NO Reading Assignment

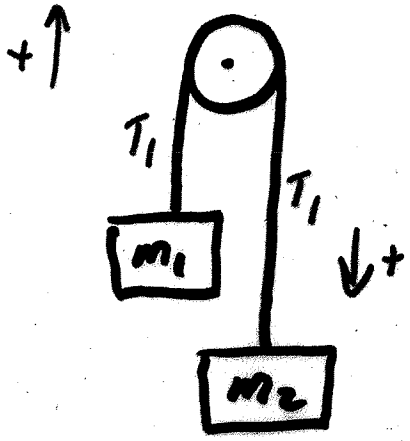
H.W Due Friday

Action Center Thursday
Wagner 145 5-7 p.m

Group problem Thursday

office hours
10:30-11:30 today

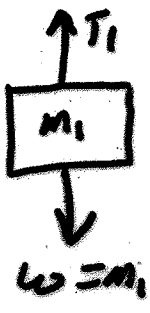
$$\vec{F}_{net} = m\vec{a} \qquad \vec{a} \neq 0$$

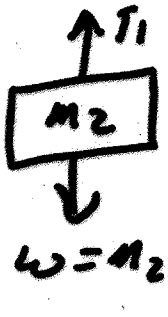


$m_1 = 10\,kg$

$m_2 = 14\,kg$

Determine $\vec{a}$





$T_1 - m_1 g = m_1 a$ $\qquad$ $-T_1 + m_2 g = m_2 a$

$T_1 = m_1 a + m_1 g$ $\qquad$ $T_1 = -m_2 a + m_2 g$

set equal

$$m_1 a + m_1 g = -m_2 a + m_2 g$$

$$a(m_1 + m_2) = g(m_2 - m_1)$$

$$\boxed{a = g\,\frac{(m_2 - m_1)}{m_1 + m_2}}$$

$m_1 = 0$

$a = g\left(\frac{m_2}{m_2}\right) = g$

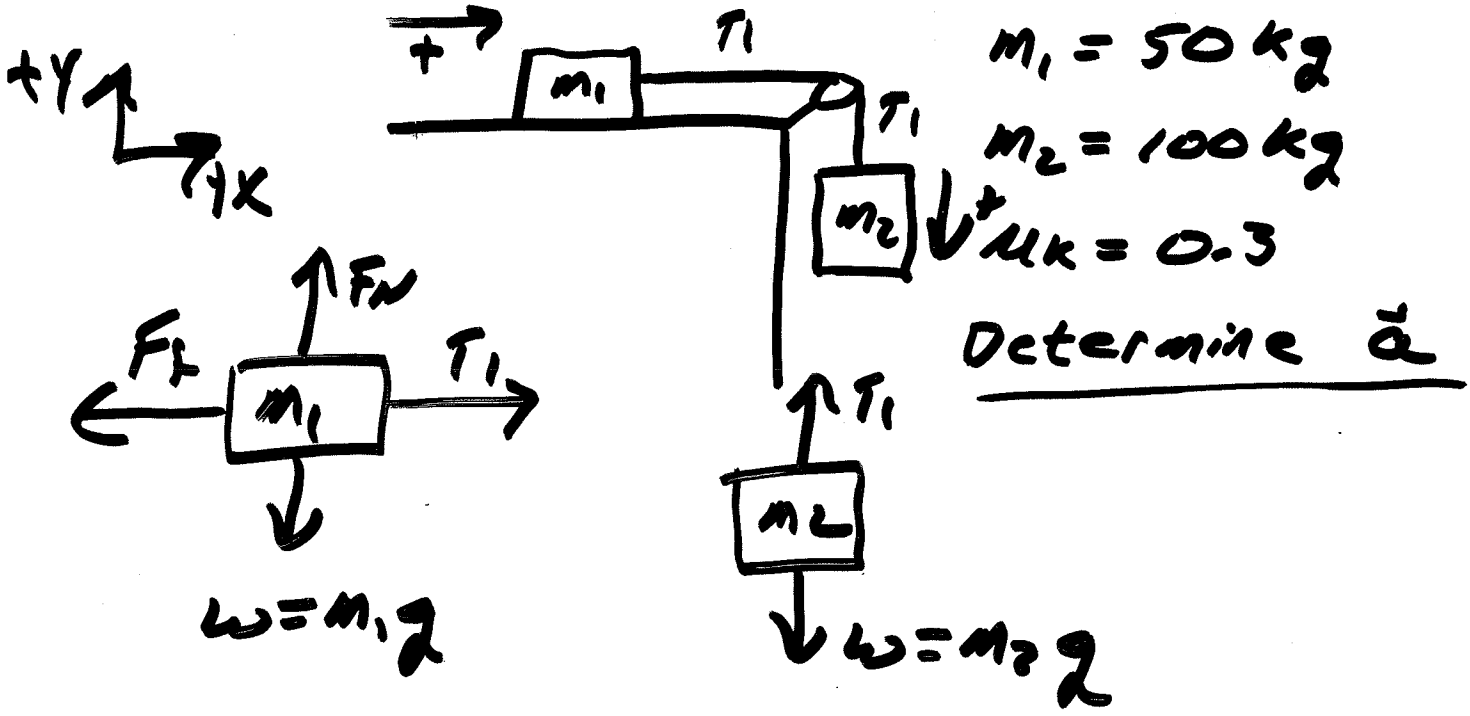
$m_2 = m_1 \quad a = 0$

$m_2 > m_1 \quad a > 0$

$m_2 < m_1 \quad a < 0$

$$a = (9.8\ m/s^2)\left(\frac{14\,kg - 10\,kg}{14\,kg + 10\,kg}\right)$$

$$\boxed{a = 1.6\ m/s^2}$$



$m_1 = 50\ kg$

$m_2 = 100\ kg$

