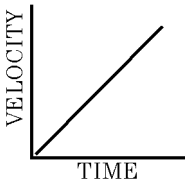
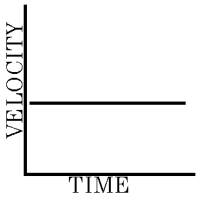
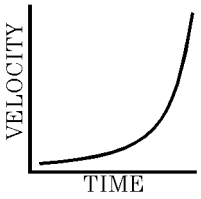
Practice - Newton's 1st and 2nd Laws

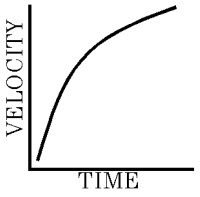
Name: _____ **Date:** _____

1. Which velocity-time graph represents the motion of an object moving with constant acceleration?

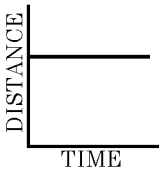
A. 

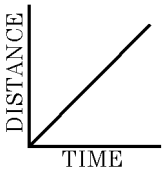
B. 

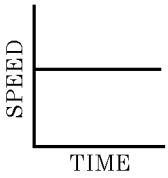
C. 

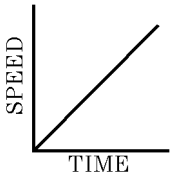
D. 

2. Which graph best represents the motion of an object that was initially at rest and is accelerating uniformly?

A. 

B. 

C. 

D. 

3. In which situation is the net force on the object equal to zero?

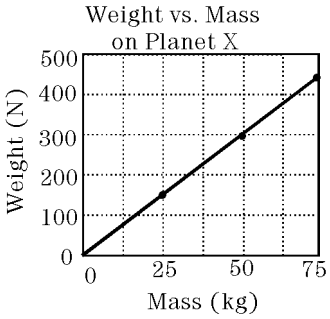
A. a satellite moving at constant speed around Earth in a circular orbit

B. an automobile braking to a stop

C. a bicycle moving at constant speed on a straight, level road

D. a pitched baseball being hit by a bat

4. The graph given shows the weight of three objects on planet *X* as a function of their mass.



The acceleration due to gravity on planet *X* is approximately

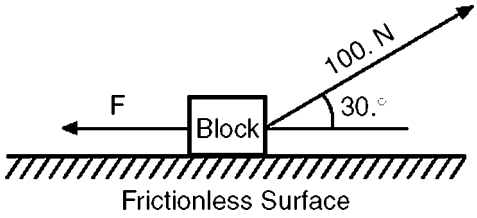
A. 0.17 m/s^2 B. 6.0 m/s^2

C. 9.8 m/s^2 D. 50 m/s^2

5. If a 30-newton force is required to accelerate a 2-kilogram object at 10 meters per $second^2$, over a level floor, then the magnitude of the frictional force acting on the object is

A. 0 N B. 10 N C. 20 N D. 30 N

6. The accompanying diagram 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. 50.0 N B. 86.6 N

C. 100. N D. 187 N

7. In an automobile collision, a 44-kilogram passenger moving at 15 meters per second is brought to rest by an air bag during a 0.10-second time interval. What is the magnitude of the average force exerted on the passenger during this time?

A. 440 N B. 660 N

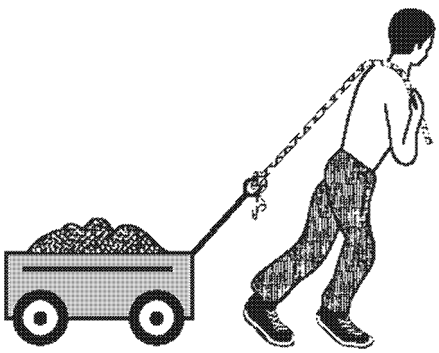
C. 4400 N D. 6600 N

8. 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. The magnitude of the frictional force acting on the object is

A. 500. N B. 450. N

C. 50. N D. 0 N

9. The accompanying diagram shows a worker using a rope to pull a cart.



The worker's pull on the handle of the cart can best be described as a force having

A. magnitude, only

B. direction, only

C. both magnitude and direction

D. neither magnitude nor direction

10. A 60-kilogram skydiver is falling at a constant speed near the surface of Earth. The magnitude of the force of air friction acting on the skydiver is approximately

A. 0 N B. 6 N C. 60 N D. 600 N

11. A force of 1 newton is equivalent to 1

A. $\frac{kg \cdot m}{s^2}$ B. $\frac{kg \cdot m}{s}$

C. $\frac{kg \cdot m^2}{s^2}$ D. $\frac{kg^2 \cdot m^2}{s^2}$

12. The data table below lists the mass and speed of four different objects.

Data Table

Object	Mass (kg)	Speed (m/s)
A	4.0	6.0
B	6.0	5.0
C	8.0	3.0
D	16.0	1.5

Which object has the greatest inertia?

