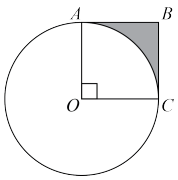


# Problem of the Week
## Problem C and Solution
## Just Outside

### Problem

In square $OABC$, points $A$ and $C$ lie on the circumference of a circle with centre $O$, and $B$ lies outside of the circle. Square $OABC$ has an area of $36\,\text{m}^2$.

Determine the area of the shaded region inside square $OABC$ and outside the circle with centre $O$, rounded to two decimal places.

### Solution

Since $OABC$ is a square with an area of $36\,\text{m}^2$, its side length must be $6\,\text{m}$. That is, $OA = OC = 6\,\text{m}$.

Since $A$ lies on the circumference of the circle with centre $O$, the radius of the circle is $r = OA = 6\,\text{m}$.

Therefore, the area of the circle is $\pi \times r^2 = \pi \times 6^2 = 36\pi\,\text{m}^2$.

Since $OABC$ is a square, $\angle AOC = 90°$.

Therefore, the area of sector $OAC$ is $\frac{90°}{360°} = \frac{1}{4}$ of the area of the circle.

In other words, the area of the sector $OAC$ is $\frac{1}{4} \times 36\pi = 9\pi\,\text{m}^2$.

Therefore,

$$\begin{aligned}\text{Area of shaded region} &= \text{Area of square } OABC - \text{Area of sector } OAC \\ &= 36 - 9\pi \\ &\approx 7.73\,\text{m}^2\end{aligned}$$

**Note**: In the problem you were asked to give your answer rounded to two decimal places. However, many times in mathematics we are actually interested in the *exact* answer. In this case, the exact answer would be $(36 - 9\pi)\,\text{m}^2$.