2. $\omega = ?$ $\omega = \frac{V}{r} = \frac{22.2\ m/s}{0.375\ m} = 59.3\ rad/s$

$\alpha = ?$ $\omega_f^2 = \omega_o^2 + 2\alpha(\Delta\theta)$

$\omega_o = 59.3\ rad/s$

$\omega_f = 0$

$\Delta\theta = 30\ rev$

$$\frac{\omega_f^2 - \omega_o^2}{2\Delta\theta} = \alpha$$

$$\frac{0 - (59.3)^2}{2(30(2\pi))} = \alpha$$

$$-9.31\ rad/s^2 = \alpha$$

$d = ?$ $d = S$ $S = \Delta\theta r$

$= 30(2\pi)(0.375)$

$d = 70.7\ m$

3. $W = ?$ $\quad v_{com} = 0.150 m/s$ $\quad$ hoop

$m = 140 kg$

$$K_0 + W_{NC} = 0$$

$$\tfrac{1}{2} I_p \omega^2 + W = 0$$

$$\tfrac{1}{2}\left(I_{com} + mh^2\right)\frac{v^2}{r^2} + W = 0$$

$$\tfrac{1}{2}\left(mr^2 + mr^2\right)\frac{v^2}{r^2} + W = 0$$

$$(mr^2)\frac{v^2}{r^2} + W = 0$$

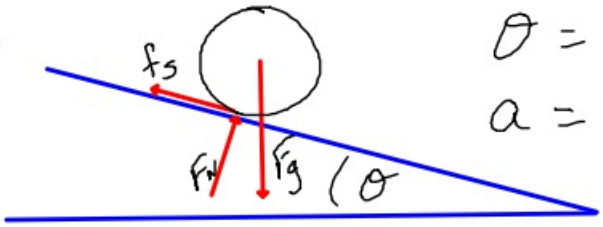
$$mv^2 + W = 0$$

$$W = -mv^2$$

$$= -(140)(0.15)^2$$

$$\boxed{W = -3.15\,J}$$

4.



$\theta = ?$

$a = 0.1g$

$$\alpha_p = \frac{\Sigma \tau_p}{I_p}$$

$$\frac{a}{r} = \frac{(r)(F_g)\sin\phi}{I_{com} + mh^2}$$

$$a = \frac{(r^2)\,mg\sin\theta}{\frac{2}{5}mr^2 + mr^2}$$

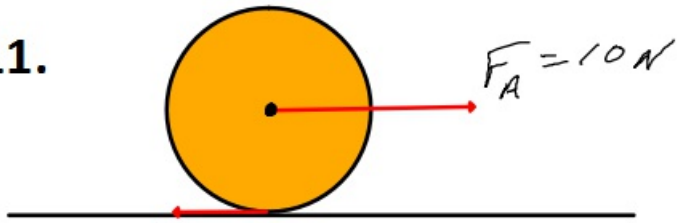
$$a = \frac{g\sin\theta}{\frac{7}{5}} = \frac{5}{7}g\sin\theta$$

$$0.1g = \frac{5}{7}g\sin\theta$$

$$0.1 = \frac{5}{7}\sin\theta$$

$$8.05^\circ = \theta$$

11.



$?=f_s \quad m=10kg \quad r=0.3m$

$a_{com} = 0.60 m/s^2$

$f_s = ?$

$$\Sigma F_x = ma_x$$

$$F_A - f_s = ma_x$$

$$10 - f_s = 10(0.6)$$

$$f_s = 4N$$

$$\boxed{f_s = -4N\hat{i}}$$

b) $I_{com} = ?$

$$\alpha = \frac{\Sigma \tau_{com}}{I_{com}}$$

$$\frac{a}{r} = \frac{\vec{r} \times \vec{f_s}}{I_{com}}$$

$$a = \frac{(r^2)(f_s)\sin 90^\circ}{I_{com}}$$

$$I_{com} = \frac{r^2 f_s}{a} = \frac{(0.3)^2(4)}{0.6}$$

$$\boxed{I_{com} = 0.60\ kgm^2}$$

7. $\omega_f = ?$

$$U_{g_i} = K_{rot} + K_{trans}$$

$$mgh_i = \tfrac{1}{2} I_{com} \omega^2 + \tfrac{1}{2} m V_{com}^2$$

$$mgh_i = \tfrac{1}{2}\left(\tfrac{1}{2} m r^2\right)\omega^2 + \tfrac{1}{2} m \omega^2 r^2$$

$$gh_i = \tfrac{3}{4} r^2 \omega^2$$

$$(9.8)(3) = \tfrac{3}{4}(0.1)^2 \omega^2$$

$$\omega = 62.6 \text{ rad/s}$$

12. $\Delta x = ?$ (for projectile)

$$U_{g_i} = K_f$$

$$mgh_i = \tfrac{1}{2}mv_{com}^2 + \tfrac{1}{2}I_{com}\omega^2$$

$$mgh_i = \tfrac{1}{2}mv^2 + \tfrac{1}{2}\left(\tfrac{2}{5}mr^2\right)\frac{v^2}{r^2}$$

$$mgh = \tfrac{1}{2}mv^2 + \tfrac{2}{10}mv^2$$

$$mgh = \tfrac{7}{10}mv^2$$

$$\tfrac{10}{7}gh = v^2$$

$$\tfrac{10}{7}(9)(4) = v^2 \qquad \underline{v = 7.48\ m/s}$$

now do a type I projectile

x	y
$a = 0$	$a = -9.8\ m/s^2$

$\Delta x = 4.8m$