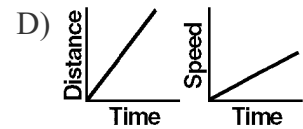
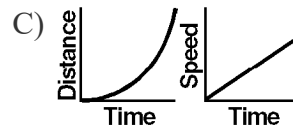
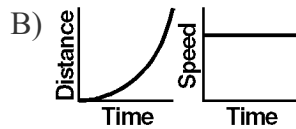
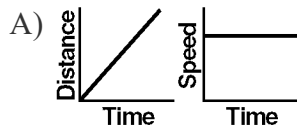


1) Which two graphs represent the motion of an object on which the net force is zero?



2) The magnitude of the force that a baseball bat exerts on a ball is 50. newtons. The magnitude of the force that the ball exerts on the bat is

A) 250 N

B) 5.0 N

C) 50. N

D) 10. N

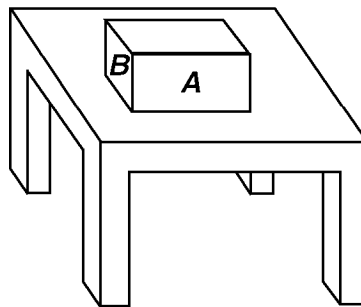
3) A baseball bat moving at high velocity strikes a feather. If air resistance is neglected, compared to the force exerted by the bat on the feather, the force exerted by the feather on the bat will be

A) smaller

C) the same

B) larger

4) In the diagram below, surface *A* of the wooden block has twice the area of surface *B*.



If it takes F newtons to keep the block moving at a constant speed across the table when it slides on surface *A*, what force is needed to keep the block moving at constant speed when it slides on surface *B*?

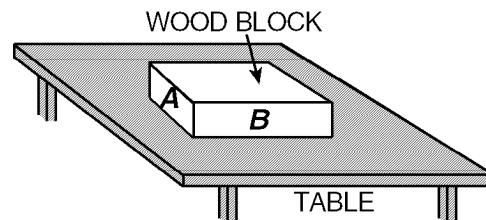
A) $2F$

B) F

C) F

D) $4F$

5) In the diagram below, surface *B* of the wooden block has the same texture as surface *A*, but twice the area of surface *A*.



If force F is required to slide the block at constant speed across the table on surface *A*, approximately what force is required to slide the block at constant speed across the table on surface *B*?

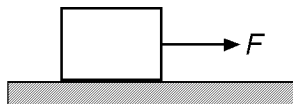
A) $4F$

B) $2F$

C) F

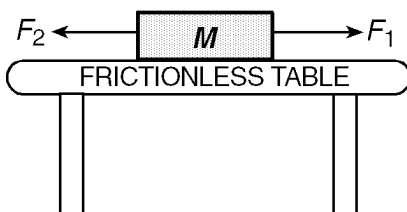
D) F

- 6) A box initially at rest on a level floor is being acted upon by a variable horizontal force, as shown in the diagram below.



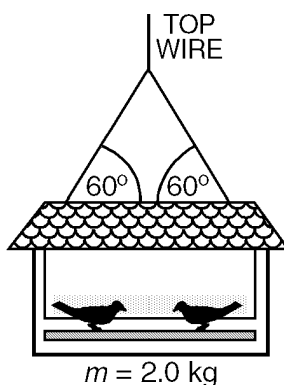
Compared to the force required to start the box moving, the force required to keep it moving at constant speed is

- A) the same
B) greater
C) less
- 7) In the diagram below, box M is on a frictionless table with forces F_1 and F_2 acting as shown.



