

8.1 Angular Velocity & Angular Acceleration

Angular Velocity:

How fast something spins?

$$\text{Speed} = \frac{\Delta d}{\Delta t}$$

Angular velocity: angular displacement

$$\omega \rightarrow \omega = \frac{\Delta \theta}{\Delta t} \quad \text{rad/sec unit}$$

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What is the angular velocity for an object that rotates 3.0 rad in 0.40 sec.?

$$\omega = \frac{\Delta \theta}{\Delta t} \quad \omega = \frac{3.0}{0.4}$$

$$\omega = 7.5 \text{ rad/sec}$$

Linear velocity of object with a radius of 6m ^{the same}

$$r \cdot \frac{\omega}{t} = 45 \text{ m/s}$$

If an object has the same Linear velocity but the radius is 3m, what happens to the angular velocity?

$$L.V. = 45 \text{ m/s}$$

$$r = 3 \text{ m}$$

$$\omega = 15 \text{ rad/s}$$

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Linear Velocity

$$V = r \omega$$

→ radius
→ angular velocity

Earth ω

$$\omega_{\text{Earth}} = \frac{2\pi \text{ rad}}{24 \text{ hours}} = \frac{2\pi \text{ rad}}{86,400 \text{ sec}} = 7.27 \times 10^{-5} \text{ rad/s}$$

$$V = (6.38 \times 10^6) \text{ m} (7.27 \times 10^{-5} \text{ rad/s})$$

$$V = 464 \text{ m/s}$$

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Angular acceleration

$$\text{Angular accel} = \frac{\Delta \text{angular velocity}}{\Delta \text{time}}$$

Alpha

$$\alpha = \frac{\Delta \omega}{\Delta t}$$

$\frac{\text{rad}}{\text{s}} \cdot \frac{1}{\text{s}}$
 $\frac{\text{rad}}{\text{s}^2}$

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Calculate the Angular Acceleration
 of an object that rotates 3 rad
 in 0.40 sec

$$\alpha = \frac{\Delta \omega}{\Delta t} = \frac{3}{0.4} = \frac{7.5}{0.4} = 18.75 \text{ rad/s}^2$$

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① Ch 8 Study Guide

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② Pg. 200
 1-10 all
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