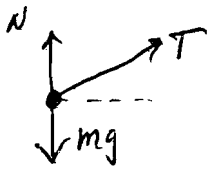
① (a)



$$F_{net,x} = T\cos\theta = m\frac{\Delta v}{\Delta t} \Rightarrow \Delta v = \frac{T\cos\theta\,\Delta t}{m}$$

$$= \frac{(25N)(\cos 30°)(1.5s)}{3.2kg}$$

$$= 10.15\ m/s$$

$$v_f = v_i + \Delta v = 4.5m/s + 10.15\ m/s = 14.6\ m/s.$$

(b)

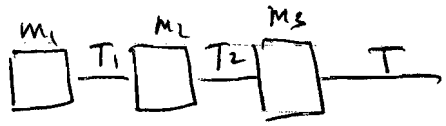
$$F_{net,y} = N + T\sin\theta - mg = 0$$

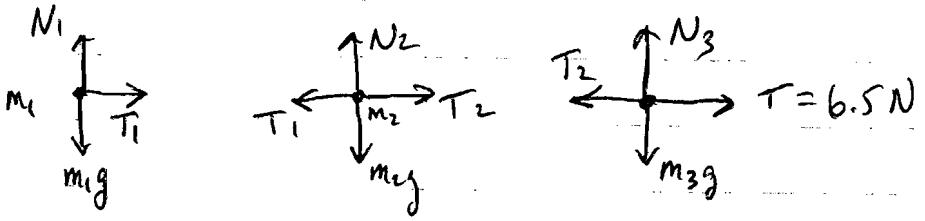
$$N = mg - T\sin\theta$$

$$= (3.2kg)(9.8\ N/kg) - (25N)(\sin 30°)$$

$$= 18.9\ N$$

②





(a) $F_{net,x} = T_1 = m_1\frac{\Delta v}{\Delta t}$ $F_{net,x} = T_2 - T_1 = m_2\frac{\Delta v}{\Delta t}$ $F_{net,x} = T - T_2 = m_3\frac{\Delta v}{\Delta t}$

$$\frac{\Delta v}{\Delta t} = \frac{T_1}{m_1} \qquad T_2 - T_1 = m_2\left(\frac{T_1}{m_1}\right) \qquad T - T_2 = m_3\left(\frac{T_1}{m_1}\right)$$

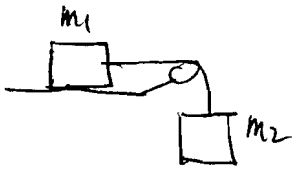
$$T - T_1 = (m_2 + m_3)\frac{T_1}{m_1}$$

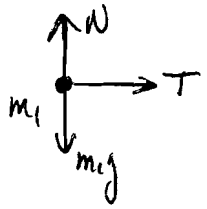
$$T_1 = \frac{m_1}{m_1+m_2+m_3}T = \frac{1.2kg}{6.7kg}(6.5N) = 1.16N$$

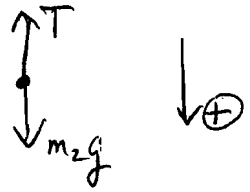
$$T_2 = T_1 + \frac{m_2}{m_1}T_1 = (1.16N)\left(1 + \frac{2.4}{1.2}\right) = 3.49N$$

(b) $\Delta v = \frac{T_1}{m_1}\Delta t = \frac{1.16N}{1.2kg}(2.4s) = 2.33\ m/s$ $v_f = v_i + \Delta v = 2.33\frac{m}{s}$

(3)







(a) $F_{net} = T = m_1 \frac{\Delta v}{\Delta t}$ $\quad F_{net} = m_2 g - T = m_2 \frac{\Delta v}{\Delta t}$

$\frac{\Delta v}{\Delta t} = \frac{T}{m_1}$ $\quad m_2 g - T = m_2 \frac{T}{m_1}$

$T = \frac{m_2 g}{1 + \frac{m_2}{m_1}} = 28.2\ N$

(b) $\Delta v = \frac{T}{m_1} \Delta t = \left(\frac{28.2\ N}{8.0\ kg}\right)(6.2\ s) = 4.2\ m/s$

$v_f = v_i + \Delta v = 4.2\ m/s$