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 cm². 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 cm², its side length must be 4 cm. That is, OA = OC = 4 cm.

Since A lies on the circumference of the circle with centre O, the radius of the circle is \( r = OA = 4 \) cm.

Therefore, the area of the circle is \( \pi \times r^2 = \pi \times 4^2 = 16\pi \) cm².

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 \( \frac{1}{4} \times 16\pi = 4\pi \) cm².

Therefore, the area of the shaded region
\[ = \text{the area of the square } OABC - \text{the area of the sector } OAC \]
\[ = 16 - 4\pi \]
\[ \approx 3.43 \text{ cm}^2. \]

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 \((16 - 4\pi) \text{ cm}^2\).