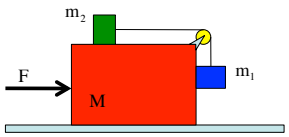
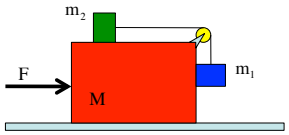
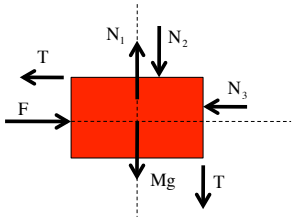
Problem 4.85

What F will keep m_2 stationary with respect to M?



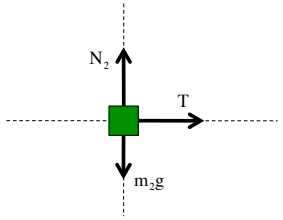
Starting the processes:

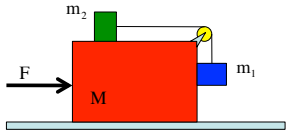




$$\sum F_x:$$

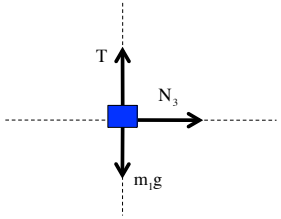
$$F - T - N_3 = Ma$$





$$\sum F_x:$$

$$T = m_2 a$$



$$\sum F_y:$$

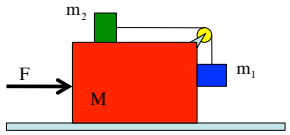
$$T - m_1 g = m_1 a$$

$$\Rightarrow T = m_1 g$$

$$\sum Fx:$$

$$N_3 = m_1 a$$

Accumulating and combining the equations:



$$N_3 = m_1 a$$

$$T = m_2 a$$

$$T = m_1 g$$

$$\Rightarrow \quad (m_2 a) = m_1 g$$

$$\Rightarrow \quad a = \frac{m_1}{m_2} g$$

$$F - T - N_3 = Ma$$

$$\Rightarrow \quad F - m_2 a - m_1 a = Ma$$

$$\Rightarrow \quad F = (M + m_2 + m_1) a$$

$$\Rightarrow \quad F = (M + m_2 + m_1)\left(\frac{m_1}{m_2} g\right)$$