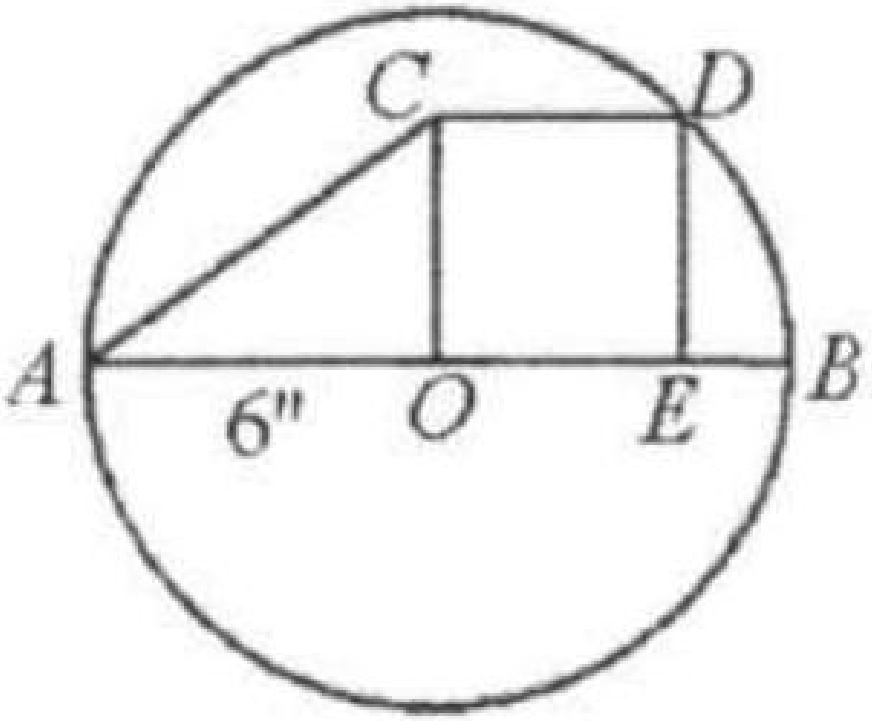
Problem

(2000 Mathcounts State Sprint) In the diagram shown, COED is a square. The radius of circle O is 6 in . What is the number of inches in AC ? Express your answer in simplest radical form.



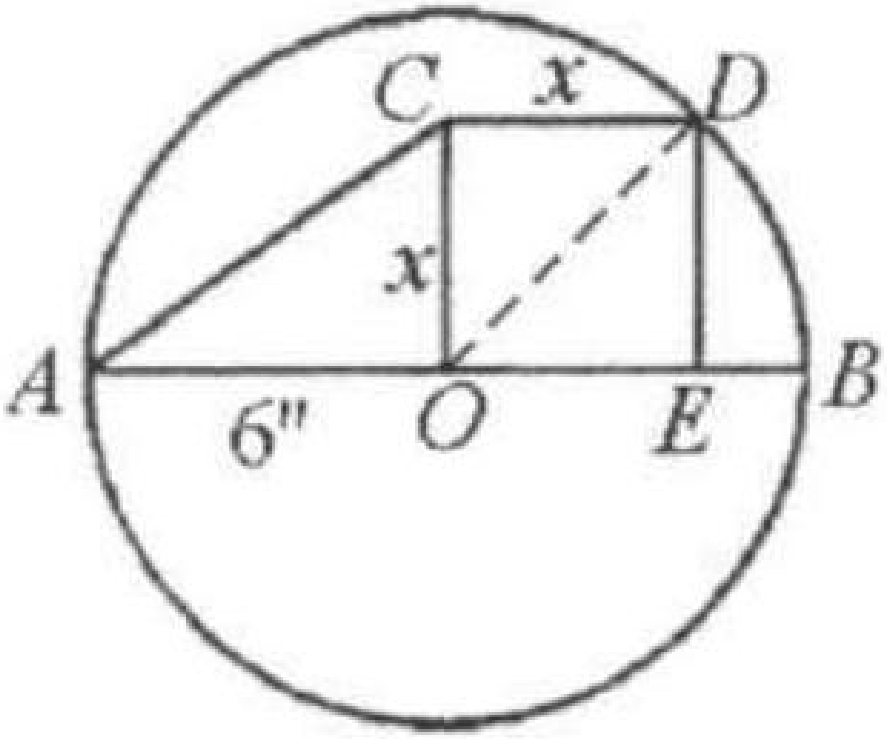
Solution

$3\sqrt{6}$.

Connect OD. As shown in the figure below, $OD = OA = 6$. They are both radii of the circle.

Applying Pythagorean Theorem to right triangle OCD yields:

$$x^2 + x^2 = 6^2 \Rightarrow \quad 2x^2 = 36 \quad \Rightarrow \quad x^2 = 18$$
$$\Rightarrow \quad x = 3\sqrt{2}.$$



Applying Pythagorean Theorem to right triangle OCA yields:
$AC^2 = (3\sqrt{2})^2 + 6^2 = 18 + 36 = 54 = (3\sqrt{6})^2 \Rightarrow \quad AC = 3\sqrt{6}.$