 and -2.5 or by an answer of 0.5 Working must be shown if their quadratic is incorrect
		$\frac{1}{2}$		A1 dep on first method mark for just $\frac{1}{2}$ oe

(f)	$[y=]5(x^2 - 2x) - 4$ or $[y=]5\left(x^2 - 2x - \frac{4}{5}\right)$		4	M1 for a correct start to write the quadratic in completed square form Allow $x$ and $y$ to be interchanged Condone division of all terms by 5 ie $x^2 - 2x - \frac{4}{5}$ oe
	$[y=]5\left((x-1)^2 - 1\right) - 4$ or $[y=]5\left((x-1)^2 - 1 - \frac{4}{5}\right)$			M1 implies previous method mark Allow $y = (\sqrt{5}x - \sqrt{5})^2 - 5 - 4$ oe Allow $x$ and $y$ to be interchanged Condone $(x-1)^2 - 1 - \frac{4}{5}$ oe
	$\frac{y+9}{5} = (x-1)^2$			M1 Allow $y + 9 = (\sqrt{5}x - \sqrt{5})^2$ oe Allow $x$ and $y$ to be interchanged
	<b>Allow candidates to swap <math>x</math> and <math>y</math> when finding inverse</b>	$[h^{-1} : x \mapsto ]$ $1 + \sqrt{\frac{x+9}{5}}$		A1 oe eg $\frac{\sqrt{x+9} + \sqrt{5}}{\sqrt{5}}$ Must only have + and must be in $x$ Do not ISW
(f) alt	$5x^2 - 10x - (y+4)[=0]$ oe		4	M1 for a correct first step of arranging all terms on the same side of an equation / expression
	$[x=]\frac{10 \pm \sqrt{100 - 4 \times 5 \times (-y-4)}}{10}$ oe			M1 dep for applying the quadratic formula correctly Allow with positive sign only eg $[x=]\frac{10 + \sqrt{100 - 4 \times 5 \times (-y-4)}}{10}$
	$[y=]\frac{10 \pm \sqrt{180 + 20x}}{10}$ oe or $[x=]\frac{10 + \sqrt{180 + 20y}}{10}$ oe			M1 dep on first M1 for recognising that $x/y$ has to be positive in a correct expression or for having a correct expression in terms of $x$ Allow un-simplified eg $[y=]\frac{10 \pm \sqrt{100 - 4 \times 5 \times (-x-4)}}{10}$
	<b>Allow candidates to swap <math>x</math> and <math>y</math> when finding inverse</b>	$[h^{-1} : x \mapsto ]$ $1 + \sqrt{\frac{x+9}{5}}$		A1 oe eg $1 + \frac{\sqrt{180 + 20x}}{10}$ Allow un-simplified eg $\frac{10 + \sqrt{100 - 4 \times 5 \times (-x-4)}}{10}$ or $\frac{10 + \sqrt{180 + 20x}}{10}$ Must only have + and must be in $x$ Do not ISW
cas for parts (a), (b), (c), (d), (f) wr for part (e)			Total 14 marks	

Question	Working	Answer	Mark	Notes
11	$2(5 + y)^2 + y^2 + 2y(5 + y) = 85$ or $2x^2 + (x - 5)^2 + 2x(x - 5) = 85$		6	M1 for substituting a linear equation into the quadratic equation Allow one sign error in their $(5 + y)$ or $(x - 5)$ This mark can be implied by an un simplified correct expansion in a correct equation eg $50 + 20y + 2y^2 + y^2 + 10y + 2y^2 = 85$ or $2x^2 + x^2 - 10x + 25 + 2x^2 - 10x = 85$
	$50 + 20y + 2y^2 + y^2 + 10y + 2y^2 = 85$ or $2x^2 + x^2 - 10x + 25 + 2x^2 - 10x = 85$			M1 for correct expansion of all brackets in a correct equation. Implied by a correct (simplified) quadratic expression. No simplification needed at this stage.
	$5y^2 + 30y - 35 [= 0]$ oe eg $y^2 + 6y - 7 [= 0]$ or $5x^2 - 20x - 60 [= 0]$ oe eg $x^2 - 4x - 12 [= 0]$			A1 dep on first method mark being awarded A correct 3 term quadratic in either $x$ or $y$ (oe so look for signs reversed, does not need to equal zero eg allow $x^2 - 4x = 12$ )
	eg $(5y - 5)(y + 7) [= 0]$ oe or $\frac{-30 \pm \sqrt{(30)^2 - 4 \times 5 \times -35}}{2 \times 5}$ oe or $5(y + 3)^2 - 80$ and $y = \pm \sqrt{\frac{80}{5}} - 3$ oe eg $(x - 6)(x + 2) [= 0]$ oe			M1 dependent on one of the two previous M marks. Solving their 3 term quadratic equation using any correct method. If the quadratic is correct then the method may be implied by <b>6 and -2</b> or by <b>1 and -7</b> . Working must be shown if their quadratic is incorrect to gain this method mark. Condone incorrect labelling
	-2 and 6 or -7 and 1			A1 dep M3 and a correct quadratic For both $x$ values correct or both $y$ values correct Condone incorrect labelling
		Correct pairings $x = 6, y = 1$ $x = -2, y = -7$		A1 dep M3 and a correct quadratic For both pairs correct, must show <b>unambiguous</b> pairings. Allow as coordinates $(6, 1)$ and $(-2, -7)$ isw transcription errors eg exchanging $x$ and $y$ values. <b>Correct answer(s) with no working scores no marks</b>
	wr			Total 6 marks