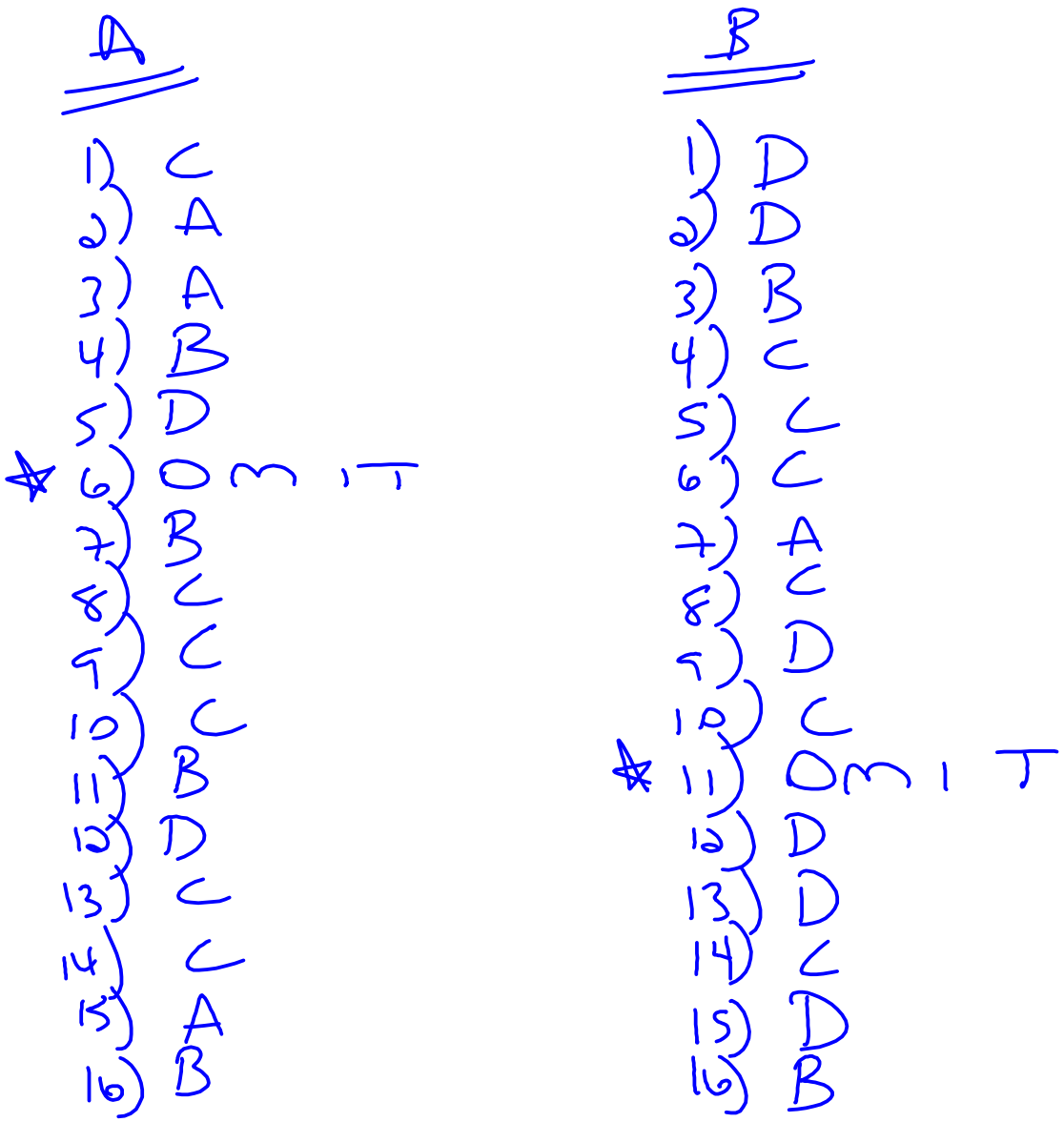
02 FEB 10

- quiz (NOT a reading ✓)
- AP TEST
- CHAPTER 5 & 6 TEST FRIDAY 12 FEB 10
- HW Q:A
- PEARSON PHYSICS
- mass on an inclined plane


