Ray Lu

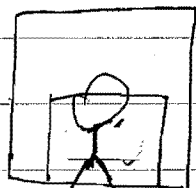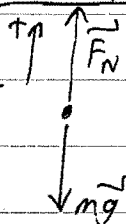# (C) Forces Problem Set

1.

Free Body Diagram

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

$\sum F_x = ma_x$ $\sum F_y = ma_y$

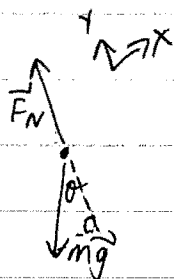No forces $F_N - mg = ma_y$

$F_N = mg + ma_y$

$F_N = 70 \, kg(9.8 \, m/s^2 + 2.0 \, m/s^2)$

$= \boxed{826 \, N}$

2.

$\sum \vec{F} = m\vec{a}$
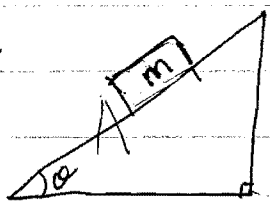
$\sum F_x = ma_x$ $\sum F_y = ma_y$

$-mg\sin\theta = ma_x$ $F_N - mg\cos\theta = 0$

$F_N = \boxed{mg\cos\theta}$

3.

$\sum \vec{F} = m\vec{a}$
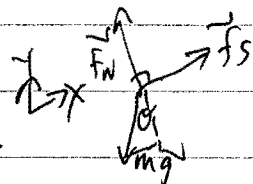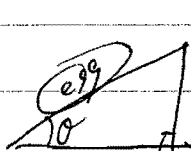
$\sum F_x = ma_x$ $\sum F_y = ma_y$

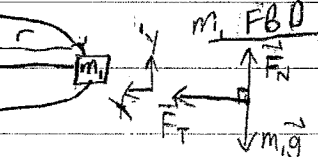$f_s - mg\sin\theta = 0$ $F_N - mg\cos\theta = 0$

$\mu_s F_N - mg\sin\theta = 0$ $F_N = mg\cos\theta$

$\mu_s mg\cos\theta - mg\sin\theta = 0$

$\mu_s = \dfrac{mg\sin\theta}{mg\cos\theta} = \tan\theta$

$\theta = \tan^{-1}(\mu_s) = \tan^{-1}(0.04) = \boxed{2.3°}$

4.

m_1 FBD

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

$\sum F_x = ma_x$ $\sum F_y = ma_y$

$F_T = m_1 a_c$ $F_N - m_1 g = 0$

$F_T = m_1 \dfrac{v^2}{r}$

m_2 FBD:

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

$\sum F_x = ma_x$ $\sum F_y = ma_y$

No forces $F_T - m_2 g = 0$