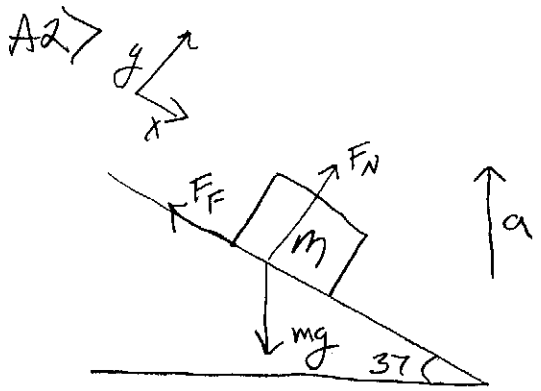
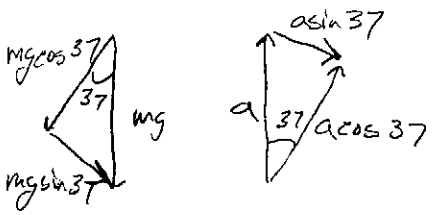
A1) explanation

A2)





A2)

$a = .780\ m/s^2$

$m = 6.5\ kg$

$\Sigma \vec{F} = m\vec{a}$

$\Sigma F_x = ma_x$

$-F_F + mg\sin 37 = m(a\sin 37)$

$mg\sin 37 - \mu F_N = m(a\sin 37)$ ①

$\Sigma F_y = ma_y$

$F_N - mg\cos 37 = m(a\cos 37)$

$F_N = ma\cos 37 + mg\cos 37$ ②

② into ①

$mg\sin 37 - \mu[ma\cos 37 + mg\cos 37] = ma\sin 37$

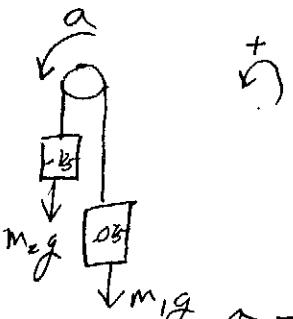
$\mu[ma\cos 37 + mg\cos 37] = mg\sin 37 - ma\sin 37$

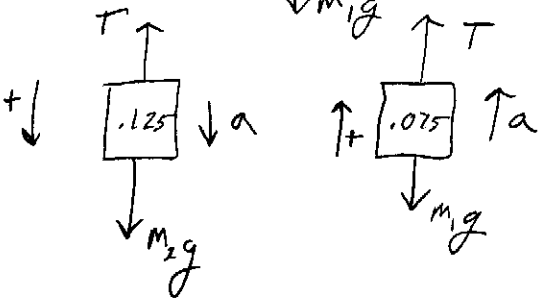
$$\mu = \frac{mg\sin 37 - ma\sin 37}{mg\cos 37 + ma\cos 37}$$

$$\mu = \frac{9.80\sin 37 - (.78)\sin 37}{9.8\cos 37 + (.78)\cos 37}$$

$$\boxed{\mu = .642}$$

A3)





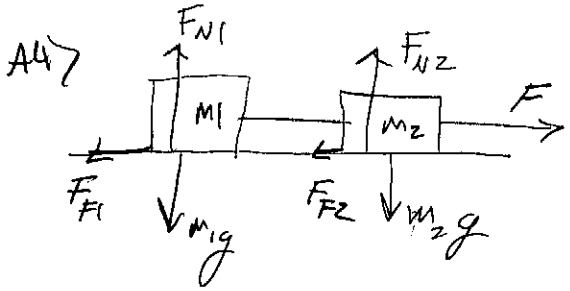
A3) $\Sigma F = ma$ system

$-m_1g + m_2g = (m_1 + m_2)a$

$\frac{-(.075)(9.8) + (.125)(9.8)}{(.075 + .125)} = a$

$\boxed{a = 2.45\ m/s^2}$

A4)



A4) $\Sigma F = ma$

Block 1

$\Sigma F_x = ma_x$ $\quad$ $\Sigma F_y = ma_y$

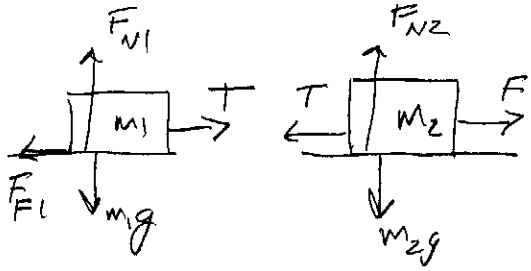
$T - F_{F1} = 0$ $\quad$ $F_{N1} - m_1g = 0$

$F_{N1} = m_1g$

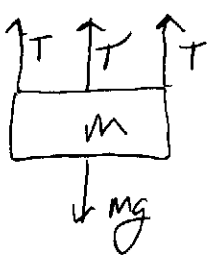
$T = F_{F1} = \mu F_{N1}$

$T = (.332)(4.45)(9.8)$

$\boxed{T = 14.5\ N}$



A5)



