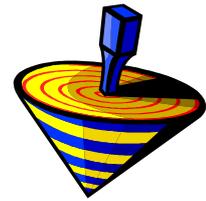


Angular Motion Part I



Think about the movement of a wheel. A wheel will move a linear distance equal to the circumference of the wheel each time it rotates. It also revolves 360 degrees, an **angular displacement (θ)**, and for many applications knowing this angular distance is very useful.

So, if there is angular distance and it can be done in a certain amount of time, then there must be **angular velocity** and **angular acceleration**. The most commonly used units for angular motion are degrees, revolutions and radians.

Radian Measure: π radians = 180°

Revolutions: 1 revolution = $360^\circ = 2\pi$ radians

DIRECTIONS: Change the following to radians and then revolutions.

45°

95°

450°

760°

Angular velocity (ω) is the ratio of the rotation angle (θ) per time (t).

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

If the angular velocity is measured in radians per unit time then linear velocity equals the radius times the angular velocity.

$$\mathbf{v} = \mathbf{r}\omega$$

Angular acceleration (α) is the ratio of the change in angular velocity (θ) per time (t).

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

Determine the motion and displacement equations for angular motion.

DIRECTIONS: On a separate sheet of paper, solve the following and show your work.

_____ 1. A wheel whose diameter is 120.0 cm was rolling down the hill at 8.00 revolutions per second. When the bell rang, it began to accelerate at a constant rate of 4.00 radians/s².

Find the angular velocity in radians per second 2.00 minutes after the bell rang.

_____ 2. The angular speed increased at a steady rate from 2.00 rad/s to 1200. rad/min in 4.00 seconds. Find the angular acceleration.

_____ 3. Sara's car has tires of radius 25.0 cm. The car accelerates from rest at a constant rate of $a = 2.00 \text{ m/s}^2$.

- _____
- Using $a = r\alpha$, find the angular acceleration of the tires.
 - Find the angular displacement after 10.0 seconds. How many revolutions is this?

_____ 4. Paula pedals her bike so that she accelerates at a constant rate of 3.00 m/s².

- _____
- Find the angular acceleration of the 0.30 m radius of the tire.
 - Find the angular velocity of the tires after 5.00 seconds if the initial angular velocity is 2.20 rad/s.

“Don't wait for your ship to come in, swim out to meet it.”

– Harvey Mackey