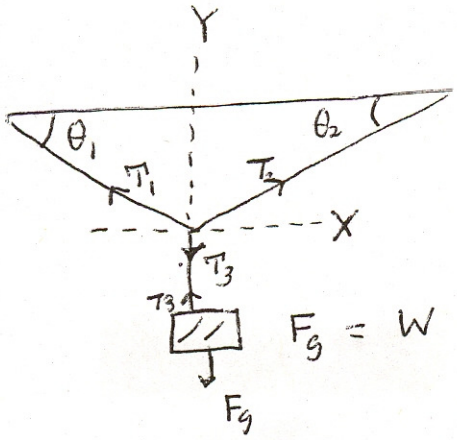
(21)

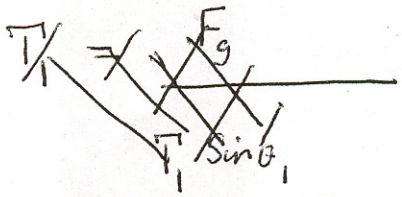


Net $\vec{F} = 0$

$\therefore$ Net $F_X = 0 \Rightarrow T_2 \cos\theta_2 - T_1 \cos\theta_1 = 0$ (1)

Net $F_Y = 0 \Rightarrow T_1 \sin\theta_1 + T_2 \sin\theta_2 - F_g = 0$ (2)

Solving



From (1)

$$T_2 = \frac{T_1 \cos\theta_1}{\cos\theta_2} \quad (3)$$

from (2)

$$T_1 \sin\theta_1 + \frac{T_1 \cos\theta_1 \sin\theta_2}{\cos\theta_2} - F_g = 0$$

$$\therefore T_1 \left(\sin\theta_1 + \frac{\cos\theta_1 \sin\theta_2}{\cos\theta_2} \right) = F_g$$

$$\therefore \boxed{T_1 = \frac{F_g \cos\theta_2}{\sin(\theta_1 + \theta_2)}}$$

(25)

$$F_2 \hat{j} + \vec{F}_1 = m\vec{a}$$

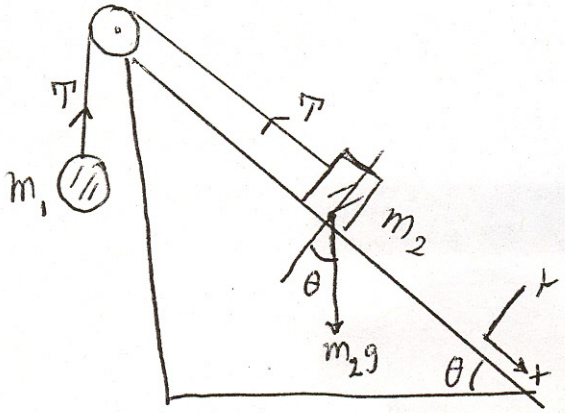
$$\therefore \vec{F}_1 = m\vec{a} - F_2 \hat{j}$$

$$= 1\,kg \times \left(10 \sin 60^\circ \frac{m}{s^2} \hat{i} + 10 \cos 60^\circ \frac{m}{s^2} \hat{j}\right) - 5\,N\,\hat{j}$$

$$= 10 \sin 60^\circ \hat{i} + 10 \cos 60^\circ \hat{j} - 5 \hat{j}$$

$$\boxed{\vec{F}_1 = 8.66\,N\,\hat{i}}$$

(28)



$m_1 = 2\ kg$

$m_2 = 6\ kg$

$\theta = 35°$

No friction

a = acceleration

m_1

$$T - m_1 g = m_1 a \quad (1)$$

m_2

$$m_2 g \sin\theta - T = m_2 a \quad (2)$$

$$N - m_2 g \cos\theta = 0 \quad (3)$$

Adding (1) and (2) :

$$m_2 g \sin\theta - m_1 g = (m_1 + m_2) a$$

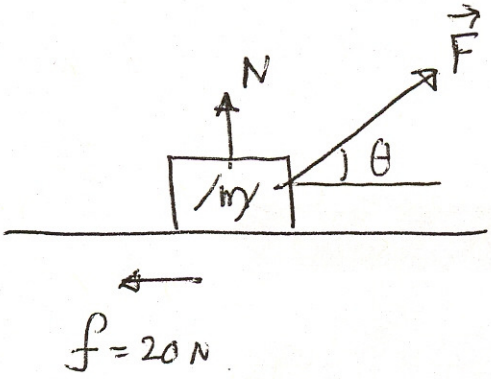
(a) $\therefore \quad a = 3.57\ m/s^2$

(b) $T = m_1 g + m_1 a = 26.74\ N$

(c) $V = (3.57\ m/s^2)(2s) = 7.14\ m/s$

Speed for both is the same.

(40)



$m = 20\ kg$

$F = 35\ N$

(a) Determine θ :

$$F\cos\theta - f = 0 \quad (1)$$

$$\therefore 35\cos\theta = 20\ N \qquad \therefore \boxed{\theta = \cos^{-1}\frac{20}{35} = 55^\circ}$$

$$N + F\sin\theta - mg = 0 \quad (2)$$

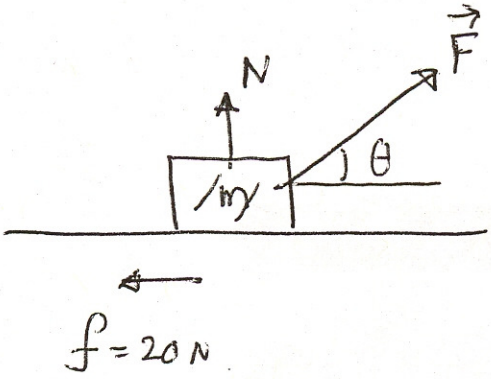
$$\therefore N = mg - F\sin\theta$$

$$= (20)(9.8) - (35)\sin 55^\circ$$

$$= 196 - 28.67 = 167.3\ N$$

$\boxed{N = 167.3\ \text{Newtons}}$

(40)



$m = 20\ Kg$

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(a) Determine θ :

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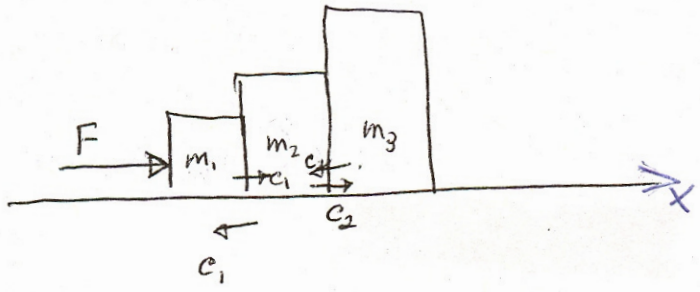
$$= 196 - 28.67 = 167.3\ N$$

$$\boxed{N = 167.3\ \text{Newtons}}$$

(54)



Frictionless Surface

m_1 $\quad F - c_1 = m_1 a \qquad (1)$

m_2 $\quad c_1 - c_2 = m_2 a \qquad (2)$

m_3 $\quad c_2 = m_3 a \qquad (3)$

$F = 18\ N$

$m_1 = 2$
$m_2 = 3$
$m_3 = 4$

Adding $\quad F = (m_1 + m_2 + m_3)\, a$

$$\therefore a = \frac{18}{9} = 2\ m/s^2$$

Then Find c_1 & c_2.

$$c_2 = m_3 a = 4 \times 2 = 8\ N$$

$$c_1 = c_2 + m_2 a = 8 + 3 \times 2 = 14\ N$$