A5) $\Sigma F = ma$

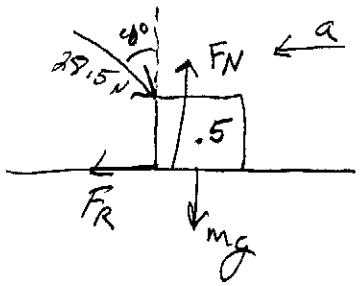
$3T - mg = 0$

$T = \frac{mg}{3}$

$T = \frac{(4.25)(9.8)}{3}$

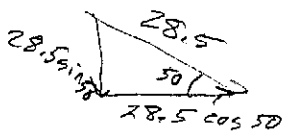
$\boxed{T = 13.9\ N}$

A6)



A6) $a = .45\ m/s^2$

$\Sigma F = ma$



$\Sigma F_x = ma_x$ $\quad$ $\Sigma F_y = ma_y$

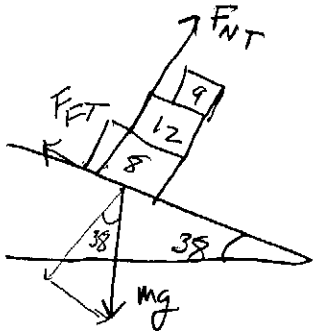
$-F_R + 28.5\cos 50 = m(-a)$

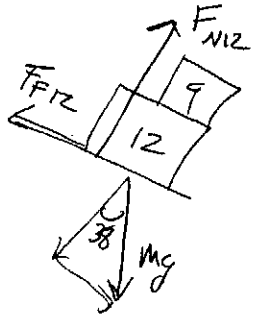
$F_R = 28.5\cos 50 + ma$

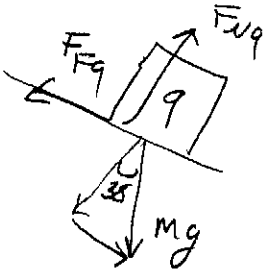
$F_R = 28.5\cos 50 + (-5)(.45)$

$$\boxed{F_R = 18.5\ N}$$

A7)







A7) Total $\quad \Sigma F = ma$

$\Sigma F_x = ma_x$ $\quad$ $\Sigma F_y = ma_y$

$-F_{FT} + mg\sin 38 = 0$ $\quad$ $F_{NT} - mg\cos 38 = 0$

$F_{FT} = mg\sin 38 = \mu F_{NT}$ $\quad$ $F_{NT} = mg\cos 38$

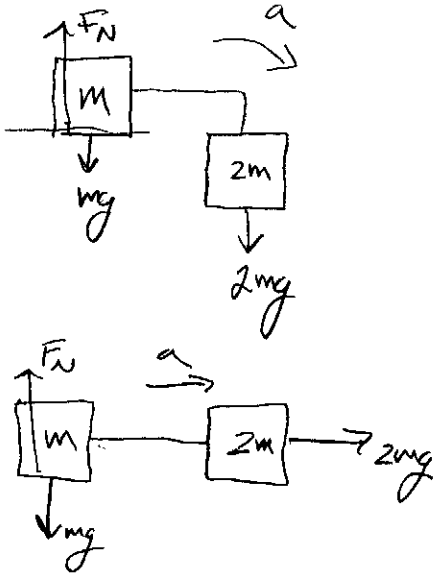
$\mu\, mg\cos 38 = mg\sin 38$

$$\mu = \frac{\sin 38}{\cos 38} = \tan 38$$

$$\boxed{\mu = .781}$$

Since this is based only on the angle all three are the same

B1)



B1) $\Sigma \vec{F} = m\vec{a}$

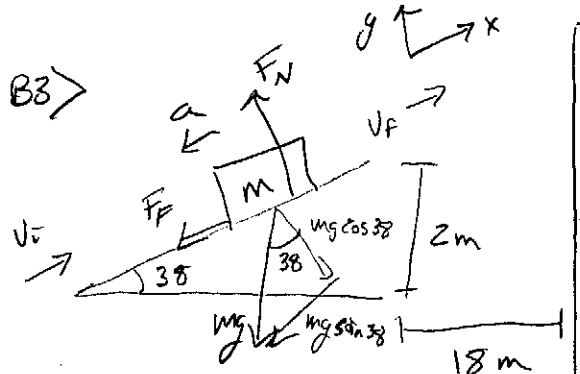
$2mg = (3m)a$

$2g = 3a$

$a = \frac{2}{3}g = 6.53\ m/s^2$

B2) explain

B3)



