Topic Y3 Trigonometry (Pre-TT) [45]

1.

In a triangle ABC, $AB = 5\sqrt{2}$ cm, $BC = 8$ cm and angle $B = 60°$.

(i) Find the exact area of the triangle, giving your answer as simply as possible. [3]

(ii) Find the length of AC, correct to 3 significant figures. [3]

(Total 6 marks)

2.

Solve each of the following equations, for $0° \leqslant x \leqslant 180°$.

(i) $2\sin^2 x = 1 + \cos x$. [4]

(ii) $\sin 2x = -\cos 2x$. [4]

(Total 8 marks)

3.

(i) Use a counter example to show that the following statement is false.

"$n^2 - n - 1$ is a prime number, for $3 \leqslant n \leqslant 10$."

(2)

(ii) Prove that the following statement is always true.

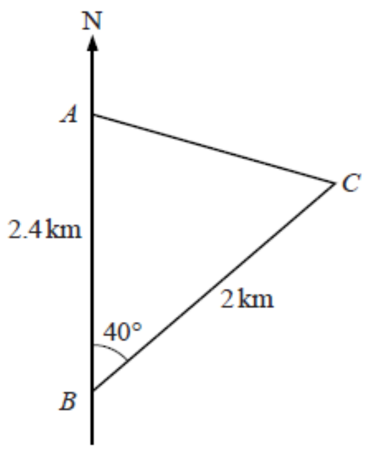
"The difference between the cube and the square of an odd number is even."

For example $5^3 - 5^2 = 100$ is even.

(4)

(Total 6 marks)

4.



The diagram shows two points A and B on a straight coastline, with A being 2.4 km due north of B. A stationary ship is at point C, on a bearing of 040° and at a distance of 2 km from B.

(i) Find the distance AC, giving your answer correct to 3 significant figures. **[2]**

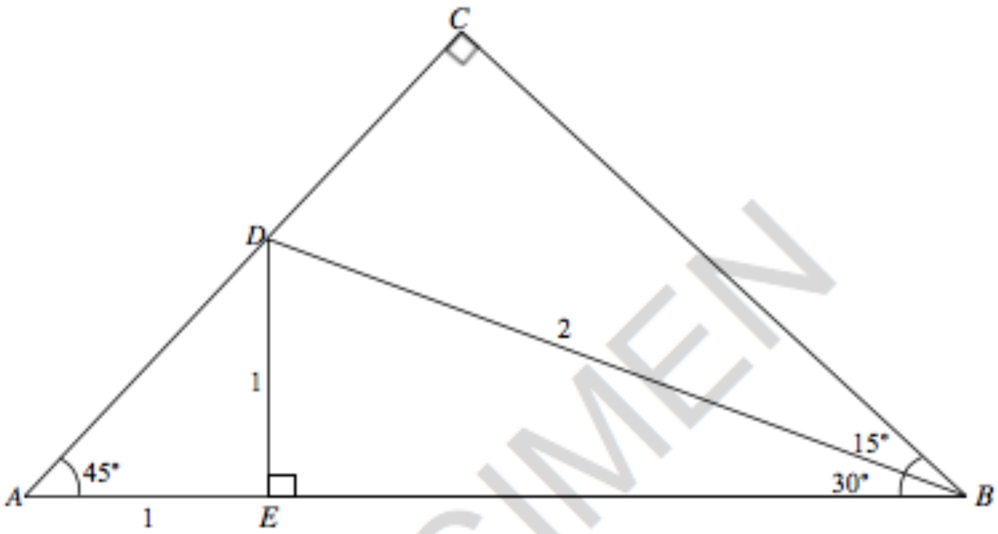
(ii) Find the bearing of C from A. **[3]**

(iii) Find the shortest distance from the ship to the coastline. **[2]**

(Total 7 marks)

5.

In this question you must show detailed reasoning.



The diagram shows triangle *ABC*. The angles *CAB* and *ABC* are each 45°, and angle $ACB = 90^\circ$. The points *D* and *E* lie on *AC* and *AB* respectively, such that $AE = DE = 1$, $DB = 2$ and angle $BED = 90^\circ$. Angle $EBD = 30^\circ$ and angle $DBC = 15^\circ$.

(i) Show that $BC = \dfrac{\sqrt{2}+\sqrt{6}}{2}$. **[3]**

(ii) By considering triangle *BCD*, show that $\sin 15^\circ = \dfrac{\sqrt{6}-\sqrt{2}}{4}$. **[3]**

(Total 6 marks)

6.

The cubic polynomial $f(x)$ is defined by $f(x) = 4x^3 - 7x - 3$.

(i) Find the remainder when $f(x)$ is divided by $(x - 2)$. **[2]**

(ii) Show that $(2x + 1)$ is a factor of $f(x)$ and hence factorise $f(x)$ completely. **[6]**

(iii) Solve the equation

$$4\cos^3\theta - 7\cos\theta - 3 = 0$$

for $0 \leqslant \theta \leqslant 2\pi$. Give each solution for θ in an exact form. **[4]**

(Total 12 marks)