A
1) C
2) A
3) A
4) B
5) D
* 6) OMIT
7) B
8) C
9) C
10) C
11) B
12) D
13) C
14) C
15) A
16) B
B
1) D
2) D
3) B
4) C
5) C
6) C
7) A
8) C
9) D
10) C
* 11) OMIT
12) D
13) D
14) C
15) D
16) B

Tuesday, February 02, 2010
9:57 AM

$$F = ma \Rightarrow a = F/m$$

$$2f = 4ma \Rightarrow a = \frac{2f}{4m} = \frac{1}{2}\frac{F}{m}$$

$$\frac{1}{2}f = 4ma$$

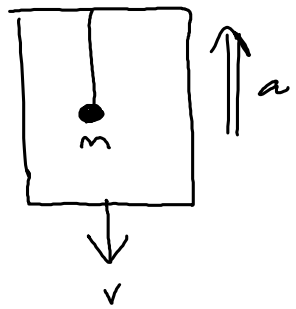
$$F = ma \Rightarrow \boxed{a} = \frac{f}{m}$$

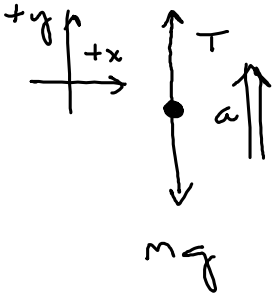
$$a = \frac{v^2 - \cancel{v_0^2}^{0}}{2x} \qquad a = \frac{v^2}{2x}$$

42
(34)

••42 A lamp hangs vertically from a cord in a descending elevator that decelerates at 2.4 m/s^2. (a) If the tension in the cord is 89 N, what is the lamp's mass? (b) What is the cord's tension when the elevator ascends with an upward acceleration of 2.4 m/s^2?

(a)





$\Sigma F_y = T - mg$

$ma = T - mg$

$ma + mg = T$

$m(a+g) = T$

$m = \frac{T}{a+g} = \frac{89\,N}{2.4\,m/s^2 + 9.8\,m/s^2} = 7.295\,kg$

(b) $T = 89\,N$

47
(41)

••47 In Fig. 5-46, a block of mass $m = 5.00$ kg is pulled along a horizontal frictionless floor by a cord that exerts a force of magnitude $F = 12.0$ N at an angle $\theta = 25.0°$. (a) What is the magnitude of the block's acceleration? (b) The force magnitude F is slowly increased. What is its value just before the block is lifted (completely) off the floor? (c) What is the magnitude of the block's acceleration just before it is lifted (completely) off the floor?

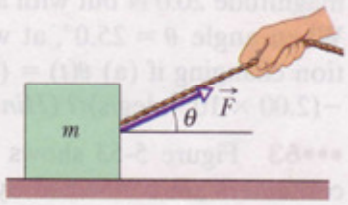
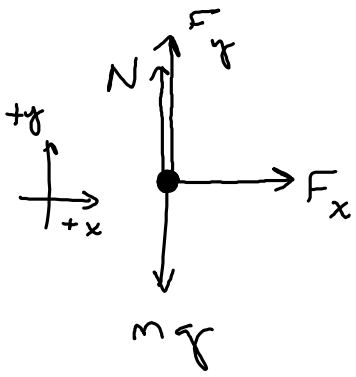


FIG. 5-46 Problems 47 and 62.



(a) $\Sigma F_x = F_x$ notation conflict

$ma_x = F\cos\theta \Rightarrow a_x = \frac{F\cos\theta}{m} = \frac{12\,N\cos 25°}{5\,kg}$

