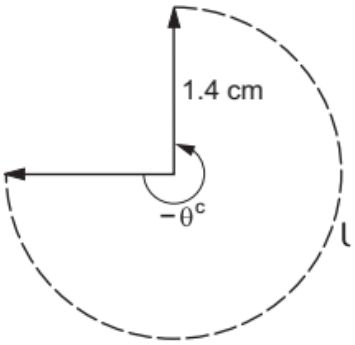
EXAMPLE 5 *The minute hand of a watch is* 1.4 cm *long. How far does its tip move in* 45 *minutes?* (Use $\pi = \frac{22}{7}$.)

SOLUTION In 60 minutes, the minute hand moves through $(2\pi)^c$.

In 45 minutes, the minute hand moves through $\left(\frac{2\pi}{60} \times 45\right)^c = \left(\frac{3\pi}{2}\right)^c$.



$\therefore \quad r = 1.4$ cm and $\theta = \left(\frac{3\pi}{2}\right)^c$.

Distance moved by the tip of the minute hand in 45 minutes is given by

$$l = r\theta = \left(1.4 \times \frac{3\pi}{2}\right) \text{cm} = \left(1.4 \times \frac{3}{2} \times \frac{22}{7}\right) \text{cm} = 6.6 \text{ cm}.$$

EXAMPLE 6 *If the arcs of the same length in two circles subtend angles of* 60° *and* 75° *at their respective centres, find the ratio of their radii.*

SOLUTION Let r_1 and r_2 be the radii of the two circles. Then,

$$\theta_1 = 60° = \left(60 \times \frac{\pi}{180}\right)^c = \left(\frac{\pi}{3}\right)^c$$

and $\theta_2 = 75° = \left(75 \times \frac{\pi}{180}\right)^c = \left(\frac{5\pi}{12}\right)^c$.

Let the length of each arc be l cm. Then,

$$l = r_1\theta_1 = r_2\theta_2$$

$$\Rightarrow \quad \left(r_1 \times \frac{\pi}{3}\right) = \left(r_2 \times \frac{5\pi}{12}\right)$$

$$\Rightarrow \quad \frac{r_1}{r_2} = \frac{5}{4}.$$

Hence, $r_1 : r_2 = 5 : 4$.