$\mu_k = 0.3$

Determine a

$F_N - \omega = 0$

$F_N = \omega = m_1 g$

$T_1 - F_f = m_1 a$

$T_1 - \mu_k F_N = m_1 a$

$T_1 - \mu_k m_1 g = m_1 a$

$T_1 = m_1 a + \mu_k m_1 g$

$-T_1 + m_2 g = m_2 a$

$T_1 = m_2 g - m_2 a$

set T_1 equal

$m_1 a + \mu_k m_1 g = m_2 g - m_2 a$

$$a = g\left(\frac{m_2 - \mu_k m_1}{m_1 + m_2}\right)$$

$$a = 9.8\ m/s^2\left(\frac{100\ kg - (0.3)(50\ kg)}{100 + 50}\right)$$

$$a = 5.55\ m/s^2$$

Interactive Question

Consider a person standing in an elevator that is moving upward at a constant velocity. The upward normal force N exerted by the elevator floor on the person is

A) larger than
B) identical to
C) smaller than

the downward weight W of the person

Interactive Question

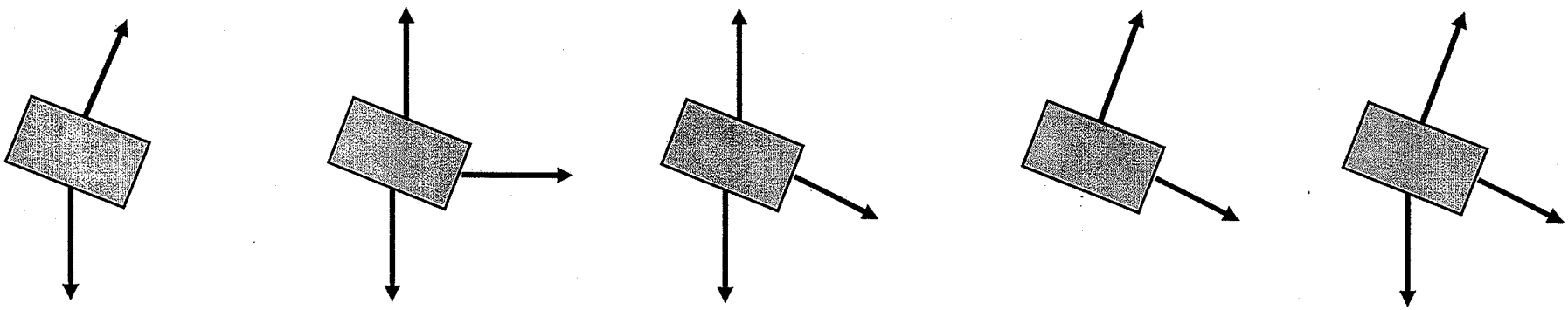
Consider a person standing in an elevator that is *accelerating upward.* The upward normal force N exerted by the elevator floor on the person is

