# 12.1(B) Describing Angular Motion

### Announcements

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### Key Concepts
- Angular position and its changes are measured in radians. One complete revolution is $2\pi$ 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
- Do you remember when Mr. Umemoto said "Here are 3 equations that are really important, and we will use them all the time, so don’t forget them"?

6. Without looking in your notes, write down the three equations of motion.

### UNIT 12 IN CLASS PROBLEMS

Do you remember when Mr. Umemoto said "Here are 3 equations that are really important, and we will use them all the time, so don’t forget them"?

- **Linear to Angular**
  - Linear
    \[ \omega = \omega_0 + \alpha t \]
  - Angular
    \[ \theta = \theta_0 + \omega_0 t + \frac{1}{2} \alpha t^2 \]
    \[ \omega^2 = \omega_0^2 + 2 \alpha \Delta \theta \]
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UNIT 12 IN CLASS PROBLEMS

7. On a certain game show, contestant spin a wheel when it is their turn. One contestant gives the wheel an initial angular speed of 3.40 rad/s. It then rotates through one-and-one-quarter revolutions and comes to rest on the BANKRUPT space. (a) Find the angular acceleration of the wheel, assuming it to be constant. (b) How long does it take for the wheel to come to rest?

\[ \alpha = \frac{\Delta \omega}{\Delta t} = -0.736 \text{ rad/s}^2 \]

\[ t = 4.62 \text{ s} \]

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?

\[ \omega = \frac{2 \pi}{T} = 87.2 \text{ rad/s} \]

\[ a = \frac{v^2}{r} = 6.4 \text{ m/s}^2 \]
6. 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 radians? (b) What centripetal acceleration do you experience during the spin cycle?

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

(b) \[
\omega = \frac{v}{r} = 12.5 \text{ m/s} \\
a_c = \frac{v^2}{r} = \frac{(12.5 \text{ m/s})^2}{0.22 \text{ m}} = 710 \text{ m/s}^2
\]

\[
a_c = r \omega^2
\]