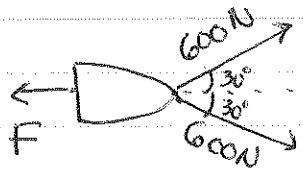
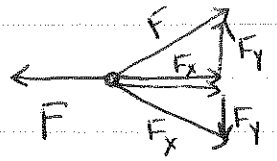
Pg 10

1) 



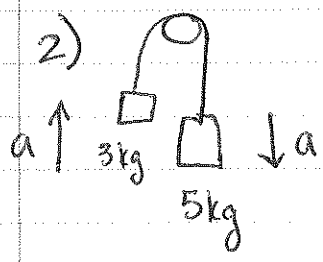
Constant velocity $\quad \sum F = 0N$

$2F_x - F_{drag} = 0N$

$F_{drag} = 2F_x = 2F\cos\theta$

$= 2((600N)(\cos 30°)$

$= 1040\ N$

2) 

① $a = ?$ use system

$$a = \frac{F_{net}}{m} = \frac{F_{g1} - F_{g2}}{m_1 + m_2} = \frac{(m_1 - m_2)g}{m_1 + m_2}$$

$$= \frac{(5kg - 3kg)(9.81 m/s^2)}{(5kg + 3kg)}$$

$$a = 2.45\ m/s^2$$

② $F_t = ?$ use one block

#1 = 3kg $\quad \sum F = ma$

$F_t - F_g = ma$

$F_t = ma + F_g = (3kg)(2.45 m/s^2)$

$+ 3kg(9.81 m/s^2)$

$= 36.8N$

#2 = 5kg $\quad \sum F = ma$

$F_t - F_g = ma$

$F_t = ma + F_g = (5kg)(-2.45 m/s^2)$ ← down

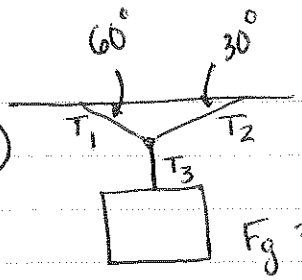
$+ 5kg(9.81 m/s^2)$

$= 36.8N$

g's already factored in

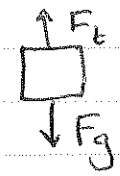
pg 10

3)



$F_g = 150.N$

feeder:



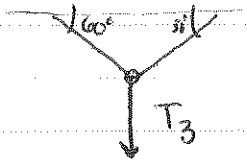
$\Sigma F = 0N$

$F_t - F_g = 0N$

$F_t = F_g$

$F_{t3} = 150.N$

ropes:



Vertical:

$\Sigma F = 0N$

$T_{1y} + T_{2y} - T_3 = 0N$

$T_1 \sin\theta_1 + T_2 \sin\theta_2 = T_3$

$(1.7)T_2 (\sin 60°) + T_2 \sin 30° = 150_N$

$1.97224\, T_2 = 150\,N$

$T_2 = 76\,N$

horizontal:

$\Sigma F = 0N$

$T_{2x} - T_{1x} = 0N$

$T_2 \cos\theta_2 = T_1 \cos\theta_1$

$T_1 = \dfrac{T_2 \cos\theta_2}{\cos\theta_1}$

$= T_2 \dfrac{\cos 30°}{\cos 60°}$

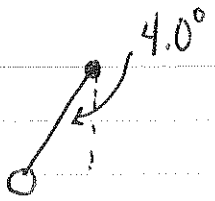
$T_1 = 1.7\, T_2$

$T_1 = 1.7(76N)$

$= 130N$

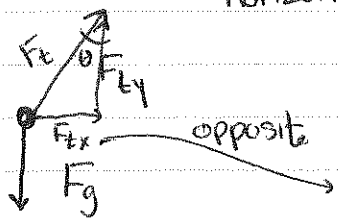
Pg 11

4)



$m = 3.0\,kg$

$a = ?$



horizontal:

$\Sigma F = ma$

$F_x = ma$

$F_t \sin\theta = ma$

$a = \dfrac{F_t \sin\theta}{m}$

$= \dfrac{30.N \sin 4.0°}{3.0kg}$

$= .70\ m/s^2$

Vertical:

$\Sigma F = 0N$

$F_y - F_g = 0N$

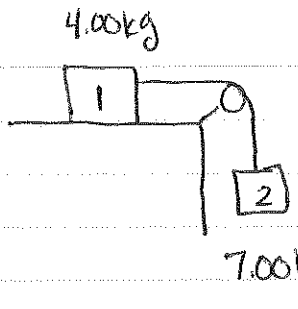
adjacent

$F_y = F_g$

$F_t \cos\theta = mg$

$F_t = \dfrac{mg}{\cos\theta} = \dfrac{(3.0kg)(9.81 m/s^2)}{\cos 4.0°} = 30.N$

Pg 11

5) 

