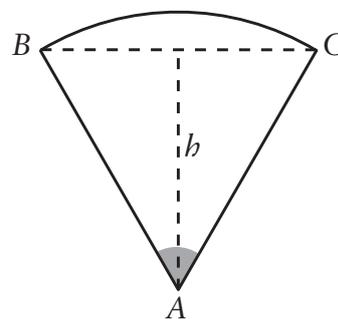
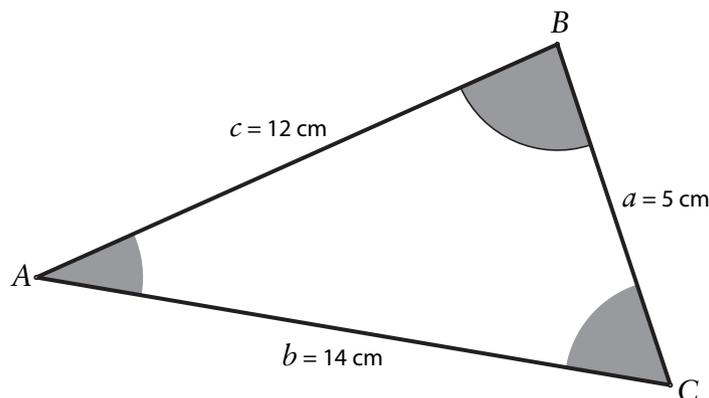


13. The diagram shows the outline of a company logo. It is in the shape of a sector ABC of a circle with centre A and radius AB . The triangle ABC is equilateral and has perpendicular height $h = 3 \text{ cm}$.
- Find, in surd form, the length of AB .
 - Find, in terms of π , the area of the logo.
 - Prove that the perimeter of the logo is: $\frac{2\sqrt{3}}{3}(\pi + 6) \text{ cm}$

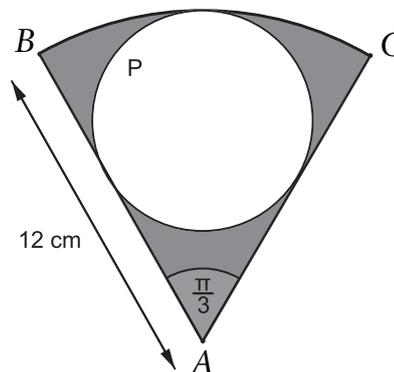


14. A man takes three bites out of a triangular slice of pizza, as shown in the diagram. Each of the man's bites has radius 2 cm.

If the lengths of the sides of the triangle were 5, 12 and 14 cm, before the bites were taken, what area of pizza is left?



15. The diagram shows an earring, made of a sector of a circle ABC , with a circle P removed. Circle P just touches the radii AB and AC and the arc BC . AB and AC both measure 12 cm; angle BAC is $\frac{\pi}{3}$ radians.
- Find the exact area of sector ABC .
 - Find the radius of circle P .
 - Find, in cm^2 , the area of metal required to make the earring.

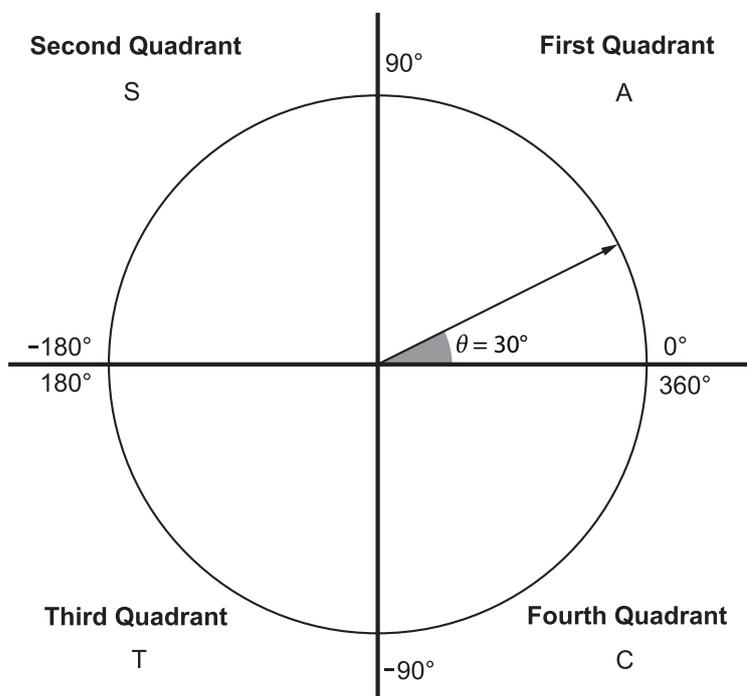


9.4 The CAST diagram

Until now, we have mainly looked at angles between 0 and 90° .

The **CAST diagram** helps you to find the sine, cosine and tangent of angles outside this range. It is often used between 0° and 360° or between -180° and 180° .

The angle 0° is aligned with the x -axis. From this reference line, all angles are measured anticlockwise, for example the angle θ shown in the diagram is 30° . An angle of 180° is aligned with the negative x -axis and 360° is in the same position as 0° .



The diagram takes its name CAST from the four quadrants. In the C (fourth) quadrant, the cosine of angles is positive. In the A quadrant, all functions (sine, cosine and tangent) of the angles are positive. In the S quadrant only the sine is positive; in the T quadrant, only tan is positive. This information is summarised in this table:

	θ	Positive	Negative
First quadrant (A)	$0 - 90^\circ$	All	
Second quadrant (S)	$90 - 180^\circ$	$\sin \theta$	$\cos \theta, \tan \theta$
Third quadrant (T)	$180 - 270^\circ$	$\tan \theta$	$\sin \theta, \cos \theta$
Fourth quadrant (C)	$270 - 360^\circ$	$\cos \theta$	$\sin \theta, \tan \theta$

EXAMPLE 1

Using the CAST diagram, state whether the sine of the following angles are positive or negative.

- a) 40° b) 120° c) 190° d) 335°

- a) 40° lies within the first quadrant, so $\sin 40^\circ$ is positive.
 b) 120° lies within the second quadrant, so $\sin 120^\circ$ is positive.
 c) 190° lies within the third quadrant, so $\sin 190^\circ$ is negative.
 d) 335° lies within the fourth quadrant, so $\sin 335^\circ$ is negative.

Check these results on your calculator.