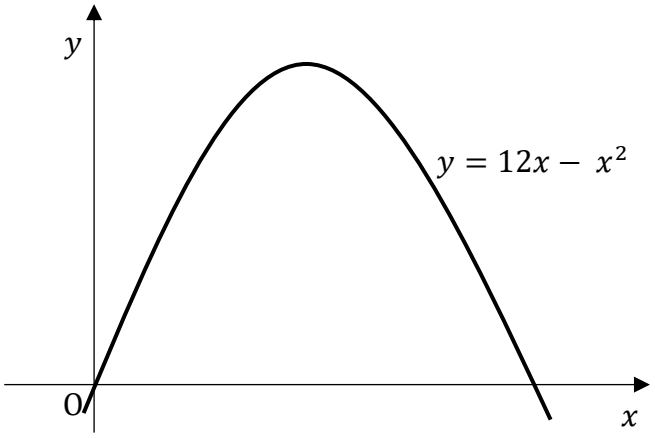
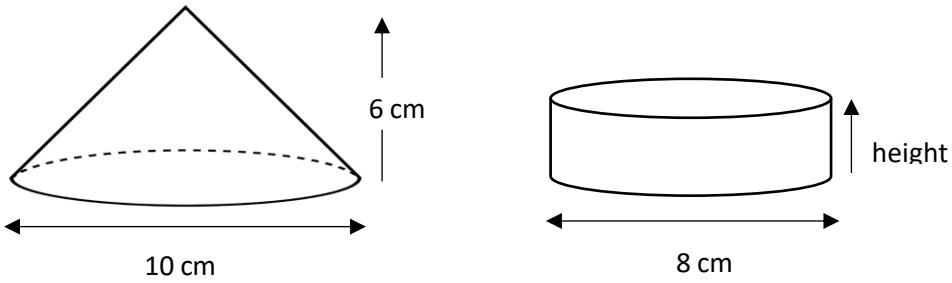
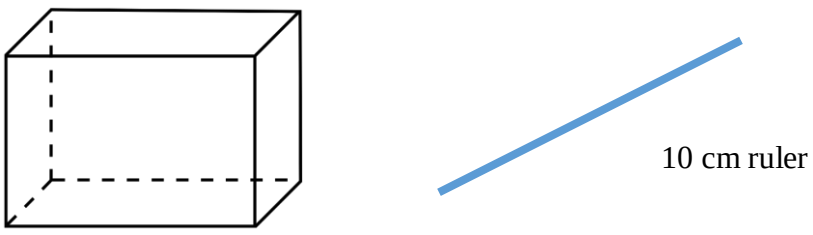
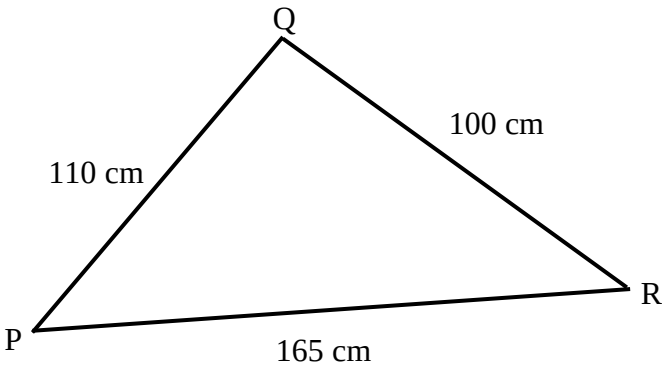
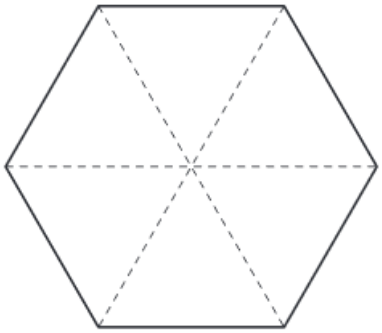
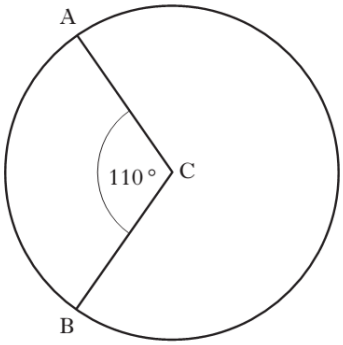
	January Prelim Revision 3 – Non Calculator	**25**
1	Multiply out the brackets and collect like terms $(2x+3)(x-5)+(x-1)^2$	**3**
2	Determine the nature of the roots of the function $f(x) = 5x^2+2x+1$	**2**
3	Write $x^2-4x+15$ in the form $(x+p)^2+q$	**2**
4	A straight line L_1 has the equation $x+y=5$ (a) Find the gradient of line L_1 (b) State the coordinates of one point on line L_1 (c) Line L_1 meets line L_2 at point P. If Line L2 has the equation $2x-3y=15$, find the coordinates of point P.	 **1** **1** **3**
5	For $2^n = \frac{1}{8}$, find a value for n	**2**
6	Simplify $\tan x° \cos x°$	**2**
7	Given that $2x^2-2x-1=0$, show that $x = \frac{1\pm\sqrt{3}}{2}$	**4**
8	The diagram below shows part of the parabola with equation $y = 12x - x^2$  (a) By factorising $12x-x^2$, find the roots of the equation $12x-x^2=0$ (b) State the equation of the axis of symmetry for this parabola (c) State the maximum value of this parabola	 **2** **1** **2**

