4-1A. A particle of mass 2 kg is initially at rest at the origin x = 0. If the only force acting on the particle is a constant 4 N in the x-direction, what is the magnitude of particle's velocity v_x at time t = 2 seconds?
(a) 1m/s (b) 2 m/s (c) 4 m/s (d) 8 m/s (e) None of these is close.

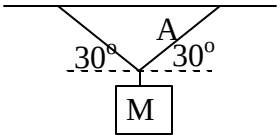
4-2A. How far does the particle in problem 4-1A move during the 2 seconds?
(a) 2 m (b) 16 m (c) 6 m (d) 8 m (e) 4m

4-3A. Neglecting air resistance, the force(s) on a football at the top of its path after being kicked is (are)
(a) the force due to the horizontal motion of the football. (b) the force of gravity (c) the force exerted by the kicker plus the force of gravity. (d) the force exerted by the earth plus the force of gravity. (e) the force due to the horizontal motion of the football plus the force of gravity.

4-4A. Four forces act on an object, **A** = 50 N east, **B** = 40 N north, **C** = 90 N west, **D** = 70 N south. What is the magnitude of the net force on the object?
(a) 260 N (b) 50 N (c) 70 N (d) 10 N (e) None of these is close.

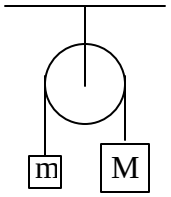
4-5A. Which one of these is the reaction force to the gravitational force on a block due to the Earth? The block is at rest on the ground.
(a) The contact force exerted on the block by the ground.
(b) The weight of the block.
(c) The contact force exerted on the ground by the block.
(d) The gravitational force on the Earth due to the block.
(e) None of these is the correct reaction force.

4-6A. A mass M = 15 kg is supported by the weightless strings shown at the right, and the angles shown are 30^o. How large is the tension in string A?
(a) 176 N (b) 87 N (c) 75 N (d) 15 N (e) 150 N



4-7A. A 75 kg woman, hanging from a 5 kg parachute, is falling with a constant terminal speed of 12 m/s. The size of the force exerted by the air on the combination of the woman and the parachute is about:
(a) 6.7 N (b) 80 N (c) 800 N (d) 960 N (e) There is not enough information to tell.

4-8A. Two masses m = 10 kg and M = 15 kg are connected by a massless string over a massless, frictionless pulley as shown at the right. What is the magnitude of the acceleration of mass M? Take g = 10 m/s^2.
(a) 0.2 m/s^2 (b) 2 m/s^2 (c) 6 m/s^2 (d) 10 m/s^2 (e) 5 m/s^2



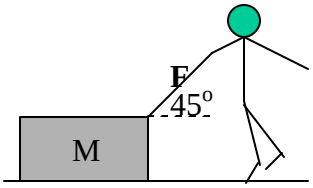
4-9A. In Problem 4.8A, how large is the tension in the string while the masses move?
(a) 30 N (b) 15 N (c) 100 N (d) 50 N (e) 120 N

4-10A. A mass hangs by a string from the top of an elevator. For which of the following will the tension in the string be largest?
(a) The elevator is moving upward with constant speed.
(b) The elevator is moving upward but its speed is slowing.
(c) The elevator is moving downward with constant speed.
(d) The elevator is moving downward but its speed is slowing.
(e) The elevator is falling freely.

4-11A. Which one of the following statements is wrong?
(a) It is possible for an object to move when no force acts on it.
(b) An object with only one force acting on it must be accelerating.
(c) If an object has zero acceleration, there can be no forces acting on it.
(d) An object that is accelerating must have a net force acting upon it.
(e) An object moving with constant velocity must have no net force acting upon it.

4-12A. A force of magnitude 25 N pushes horizontally on a 20 kg box sliding on flat ground with kinetic friction coefficient $\mu_k = 0.1$. What is the acceleration of the box?
(a) 5 m/s^2 (b) 1.25 m/s^2 (c) 0.5 m/s^2 (d) 0.25 m/s^2 (e) The force isn't enough to accelerate the box.

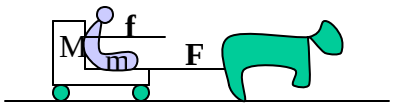
Use the following for problems 4-13A and 4-14A. A person pulls an M = 20 kg box with a force **F** = 100 N directed 45^o above the horizontal as shown at the right.



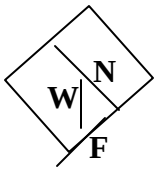
4-13A. About how large is the normal force of the box upon the ground?
(a) 130 N (b) 200 N (c) 70 N (d) 140 N (e) 270 N

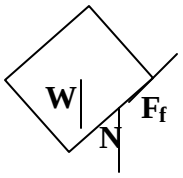
4-14A. If the coefficient of kinetic friction between the box and the ground is μ_k = 0.20, how large is the box's acceleration?
(a) 2.3 m/s^2 (b) 1.6 m/s^2 (c) 3.4 m/s^2 (d) 3.0 m/s^2 (e) zero; the friction force is too large.