If the magnitude of F_1 is greater than the magnitude of F_2 , then the box is

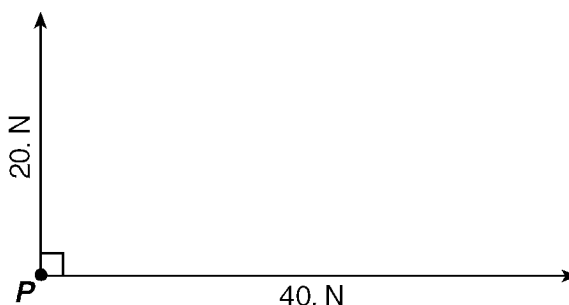
- A) accelerating in the direction of F_1
B) moving with a constant speed in the direction of F_2
C) moving with a constant speed in the direction of F_1
D) accelerating in the direction of F_2
- 8) A test booklet is sitting at rest on a desk. Compared to the force of the booklet on the desk, the force of the desk on the booklet is
- A) greater
B) the same
C) less
- 9) A bird feeder with two birds has a total mass of 2.0 kilograms and is supported by wire as shown in the diagram below.



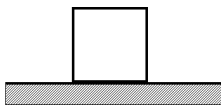
The force in the top wire is approximately

- A) 14 N
B) 10. N
C) 20. N
D) 39 N

- 10) An 800-newton person is standing in an elevator. If the upward force of the elevator on the person is 600 newtons, the person is
- A) accelerating upward
B) at rest
C) moving downward at constant speed
D) accelerating downward
- 11) A student weighing 500. newtons stands on a spring scale in an elevator. If the scale reads 520. newtons, the elevator must be
- A) moving downward at constant speed
B) moving upward at constant speed
C) accelerating upward
D) accelerating downward
- 12) A 20.-newton force due north and a 40.-newton force due east act concurrently on a 10.-kilogram object, located at point P .



- (a) Using a ruler, determine the scale used in the vector diagram by finding the number of newtons represented by each centimeter.
- (b) Use a ruler and protractor to construct the vector that represents the resultant force.
- (c) What is the magnitude of the resultant force?
- (d) What is the measure of the angle (in degrees) between east and the resultant force?
- (e) Calculate the magnitude of the acceleration of the object. [*Show all calculations, including the equation and substitution with units.*]
- 13) An aluminum block weighing 20. newtons, sliding from left to right in a straight line on a horizontal steel surface, is acted on by a 2.4-newton friction force. The block will be brought to rest by the friction force in a distance of 10. meters.
- (a) On the diagram of the block, draw an arrow to identify the direction of each force acting on the block while it is still moving, but is being slowed by the friction force. Identify each force by appropriately labeling the arrow that represents its line of direction.

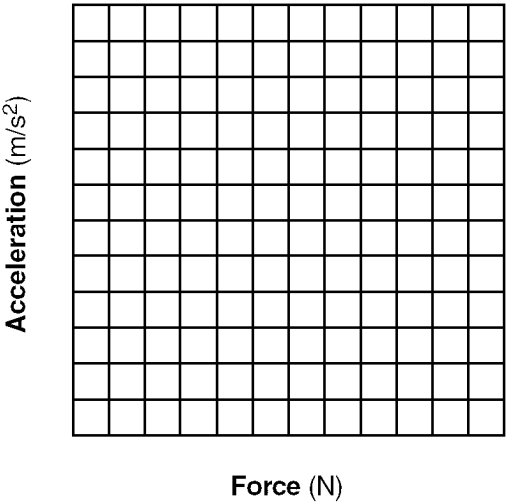


- (b) Determine the magnitude of the acceleration of the block as it is brought to rest by friction force. [*Show all work.*]

14) In a laboratory exercise, a student collected the following data as the unbalanced force applied to a body of mass M was changed.

DATA TABLE:

Force (newtons)	Acceleration (meters per second ²)
4.0	2.1
8.0	4.0
12.0	6.0
16.0	7.9
20.0	10.0



- (a) Label the axes of the graph with the appropriate values for force and acceleration.
- (b) Plot an acceleration versus force graph for the laboratory data provided.
- (c) Using the data or your graph, determine the mass, M , of the body. [*Show all calculations.*]