Directions: The following questions are very similar to the questions on the unit test. Provide your best answer for each of the following questions.

1. _____   A box is pushed toward the right across a classroom floor. The force of friction on the box is
            directed toward the

   A) right   B) floor   C) ceiling   D) left

2. _____   A 50.-newton horizontal force is needed to keep an object weighing 500. newtons moving at a
            constant velocity of 2.0 meters per second across a horizontal surface. What is the magnitude of
            the frictional force acting on the object?
   A) 500 N   B) 50 N   C) 0 N   D) 450 N

3. _____   The diagram below shows a granite block being slid at constant speed across a horizontal
            concrete floor by a force parallel to the floor.

GRANITE →v
CONCRETE FLOOR

   Which pair of quantities could be used to determine the coefficient of friction for the granite on the
   concrete?

   A) frictional force and speed of block
   B) mass and speed of block
   C) mass and normal force on the block
   D) frictional force and normal force on the block

4. _____   A 60-kilogram skydiver is falling at a constant speed near the surface of Earth. What is the
            approximate magnitude of the force of air friction acting on the skydiver?

5. _____   In the diagram below, a box is on a frictionless horizontal surface with forces F_1 and F_2 acting as shown.

F_2 ←   Box   → F_1
FRICTIONLESS SURFACE
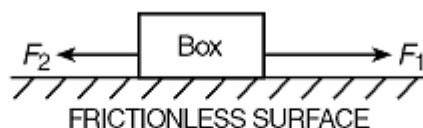
   If the magnitude of F_1 is greater than the magnitude of F_2, then the box is

   A) accelerating in the direction of F_1
   B) moving at constant speed in the direction of F_1
   C) moving at constant speed in the direction of F_2
   D) accelerating in the direction of F_2

6. _____ The graph below represents the relationship between the forces applied to an object and the corresponding accelerations produced.

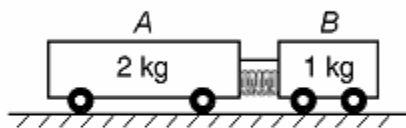
Force vs. Acceleration
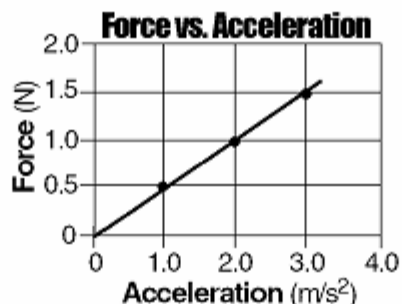
What is the inertial mass of the object?

7. _____ The diagram below shows a block on a horizontal frictionless surface. A 100.-newton force acts on the block at an angle of 30.° above the horizontal.
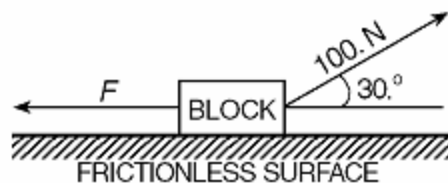
What is the magnitude of force F if it establishes equilibrium?
A) 86.6 N B) 50.0 N C) 100. N D) 187 N

8. _____ A net force of 25 newtons is applied horizontally to a 10.-kilogram block resting on a table. What is the magnitude of the acceleration of the block?

A) 0.0 m/s^2 B) 0.40 m/s^2 C) 2.5 m/s^2 D) 0.26 m/s^2

9. _____ The diagram below shows a compressed spring between two carts initially at rest on a horizontal frictionless surface. Cart A has a mass of 2 kilograms and cart B has a mass of 1 kilogram. A string holds the carts together.

What occurs when the string is cut and the carts move apart?
A) The magnitude of the acceleration of cart A is one-half the magnitude of the acceleration of cart B.
B) The length of time that the force acts on cart A is twice the length of time the force acts on cart B.
C) The magnitude of the force exerted on cart A is one-half the magnitude of the force exerted on cart B.
D) The magnitude of the impulse applied to cart A is twice the magnitude of the impulse applied to cart B.

Free-Response

For Complete Credit:
  Show the equation, substitution with units and a final answer including units. Draw a freebody diagram for each of the cases as well.


10. Find the net force on an object that has a mass of 20.0 kg, an applied force of 100 N on a surface with a friction coefficient of 0.21

11. What is the frictional force on a 10kg rubber block on dry concrete just before it begins to slide?

12. A 24kg crate initially at rest on a horizontal floor requires a 75N horizontal force to set it in motion. Find the coefficient of static friction between the crate and the floor.

13. A student moves a box of books by attaching a rope to the box and pulling with a force of 90.0N. The box of books has a mass of 20.0kg, and the coefficient of kinetic friction between the bottom of the box and the sidewalk is 0.50. Find the acceleration of the box.

14.

In the scaled diagram, two forces, F_1 and F_2, act on a 4.0-kilogram block at point P. Force F_1 has a magnitude of 12.0 newtons, and is directed toward the right.

4.0 kg

F_2 P $F_1 = 12.0$ N

(Drawn to scale)
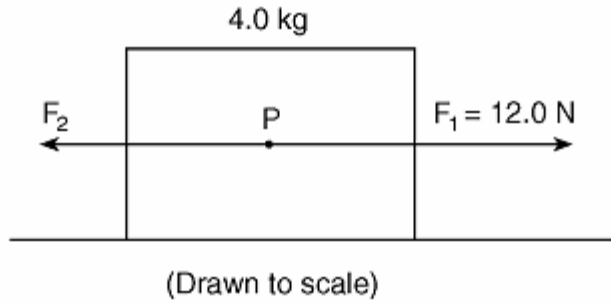
a.   Using a ruler and the scaled diagram shown, determine the magnitude of F_2 in newtons.

b.   Determine the magnitude of the net force acting on the block shown in the diagram.

c.   Calculate the magnitude of the acceleration of the block shown in the diagram. [*Show all work, including the equation and substitution with units.*]

15. The crate below rests on an incline.

a) Label each of the vectors and then draw and label the component vectors of the weight.
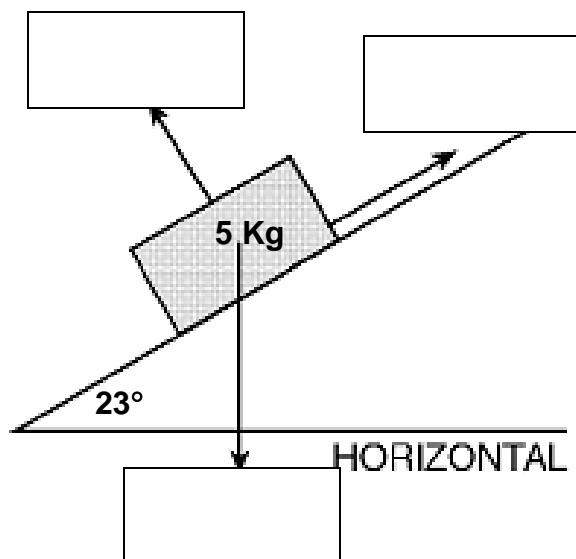
b) Determine the Force of friction required to hold this crate in place.

5 Kg

23°

HORIZONTAL