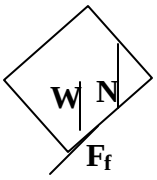
4-15A. A child of mass m = 5 kg sits in an open cart of mass M =20 kg. A horse pulling the cart exerts a horizontal force **F** = 10 N on the cart which accelerates the cart. Neglect friction between the cart wheels and the ground.
About how large is the horizontal force **f** that the cart exerts on the child?
(a) 10 N (b) 2.5 N (c) 50 N (d) 2 N (e) There isn't enough information to tell.

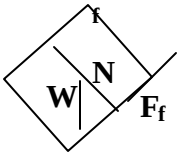


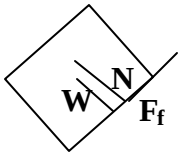
4-16A. A block of weight **W** = **Mg** is sliding **down** a plane that has friction. Which one of the following pictures is a complete and correct free-body diagram for the block?

a) 

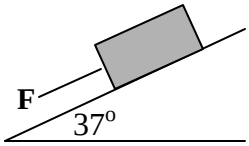
b) 

c) 

d) 

e) 

Use the figure at the right for problems 4-17A and 4-18A
A block of mass 50 kg is free to slide up or down a plane that makes angle of 37^o with the horizontal. Take g = 10 m/s^2.



4-17A. If there is no friction, how large a force F is needed to hold the block fixed?
(a) 300 N (b) 500 N (c) 400 N (d) 100 N (e) 250 N

4-18A. If the coefficient of static friction is μ_s = 0.20, what size force will push the block up the plane at constant speed?
(a) 220 N (b) 420 N (c) 580 N (d)200 N (e) 380 N

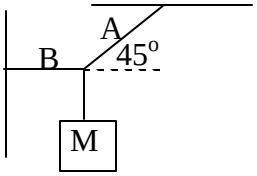
4-1B. A block of mass 3 kg, sliding on a horizontal frictionless surface, starts with velocity v_x = 10 m/s is subjected to a constant horizontal force of size 9 N for 4 seconds. What is the particle's speed v at time t = 4 sec?
(a) 22 m/s (b) 12 m/s (c) 91 m/s (d) 71 m/s (e) None of these is close.

4-2B. How far does the block of problem 4-1B move in the 4 seconds?
(a) 56 m (b) 40 m (c) 72 m (d) 24 m (e) 64 m.

4-3B. Neglecting air resistance, the force(s) on a football while it is descending after being kicked is (are)
(a) the force due to the horizontal motion of the football. (b) the force exerted by the earth plus the force of gravity
(c) the force exerted by the kicker plus the force of gravity. (d) the force of gravity. (e) the force due to the horizontal motion of the football plus the force of gravity.

4-4B. Four forces act on an object, **A** = 50 N east, **B** = 20 N north, **C** = 100 N west, **D** = 70 N south. About what is the magnitude of the net force on the object?
(a) 60 N (b) 50 N (c) 70 N (d) 150 N (e) None of these is close.

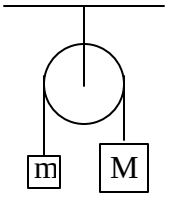
4-5B. Which one of these is the reaction force to the contact force exerted on a block by the ground on which the block sits.
(a) The gravitational force exerted on the block due to the Earth.
(b) The weight of the block.
(c) The contact force exerted on the ground by the block.
(d) The gravitational force exerted on the Earth due to the block.
(e) None of these is the correct reaction force.



4-6B. A mass M = 1.0 kg is supported by the weightless strings shown at the right. If the angle shown is 45°, about how large are the tensions in strings A and B (*in that order*)? Take g = 10 m/s^2.
(a) 10 Nt, 14 Nt (b) 10 Nt, 10 Nt (c) 14 Nt, 14 Nt (d) 14 Nt 10 Nt (e) None of these.

4-7B. A 5 kg parachute is falling with a constant terminal speed of 12 m/s. If g = 10 m/s^2, the magnitude of the force being exerted by the air on the parachute is about:
(a) 10 N (b) 5 N (c) 100 N (d) 50 N (e) There is not enough information to tell.

4-8B. Two masses m = 4 kg and M = 12 kg are connected together by a massless string over a massless and frictionless pulley as shown at the right. What is the magnitude of the acceleration of the 12 kg mass?
(a) 5 m/s^2 (b) 10 m/s^2 (c) 8 m/s^2 (d) 0.5 m/s^2 (e) 6.7 m/s^2

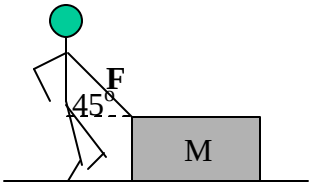


4-9B. In problem 4-8B, how large is the tension in the string while the masses move?
(a) 60 N (b) 120 N (c) 30 N (d) 40 N (e) None of these is close.

