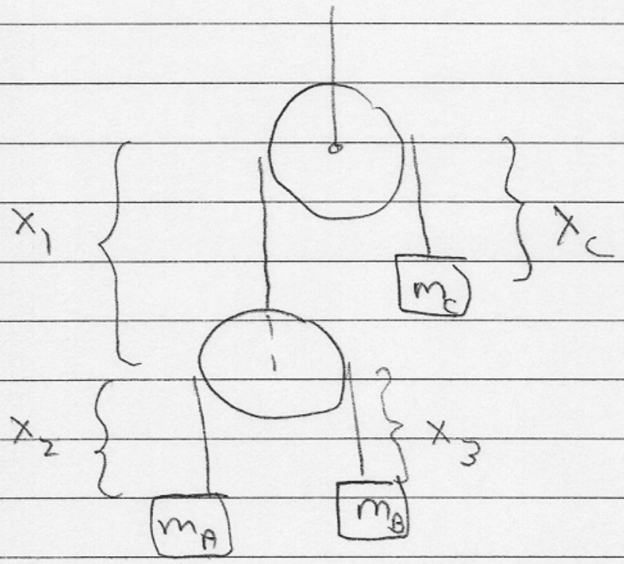
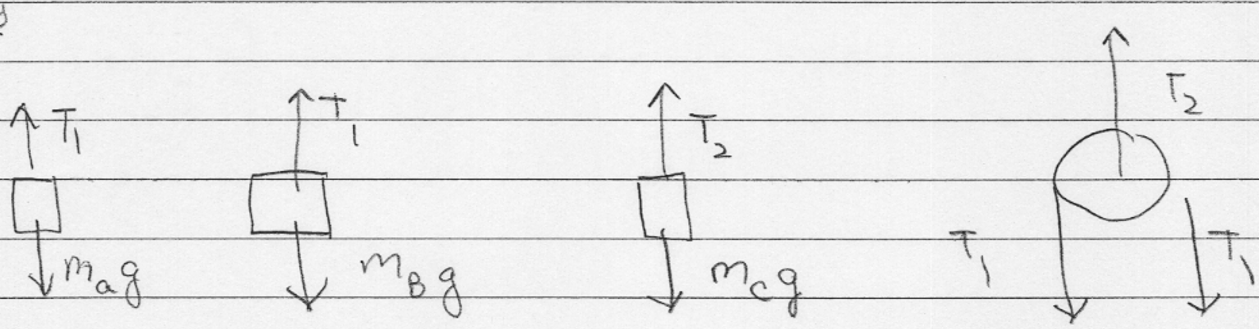
Solution



F_{Bdy}



$$T_1 - m_a g = m_a a_a$$

$$T_1 - m_B g = m_b a_b$$

$$T_2 - m_c g = m_c a_c$$

$$T_2 - 2T_1 = \cancelto{0}{m} a \Rightarrow T_2 = 2T_1$$

Then

$x_A = x_1 + x_2$ $\qquad$ $x_1 + x_c = L$ $\qquad$ $a_1 = -a_c$

$x_B = x_1 + x_3$ $\qquad$ $x_2 + x_3 = L$ $\qquad$ $a_2 = -a_3$

$$\ddot{x}_A = \ddot{x}_1 + \ddot{x}_2 = -a_c + a_2$$

$$\ddot{x}_B = \ddot{x}_1 + \ddot{x}_3 = -a_c - a_2$$

So

#1 $\quad T_1 - m_a g = m_a(-a_c + a_2)$ $\qquad$ Unknowns: a_2, a_c,

#2 $\quad T_1 - m_b g = m_b(-a_c - a_2)$ $\qquad$ three equations:

#3 $\quad 2T_1 - m_c g = m_c a_c$

Adding #1 & #2 after dividing by m_a & m_b respectively yields

#4 $\quad -\frac{T_1}{2}\left(\frac{1}{m_a} + \frac{1}{m_b}\right) + g = +a_c$

#5 $\quad \frac{2T_1}{m_c} - g = g - \frac{T_1}{2}\left(\frac{1}{m_A} + \frac{1}{m_b}\right)$ $\qquad$ (Taking #3 + using #

$$2T_1\left(\frac{1}{m_c} + \frac{1}{4}\left(\frac{1}{m_A} + \frac{1}{m_b}\right)\right) = 2g \Rightarrow$$

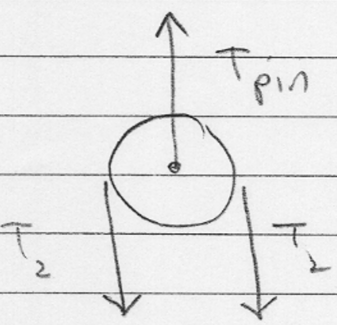
So

$$\frac{1}{m_c} + \frac{1}{4}\left(\frac{1}{m_a} + \frac{1}{m_b}\right) = \frac{4m_a m_b + m_c(m_A + m_b)}{4m_a m_b m_c} = \frac{1}{\bar{m}}$$

So

$$T_1 = \bar{m} g$$

$$T_2 = 2T_1 = 2\bar{m} g$$



$$T_{pin} = 2T_2 = 4\bar{m} g = \frac{16\, m_a m_b m_c}{4m_a m_b + m_c(m_a + m_b)}$$

$$a_c = \frac{2T_1}{m_c} - g$$

$$a_c = \frac{2\bar{m}}{m_c} g - g = \frac{8m_a m_b}{4m_a m_b + m_c(m_a + m_b)} g - g$$

$$a_c = \frac{4m_a m_b - m_c(m_a + m_b)}{4m_a m_b + m_c(m_a + m_b)} g$$