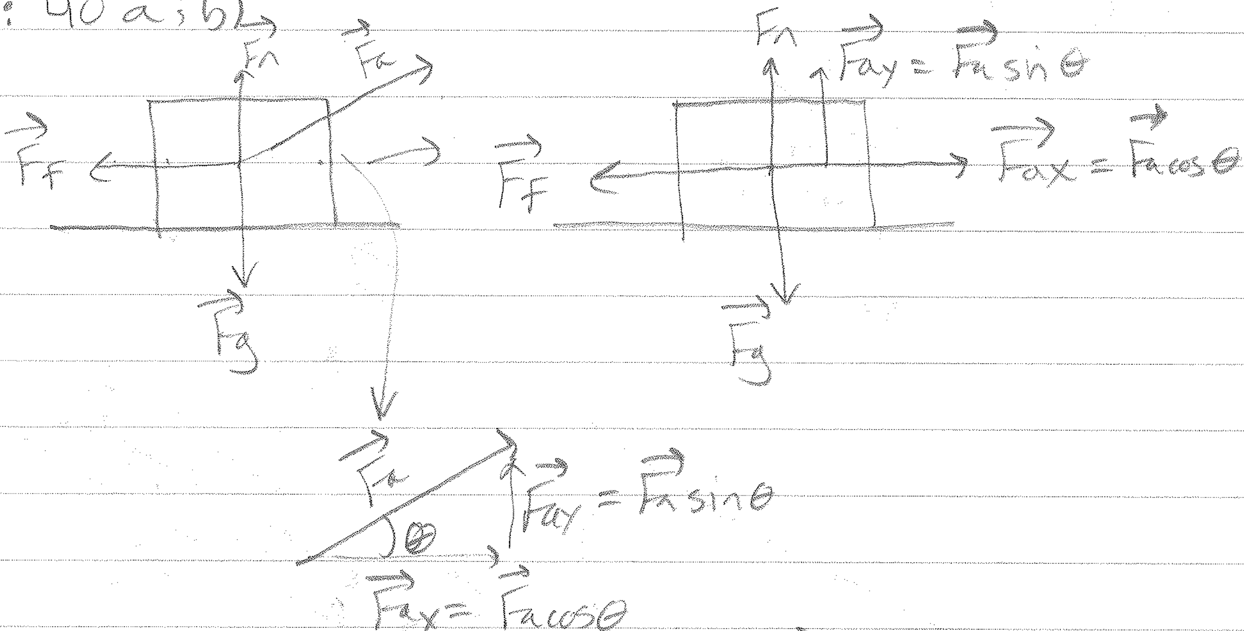
Pg 110: 40 a ; b)



a.) * constant speed = 0 acceleration ⟶ $\Sigma \vec{F} = 0N$

$\Sigma \vec{F} = \vec{F_{ax}} - \vec{F_f} = \vec{F_{ax}} = \vec{F_F}$

* we were given $\vec{F_F}$; $\vec{F_a}$ in problem

$F_a\cos\theta = \vec{F_f} \longrightarrow 35.0N \cos\theta = 20.0N$

$\theta = \cos^{-1}\left(\frac{20.0N}{35.0N}\right)$ $\theta = 55.15^\circ$

b) $\vec{F_{ax}} = \vec{F_F} \rightarrow \vec{F_a}\cos\theta = \mu \cdot \vec{F_n}$

$\vec{F_a}\cos\theta = \mu \cdot (\vec{F_g} - \vec{F_{ay}})$

$\vec{F_a}\cos\theta = \mu \cdot (m \cdot g - \vec{F_a}\sin\theta)$

$\vec{F_g} = \vec{F_n} + \vec{F_{ay}}$ (in equilibrium)

