Name: _____

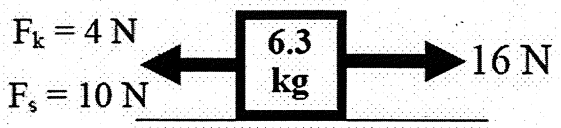
Period: _____

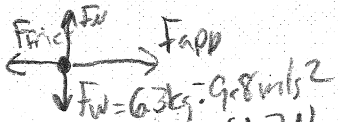
Forces Review

3.9

1. A gun shoots a bullet. Which is greater: the force of the gun on the bullet; the force of the bullet on the gun?

They are the same

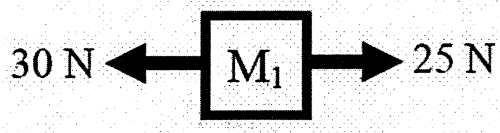


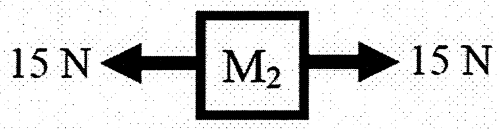


2. Use the mass at the left to answer the following.
   - A. Draw a force diagram below the object.
   - B. How much force is necessary to start the object moving? 10N+
   - C. How much force is necessary to keep it moving? 4N
   - D. What is the normal force on the object? 61.7N
   - E. If the object starts at rest, does it start to slide? Yes 16>10
   - F. If it was already moving, calculate its acceleration.

$\Sigma F = ma$

$16N - 4N = 6.3 \cdot a \quad a = 1.9 m/s^2$





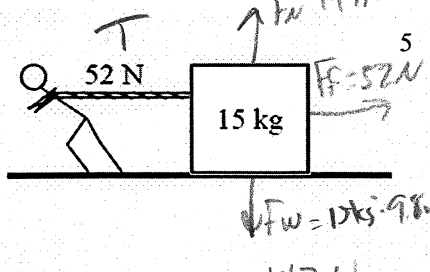
3. Which of the two above objects applies: M_1, M_2, both, or neither?

A. M_2 Could be at rest.
B. M_1 Could be accelerating.
C. B Could be moving to the left.
D. M_1 Has a net force.
E. M_2 Is at constant speed.
F. B Could be moving.
G. none Could be accelerating to the right.
H. Both Could be moving up.
I. Both Could have a velocity = 0m/s.
J. M_2 Has no net force.

4 A 120 kg object is on Pluto, which is still quite depressed by its recent astronomical demotion.

A. What is the mass of the object on the earth? 120kg
B. What is the weight of the object in space? 0 N
C. What is the weight of the object on the earth? $F_W = 120kg \cdot 9.8 m/s^2 = 1176N$
D. Given Pluto's information ($m = 1.31 \times 10^{22}$kg; $r = 1.161 \times 10^6$), calculate the weight of the object on Pluto.

$F_g = G\frac{m_1 \cdot m_2}{r^2} \quad \frac{6.673 \times 10^{-11} \cdot 120kg \cdot 1.31 \times 10^{22} kg}{(1.161 \times 10^6)^2} = 77.8N$



5 Slim Jim pulls with 52 N on a 15 kg box across the floor at constant speed. There is friction between the box and the floor.

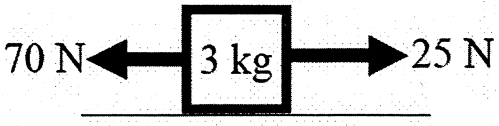
A. Since it is at constant speed, what is its acceleration? $0 m/s^2$
B. Draw all of the forces on the box.
C. In the x-direction only, use $\Sigma F = ma$ to find the force of friction on the box.

$\Sigma F = ma$

$F_F - 52N = 15kg \cdot 0 m/s^2 \quad F_F = 52N$

D. Challenge: Find the coefficient of friction of the floor.

$F_F = \mu F_N \quad 52N = \mu \cdot 147N \quad \mu = 0.35$



6 Find the acceleration of the object.

$\Sigma F = ma$

$25N - 70N = 3kg \cdot a \quad = -15 m/s^2$

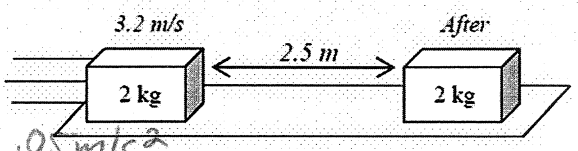
a ? Δx 2.5m Vf 0m/s Vi 3.2m/s t —

7 A box moving 3.2m/s stops in 2.5m.

A. Use a kinematic equation to find the acceleration of the object.

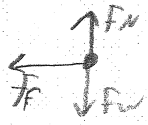
$(V_f)^2 = (V_i)^2 - 2a\Delta x$ $10.24 = 5a$