A) larger than
B) identical to
C) smaller than

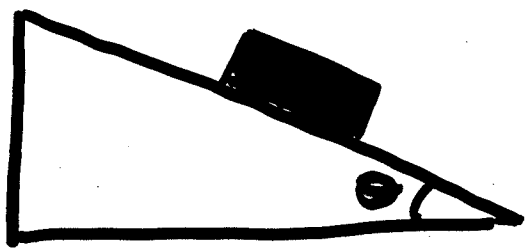
the downward weight W of the person

Interactive Question

Which of the following is the correct free body diagram for an object sliding down a frictionless incline.

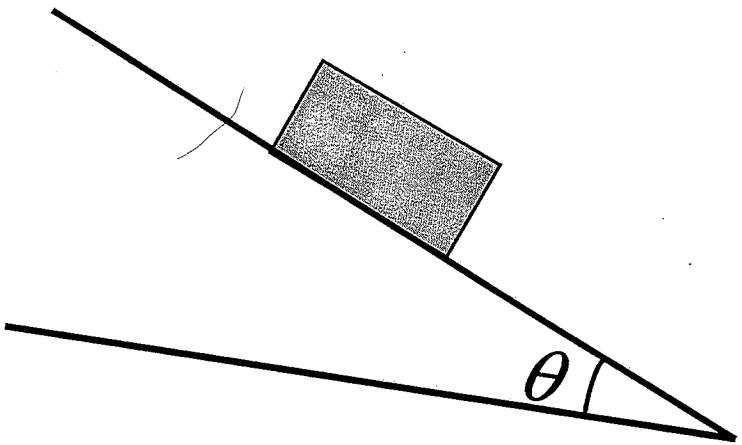


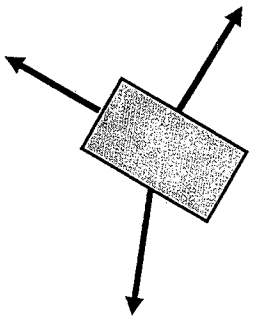
(A) (B) (C) (D) (E)



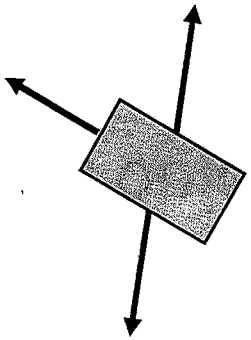
Interactive Question

Which is the correct free body diagram for an object sliding down an inclined surface? Don't neglect friction.

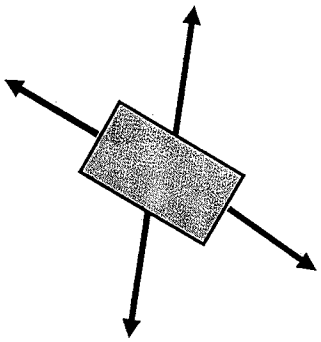




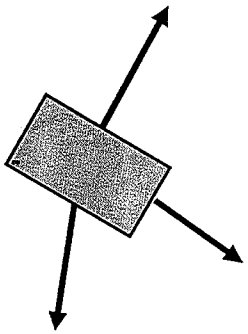
(A)



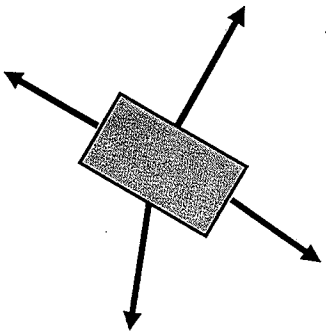
(B)



(C)

