03FEB10

- HW Q & A
- Pearson Physics
- friction

19
(13)

•19 In Fig. 5-38, let the mass of the block be 8.5 kg and the angle θ be 30°. Find (a) the tension in the cord and (b) the normal force acting on the block. (c) If the cord is cut, find the magnitude of the resulting acceleration of the block. SSM WWW

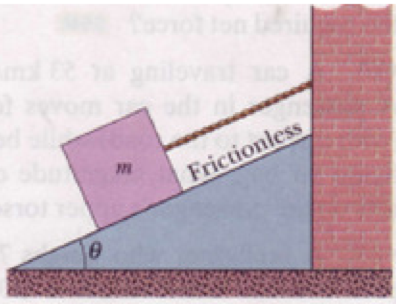
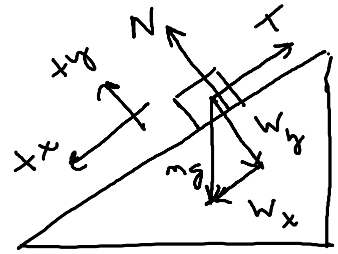
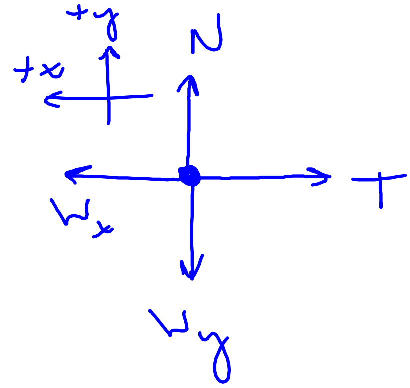


FIG. 5-38 Problem 19.





(a) $\underbrace{\sum F_x}_{} = W_x - T$

$\overset{0}{\cancel{ma_x}} = mg\sin\theta - T$

$T = mg\sin\theta$

$= (8.5\,kg)(9.8\,m/s^2)\sin 30° = 41.65\,N$

$$\boxed{\vec{T} = -41.65\,N\,\hat{i}}$$

(b) $\underbrace{\sum F_y}_{} = N - W_y$

$\overset{0}{\cancel{ma_y}} = N - mg\cos\theta$

$N = mg\cos\theta$

$= (8.5\,kg)(9.8\,m/s^2)\cos 30° = 72.140\,N$

$$\boxed{\vec{N} = +72.140\,N\,\hat{j}}$$

(c) $\underbrace{\sum F_x}_{} = W_x$

$\cancel{m}a_x = \cancel{m}g\sin\theta$

$a_x = (9.8\,m/s^2)\sin 30° = 4.9\,m/s^2$

$$\boxed{\vec{a}_x = +4.9\,\mathrm{m/s^2}\ \hat{i}}$$

32
(24)

••32 In Fig. 5-41, a crate of mass $m = 100$ kg is pushed at constant speed up a frictionless ramp ($\theta = 30.0°$) by a horizontal force $\vec{F}$. What are the magnitudes of (a) $\vec{F}$ and (b) the force on the crate from the ramp?

~~**••33** A 40 kg girl and an 8.4 kg sled are on the frictionless ice of a frozen lake, 15 m apart but connected by a rope of negligible mass. The girl exerts a hori-~~

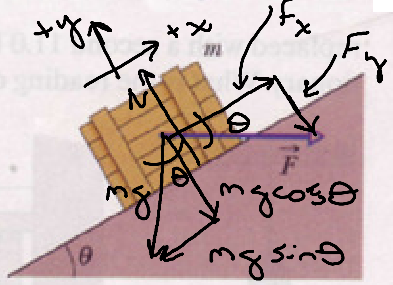
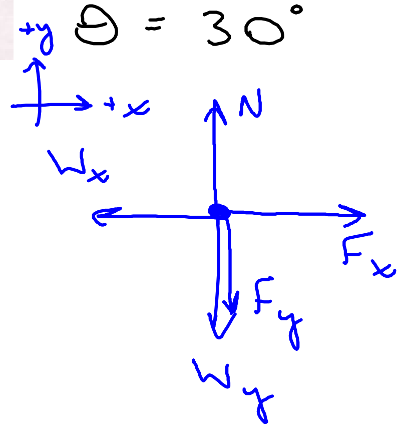


