Topic Y3 Trigonometry (Post-TT) [38] MARKSCHEME

1.

(i)	$\Delta = \frac{1}{2} \times 10 \times 7 \times \sin 80 = 34.5 \text{cm}^2$	M1 A1	 2	For use of $\frac{1}{2} ca \sin B$ or complete equiv. For correct value 34.5
(ii)	$b^2 = 10^2 + 7^2 - 2 \times 10 \times 7 \times \cos 80$ Hence length of CA is 11.2 cm	M1 A1	 2	For attempted use of the correct cosine formula For correct value 11.2
(iii)	$\sin C = \frac{10 \sin 80}{11.166...} = 0.8819...$ Hence angle C is 61.9°	M1 A1	 2 6	For use of the sine rule to find C, or equivalent For correct value 61.9

2.

(i)	$3(1-\sin^2\theta) = \sin\theta + 1$ $3 - 3\sin^2\theta = \sin\theta + 1$ $3\sin^2\theta + \sin\theta - 2 = 0$	M1 A1 2	Use $\cos^2\theta = 1 - \sin^2\theta$ Show given equation correctly
(ii)	$(3\sin\theta - 2)(\sin\theta + 1) = 0$ $\sin\theta = \frac{2}{3}$ or -1 $\theta = 42°, 138°, 270°$	M1 A1 A1 A1 A1√ 5	Attempt to solve quadratic equation in $\sin\theta$ Both values of $\sin\theta$ correct Correct answer of 270° Correct answer of 42° For correct non-principal value answer, following their first value of θ in the required range (any extra values for θ in required range is max 4/5) (radians is max 4/5) SR: answer only (or no supporting method) is B1 for 42°, B1√ for 138°, B1 for 270°
		7	

3.

(i)		31 gives $3^2 + 1^2 = 10$ 10 is even and hence the suggestion is false	**M1** **E1** **[2]**	**2.1** **2.1**		**OR** **M1** 37 gives $3^2 + 7^2 = 58$ **E1** 58 is even and hence the suggestion is false
(ii)		$n^2 + (n+1)^2 + (n+2)^2$ $3n^2 + 6n + 5$ $3(n^2 + 2n + 1) + 2$ which always leaves a remainder of 2 and so cannot be divided by 3	**M1** **A1FT** **E1** **[3]**	**2.1** **1.1** **2.1**	Any valid expressions for three consecutive integers FT *their* expressions Correct conclusion.	

4.

(i)	(a) 	B1 B1 2		Correct shape of $k\cos x$ graph (90, 0), (270, 0) and (0, 2) stated or implied
	(b) $\cos x = 0.4$ $x = 66.4°, 294°$	M1 A1 A1√ 3		Divide by 2, and attempt to solve for x Correct answer of 66.4° / 1.16 rads Second correct answer only, in degrees, following their x
(ii)	$\tan x = 2$ $x = 63.4°, -117°$	M1 A1 A1√ 3		Use of $\tan x = \frac{\sin x}{\cos x}$ (or square and use $\sin^2 x + \cos^2 x \equiv 1$) Correct answer of 63.4° / 1.56 rads Second correct answer only, in degrees, following their x
		8		

5.

(i)	$ABC = 360 - (150 + 110) = 100°$ **A.G.**	**B1**	Show convincingly that angle ABC is 100°
		1	
(ii)	$CA^2 = 15^2 + 27^2 - 2\times15\times27\times\cos100^0$	**M1**	Attempt use of correct cosine rule
	$= 1094.655\ldots$		
	$CA = 33.1$	**A1**	Obtain 33.1 km
		2	
(iii)	$\frac{\sin C}{15} = \frac{\sin 100}{33.1}$ or $\frac{\sin A}{27} = \frac{\sin 100}{33.1}$	**M1**	Attempt use of sine rule to find angle C or A (or equiv using cosine rule)
		A1√	Correct unsimplified eqn, following their CA
	$C = 26.5°$ $\quad A = 53.5°$	**A1**	Obtain $C = 26.5°$ or $A = 53.5°$ (allow 53.4°)
	Hence bearing is 263°	**A1√**	Obtain 263 or 264 (or 290° – their angle C / 210 + their angle A)
		4	

6.

Question	Scheme	Marks	AOs
7	Attempts $\overrightarrow{AC} = \overrightarrow{AB} + \overrightarrow{BC} = 2\mathbf{i}+3\mathbf{j}+\mathbf{k}+\mathbf{i}-9\mathbf{j}+3\mathbf{k} = 3\mathbf{i}-6\mathbf{j}+4\mathbf{k}$	M1	3.1a
	Attempts to find any one length using 3-d Pythagoras	M1	2.1
	Finds all of $\lvert AB\rvert = \sqrt{14}$, $\lvert AC\rvert = \sqrt{61}$, $\lvert BC\rvert = \sqrt{91}$	A1ft	1.1b
	$\cos BAC = \frac{14+61-91}{2\sqrt{14}\sqrt{61}}$	M1	2.1
	angle $BAC = 105.9°$ *	A1*	1.1b
		(5)	
			(5 marks)