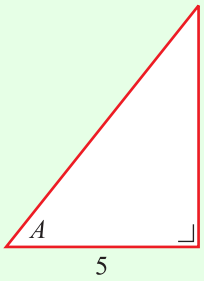
# TRIGONOMETRY (Q 5, PAPER 2)

## 2009

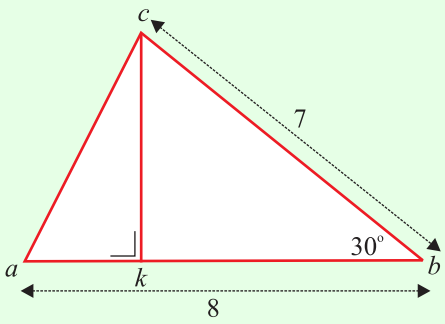
5 (a) The length, 5, of a side of the right-angled triangle is shown and $A$ is the angle indicated, where $\tan A = \frac{7}{5}$.




(i) Copy the diagram into your answer book and on it mark the side of length 7.

(ii) Find the length of the third side.

(b) In the triangle $abc$,
$|ab| = 8$ cm, $|bc| = 7$ cm
and $|\angle abc| = 30^\circ$.

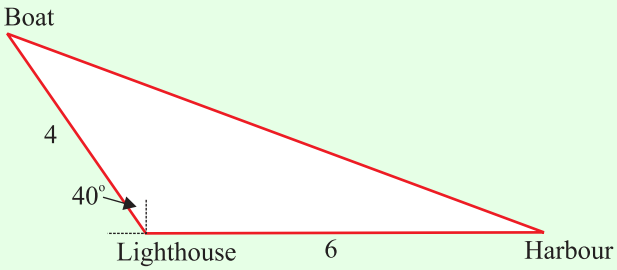



(i) Find the area of the triangle $abc$.

(ii) Given that $ck \perp ab$, find $|ck|$.

(iii) Given that $|ac| = 4$ cm, find $|\angle kca|$ correct to the nearest degree.

(c) A harbour is 6 km due East of a lighthouse.
A boat is 4 km from the lighthouse.
The bearing of the boat from the lighthouse is N 40° W.



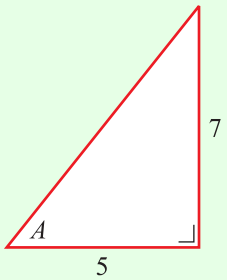

(i) How far is the boat from the harbour?
Give your answer correct to one decimal place.

(ii) Find the bearing of the boat from the harbour.
Give your answer correct to the nearest degree.

**SOLUTION**

**5 (a) (i)**

$$\tan A = \frac{y}{x} = \frac{\text{Opposite}}{\text{Adjacent}}$$




**5 (a) (ii)**

$x^2 + y^2 = r^2$

$r^2 = 5^2 + 7^2$

$r^2 = 25 + 49$

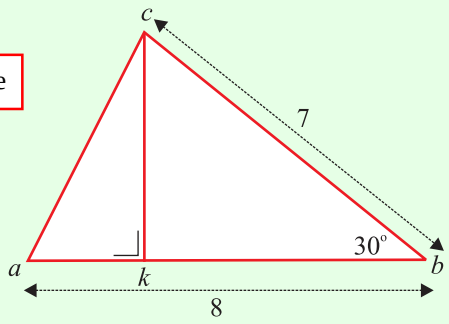
$r^2 = 74$

$r = \sqrt{74}$

**5 (b) (i)**

Area = $\frac{1}{2}\times$ Product of 2 sides $\times$ Sine of the included angle

$$\text{Area} = \tfrac{1}{2}(8)(7)\sin 30^\circ = 14 \text{ cm}^2$$




**5 (b) (ii)**

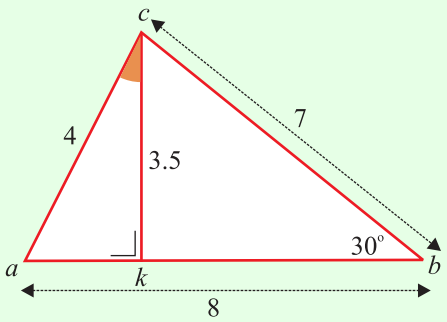
$$\sin 30^\circ = \frac{|ck|}{7} \Rightarrow |ck| = 7\sin 30^\circ = 3.5 \text{ cm}$$

$$\sin A = \frac{y}{r} = \frac{\text{Opposite}}{\text{Hypotenuse}}$$

**5 (b) (iii)**

$$\cos A = \frac{x}{r} = \frac{\text{Adjacent}}{\text{Hypotenuse}}$$

$$\cos|\angle kca| = \frac{3.5}{4} \Rightarrow |\angle kca| = \cos^{-1}\left(\frac{3.5}{4}\right) = 29^\circ$$




**5 (c) (i)**

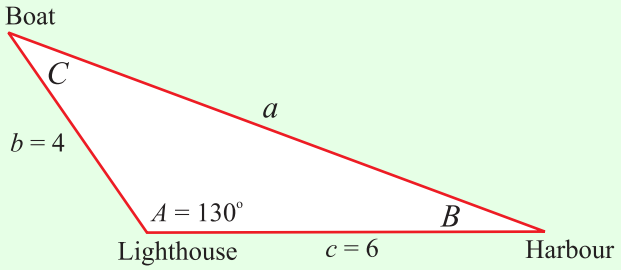
$$a^2 = b^2 + c^2 - 2bc\cos A$$

$$a^2 = 4^2 + 6^2 - 2(4)(6)\cos 130^\circ$$

$$a^2 = 16 + 36 - 48\cos 130^\circ$$

$$a^2 = 82.85$$

$$a = \sqrt{82.85} = 9.1 \text{ km}$$




**5 (c) (i)**

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

$$\frac{\sin B}{4} = \frac{\sin 130^\circ}{9.1}$$

$$\sin B = \frac{4\sin 130^\circ}{9.1} = 0.3367$$

$$B = 20^\circ$$

**Ans**: N 70° W or W 20° N