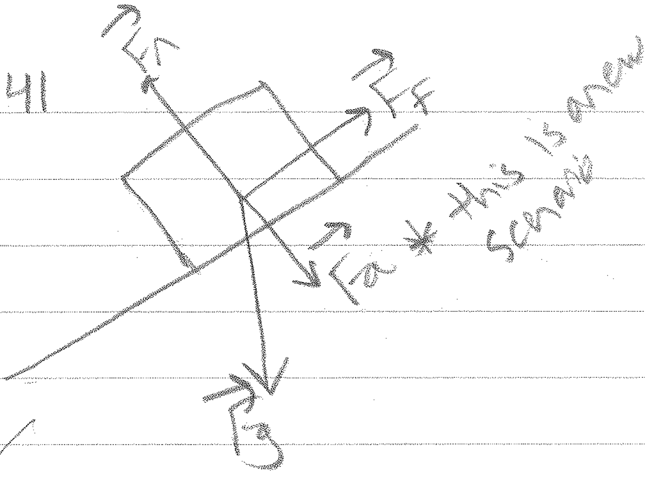
$Mg = \vec{F_n} + \vec{F_a}\sin\theta$

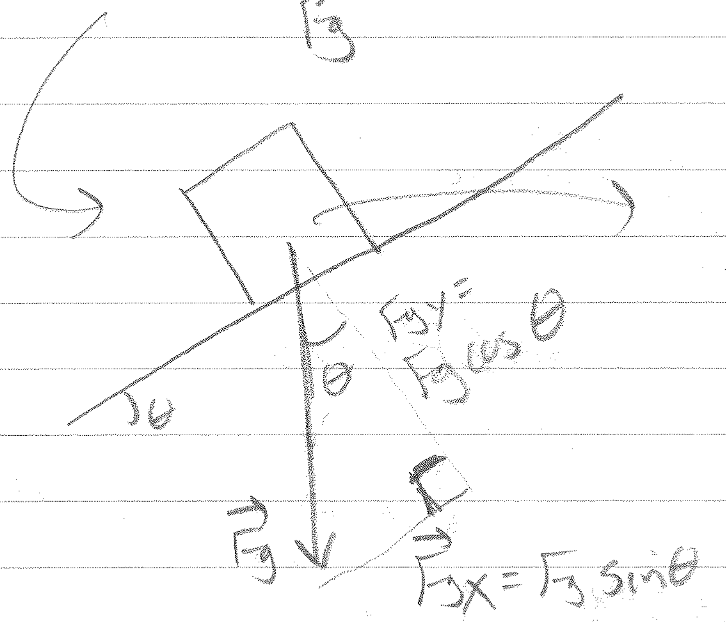
$\vec{F_n} = Mg - \vec{F_a}\sin\theta$

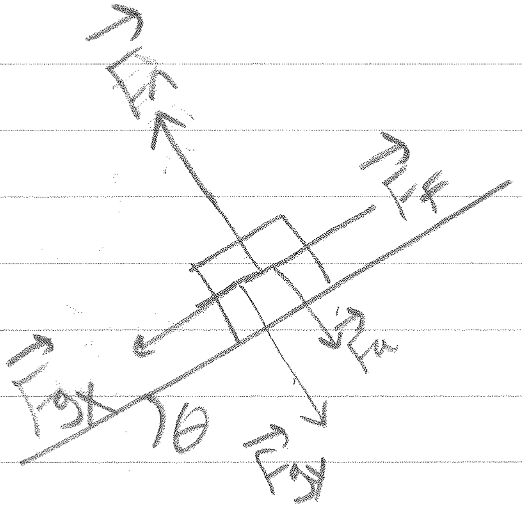
$\vec{F_n} = (20kg \cdot 10m/s^2) - (35.0N \sin 55.15^\circ)$

$\vec{F_n} = 171N$

Pg 110 41







in equilibrium

ΣF (in direction perpendicular to incline) $= \vec{F_n} - (\vec{F_a} + \vec{F_{gy}}) = 0N$

$\vec{F_n} = \vec{F_a} + \vec{F_{gy}}$

$\vec{F_F}/\mu = \vec{F_a} + \vec{F_g}\cos\theta$ $\quad$ $\vec{F_{gx}} = \vec{F_F}$ (in equilibrium)

$$\frac{\vec{F_{gx}}}{\mu} = \vec{F_a} + mg\cos\theta$$

$$\vec{F_a} = \left(\frac{(3.00kg)(10m/s^2)\sin(35°)}{.300}\right) - (3.00kg)(10m/s^2)\cos(35$$

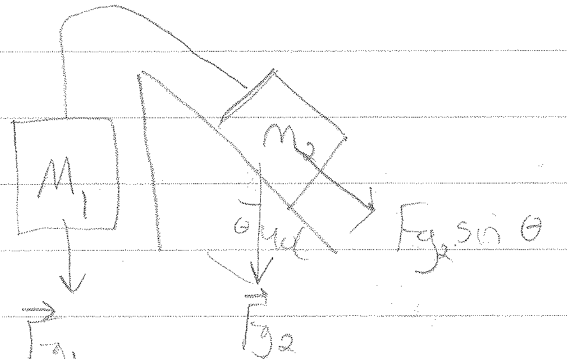
$$\frac{mg\sin\theta}{\mu} = \vec{F_a} + mg\cos\theta$$

$\vec{F_a} = 32.7N$

$$\vec{F_a} = \frac{mg\sin\theta}{\mu} - mg\cos\theta$$

Tension

pg 109.26)