FIG. 5-41 Problem 32.

constant speed $a_x = 0$

$m = 100\text{kg}$

$\theta = 30°$



(a) $\underbrace{\sum F_x}_{0} = F_x - W_x$

$0\ \cancel{\sum m a_x} = F\cos\theta - mg\sin\theta$

$\dfrac{F\cancel{\cos\theta}}{\cancel{\cos\theta}} = mg\dfrac{\sin\theta}{\cos\theta}$

$F = mg\tan\theta = (100\text{kg})(9.8\text{m/s}^2)\tan 30°$

$= 565.803\text{N}$

(b) $\underbrace{\sum F_y}_{0} = N - W_y - F_y$

$0\ \cancel{\sum m a_y} = N - mg\cos\theta - F\sin\theta$

$N = mg\cos\theta + F\sin\theta$

$= (100\text{kg})(9.8\text{m/s}^2)\cos 30° + (565.803\text{N})\sin 30°$

$= 1{,}131.606\text{N}$

54
(46)

••54 In Fig. 5-52, three ballot boxes are connected by cords, one of which wraps over a pulley having negligible friction on its axle and negligible mass. The three masses are $m_A = 30.0$ kg, $m_B = 40.0$ kg, and $m_C = 10.0$ kg. When the assembly is released from rest, (a) what is the tension in the cord connecting B and C, and (b) how far does A move in the first 0.250 s (assuming it does not reach the pulley)?

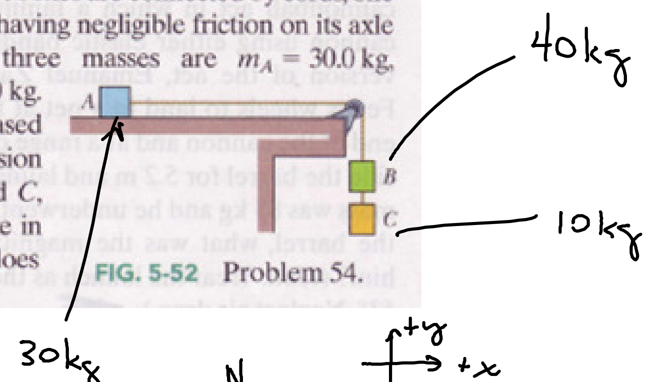
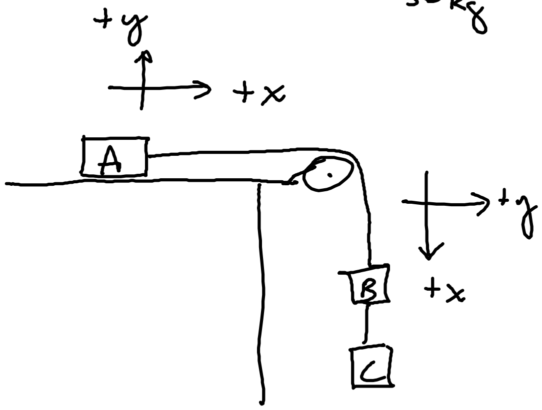
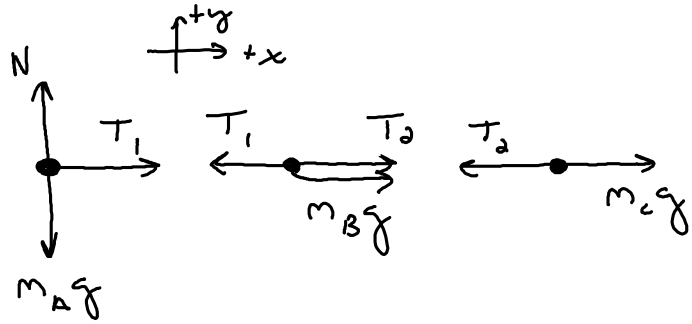
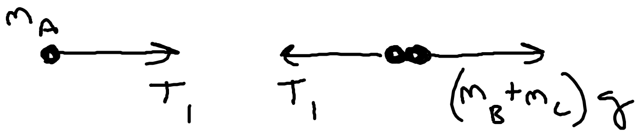


FIG. 5-52 Problem 54.