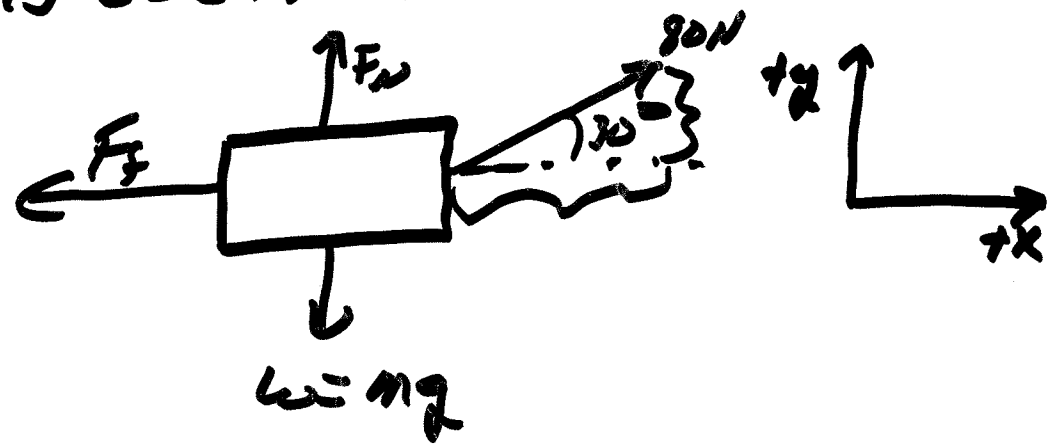


(D)



(E)

Ex) A 20kg box is being pulled across a surface at a constant velocity. A pulling force of magnitude 80N is applied at 30° above horizontal. What is coefficient of kinetic friction



