Exercise 175

As a point P moves around a circle, the measure of the angle changes. The measure of how fast the angle is changing is called *angular speed*, ω, and is given by $\omega = \theta/t$, where θ is in radians and t is time. Find the angular speed for the given data. Round to the nearest thousandth.
a. $\theta = \frac{7\pi}{4}$ rad, $t = 10$ sec b. $\theta = \frac{3\pi}{5}$ rad, $t = 8$ sec c. $\theta = \frac{2\pi}{9}$ rad, $t = 1$ min d. $\theta = 23.76$ rad, $t = 14$ min

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Solution

Use the formula for angular speed,

$$\omega = \frac{\theta}{t},$$

where θ is in radians and t is in seconds.

Part (a)

If $\theta = \frac{7\pi}{4}$ rad and $t = 10$ sec, then

$$\omega = \frac{\frac{7\pi}{4} \text{ rad}}{10 \text{ sec}} \approx 0.550 \ \frac{\text{rad}}{\text{s}}.$$

Part (b)

If $\theta = \frac{3\pi}{5}$ rad and $t = 8$ sec, then

$$\omega = \frac{\frac{3\pi}{5} \text{ rad}}{8 \text{ sec}} \approx 0.236 \ \frac{\text{rad}}{\text{s}}.$$

Part (c)

If $\theta = \frac{2\pi}{9}$ rad and $t = 1$ min, then

$$\omega = \frac{\frac{2\pi}{9} \text{ rad}}{1 \ \cancel{\text{min}} \times \frac{60 \text{ sec}}{1 \ \cancel{\text{min}}}} \approx 0.012 \ \frac{\text{rad}}{\text{s}}.$$

Part (d)

If $\theta = 23.76$ rad and $t = 14$ min, then

$$\omega = \frac{23.76 \text{ rad}}{14 \ \cancel{\text{min}} \times \frac{60 \text{ sec}}{1 \ \cancel{\text{min}}}} \approx 0.028 \ \frac{\text{rad}}{\text{s}}.$$