Rotation Motion Equations Review:

A: Angular Velocity:

1 Revolution = 2π radians.

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

$\omega = $ Rotational Velocity

$\Delta\theta = $ Angular Displacement

1. An object makes half a revolution in a time of 50 seconds. What is its angular velocity?

2. An object makes 4 revolutions in a time of 3 minutes. What is its angular velocity?

B: Angular Acceleration:

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

$\alpha = $ Angular Acceleration

3. A wheel is not spinning at all. After a time fo 50 seconds, it can complete 2 revolutions in 3 seconds.
a. What is its initial angular velocity?

b. What is its final angular velocity?

c. What is its angular acceleration?

4. A wheel is able to spin 5 revolutions in 20 seconds.
After a time of 3 minutes,
It can complete 6 revolutions in 20 seconds.

a. What is its initial angular velocity?

b. What is its final angular velocity?

c. What is its angular acceleration?

C: Rotational Inertia

$$I = mr^2$$

$I =$ rotational inertia of a point mass
$m =$ mass
$r =$ moment arm (the distance from the point to the axis of rotation)

5. A 55 kg person on a spinning amusement park ride is located 8 meters from the axis of rotation. What is their rotational inertia?

6. A 65 kg big dog is on a spinning amusement part ride and is located 6 meters from the axis of rotation. What is its rotational inertia?

D: Torque

$$\Sigma \tau = I\alpha$$

$\Sigma \tau$ = net torque

I = rotational inertia

α = angular acceleration

7. An object with a rotational inertia of 80 kg m^2 accelerates at a rate of 4 radians/sec^2. What is the net torque acting on that object?

8. An object with a rotational inertia of 120 kg m^2 accelerates at a rate of 2 radians/sec^2. What is the net torque acting on that object?