$$\underbrace{\Sigma F} = T_1 \qquad \underbrace{\Sigma F} = (m_B+m_c)g - T_1$$

$$① \boxed{m_A a = T_1} \qquad ② \boxed{(m_B+m_c)a = (m_B+m_c)g - T_1}$$

add ① & ②
$$m_A a + (m_B+m_c)a = (m_B+m_c)g$$

$$a = \frac{m_B+m_c}{m_A+m_B+m_c} g = \frac{40kg+10kg}{30kg+40kg+10kg} 9.8 m/s^2$$

$$\boxed{a = 6.125 m/s^2}$$

for mass C
$$\underbrace{\Sigma F} = m_c g - T_2$$

$$m_c a = m_c g - T_2$$

$$T_2 = m_c g - m_c a = m_c(g - a)$$

$$= 10\text{kg}\left(9.8\,\text{m/s}^2 - 6.125\,\text{m/s}^2\right)$$

$$= \boxed{36.75\,\text{N}}$$

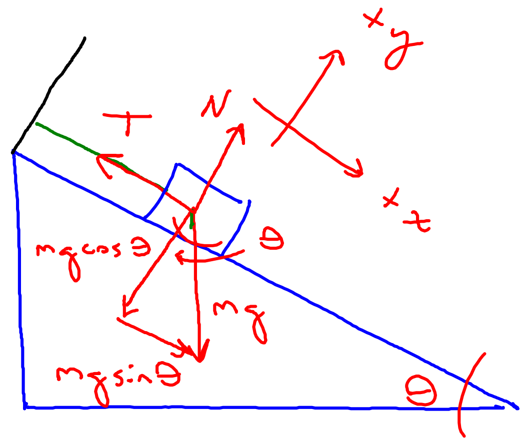
(b) if $\Delta t = 0.25\,\text{s}$, how far does m_A move?

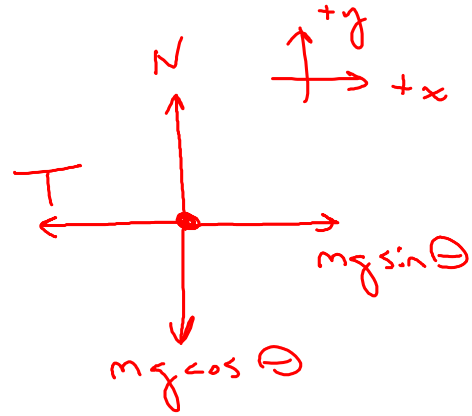
$$y = \cancel{v_0 t}^{\,0} + \tfrac{1}{2} a t^2$$

$$= \tfrac{1}{2}\left(6.125\,\text{m/s}^2\right)\left(0.25\,\text{s}\right)^2$$

$$= \boxed{0.191\,\text{m}}$$

$m = 1\,kg$





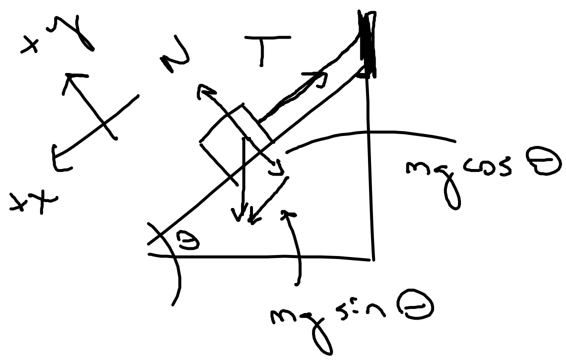
$$\underbrace{\sum F_x}_{} = mg\sin\theta - T$$

$$0 = \cancel{ma_x} = mg\sin\theta - T$$

$$T = mg\sin\theta$$

TRIAL	θ	T
1	40°	6.3N (4.7N)
2	35°	5.6N (4N)
3	30°	4.9N (3.1N)

Trial	Mass	θ	F(experimental)	F(theoretical)
1	1.6kg	22°	6.1 N	5.9N
2	1.6kg	25°	7.1 N	6.6N
3	1.6kg	39°	10.6N	9.9N



$$\underbrace{\Sigma F_x}_{} = mg\sin\theta - T$$

$$\cancel{ma_x} = mg\sin\theta - T$$

$$T = mg\sin\theta$$

$$= (1.6\text{kg})(9.8\text{m/s}^2)\sin\theta$$

from PEARSON

from Chapter 6 #'s $1 \rightarrow 18$