$\Sigma F = ma$

$\Sigma F_x = ma_x$

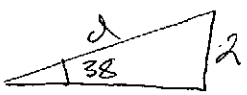
$-F_F - mg\sin 38 = m(a)$

$\mu F_N + mg\sin 38 = ma$

$\Sigma F_y = ma_y$

$-mg\cos 38 + F_N = 0$

$F_N = mg\cos 38$

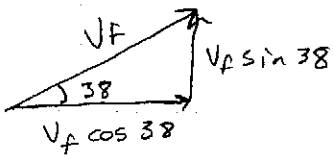


$\sin 38 = \frac{2}{d}$

$d = \frac{2}{\sin 38}$

B3) $m = 60\ kg$

$\mu = .445$



x) $d = d_0 + V_i t + \frac{1}{2}at^2$

$18 = V_f \cos 38\ t \qquad t = \frac{18}{V_f \cos 38}$

y) $d = d_0 + V_i t + \frac{1}{2}at^2$

$0 = 2 + V_f \sin 38\ t + \frac{1}{2}(-9.8)t^2$

$0 = 2 + V_f \sin 38\left[\frac{18}{V_f \cos 38}\right] - 4.9\left[\frac{18}{V_f \cos 38}\right]^2$

$V_f = 12.616\ m/s$

$\mu mg\cos 38 + mg\sin 38 = ma$

$(.445)(9.8)\cos 38 + (9.8)\sin 38 = a$

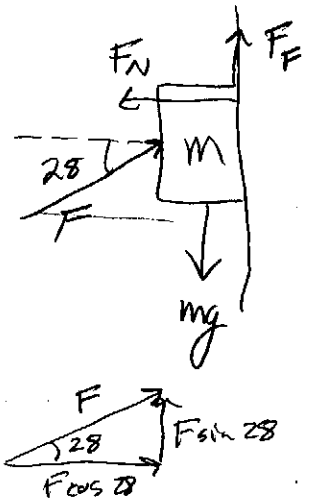
$a = 9.470\ m/s^2$

$V_f^2 = V_i^2 + 2ad$

$(12.616)^2 = V_i^2 + 2(-9.47)\left(\frac{2}{\sin 38}\right)$

$V_i = 14.8\ m/s$

B4)



B4) $\mu_s = .65$ $\quad F = 24N$

$\mu_k = .3$

$\Sigma \vec{F} = m\vec{a}$

$\Sigma F_x = ma_x$ $\qquad \Sigma F_y = ma_y$

$F\cos 28 - F_N = 0$ $\qquad F_F - mg + F\sin 28 = 0$

$F_N = F\cos 28$

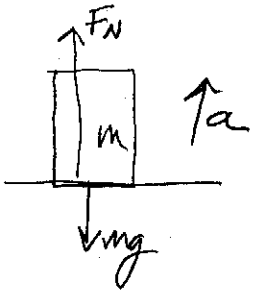
$\mu F_N - mg + F\sin 28 = 0$

$\mu F\cos 28 + F\sin 28 = mg$

$(.65)(24)\cos 28 + 24\sin 28 = m(9.8)$

$\boxed{m = 2.56 \text{ kg}}$

B5)



B5) $\Sigma \vec{F} = m\vec{a}$

$F_N - mg = ma$

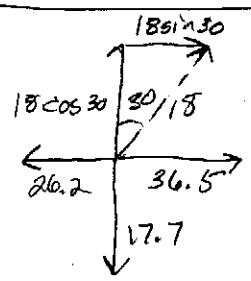
$1.32mg - mg = ma$

$.32mg = ma$

$a = .32g$

$\boxed{a = 3.14 \text{ m/s}^2}$

B6)

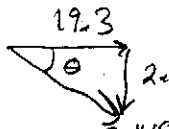


$\Sigma F_x = -26.2 + 36.5 + 18\sin 30$

$\Sigma F_x = 19.3$

$\Sigma F_y = 18\cos 30 - 17.7$

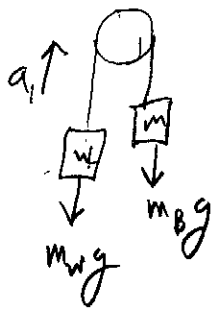
$\Sigma F_y = -2.1115$

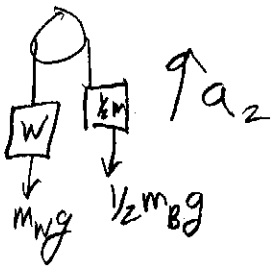


$\text{Tan}\,\theta = \frac{2.1115}{19.3} \Rightarrow \theta = 6.24°$

$\boxed{\text{19.4 N} \searrow 6.24°}$

B7)





$m_B = 150\ kg$ $\quad h = 4m$

$a_1 = 2.58\ m/s^2$

$\Sigma F = ma$

$-m_w g + m_B g = (m_w + m_B)a$

$-m_w g + m_B g = m_w a + m_B a$

$m_B g - m_B a = m_w a + m_w g$

$m_B(g-a) = m_w(a+g)$

$\frac{150(9.8-2.58)}{(2.58+9.8)} = m_w$

$m_w = 87.47981\ kg$

$\Sigma F = ma$

$-m_w g + \frac{1}{2}m_B g = (m_w + \frac{m_B}{2})(-a)$

$-(87.47981)(9.8) + \frac{1}{2}(150)(9.8) = (87.47981 + 75)(-a)$

$a = .7527\ m/s^2$

$v_f^2 = v_i^2 + 2ad$

$v_f^2 = 2(.7527)(4)$

$\boxed{v_f = 2.45\ m/s}$