



Problem of the Week

Problem C and Solution

Both Inside and Outside

Problem

A and C lie on the circumference of the circle with centre O . $OABC$ is a square with area 16 cm^2 . Determine the area of the shaded region, accurate to two decimal places. That is, determine the area of the region inside square $OABC$ but outside the circle.

Solution

Since $OABC$ is a square with area 16 cm^2 , its side length must be 4 cm . That is, $OA = OC = 4 \text{ cm}$.

Since A lies on the circumference of the circle with centre O , the radius of the circle is $r = OA = 4 \text{ cm}$.

Therefore, the area of the circle is $\pi \times r^2 = \pi \times 4^2 = 16\pi \text{ cm}^2$.

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

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

In other words, the area of the sector OAC is $\frac{1}{4} \times 16\pi = 4\pi \text{ cm}^2$.

Therefore,

$$\begin{aligned} & \text{the area of the shaded region} \\ &= \text{the area of the square } OABC - \text{the area of the sector } OAC \\ &= 16 - 4\pi \\ &\approx 3.43 \text{ cm}^2. \end{aligned}$$

Note: In the problem you were asked to give your answer correctly rounded to 2 decimal places. Many times in mathematics we are actually interested in the **exact** answer. In this case, the exact answer is $(16 - 4\pi) \text{ cm}^2$.

