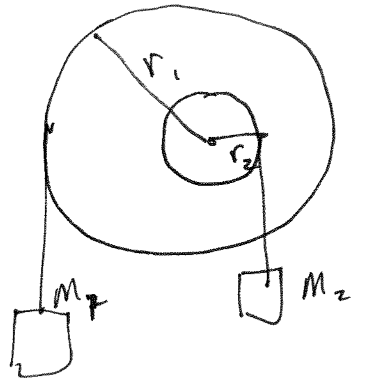
$I = 2.0\,kg\cdot m^2$ $r_1 = 50\,cm$ $m_1 = 1.0\,kg$

$r_2 = 20\,cm$ $M_2 = 2.0\,kg$



Since the masses are hanging from the pulley, $\theta = 90^\circ$

a) Find the angular acceleration

for m_1 $T_1 \uparrow$ $m_1 g \downarrow$ $\Sigma F = ma \rightarrow \boxed{T_1 - m_1 g = m_1 a_1}$ #1

for M_2 $\uparrow T_2$ $\downarrow M_2 g$ $\Sigma F = ma \rightarrow \boxed{T_2 - M_2 g = -M_2 a_2}$ #2

(Assume M_2 will drop + m_1 will rise)

for the pulley

$\Sigma \tau = \cancel{m}I\alpha \rightarrow \boxed{r_1 T_1 - r_2 T_2 = -I\alpha}$ #3 (α rotates clockwise)

~~combin~~

From #1 $T_1 = m_1 g + m_1 a_1$

from #2 $T_2 = M_2 g - M_2 a_2$

sub ~~#~~ into #3

$$r_1[m_1 g + m_1 a_1] - r_2[M_2 g - M_2 a_2] = -I\alpha$$

now going from linear to rotational $\boxed{a_1 = \alpha \cdot r_1}$ #4

and $\boxed{a_2 = \alpha \cdot r_2}$ #5

$$\text{so } r_1[m_1 g + m_1 r_1 \alpha] - r_2[M_2 g - M_2 r_2 \alpha] = -I\alpha$$

$$r_1 m_1 g + r_1^2 m_1 \alpha - r_2 M_2 g + r_2^2 M_2 \alpha = -I\alpha$$

put α terms on left-hand side

$$r_1^2 m_1 \alpha + r_2^2 m_2 \alpha + I\alpha = r_2 M_2 g - r_1 m_1 g$$

$$\alpha[r_1^2 m_1 + r_2^2 m_2 + I] = [r_2 M_2 - r_1 M_1] g$$

$$\alpha = \frac{[r_2 M_2 - r_1 M_1] g}{r_1^2 m_1 + r_2^2 M_2 + I} = \frac{[(0.20\,m)(2.0\,kg) - (0.50\,m)(1.0\,kg)](9.8\,m/s^2)}{(0.20\,m)^2(2.0\,kg) + (0.50\,m)^2(1.0\,kg) + 2\,kg\,m^2}$$

$$= \frac{(9.8)(0.40 - 0.50)\,kg\,m^2/s^2}{(0.08 + 0.25 + 2)\,kg\,m^2} = \frac{-0.98}{2.33} = \boxed{-0.42\,\frac{rad}{s^2}}$$

b) What are the linear accelerations of the weights?

From equation #3 I assumed the angular acceleration is $-\alpha$. Since the answer is $\alpha = -0.42 \text{ rad/s}^2$

Then the actual acceleration is $\left(+0.42 \text{ rad/s}^2\right)$ counter-clockwise rotation.

for mass #1 I assumed m_1 was rising.

from #4 $a_1 = \alpha \cdot r_1 = \left(-0.42 \frac{\text{rad}}{\text{s}^2}\right)(0.50\text{m})$

$= -0.21 \text{ m/s}^2$

The negative means m_1 is actually sinking with an acceleration of $\boxed{0.21 \text{ m/s}^2}$

for mass #2 I assumed m_2 was sinking

from #5 $a_2 = \alpha \cdot r_2 = \left(-0.42 \frac{\text{rad}}{\text{s}^2}\right)(0.20\text{m})$

$= -0.084 \text{ m/s}^2$

The negative means m_2 is actually rising with an acceleration of $\boxed{0.084 \text{ m/s}^2}$