$0 = (3.2\,m/s)^2 - 2a\,2.5m$ $a = \frac{10.24}{5}$ $a = -2.05\,m/s^2$



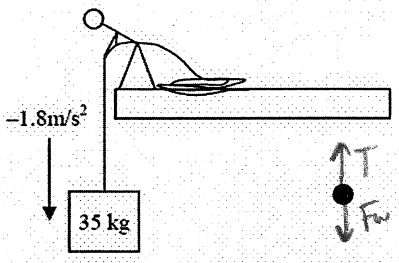
B. Find the force of friction that stopped the object.

$\Sigma F = m \cdot a$ $F = 2kg \cdot -2.05\,m/s^2$



8 A 6kg mass has an acceleration of 8.2m/s^2. What net force caused this?

$\Sigma F = ma = 6kg \cdot 8.2\,m/s^2 = 49.2\,N$



9 Slim Jim is lowering a 35kg mass with an acceleration of −1.8 m/s^2.

A. On the dot, draw a force body diagram.

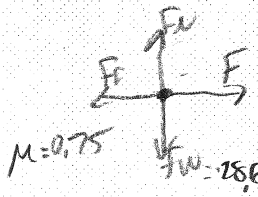
B. Find the tension in the rope.

$\Sigma F = ma$

$T + 343N = 35kg \cdot -1.8\,m/s^2$

$T - 343 = -63$ $T = 280N$

10 A rightward force of 302 N is applied to a 28.6-kg crate to accelerate it across the floor. The coefficient of friction between the crate and the floor is 0.750. Determine the acceleration of the crate.

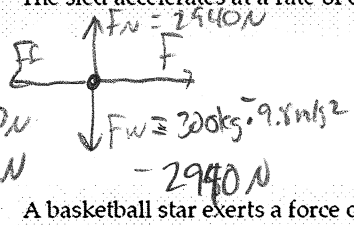


$\mu = 0.75$ $F_w = 28.6kg \cdot 9.8\,m/s^2$

$a = \frac{\Sigma F}{m}$ $302N - \mu \cdot 280.3N$ $a = \frac{91.8N}{28.6kg} = 3.2\,m/s^2$

$a = \frac{302N - 0.75 \cdot 280.3N}{28.6kg}$

11 During a football workout, two linemen are pushing the coach on the sled. The combined mass of the sled and the coach is 300. kg. The coefficient of friction between the sled and the grass is 0.800. The sled accelerates at a rate of 0.580 m/s/s. Determine the force applied to the sled by the lineman.



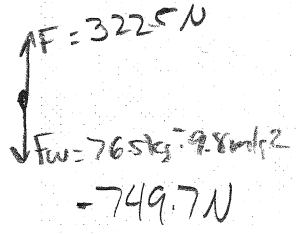
$\mu \cdot 2940N$ $f_f = 2352N$

$\Sigma F = ma$

$F + 2352N = 300kg \cdot 0.58\,m/s^2$

$F + 2352N = 174N$ $F = 2526N$

12 A basketball star exerts a force of 3225 N (average value) upon the gym floor in order to accelerate his 76.5-kg body upward. (a) Determine the acceleration of the player. (b) Determine the final speed of the player if the force endures for a time of 0.150 seconds.

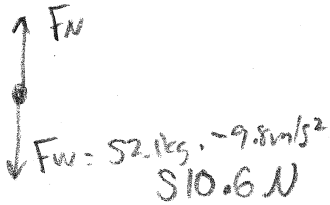


$a = \frac{F + F_w}{m}$ $a = \frac{3225N - 749.7N}{76.5N}$ $a = 32.4\,m/s^2$

$a = \frac{V_f - V_i}{t}$ $V_f = V_i + a \cdot t$ $= 32.4\,m/s^2 \cdot 0.15s$ $= 4.86\,m/s$

$a = 32.4\,m/s^2$ $t = 0.15s$ $V_i = 0\,m/s$ $V_f = ?$ $\Delta x = —$

13 At the end of the Giant Drop free fall ride, riders experience a large upward normal force to bring their falling bodies to a stop. Determine the normal force value required to accelerate a 52.1-kg physics student with an upward acceleration of 27.4 m/s/s.



$F_N + -510.6N = 52.1kg \cdot 27.4\,m/s^2$

$F_N + -510.6N = 1427.5N$

$F_N = 1938.1N$