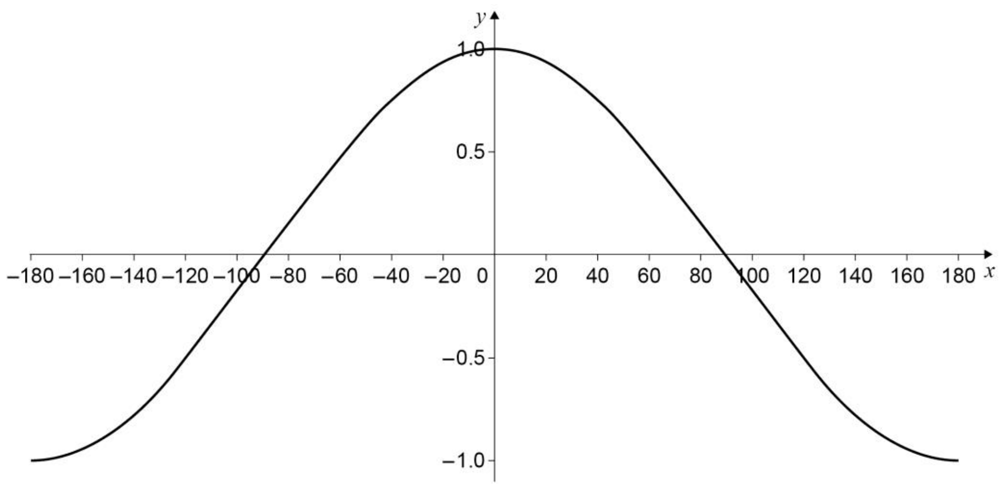
TOPIC TEST MARK

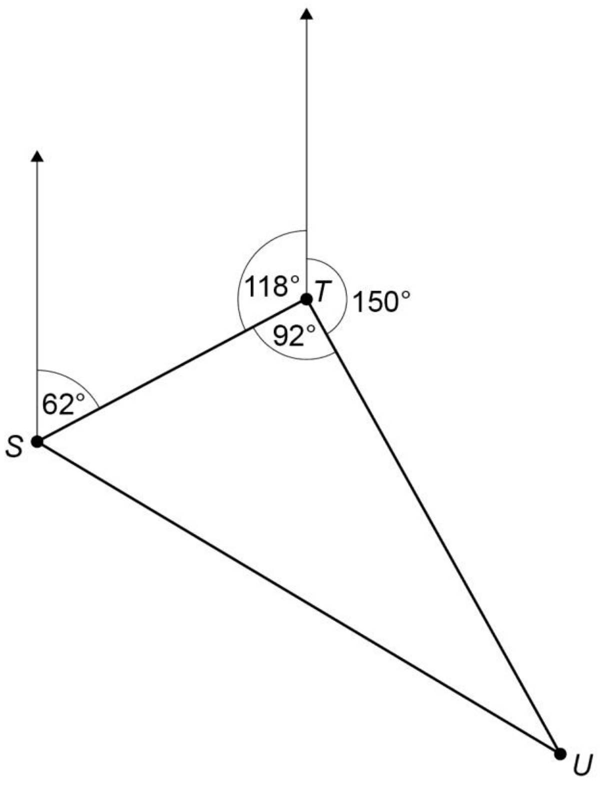
AS and A-level MATHS

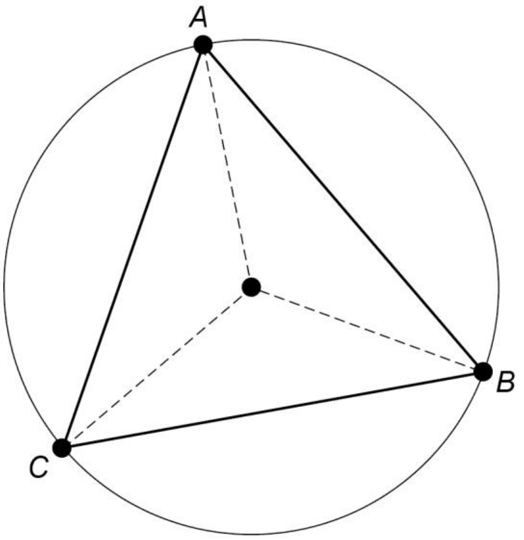
Trigonometry 1

Mark scheme

Specification content coverage: E1, E3 (AS content)

Question	Solutions	Mark
1 (a)	Circles y = sin x	1
1 (b)	Rotational symmetry of order 2 about origin (or any multiple of 180º) Repeats every 180º	1 1
2	Using Pythagoras' theorem on a right-angled triangle gives opp = 4 $\sin\theta = \frac{\text{opp}}{\text{hyp}} = \frac{4}{5}$ and $\tan\theta = \frac{\text{opp}}{\text{adj}} = \frac{4}{3}$	1 1
3 (a)		2
3 (b)	$x = \cos^{-1}\left(-\frac{3}{4}\right) = 138.5903779...$ The values within the range are 139º and 221º	1 1

4 (a)	$a^2 = b^2 + c^2 - 2bc \cos A$ $7^2 = 3^2 + 5^2 - 2 \times 3 \times 5 \cos \theta$ $15 = -30 \cos \theta$ $\cos\theta = -\frac{1}{2}$ $\theta = 120^{\circ}$	1 use of cosine rule 1 1
4 (b)	Area of triangle $= \frac{1}{2} ab \sin C$ Area of triangle $= \frac{1}{2} \times 3 \times 5 \sin 120^{\circ}$ Area of triangle $= \frac{1}{2} \times 3 \times 5 \times \frac{\sqrt{3}}{2}$ Area of triangle $= \frac{15\sqrt{3}}{4}$ cm^3	1 use of sine rule 1 1
5	$\sin(180^{\circ} - x) = 0.8$ $\sin(180^{\circ} + x) = -0.8$	1 1
6	 $SU^2 = 5^2 + 8^2 - 2 \times 5 \times 8 \cos 92^{\circ}$ $SU^2 = 91.79195……$ SU =9.6 km (correct to 2 significant figures)	1 diagram and identifying angles needed 1 1

7 (a)	 $C=2\pi r, 10\pi=2\pi r, r=5$ Three triangles meet at the centre of the circle with 120º in each Area of triangle $=\frac{1}{2}ab\sin C$ Area of each of the three smaller triangles $=\frac{1}{2}5\times5\sin120^\circ\frac{25\sqrt{3}}{4}$ Therefore, area of equilateral triangle $=\frac{75\sqrt{3}}{4}$	1 method 1 1 1 1
7 (b)	Each chord can be found by using the cosine rule $a^2 = b^2 + c^2 - 2bc\cos A$ $a^2 = 5^2 + 5^2 - 2\times5\times5\cos120^\circ$ $a^2 = 75$ $a=\sqrt{75}=5\sqrt{3}$ Therefore, perimeter $=15\sqrt{3}$	1 1 1
8 (a)	Using the cosine rule $a^2 = b^2 + c^2 - 2bc\cos A$ $4^2 = 5^2 + x^2 - 2\times5\times x\cos30^\circ$ Rearranging gives $16=25+x^2-10\frac{\sqrt{3}}{2}x$ $x^2-5\sqrt{3}x+9=0$	 1 1

8 (b)	Either considers the discriminant (39) and shows positive or states the two solutions from a calculator to be $\frac{\sqrt{3}}{2}\left(5 \pm \frac{\sqrt{13}}{2}\right)$ Acknowledges that this is an example of ambiguous case of the sine rule and there are two different possible lengths for *x* for the information given.	1 1