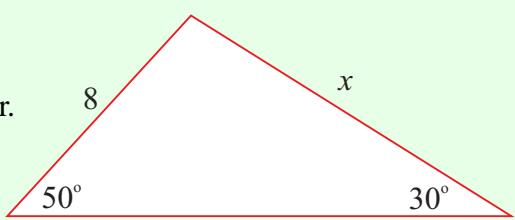


TRIGONOMETRY (Q 5, PAPER 2)**2011**

5. (a) Use the sine rule to calculate the value of x in the diagram.

Give your answer correct to the nearest integer.



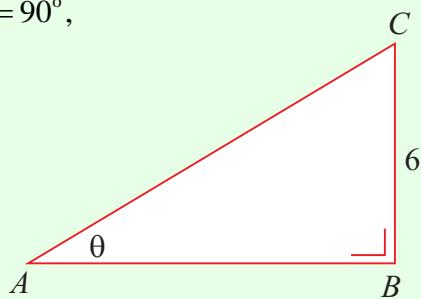
- (b) In the triangle ABC , $|BC| = 6$ cm, and $|\angle ABC| = 90^\circ$,

$$|\angle CAB| = \theta \text{ and } \sin \theta = \frac{3}{5}.$$

- (i) Find $|AC|$.

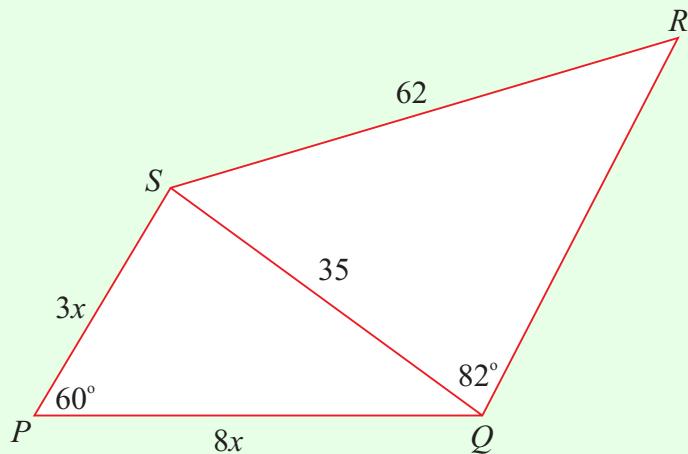
- (ii) Find $|AB|$.

- (iii) Verify that $\cos^2 \theta + \sin^2 \theta = 1$.



- (c) $PQRS$ is a quadrilateral with diagonal $[SQ]$.

$$|RS| = 62, |SQ| = 35, |\angle SQR| = 82^\circ, |\angle SPQ| = 60^\circ, |SP| = 3x \text{ and } |PQ| = 8x.$$



- (i) Find $|\angle QRS|$, correct to the nearest degree, given that $0^\circ \leq |\angle QRS| \leq 90^\circ$.

- (ii) Find the value of x .

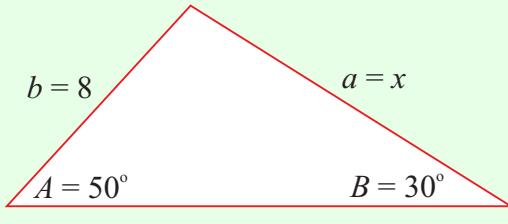
SOLUTION**5 (a)**

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

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

$$\frac{x}{\sin 50^\circ} = \frac{8}{\sin 30^\circ}$$

$$\therefore x = \frac{8 \sin 50^\circ}{\sin 30^\circ} = 12$$

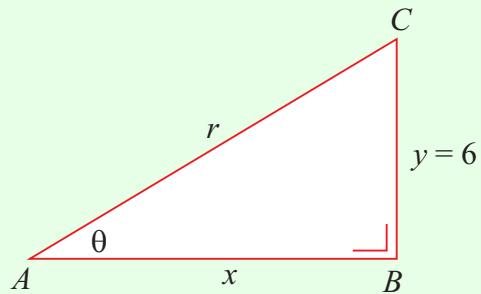
**5 (b) (i)**

$$\sin \theta = \frac{3}{5} = \frac{6}{|AC|}$$

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

$$3|AC| = 30$$

$$|AC| = 10 \text{ cm}$$

**5 (b) (ii)**

$$|AB|^2 + |BC|^2 = |AC|^2 \quad x^2 + y^2 = r^2$$

$$|AB|^2 + 6^2 = 10^2$$

$$|AB|^2 + 36 = 100$$

$$|AB|^2 = 100 - 36$$

$$|AB|^2 = 64$$

$$|AB| = \sqrt{64} = 8 \text{ cm}$$

5 (b) (iii)

$$\sin \theta = \frac{3}{5}$$

$$\cos \theta = \frac{8}{10} = \frac{4}{5}$$

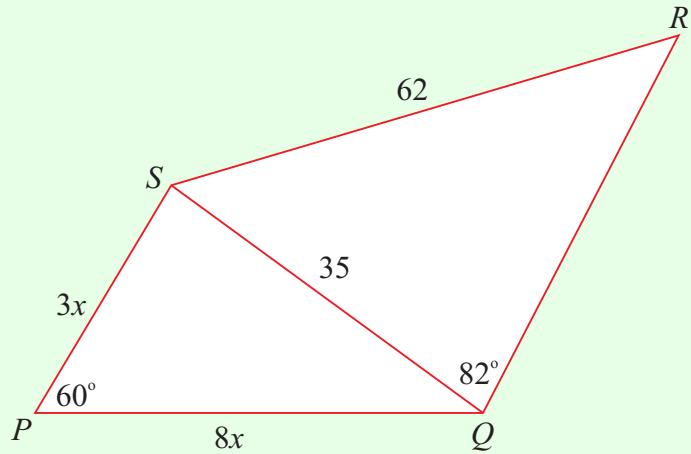
$$\cos A = \frac{x}{r} = \frac{\text{Adjacent}}{\text{Hypotenuse}}$$

$$\cos^2 \theta + \sin^2 \theta = \left(\frac{4}{5}\right)^2 + \left(\frac{3}{5}\right)^2$$

$$= \frac{16}{25} + \frac{9}{25}$$

$$= \frac{25}{25}$$

$$= 1$$

5 (c) (i)

Separate out the triangles. Consider triangle SRQ . Call A angle $|\angle QRS|$.

A diagram showing triangle SRQ with vertex A at the top. The angle at S is labeled $\alpha = 35$. The angle at Q is labeled $B = 82^\circ$. The angle at R is labeled $A = 34^\circ$. The side SR is labeled $b = 62$. The side RQ is labeled $a = 35$. The side SQ is labeled $c = 3x$.

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

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

$$\frac{\sin A}{35} = \frac{\sin 82^\circ}{62}$$

$$\sin A = \frac{35 \sin 82^\circ}{62}$$

$$\therefore A = \sin^{-1} \left(\frac{35 \sin 82^\circ}{62} \right) = 34^\circ$$

5 (c) (ii)

Consider triangle SPQ .

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

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

$$35^2 = (8x)^2 + (3x)^2 - 2(8x)(3x) \cos 60^\circ$$

$$1225 = 64x^2 + 9x^2 - 48x^2 \left(\frac{1}{2}\right)$$

$$1225 = 64x^2 + 9x^2 - 24x^2$$

$$1225 = 49x^2$$

$$\frac{1225}{49} = x^2$$

$$25 = x^2$$

$$\sqrt{25} = x$$

$$\therefore x = 5$$

