Triangles, Sine and Cosine Rules – Section Test (Answers)

1)

120° is in the second quadrant, so its cosine is negative.

$$\cos 120^\circ = -\cos(180^\circ - 120^\circ) = -\cos 60^\circ = -\frac{1}{2}$$

2)

120° is in the second quadrant, so its sine is positive.

$$\sin 120^\circ = \sin(180^\circ - 120^\circ) = \sin 60^\circ = \frac{\sqrt{3}}{2}$$

3)

$$\tan^2 30^\circ + \tan^2 60^\circ = \left(\frac{1}{\sqrt{3}}\right)^2 + \left(\sqrt{3}\right)^2 = \tfrac{1}{3} + 3 = \tfrac{10}{3}$$

4)

$$\sin^2 60^\circ + \cos^2 150^\circ = \left(\frac{\sqrt{3}}{2}\right)^2 + \left(-\frac{\sqrt{3}}{2}\right)^2 = \tfrac{3}{4} + \tfrac{3}{4} = \tfrac{3}{2}$$

5)

$$\cos 30^\circ = \frac{\sqrt{3}}{2}$$

$\cos x$ is positive in the first and fourth quadrants, so $\cos 330^\circ = \frac{\sqrt{3}}{2}$.

6)

Using the sine rule:

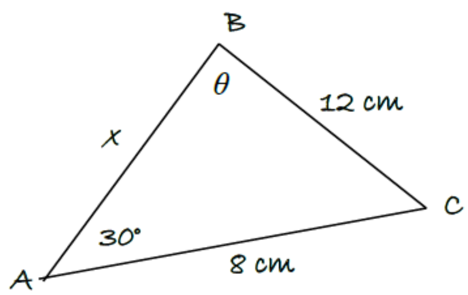
$$\frac{\sin B}{b} = \frac{\sin A}{a}$$

$$\frac{\sin\theta}{8} = \frac{\sin 30}{12}$$

$$\sin\theta = \frac{8\sin 30}{12}$$

$$\theta = 19.5^\circ$$

The angle ABC is 19.5°.



7)

From question 6, angle ACB $= 180^\circ - 30^\circ - 19.47^\circ = 130.53^\circ$

Using the sine rule:

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

$$\frac{x}{\sin 130.53^\circ} = \frac{12}{\sin 30^\circ}$$

$$x = \frac{12\sin 130.53^\circ}{\sin 30^\circ}$$

$$x = 18.2$$

The side AB is 18.2 cm.

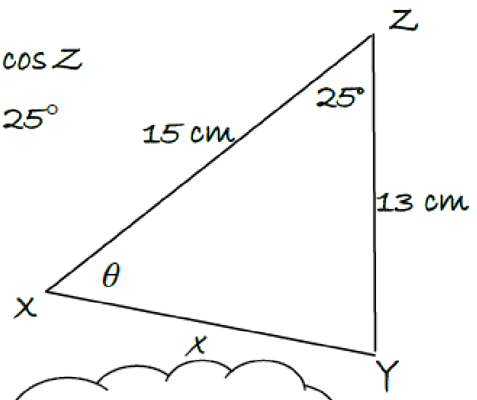
8)

Using the cosine rule: $XY^2 = XZ^2 + YZ^2 - 2 \times XZ \times YZ \cos Z$

$$= 15^2 + 13^2 - 2 \times 15 \times 13 \cos 25^\circ$$

$$XY = 6.37$$

The side XY is 6.37 cm.



9)

Using the sine rule:

$$\frac{\sin\theta}{13} = \frac{\sin 25^\circ}{6.367}$$

$$\sin\theta = \frac{13 \sin 25^\circ}{6.367}$$

$$\theta = 59.6^\circ \text{ or } 120.4^\circ$$

Alternatively the cosine rule can be used

Since XZ is the longest side, Y must be the largest angle, so θ cannot be 120.4°.
Therefore $\theta = 59.6°$.

10)

Area of triangle $= \frac{1}{2} xy \sin Z$

$$= \tfrac{1}{2} \times 13 \times 15 \sin 25^\circ$$

$$= 41.2$$

The area of the triangle is 41.2 cm² (3 s.f.)