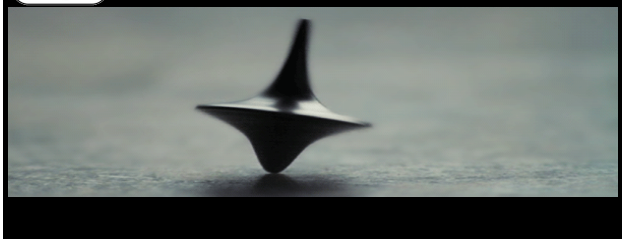
DAILY ANNOUNCEMENTS

PRACTICE	LABS	TESTS
Unit 12 Problems (1-5)	Roller Coaster Lab (Due Today)	Unit 12 Test Friday (3/29/19)

Describing Rotational Motion

Learning Target

12.1 I can describe, interpret, and solve problems involving angular motion.



UNIT 12 IN CLASS PROBLEMS

6. Without looking at your notes or reference page, write the equation for centripetal acceleration.

$a_c = \frac{v^2}{r}$

Key Concepts

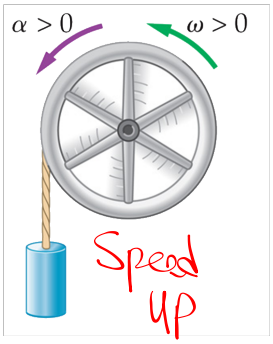
- Angular position and its changes are measured in radians. One complete revolution is 2π rad.
- Angular velocity is given by the following equation.

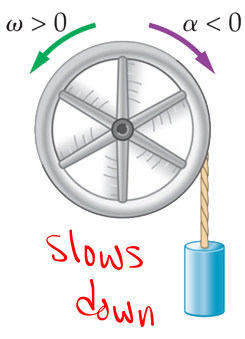
$$\omega = \frac{\Delta\theta}{\Delta t}$$

- Angular acceleration is given by the following equation.

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

Rotational Kinematics





Linear and Angular Relationships

Table 8-1
Linear and Angular Measures

Quantity	Linear	Angular	Relationship
Displacement	d (m)	θ (rad)	$d = r\theta$
Velocity	v (m/s)	ω (rad/s)	$v = r\omega$
Acceleration	a (m/s^2)	α (rad/s^2)	$a = r\alpha$

UNIT 12 IN CLASS PROBLEMS

7. As the wind dies, a windmill that was rotating at 2.1 rad/s begins to slow down with a constant angular acceleration of -0.45 rad/s^2. How much time does it take for the windmill to come to a complete stop?

8. A washing machine's spin cycle is 542 rev/min. The diameter of the drum is 44.0 cm. **(a)** What is the angular speed in rad/s? **(b)** What centripetal acceleration do you clothes experience during the spin cycle?

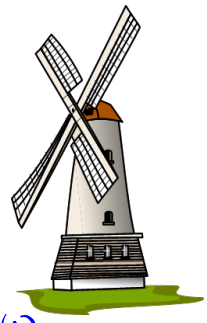
UNIT 12 IN CLASS PROBLEMS

7. As the wind dies, a windmill that was rotating at 2.1 rad/s begins to slow down with a constant angular acceleration of -0.45 rad/s^2. How much time does it take for the windmill to come to a complete stop?

$\omega_o = 2.1 \frac{rad}{s}$

$\omega_f = 0$

$\alpha = -0.45 \frac{rad}{s^2}$



$\alpha = \frac{\Delta\omega}{t} = \frac{\omega_f - \omega_o}{t}$

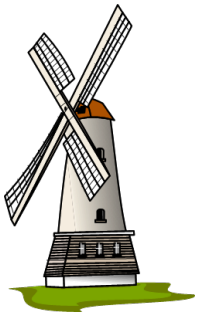
UNIT 12 IN CLASS PROBLEMS

7. As the wind dies, a windmill that was rotating at 2.1 rad/s begins to slow down with a constant angular acceleration of -0.45 rad/s^2. How much time does it take for the windmill to come to a complete stop?

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

$\Delta t = \frac{\omega_f - \omega_o}{\alpha}$

$\Delta t = 4.7$ s



UNIT 12 IN CLASS PROBLEMS

8. A washing machine's spin cycle is 542 rev/min. The diameter of the drum is 44.0 cm. **(a)** What is the angular speed in rad/s? **(b)** What centripetal acceleration do you clothes experience during the spin cycle?

$d = 44$ cm

$r = 22$ cm $= 0.22$ m

$\omega = 542 \frac{rev}{min} \times \frac{2\pi\ rad}{1\ rev} \times \frac{1\ min}{60\ s}$

$a_c = \frac{v^2}{r} = \frac{12.5^2}{0.22\ m}$

$v = r\omega = (0.22\ m)\left(56.8 \frac{rad}{s}\right)$

$v = 12.5 \frac{m}{s} \times 2.24$

UNIT 12 IN CLASS PROBLEMS

8. A washing machine's spin cycle is 542 rev/min. The diameter of the drum is 44.0 cm. **(a)** What is the angular speed in rad/s? **(b)** What centripetal acceleration do you clothes experience during the spin cycle?

(a) $\frac{542\ rev}{min} \times \frac{2\pi\ rad}{1\ rev} \times \frac{1\ min}{60\ s} = 56.8$ rad/s

(b) $v = r\omega = 12.5$ m/s^2

$a_c = \frac{v^2}{r} = 710$ m/s^2