$\mu = .300$

$F_f = \mu F_N = \mu mg$
$= .300(4.00kg)(9.81 m/s^2)$
$= 11.8N$

① $a = ?$ system as a whole

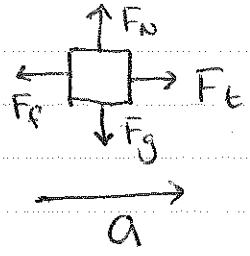
$$a = \frac{F_{net}}{m_{tot}} = \frac{F_{g2} - F_f}{m_1 + m_2} = \frac{m_2 g - F_f}{m_1 + m_2}$$

$$= \frac{(7.00kg)(9.81 m/s^2) - 11.8N}{7.00kg + 4.00kg}$$

$= 5.17 m/s^2$

② $F_t = ?$ just one block

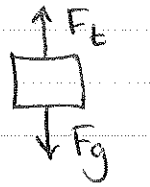
#1:



$\Sigma F = ma$
$F_t - F_f = ma$
$F_t = ma + F_f$
$= (4.00kg)(5.17 m/s^2)$
$+ 11.8N$
$= 32.5N$

OR

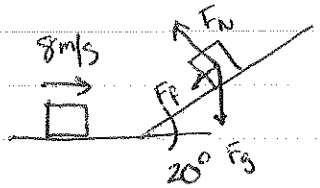
#2:



$\Sigma F = ma$
$F_t - F_g = ma$

$F_t = ma + F_g$
$= (7.00kg)(-5.17 m/s^2) + (7.00kg)(9.81 m/s^2)$
$= 32.5N$

Pg 11

6) 

$m = 5.0\,kg$
$\theta = 20.°$
$V_0 = 8.0\,m/s$
$\mu = .20$

$x = ?$ to stop
$V_f = 0\,m/s$

① Find a first $\quad \Sigma F = ma$

$-F_{g\parallel} - F_f = ma$

$-F_{g\parallel} - \mu F_N$

$-mg\sin\theta - \mu mg\cos\theta = ma$

$-g\sin\theta - \mu g\cos\theta = a$

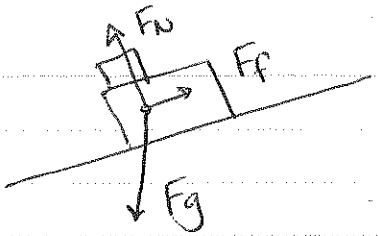
$-(9.81\,m/s^2)\sin 20° - .20(9.81\,m/s^2)\cos 20°$

$-5.2\,m/s^2$

② $V^2 = V_0^2 + 2ax$

$x = \frac{-V_0^2}{2a} = \frac{-(8.0\,m/s)^2}{2(-5.2\,m/s^2)} = 6.2\,m$

Pg 12 7)



$\theta = 10.0°$
$\mu_s = .350$
max a before slip

$$\Sigma F = ma$$

$$F_f - F_{g\parallel} = ma$$

$$\mu F_N - F_g \sin\theta = ma$$

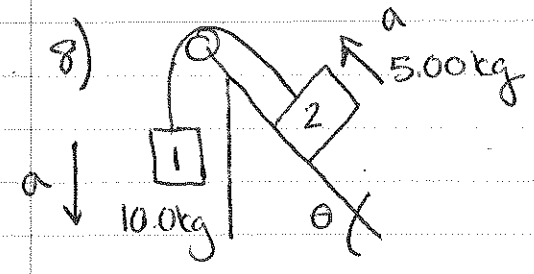
$$\mu m g \cos\theta - m g \sin\theta = m a$$

$$a = \mu g \cos\theta - g \sin\theta$$

$$= (.350)(9.81 \text{ m/s}^2)\cos 10.0° - 9.81 \text{ m/s}^2 \sin 10.0°$$

$$= 1.68 \text{ m/s}^2$$

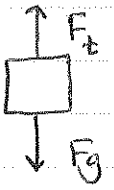
Pg 12 8)



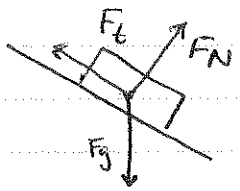
$\theta = 40.0°$

smooth incline = no friction

#1



#2



a) $a = ?$ use system as a whole

$$a = \frac{F_{net}}{m} = \frac{F_{g1} - F_{g2\parallel}}{m_1 + m_2} = \frac{m_1 g - m_2 g \sin\theta}{m_1 + m_2}$$

$$= \frac{(10.0\,kg)(9.81\,m/s^2) - (5.00\,kg)(9.81\,m/s^2)\sin 40.0}{10.0\,kg + 5.00\,kg}$$

$$= 4.44\,m/s^2$$

b) $F_t = ?$ use one box

#1 = 10.0kg

$$\Sigma F = ma$$
$$F_t - F_g = ma$$
$$F_t = ma + F_g$$
$$= (10.0\,kg)(-4.44\,m/s^2) + (10.0\,kg)(9.81\,m/s^2)$$
$$= 53.7\,N$$

#2 = 5.00kg

$$\Sigma F = ma$$
$$F_t - F_{g\parallel} = ma$$
$$F_t = ma + F_{g\parallel} = ma + mg\sin\theta$$
$$= (5.00\,kg)(4.44\,m/s^2) + (5.00\,kg)(9.81\,m/s^2)(\sin 40.0)$$
$$= 53.7\,N$$