4-10B. A person weighs 70 N on a scale on the bathroom floor. If the person carries that scale onto an elevator, and stands on it while the elevator moves, which one of the following statements is WRONG?
(a) The scale will read less than 70 N when the elevator is moving downward with increasing speed.
(b) The scale will read 70 N when the elevator is at rest.
(c) The scale will read more than 70 N when the elevator is moving upward, but with decreasing speed.
(d) The scale will read 70 N when the elevator is moving upward with constant speed.
(e) The scale will read more than 70 N when the elevator is moving downward, but with decreasing speed.

4-11B. Which one of the following statements is wrong?
(a) An object cannot move unless a force acts on it.
(b) An object with only one force acting on it must be accelerating.
(c) If an object has zero acceleration, there can be no net force acting upon it.
(d) An object that is accelerating must have a net force acting upon it.
(e) An object moving with constant velocity must have no net force acting upon it.

4-12B. A force of magnitude 50 N pushes horizontally on a 20 kg box sliding on flat ground with kinetic friction coefficient μ_k = 0.2. How large is the acceleration of the box?
(a) 5 m/s^2 (b) 1.25 m/s^2 (c) 0.5 m/s^2 (d) 25 m/s^2 (e) The force isn't enough to accelerate the box.

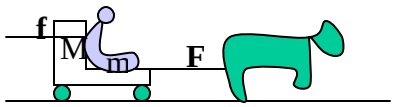


Use the following for problems 4-13B and 4-14B. A man pushes a 15 kg box with a force of 100 N directed 45° below the horizontal as shown at the right

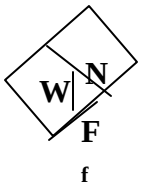
4-13B. About how large is the normal force of the box upon the ground?
(a) 80 N (b) 200 N (c) 50 N (d) 120 N (e) 220 N

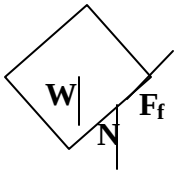
4-14B. If the coefficient of kinetic friction between the box and the ground is μ_k = 0.10, about how large is the box's acceleration?
(a) 3.3 m/s^2 (b) 6.2 m/s^2 (c) 2.0 m/s^2 (d) 3.7 m/s^2 (e) zero; the friction force is too large.

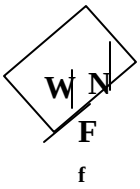
4-15B. A child of mass 6 kg rides in a cart of mass 24 kg. The horse pulling the cart exerts a horizontal force **F** = 15 N on the cart, which accelerates the cart and child. Neglect friction between the cart wheels and the ground. About what is the magnitude of the horizontal force **f** the child exerts on the cart?
(a) 15 N (b) 1.5 N (c) 4 N (d) 3 N (e) There isn't enough information to tell.

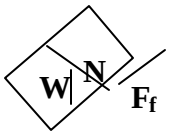


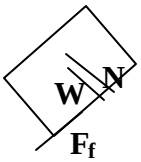
4-16B. A block of weight W = Mg is sliding **up** a plane that has friction. Which one of the following pictures is a complete and correct free-body diagram for the block?

(a)


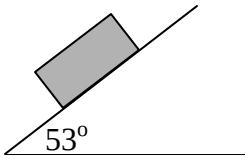
(b)


(c)


(d)


(e)


Use the figure at the right for problems 4-17B and 4-18B.
A block of mass 50 kg is free to slide up or down a plane that makes angle of 53° with the horizontal. Take g = 10 m/s^2.



4-17B. If the coefficient of kinetic friction is μ_k = 0.2, about how large will be the acceleration of the block down the plane?
(a) 8 m/s^2 (b) 7 m/s^2 (c) 6 m/s^2 (d) 5 m/s^2 (e) None of these is close.

4-18B. If the coefficient of kinetic friction is μ_k = 0.2, what size minimumadditional force is needed to make the block slide down the plane with constant speed?
(a) 460 N (b) 340 N (c) 300 N (d) 600 N (e) None of these is close.

4-1A) c 2A) e 3A) b 4A) b 5A) d 6A) e 7A) c 8A) b 9A) e 10A) d 11A) c 12A) d 13A) a 14A) a 15A) d 16A) d 17A) a 18A) e

4-1B) a 2B) e 3B) d 4B) c 5B) c 6B) d 7B) d 8B) a 9B) a 10B) c 11B) a 12B) c 13B) e 14B) a 15B) d 16B) a 17B) b 18B) b