$= \boxed{2.175\ m/s^2}$

(b) $\Sigma F_y = F_y + N - mg$

$0 = F\sin\theta + N - mg \Rightarrow N = mg - F\sin\theta$

$= (5kg)(9.8\,m/s^2) - 12N\sin 25°$

$= 43.909N$

when does $N = 0$? $N = 0 = mg - F\sin\theta$

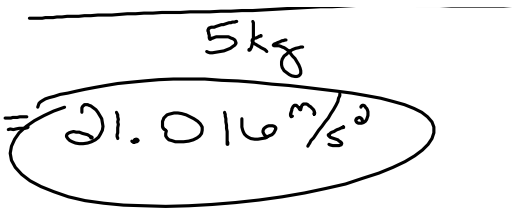
or $mg = F\sin\theta$

$F = \frac{mg}{\sin\theta} = \frac{(5kg)(9.8\,m/s^2)}{\sin 25°}$

$= \boxed{115.944N}$

(c) if $F = 115.944N$, $a_x = \frac{F\cos\theta}{m}$

$= 115.944N\cos 25°$


5kg
= 21.016 m/s²

••48 In earlier days, horses pulled barges down canals in the manner shown in Fig. 5-47. Suppose the horse pulls on the rope with a force of 7900 N at an angle of $\theta = 18°$ to the direction of motion of the barge, which is headed straight along the positive direction of an x axis. The mass of the barge is 9500 kg, and the magnitude of its acceleration is 0.12 m/s^2. What are the (a) magnitude and (b) direction (relative to positive x) of the force on the barge from the water? GO

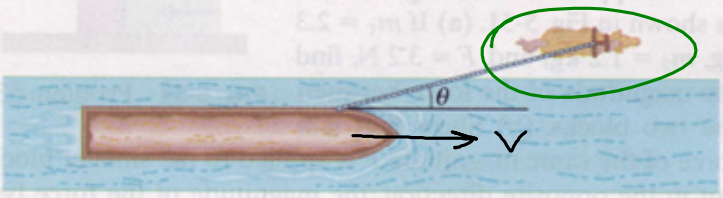
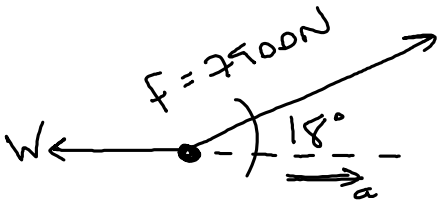
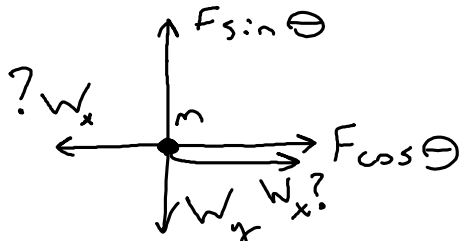


FIG. 5-47 Problem 48.



$m = 9500\ kg$

$a = 0.12\ m/s^2$

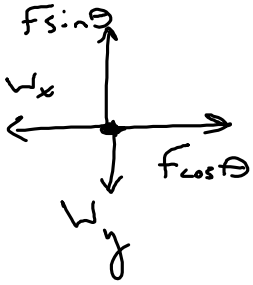


$W \equiv$ force of H_2O

$F\cos\theta = 7900N\cos 18° = 7513.346N$

this would yield $a = 0.791\ m/s^2$

$\therefore W_x$ is opposite $F\cos\theta$



$$\Sigma F_x = F\cos\theta - W_x$$

$$ma_x = F\cos\theta - W_x$$

$$W_x = F\cos\theta - ma_x$$

$$= 7513.346N - (9500kg)(0.12\ m/s^2)$$

$$= 6373.346N$$

$$\boxed{\vec{W}_x = -6373.346N\,\hat{i}}$$

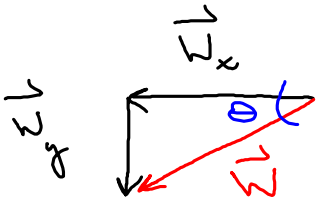
$$\Sigma F_y = F\sin\theta - W_y$$

$$0 = ma_y = F\sin\theta - W_y$$

$$W_y = F \sin\theta$$

$$= 7900\,N \sin 18^\circ = 2441.234\,N$$

$$\boxed{\vec{W}_y = -2441.234\,N\,\hat{j}}$$



$$\|\vec{W}\| = \left(W_x^2 + W_y^2\right)^{1/2}$$

$$= 6824.893\,N$$

$$\theta = 20.959^\circ \text{ below } -\hat{x}$$

50
(42)

••50 Figure 5-48 shows four penguins that are being playfully pulled along very slippery (frictionless) ice by a curator. The masses of three penguins and the tension in two of the cords are $m_1 = 12$ kg, $m_3 = 15$ kg, $m_4 = 20$ kg, $T_2 = 111$ N, and $T_4 = 222$ N. Find the penguin mass m_2 that is not given.