A. A B. B C. C D. D

13. A student is standing in an elevator that is accelerating downward. The force that the student exerts on the floor of the elevator must be

A. less than the weight of the student when at rest

B. greater than the weight of the student when at rest

C. less than the force of the floor on the student

D. greater than the force of the floor on the student

14. What is an essential characteristic of an object in equilibrium?

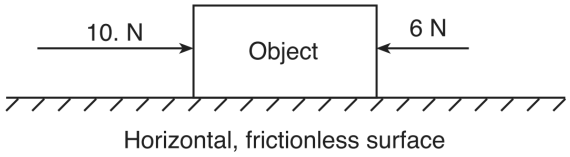
A. zero velocity

B. zero acceleration

C. zero potential energy

D. zero kinetic energy

15. Two forces act concurrently on an object on a horizontal, frictionless surface, as shown in the diagram below.



What additional force, when applied to the object, will establish equilibrium?

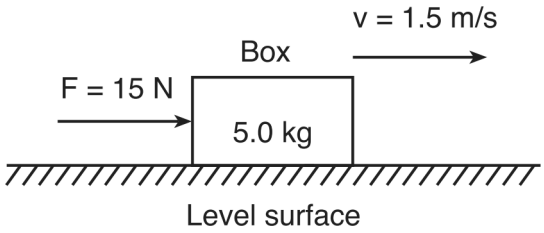
A. 16 N toward the right

B. 16 N toward the left

C. 4 N toward the right

D. 4 N toward the left

16. As shown in the diagram below, an open box and its contents have a combined mass of 5.0 kilograms. A horizontal force of 15 newtons is required to push the box at a constant speed of 1.5 meters per second across a level surface.



The inertia of the box and its contents increases if there is an increase in the

A. speed of the box

B. mass of the contents of the box

C. magnitude of the horizontal force applied to the box

D. coefficient of kinetic friction between the box and the level surface

17. Which situation describes an object that has *no* unbalanced force acting on it?

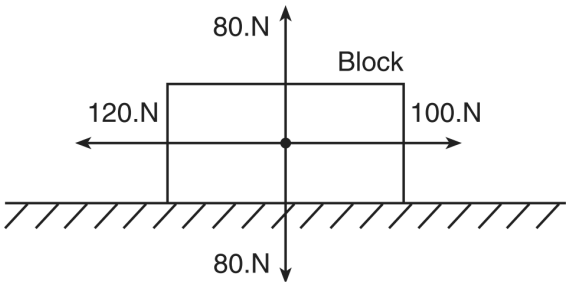
A. an apple in free fall

B. a satellite orbiting Earth

C. a hockey puck moving at constant velocity acrcoss ice

D. a laboratory cart moving down a frictionless 30.° incline

18. Four forces act concurrently on a block on a horizontal surface as shown in the diagram below.



As a result of these forces, the block

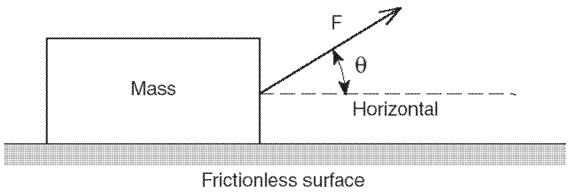
A. moves at constant speed to the right

B. moves at constant speed to the left

C. accelerates to the right

D. accelerates to the left

19. The accompanying diagram shows a force of magnitude F applied to a mass at angle θ relative to a horizontal frictionless surface.



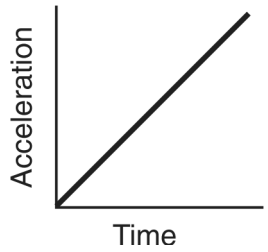
As angle θ is increased, the horizontal acceleration of the mass

A. decreases B. increases

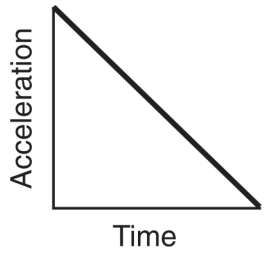
C. remains the same

20. A constant unbalanced force is applied to an object for a period of time. Which graph best represents the acceleration of the object as a function of elapsed time?

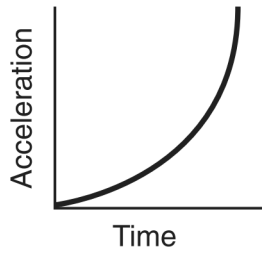
A.



