QQQ - PureYr1 - Chapter 9 – Trigonometric Ratios (v4)

Total Marks: 17

(17 = Platinum, 15 = Gold, 13 = Silver, 11 = Bronze)

1.

Figure 1

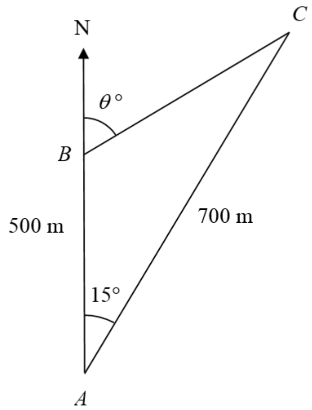


Figure 1 shows 3 yachts A, B and C which are assumed to be in the same horizontal plane. Yacht B is 500 m due north of yacht A and yacht C is 700 m from A. The bearing of C from A is 015°.

(a) Calculate the distance between yacht B and yacht C, in metres to 3 significant figures.

(3)

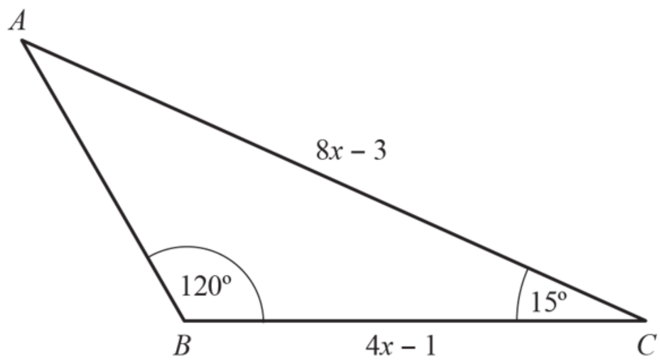
The bearing of yacht C from yacht B is $\theta°$, as shown in Figure 1.

(b) Calculate the value of θ.

(4)

2.

The diagram shows $\triangle ABC$ with $AC = 8x - 3$, $BC = 4x - 1$, $\angle ABC = 120°$ and $\angle ACB = 15°$.



(a) Show that the exact value of x is $\dfrac{9+\sqrt{6}}{20}$.

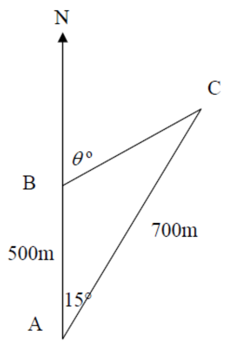
(7)

(b) Find the area of $\triangle ABC$, giving your answer to 2 decimal places.

(3)

(Total 10 marks)

6.



(a)	$BC^2 = 700^2 + 500^2 - 2 \times 500 \times 700 \cos 15°$ (= 63851.92…) BC = 253 awrt	M1 A1 A1 (3)
(b)	$\dfrac{\sin B}{700} = \dfrac{\sin 15}{\text{candidate's } BC}$	M1
	$\sin B = \sin 15 \times 700 / 253_c = 0.716..$ and giving an **obtuse** B (134.2°) dep on 1st M	M1
	θ = 180° - candidate's angle B (Dep. on first M only, B can be acute) $\theta = 180 - 134.2 = (0)45.8$ (allow 46 or awrt 45.7, 45.8, 45.9) [46 needs to be from correct working]	M1 A1 (4) **[7]**

10a

$\angle A = 45°$ seen or implied in later working.	**B1**
Makes an attempt to use the sine rule, for example, writing $\dfrac{\sin 120°}{8x-3} = \dfrac{\sin 45°}{4x-1}$	**M1**
States or implies that $\sin 120° = \dfrac{\sqrt{3}}{2}$ and $\sin 45° = \dfrac{\sqrt{2}}{2}$ **NOTE:** Award ft marks for correct work following incorrect values for sin 120° and sin 45°	**A1**
Makes an attempt to solve the equation for x. Possible steps could include: $\dfrac{\sqrt{3}}{16x-6} = \dfrac{\sqrt{2}}{8x-2}$ or $\dfrac{\sqrt{6}}{16x-6} = \dfrac{1}{4x-1}$ or $\dfrac{3}{16x-6} = \dfrac{\sqrt{6}}{8x-2}$ $(8\sqrt{3})x - 2\sqrt{3} = (16\sqrt{2})x - 6\sqrt{2}$ or $(4\sqrt{6})x - \sqrt{6} = 16x - 6$ or $24x - 6 = (16\sqrt{6})x - 6\sqrt{6}$ $6\sqrt{2} - 2\sqrt{3} = x(16\sqrt{2} - 8\sqrt{3})$ or $(4\sqrt{6})x - \sqrt{6} = 16x - 6$ or $12x - 3 = (8\sqrt{6})x - 3\sqrt{6}$	**M1ft**
$x = \dfrac{6\sqrt{2} - 2\sqrt{3}}{16\sqrt{2} - 8\sqrt{3}}$ or $x = \dfrac{6 - \sqrt{6}}{16 - 4\sqrt{6}}$ or $x = \dfrac{3\sqrt{6} - 3}{8\sqrt{6} - 12}$ o.e.	**A1ft**
Makes an attempt to rationalise the denominator by multiplying top and bottom by the conjugate. Possible steps could include: $x = \dfrac{(3\sqrt{2} - \sqrt{3})}{(8\sqrt{2} - 4\sqrt{3})} \times \dfrac{(8\sqrt{2} + 4\sqrt{3})}{(8\sqrt{2} + 4\sqrt{3})}$ $x = \dfrac{48 + 12\sqrt{6} - 8\sqrt{6} - 12}{128 - 48}$ $x = \dfrac{36 + 4\sqrt{6}}{80}$	**M1ft**
States the fully correct simplifed version for x. $x = \dfrac{9 + \sqrt{6}}{20}$ *	**A1***
NOTE: Award ft marks for correct work following incorrect values for sin 120° and sin 45°	**(7 marks)**

10b

States or implies that the formula for the area of a triangle is $\frac{1}{2}ab\sin C$ or $\frac{1}{2}ac\sin B$ or $\frac{1}{2}bc\sin A$	**M1**
$\dfrac{1}{2}\left(4\left(\dfrac{9+\sqrt{6}}{20}\right) - 1\right)\left(8\left(\dfrac{9+\sqrt{6}}{20}\right) - 3\right)(\sin 15 \text{ or } awrt\, 0.259)$ or $\frac{1}{2}(awrt\,1.29)(awrt\,1.58)(\sin 15 \text{ or } awrt\, 0.259)$.	**M1**
Finds the correct answer to 2 decimal places. 0.26	**A1**
NOTE: Exact value of area is $\frac{1}{200}(24 + 11\sqrt{6})(\sqrt{6} - \sqrt{2})$. If 0.26 not given, award M1M1A0 if exact value seen.	**(3 marks)** **Total** **10 marks**