$\Sigma\vec{F} = \vec{F}_{g_1} - \vec{F}_{g_2}\sin\theta = m_{system}\vec{a}$

$\hookrightarrow M_1 g - m_2 g \sin\theta = m_{system}\vec{a}$

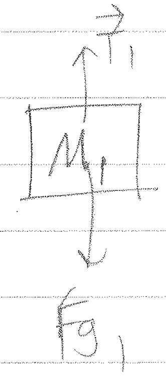
$\hookrightarrow \vec{a} = \dfrac{M_1 g - m_2 g \sin\theta}{(M_1 + m_2)}$

*acceleration is same for whole system & individual blocks, they move as 1 object

$\vec{a} = \dfrac{(10.0\,kg \cdot 10\,m/s^2) - (5.0\,kg \cdot 10\,m/s^2 \cdot \sin 40°)}{(10.0\,kg + 5.00\,kg)}$

$\vec{a} = 4.43\,m/s^2$

*Can solve for T in either block, I chose hanging



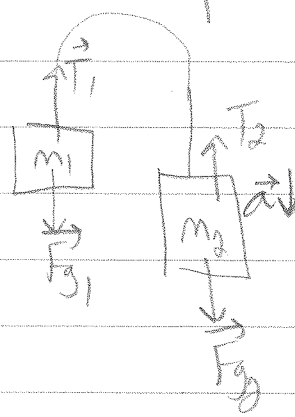
$\vec{a}\downarrow \rightarrow$ so $\Sigma\vec{F} = \vec{F}_{g_1} - \vec{T}_1 = M_1 a$

$\hookrightarrow M_1 g - \vec{T}_1 = M_1 a$

$\hookrightarrow \vec{T}_1 = M_1 g - M_1 a$

$\vec{T}_1 = 55.7\,N$

34 → will solve part b first



$$\sum \vec{F} = \vec{F}_{g_2} - \vec{F}_{g_1} = m_{system}\,\vec{a}$$

$$mass_{system}\,\vec{a} = mg_2 - mg_1$$

$$(m_1 + m_2)\vec{a} = mg_2 - mg_1$$

$$\vec{a} = \frac{mg_2 - mg_1}{(m_1 + m_2)}$$

$$\vec{a} = \frac{(5.00kg \cdot 10m/s^2) - (3.00kg \cdot 10m/s^2)}{(3.00kg + 5.00kg)}$$

$$\vec{a} = 2.5 m/s^2$$

a.)

(5.00kg) $\vec{a}\downarrow$

$$\sum \vec{F} = \vec{F}_{g_2} - \vec{T} = m \cdot \vec{a}$$

$$m_2 \cdot \vec{a} = \vec{F}_{g_2} - \vec{T}$$

$$m_2 \cdot \vec{a} = m_2 \cdot g - \vec{T}$$

$$\vec{T} = m_2 \cdot g - m_2\vec{a}$$

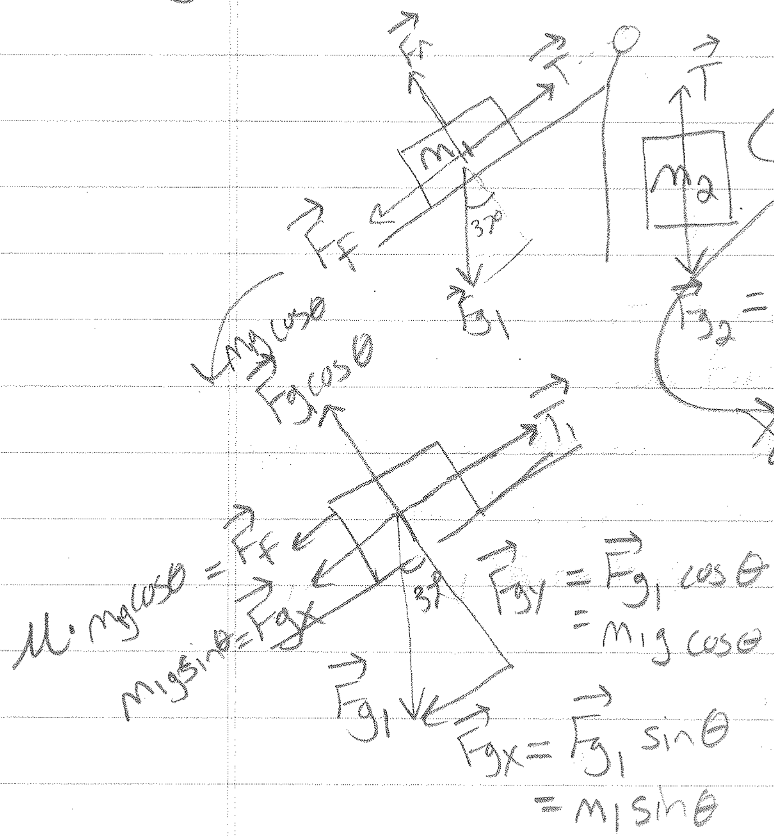
$$\boxed{\vec{T} = 37.5 N}$$

Pg 111 #49

$$\Sigma \vec{F}_{system} = (m_1 + m_2)\vec{a} = \vec{F}_{g2} - \vec{F}_f - \vec{F}_{gx}$$