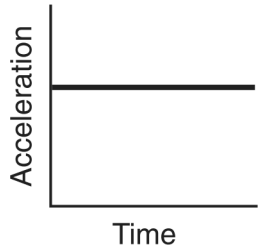
B.



C.



D.



21. A man standing on a scale in an elevator notices that the scale reads 30 newtons greater than his normal weight. Which type of movement of the elevator could cause this greater-than-normal reading?

A. accelerating upward

B. accelerating downward

C. moving upward at constant speed

D. moving downward at constant speed

22. Base your answer(s) to the following question(s) on the information below.

A manufacturer's advertisement claims that their 1,250-kilogram (12,300-newton) sports car can accelerate on a level road from 0 to 60.0 miles per hour (0 to 26.8 meters per second) in 3.75 seconds.

What is the normal force exerted by the road on the car?

23. Determine the acceleration, in meters per second^2, of the car according to the advertisement.

24. Calculate the net force required to give the car the acceleration claimed in the advertisement. [Show all work, including the equation and substitution with units.]

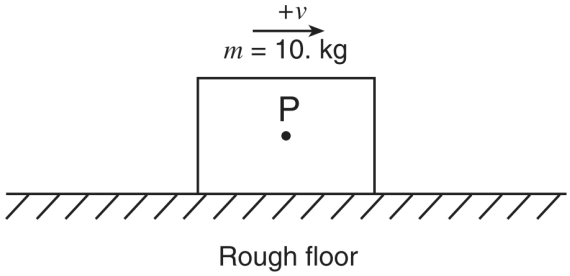
25. Base your answer(s) to the following question(s) on the information below.

A soccer player accelerates a 0.50-kilogram soccer ball by kicking it with a net force of 5.0 newtons.

Calculate the magnitude of the acceleration of the ball. [Show all work, including the equation and substitution with units.]

26. Base your answer(s) to the following question(s) on the information and diagram below.

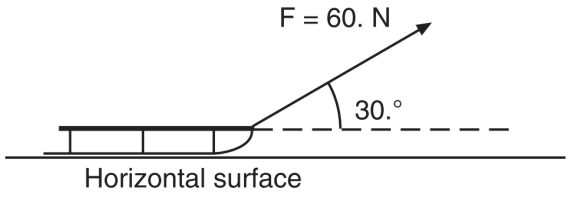
A 10.-kilogram box, sliding to the right across a rough horizontal floor, accelerates at -2.0 meters per second2 due to the force of friction.



Calculate the magnitude of the net force acting on the box. [Show all work, including the equation and substitution with units.]

27. Base your answer(s) to the following question(s) on the information and diagram below.

A force of 60. newtons is applied to a rope to pull a sled across a horizontal surface at a constant velocity. The rope is at an angle of 30. degrees above the horizontal.



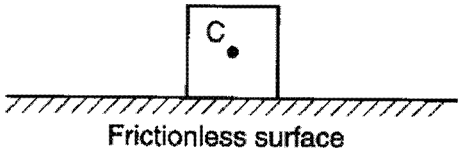
Calculate the magnitude of the component of the 60.-newton force that is parallel to the horizontal surface. [Show all work, including the equation and substitution with units.]

28. Determine the magnitude of the frictional force acting on the sled.

29. Base your answer(s) to the following question(s) on the information below.

A 5.0-kilogram block weighing 49 newtons sits on a frictionless, horizontal surface. A horizontal force of 20. newtons toward the right is applied to the block. [Neglect air resistance]

On the diagram below, draw a vector to represent each of the three forces acting on the block. Use a ruler and a scale of 1.0 centimeter = 10. newtons. Begin each vector at point *C* and label its magnitude in newtons.



Practice - Newton's 1st and 2nd Laws 12/15/2018

1.
Answer: A

2.
Answer: D

3.
Answer: C

4.
Answer: B

5.
Answer: B

6.
Answer: B

7.
Answer: D

8.
Answer: C

9.
Answer: C

10.
Answer: D

11.
Answer: A

12.
Answer: D

13.
Answer: A

14.
Answer: B

15.
Answer: D

16.
Answer: B

17.
Answer: C

18.
Answer: D

19.
Answer: A

20.
Answer: D

21.
Answer: A

22.
Answer: 12,300 N

23.
Answer: 7.15 m/s^2

24.
Answer: 8,930 N

25.
Answer: 10. m/s^2

26.
Answer: $a = \frac{F_{net}}{m} F_{net} = maF_{net} = (10.kg)(-2.0m/s^2)F_{net} = -20.Nor20N$

27.
Answer: $A_x = A \cos \theta$
$F_x = (60.\ \text{N}) \cos 30.°$
$F_x = 52\ \text{N}$

28.
Answer: 52 N

29.
Answer: