Kinematic Equations

Angular	Linear
$\omega_f = \omega_i + \alpha\Delta t$	$v_f = v_i + a\Delta t$
$\Delta\theta = \omega_i\Delta t + ½\alpha\Delta t^2$	$\Delta x = v_i\Delta t + ½a\Delta t^2$
$\omega_f^2 = \omega_i^2 + 2\alpha\Delta\theta$	$v_f^2 = v_i^2 + 2a\Delta x$

Note: remember! the kinematic equations only work for *constant* acceleration, whether angular or linear

Rolling Motion

- A bicycle slows down uniformly from
  a distance of 115 m. Each wheel and tire has an overall diameter of 68.0 cm. Determine

a) the angular velocity of the wheels at the initial instant

b) the total number of revolutions each wheel rotates in coming to rest

c) the angular acceleration of the wheel

d) the time it took to come to a stop

Rolling Motion

- *A bicycle slows down uniformly from v_0 = 8.40 m/s to rest over a distance of 115 m. Each wheel and tire has an overall diameter of 68.0 cm. Determine*

a) the angular velocity of the wheels at the initial instant

- $\omega_0 = v_0/r$
- ω_0 = (8.40 m/s)/(0.340 m)
- ω_0 = 24.7 rad/s

Rolling Motion

- *A bicycle slows down uniformly from v_0 = 8.40 m/s to rest over a distance of 115 m. Each wheel and tire has an overall diameter of 68.0 cm. Determine*

b) the total number of revolutions each wheel rotates in coming to rest

- Revs = d/C
- Revs = $d/(2\pi r)$
- Revs = (115 m)/(2π•0.340 m)
- Revs = 53.8 rev

Rolling Motion

- *A bicycle slows down uniformly from v_0 = 8.40 m/s to rest over a distance of 115 m. Each wheel and tire has an overall diameter of 68.0 cm. Determine*

c) the angular acceleration of the wheel

- $\alpha = (\omega_1^2 - \omega_0^2)/(2\Delta\theta)$
- $\alpha = (0 - (24.7\ \text{rad/s})^2)/(2 \bullet 2\pi \bullet 53.8\ \text{rev})$
- $\alpha = -0.902\ \text{rad/s}^2$

Rolling Motion

- *A bicycle slows down uniformly from $v_0 = 8.40$ m/s to rest over a distance of 115 m. Each wheel and tire has an overall diameter of 68.0 cm. Determine*

c) the time it took to come to a stop

- $t = (\omega_1 - \omega_0)/\alpha$
- $t = (0 - 24.7 \text{ rad/s})/(-0.902 \text{ rad/s}^2)$
- $t = 27.4$ s