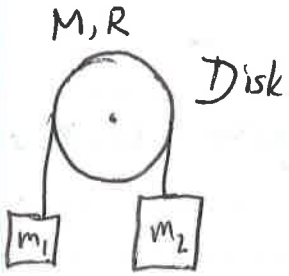


Given: $m_1 = 3\ kg$ Disk → $I_{cm} = \frac{1}{2}MR^2$

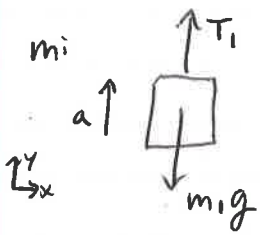
$m_2 = 5\ kg$

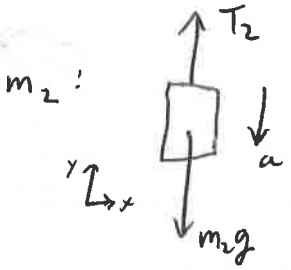
$M = 4\ kg$ $R = 8\ cm = 0.08\ m$

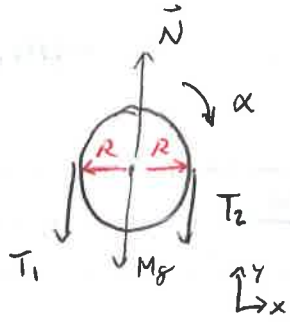
Assume cord doesn't stretch or slip on pulley. (So $\alpha = \frac{a}{R}$)

a) Acceleration of blocks?

Draw FBD's







$\Sigma F_x = 0$

$\Sigma F_y = T_1 - m_1 g = ma$

$\Sigma F_x = 0$

$\Sigma F_y = T_2 - m_2 g = -m_2 a$

$\Sigma F_y = 0$

$\Sigma F_y = N - T_1 - T_2 - Mg = 0$

$\Sigma \tau_0 = RT_1 - RT_2 = -I\alpha$

$T_1 = m_1(g+a)$ $T_2 = m_2(g-a)$ $R(T_1 - T_2) = -\frac{1}{2}MR^2\frac{a}{R}$

Solve for $a = \left(\frac{m_2 - m_1}{m_1 + m_2 + \frac{M}{2}}\right) g = 0.2g = 1.96\ \frac{m}{s^2}$ $\alpha = \frac{a}{R} = 24.5\ rad/s^2$

b) Tensions, T_1 & T_2? Sub expression for 'a' into T_1, T_2:

Do algebra: $T_1 = m_1 g\left(1 + \frac{m_2 - m_1}{m_1 + m_2 + \frac{M}{2}}\right) = 35.3\ N$

$T_2 = m_2 g\left(1 - \frac{m_2 - m_1}{m_1 + m_2 + \frac{M}{2}}\right) = 39.2\ N$

c) Net torque about center of pulley?

$\Sigma \tau_0 = RT_1 - RT_2 = (0.08m)(35.3N - 39.2N) = 0.31\ N\cdot m$ $\left(= \frac{1}{2}MR^2\alpha\right)$ ✓