$y: +F_N - mg + 80\sin 30^\circ = 0$

$x: -f_f + 80\cos 30^\circ = 0$

$-F_N = mg - 80\sin 30^\circ$

$F_f = 80\cos 30^\circ$

$F_N = (20kg)(9.8\ m/s^2) - 80\sin 30^\circ$

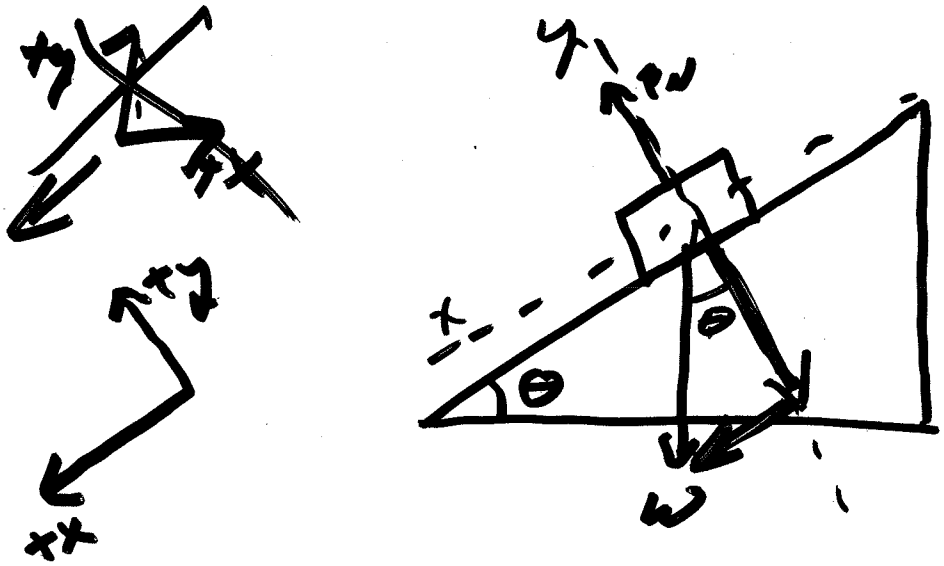
$F_N = 156\ N$

$\mu_k F_N = 80\cos 30^\circ$

$\mu_k = \frac{80\cos 30^\circ}{F_N}$

$\mu_k = \frac{80\cos 30^\circ}{156\ N} = .44$

incline & plane
no friction



$w_y: w\cos\theta$

$w_x = w\sin\theta$

$y: \Sigma F_y = 0$ $\quad F_N - w\cos\theta = 0$

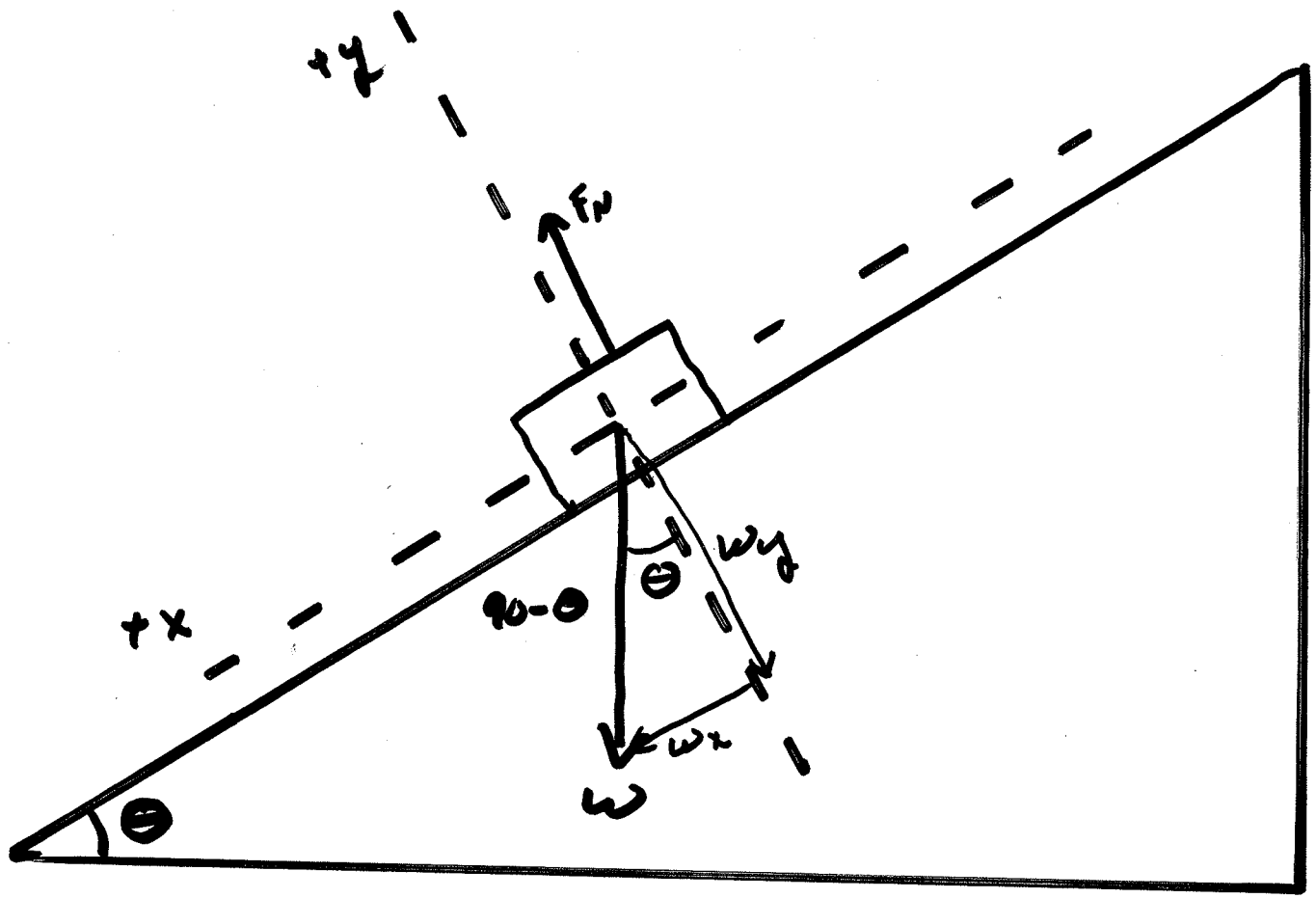
$\boxed{F_N = mg\cos\theta}$

$x: \Sigma F_x = ma$

$w\sin\theta = ma$

$mg\sin\theta = ma$

$\boxed{a = g\sin\theta}$


+y
f_N
+x
90-θ
θ
w_y
w_x
w
θ