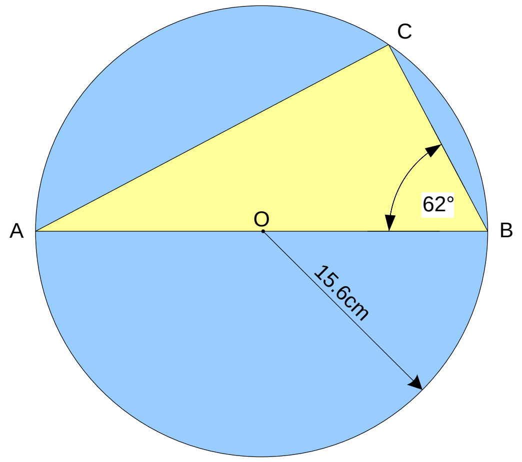
What is the area of the circle outside the triangle?



What do we know?

The radius of the circle is 15.6cm.

The triangle has an angle of 62°.

The hypotenuse of the triangle goes through the centre of the circle.

What do we need to find out?

What is the diameter (and therefore the length of the hypotenuse)?

Is the triangle a right angled triangle?

What is the area of the circle?

What are the lengths of each side of the triangle?

What is the area of the triangle?

What is the area of the circle - the area of the triangle?

What can we derive?

The triangle ABC is a right angled triangle as an angle subtended by the diameter is always a right angle.

The calculations

To calculate the length of AB:

AB forms the diameter of the circle as it is a chord that goes through the centre. As such, its length can be calculated by:

$$Diameter, d = 2r, where\ r\ is\ the\ radius.$$

$$d = 2r$$

=2(15.6)

=31.2 cm

To calculate the length of BC:

$$\sin\theta = \frac{Opposite}{Hypotenuse}$$

$$\cos\theta = \frac{Adjacent}{Hypotenuse}$$

$$\tan\theta = \frac{Opposite}{Adjacent}$$

As AB forms the hypotenuse of the triangle ABC and BC forms the side adjacent (next to) the known angle, we can use the cosine function.

$$cos\ 63° = \frac{Adjacent}{31.2}$$

$$31.2(cos\ 63°) = \frac{Adjacent}{31.2} \times 31.2$$

$$\therefore\ Adjacent\ =\ 31.2(cos\ 63°)$$

= 31.2(0.4540)

=14.1645 cm

To calculate the length of AC:

As AB forms the hypotenuse of triangle ABC and AC forms the side opposite the known angle, we can use the sine function.

$$\sin 63° = \frac{Opposite}{31.2}$$

$$31.2(\sin 63°) = \frac{Opposite}{31.2} \times 31.2$$

$$\therefore\ Opposite\ =\ 31.2(\sin 63°)$$

=31.2(0.891)

=27.7994 cm

To calculate the area of the triangle, ABC:

As we have a right angled triangle, we can use the formula,

$$Area\ of\ a\ triangle\ = \frac{1}{2}\ base\ \times\ perpendicular\ height$$

where base is BC = 14.1645 cm

and the height is AC = 27.7994 cm

Putting these numbers into the formula and calculating, we find that the area of the triangle is 196.8823cm^2 to four decimal places.

To calculate the area of the circle, we have $A = \pi r^2$ where A is the area, r is the radius and Pi is 3.142.

$$A\ =\ \pi(15.6^2)$$

= 764.538 cm^2

To calculate the area of the circle outside the triangle

Area$_{\text{Circle outside triangle}}$ = Area$_{\text{Circle}}$ - Area$_{\text{Triangle}}$

= 764.538 - 196.8823

= 567.6557 cm^2

So the area of the circle outside the triangle is about 568cm^2 when rounded to the nearest integer.