	January Prelim Revision 3 – Calculator	**35**
1	Shown below is a cone and a cylinder which have the same volume  (a) The cone has a diameter of 10 cm and a height of 6cm. Calculate the volume of the cone, give your answer correct to **two significant figures.**	**3**
	(b) The cylinder has the same volume of the cone, and its diameter is 8cm. Calculate the height of the cylinder.	**2**
2	71% of the earth's surface area is water and 29% is land. The area of the land is approximately 1.48×10^8 km^2. Calculate the total surface area of the earth. Give your answer in scientific notation correct to **3 significant figures**	**4**
3	A new heating system is installed in a greenhouse. Sample temperatures in degrees Celsius are recorded for one week: 22 23 25 21 19 24 20 (a) For this sample calculate the mean and the standard deviation	**4**
	The heating system us operating effectively if the mean temperature is 23 ± 0.6 degrees and the standard deviation is less than 2.3 degrees. (b) Is this system working effectively? Give a reason for your answer	**2**
4	The box below is a cuboid with dimensions of 7 cm by 4 cm by 5 cm. Can I fit a 10 cm ruler into this box?  	**3**

5	 For the triangle shown. Calculate the size of angle Q	**3**
6	The top of a table is in the shape of a regular hexagon. The three diagonals of the hexagon are shown as dotted line which have a length of 30 centimetres. Calculate the area of the top of the table 	**4**
7	For the minor sector of the circle shown in the diagram. The centre angle ACB is 110° The area of the sector is 47 cm^2 Calculate the length of the radius AC 	**4**
8	The blades on a wind turbine rotate at a steady pace. The height, *h* metres, of the top blade of the turbine above the ground at *t* seconds is given by the function $h(t) = 8 + 6\sin t°$ (a) Calculate the height of the blade after 30 seconds (b) Find the two times during the first turn when the height of the blades is 12 metres	**2** **4**

	Non Calculator – Answers
1	$2x^2 - 10x + 3x - 15 + x^2 - 2x + 1 = \mathbf{3x^2 - 9x - 14}$
2	$b^2 - 4ac = 2^2 - 4 \times 5 \times 1 = -16$, **$-16 < 0$ so there are no real roots**
3	$\mathbf{(x-2)^2 + 11}$
4	(a) $x + y = 5$, $y = -x + 5$ so the gradient is -1 (b) $(2,3)$, $(1,4)$ etc (c) $x + y = 5$ Scale $3x + 3y = 15$ $2x - 3y = 15$ $\underline{2x - 3y = 15}$ $5x = 30$ $\mathbf{P(6,-1)}$
5	$2^3 = 8$, so $2^{-3} = \frac{1}{8}$, $\boldsymbol{n = -3}$
6	$\tan x° = \dfrac{\sin x°}{\cos x°} \rightarrow \dfrac{\sin x°}{\cos x°} \times \cos x° = \sin x°$
7	$x = \frac{-(2) \pm \sqrt{(-2)^2 - 4 \times 2 \times (-1)}}{2 \times 2} \rightarrow$ $x = \frac{2 \pm \sqrt{12}}{4} \rightarrow$ $x = \frac{2 \pm 2\sqrt{3}}{4} = \frac{1 \pm \sqrt{3}}{2}$ as required
8	(a) $x(12 - x) = 0$, $x = 0$ and $x = 12$ (b) $x = 6$ (c) $x = 6$, $y = 36$

	Calculator Answers
1	$V(\text{cone}) = \frac{1}{3}\pi \times 5^2 \times 6 =$ $157.079 = 160\text{cm}^3$ $V(\text{cylinder})$ $160 = \pi \times 4^2 \times h$, $h = 3.125$, height is $\mathbf{3.1\ cm}$
2	$29\% = 1.48 \times 10^8$, $100\% = 510344827.6 = \mathbf{5.1 \times 10^8}$
3	Mean is 22 degrees St Dev = $\sqrt{\frac{28}{6}} = 2.16$ The standard deviation is less than 2.3 degrees, but the mean temperature is not within the given tolerance, so the system is not working effectively.
4	The space diagonal is $\sqrt{7^2 + 4^2 + 5^2} = 3\sqrt{10}$ $3\sqrt{10} = 9.49\ cm < 10\ cm$ So the 10 cm ruler will not fit in the cuboid
5	$\cos Q = \dfrac{110^2 + 100^2 - 165^2}{2 \times 110 \times 100} = \dfrac{-41}{176}$, $\boldsymbol{Q = 103.5°}$
6	Area of each triangle is $A_T = \frac{1}{2} \times 15 \times 15 \times \sin 60 = 97.4278..$ Area of table is $6 \times A_T =$ $\mathbf{584.4\ cm^2}$
7	$47 = \frac{110}{360} \times \pi \times AC^2$, $AC^2 = 48.9618...$ length of radius AB is $\sqrt{48.9618}$ =**7 cm**
8	(a) height is $8 + 6 \times \sin 30 =$ $\mathbf{11\ m}$ (b) $12 = 8 + 6\sin t$, $\frac{4}{6} = \sin t$, $t = 41.8°$ and $138.2°$