

Angular and Linear Speed Review (key)

Example 1: Angular Speed of a Ferris Wheel

Problem: A Ferris wheel with a radius of 10 meters makes 1 full revolution every 20 seconds. What is its angular speed?

Solution:

1 revolution = 2π radians

Time = 20 seconds

$$\omega = \frac{2\pi}{20} = \frac{\pi}{10} \approx 0.314 \text{ rad/s}$$

Answer: Angular speed is approximately **0.314 rad/s**

Example 2: Rotating Radar Dish

Problem: A radar dish rotates 90° in 5 seconds. What is its angular speed?

Convert degrees to radians:

$$90^\circ = \frac{\pi}{2} \text{ radians}$$
$$\omega = \frac{\theta}{t} = \frac{\pi/2}{5} = \frac{\pi}{10} \approx 0.314 \text{ rad/s}$$

Answer: Angular speed is approximately **0.314 rad/s**

Example 3: Angle from Angular Speed

Problem: An object rotates at 2 rad/s. How many radians will it rotate through in 12 seconds?

$$\theta = \omega \cdot t = 2 \cdot 12 = 24 \text{ radians}$$

Answer: The object rotates through **24 radians**

Example 4: Linear Speed of a Point on a Wheel

Problem: A wheel with radius 0.5 meters spins at 6 rad/s. What is the linear speed of a point on its edge?

Use:

$$v = r\omega = 0.5 \cdot 6 = 3 \text{ m/s}$$

Answer: Linear speed is **3 m/s**

Example 5: Length of an Arc

Problem: A pendulum swings in an arc of 60° , and the length of the pendulum (radius) is 2 m. How far does the tip travel?

Convert degrees to radians:

$$60^\circ = \frac{\pi}{3} \text{ radians}$$

Arc length:

$$s = r\theta = 2 \cdot \frac{\pi}{3} = \frac{2\pi}{3} \approx 2.094 \text{ m}$$

Answer: The tip travels approximately **2.094 meters**

Example 6: Find Angular Speed from Linear Speed

Problem: A car tire has a radius of 0.3 meters and is moving at a linear speed of 12 m/s. What is the angular speed?

Use:

$$v = r\omega \Rightarrow \omega = \frac{v}{r} = \frac{12}{0.3} = 40 \text{ rad/s}$$

Answer: Angular speed is **40 rad/s**