$$(m_1 + m_2)\vec{a} = m_2 g - \mu \cdot m_1 g \cos\theta - m g \sin\theta$$

$$\vec{a} = \frac{m_2 g - \mu \cdot m_1 g \cos\theta - m g \sin\theta}{(m_1 + m_2)}$$

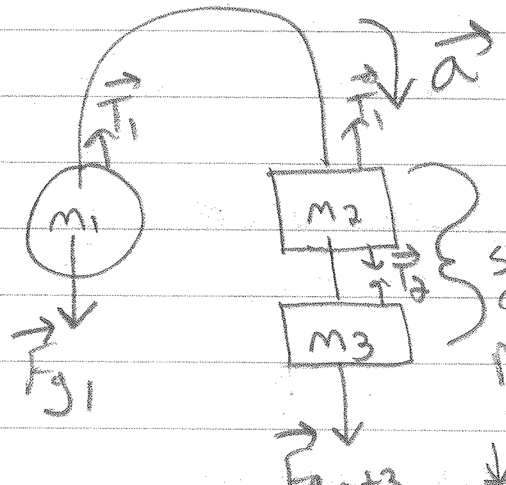


~~$\vec{a} = (12.0kg \cdot 10m/s^2) - .250 \cdot 7.00kg$~~

$$\vec{a} = \frac{(12.0kg \cdot 10m/s^2) - (.250 \cdot 7.00kg \cdot 10m/s^2 \cos 37°) - (7.00kg \cdot 10m/s^2 \cdot \sin 37°)}{(7.00kg + 12.0kg)}$$

$$\vec{a} = 3.36 m/s^2$$

Pg 112 62a-b



since these are on same side of pulley, just combine them to solve for part a.

* since all are connected by strings, and move as one, all will have same acceleration

$$\sum \vec{F} = m_{tot} \cdot \vec{a} = \vec{F}_{g_{2+3}} - \vec{F}_{g_1}$$

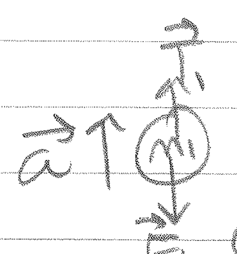
$$\sum \vec{F} = m_{tot} \cdot \vec{a} = (m_2 + m_3) \cdot g - m_1 g$$

$$\vec{a} = \frac{(m_2 + m_3) g - m_1 g}{(m_1 + m_2 + m_3)}$$

$$\vec{a} = \frac{(4.00kg + 3.00kg)(10m/s^2) - (5.00kg)(10m/s^2)}{(5.00kg + 4.00kg \cdot 3.00kg)}$$

$$\vec{a} = 1.67 m/s^2$$

b.) For T_1 *use $\vec{a}$ from part 1



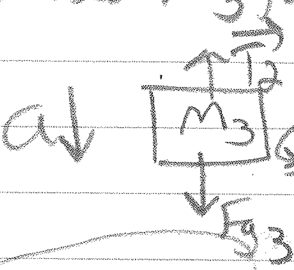
$$\sum \vec{F} = \vec{T}_1 - \vec{F}_{g_1} = m_1 \cdot \vec{a}$$

$$\vec{T}_1 = (m_1 \cdot \vec{a}) + \vec{F}_{g_1}$$

$$\vec{T}_1 = (5.00kg \cdot 1.67m/s^2) + (5.00kg \cdot 10m/s^2)$$

$$\vec{T}_1 = 58.4N$$

b.) For T_2 → can use m_2 or m_3, I used m_3 and $\vec{a}$ from part $\vec{a}$



$$\sum \vec{F} = \vec{F}_{g_3} - \vec{T}_2 = m_3 \cdot \vec{a}$$

$$\vec{T}_2 = (m_3 \cdot 10) - (m_3 \cdot \vec{a})$$

$$\vec{T}_2 = (3.00kg \cdot 10) - (3.0 \cdot 1.67)$$

$$T_2 = 25N$$