FIG. 5-48 Problem 50.

m_2

$m_1 + m_2$ $\quad$ $m_3 + m_4$ $\Longrightarrow$

m_A $\quad$ m_B

+y
+x

T_2 $\quad$ T_2 $\quad$ T_4

$\Sigma F = T_2$ $\quad$ $\Sigma F = T_4 - T_2$

$m_A a = T_2$ $\quad$ $m_B a = T_4 - T_2$

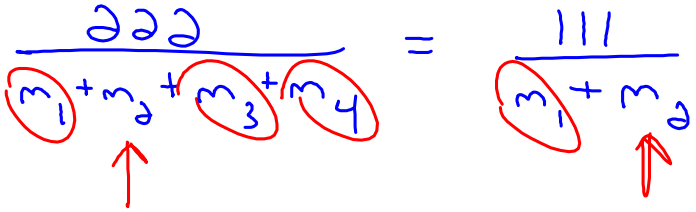
$$a = \frac{T_4 - T_2}{m_B} = \frac{T_4 - T_2}{m_3 + m_4}$$

$$= \frac{222\,N - 111\,N}{15\,kg + 20\,kg}$$

$$= 3.171\ m/s^2$$

$$m_A = \frac{T_2}{a} = \frac{111\,N}{3.171\ m/s^2} = 35\,kg$$

$m_A = m_1 + m_2 \Longrightarrow m_2 = m_A - m_1 = 35\,kg - 12\,kg = \boxed{23\,kg}$



77
(66)

77 In Fig. 5-63, 4.0 kg block A and 6.0 kg block B are connected by a string of negligible mass. Force $\vec{F}_A = (12\text{ N})\hat{i}$ acts on block A; force $\vec{F}_B = (24\text{ N})\hat{i}$ acts on block B. What is the tension in the string?

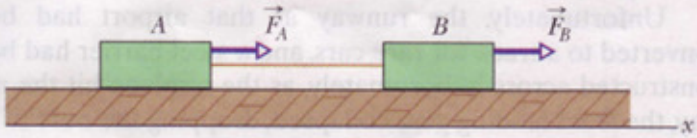
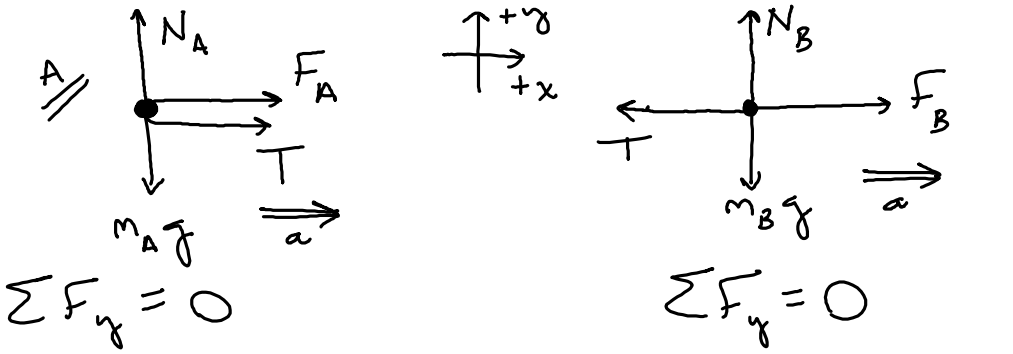


FIG. 5-63 Problem 77.



