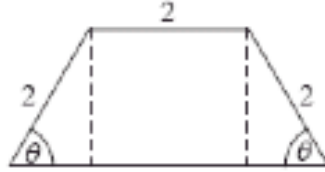


SATPREP

Assignment : Trigonometry

1. The diagram below shows a plan for a window in the shape of a trapezium.



Three sides of the window are 2 m long. The angle between the sloping sides of the window and the base is θ , where $0 < \theta < \frac{\pi}{2}$.

- (a) Show that the area of the window is given by $y = 4 \sin \theta + 2 \sin 2\theta$.
- (b) Zoe wants a window to have an area of 5 m^2 . Find the two possible values of θ .
- (c) John wants two windows which have the same area A but different values of θ . Find all possible values for A .
2. The diagram below shows a circle with centre O and radius 8 cm.

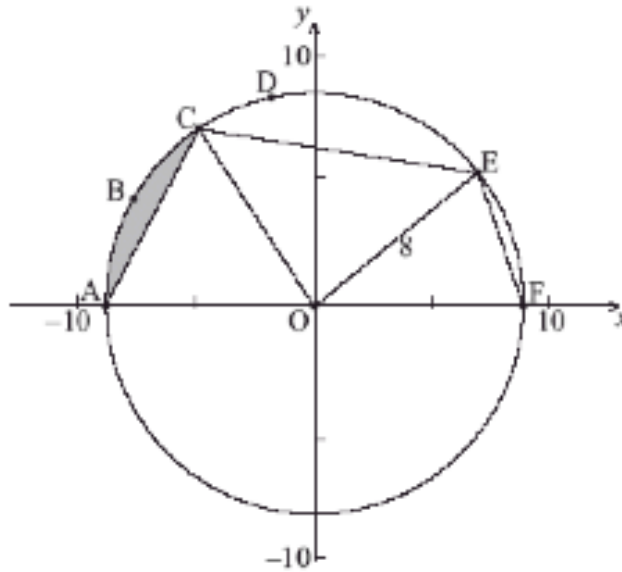


diagram not to scale

The points A, B, C, D, E and F are on the circle, and [AF] is a diameter. The length of arc ABC is 6 cm.

- (a) Find the size of angle AOC.
- (b) Hence find the area of the shaded region.

The area of sector OCDE is 45 cm^2 .

- (c) Find the size of angle COE.
- (d) Find EF.

3. The following diagram shows a waterwheel with a bucket. The wheel rotates at a constant rate in an anticlockwise (counterclockwise) direction.

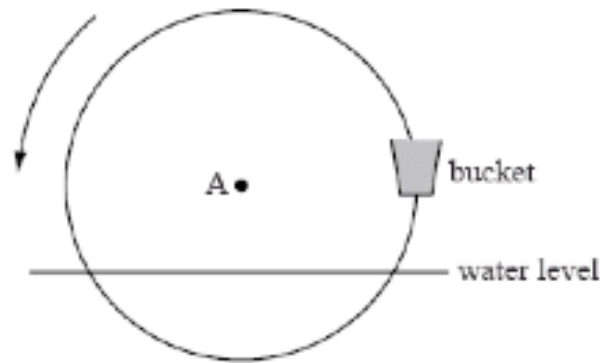


diagram not to scale

The diameter of the wheel is 8 metres. The centre of the wheel, A, is 2 metres above the water level. After t seconds, the height of the bucket above the water level is given by $h = a \sin bt + 2$.

- (a) Show that $a = 4$.

The wheel turns at a rate of one rotation every 30 seconds.

- (b) Show that $b = \frac{\pi}{15}$.

In the first rotation, there are two values of t when the bucket is **descending** at a rate of 0.5 m s^{-1} .

- (c) Find these values of t .
- (d) Determine whether the bucket is underwater at the second value of t .