$\Sigma F_y = 0$

$\Sigma F_y = 0$

$\Sigma F_x = F_A + T$

$m_A a = F_A + T$

$\Sigma F_x = F_B - T$

$m_B a = F_B - T$

$$m_A a = F_A + T$$

$$+ \quad m_B a = F_B - T$$

$$m_A a + m_B a = F_A + F_B$$

$$(m_A + m_B)\, a = F_A + F_B$$

$$a = \frac{F_A + F_B}{m_A + m_B} = \frac{12N + 24N}{4kg + 6kg}$$

$$= 3.6\ m/s^2$$

$$T = m_A a - F_A$$

$$= (4kg)(3.6\ m/s^2) - 12N$$

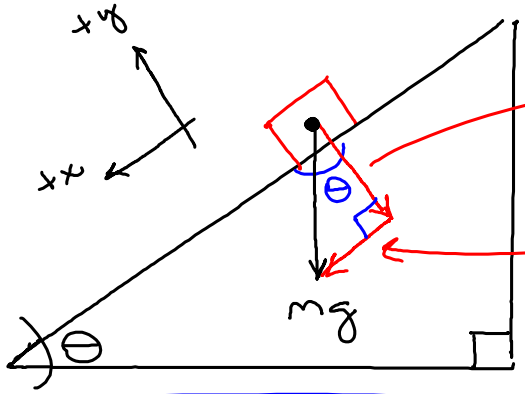
$$= 2.4N$$

OR $M = m_A + m_B \Longrightarrow \Sigma F = F_A + F_B$

$$Ma = F_A + F_B$$

$$a = \frac{F_A + F_B}{M}$$

Mass on an Incline no friction

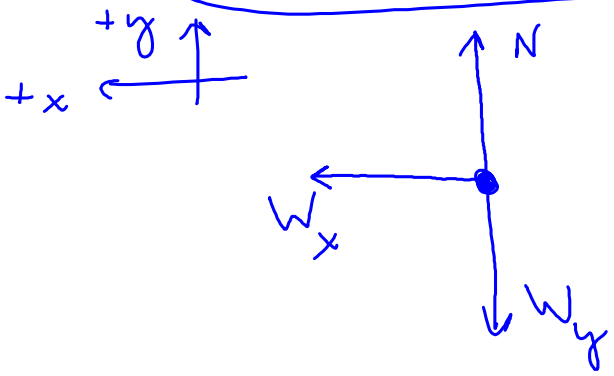


y component of weight

x component of weight

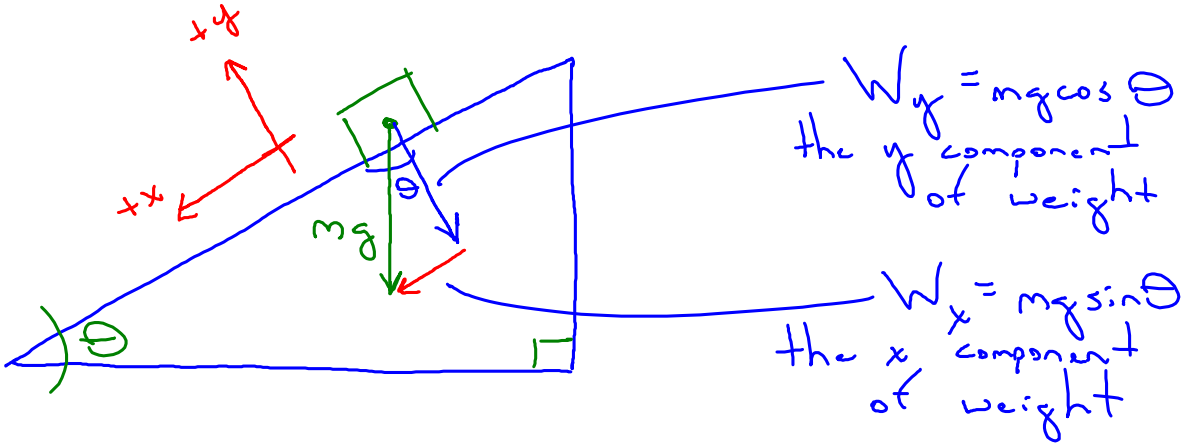
W ≡ weight

$$W_x = mg\sin\theta$$
$$W_y = mg\cos\theta$$



$$\Sigma f_x = W_x$$
$$ma_x = mg\sin\theta$$
$$\Sigma f_y = N - W_y$$
$$0 = N - mg\cos\theta$$
$$N = mg\cos\theta$$

SAMPLE 5-5 p101


+y
+x
mg
θ
θ
1
$W_y = mg\cos\theta$
the y component of weight
$W_x = mg\sin\theta$
the x component of weight

HW

ARW Chapter 5

19 (13)

32 (24)

54 (46)