1 In the absence of a net force, a moving object will

A slow down and eventually stop

B stop immediately

C turn right

D move with constant velocity

E turn left

2 When a cat sleeps on a table, the net force on it is

- A zero
- B directed upward
- C directed downward
- D directed in the horizontal direction
- E more information is required

3 When the engines on a rocket ship in deep space, far from any other objects, are turned off, it will

- A slow down and eventually stop
- B stop immediately
- C turn right
- D move with constant velocity
- E turn left

4 In order for a rocket ship in deep space, far from any other objects, to move in a straight line with constant speed it must exert a net force that is

- A proportional to its mass
- B proportional to its weight
- C proportional to its velocity
- D zero
- E proportional to its displacement

5 If a book on the dashboard of your car suddenly flies towards you, the forward velocity of the car must have

- A decreased
- B increased
- C changed direction to the right
- D become zero
- E changed direction to the left

6 Which Newton's law can explain the following statement that we often see on the highway display: "Buckle up –it's the State Law"?

- A First Newton's Law
- B Second Newton's Law
- C Third Newton's Law
- D Gravitational Law
- E None from the above

7 A spacecraft travels at a constant velocity in empty space far away from any center of gravity. Which of the following about the force applied on the spacecraft is true?

A The applied force is equal to its weight

B The applied force is slightly greater than its weight

C The applied force is slightly less that its weight

D The applied force must perpendicular to its velocity

E No applied force is required to maintain a constant velocity

8 A boy rides a bicycle at a constant velocity. Which of the following about the net force is true?

A There is a net force acting in the velocity direction

B There is a net force acting opposite to the velocity direction

C The net force is zero

D There is a net force acting perpendicularly to the velocity direction

E None from the above

9 A passenger standing in a moving bus, facing forward suddenly falls forward. This can be an indication which of the following?

- ○ **A The bus speeds up**
- ○ **B The bus slows down**
- ○ **C The bus doesn't change its velocity**
- ○ **D The bus turns to the right**
- ○ **E The bus turns to the left**

10 A passenger standing in a moving bus, facing forward suddenly falls backward. This can be an indication which of the following?

- A The bus speeds up
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12 The acceleration of an object is proportional to

- A the net force acting on it
- B its position
- C its velocity
- D its mass
- E its displacement

13 The acceleration of an object is inversely proportional to

- A the net force acting on it
- B its position
- C its velocity
- D its mass
- E its displacement

14 A net force F accelerates a mass m with an acceleration a. If the same net force is applied to mass 5m, then the acceleration will be

- A 5a
- B 25a
- C a/5
- D a/25
- E a/10

15 A net force F acts on a mass m and produces an acceleration a. What acceleration results if a net force 3F acts on mass 6m?

- A a/2
- B 8a
- C 4a
- D 2a
- E a/4

16 A loaded truck collides with a car causing huge damage to the car. Which of the following is true about the collision?

- ○ **A** The force on the truck is greater than the force on the car
- ○ **B** The force on the car is greater than the force on the truck
- ○ **C** The force on the truck is the same in magnitude as the force on the car
- ○ **D** During the collision the truck makes greater displacement than the car
- ○ **E** During the collision the truck has greater acceleration than the car

17 When a baseball is struck by a bat, the force of the bat on the ball is equal and opposite to the force of the ball on the bat. This is an example of

- A Newton's first law
- B Newton's second law
- C Newton's third law
- D Newton's law of gravitation
- E None from the above

18 If you exert a force F on an object which has a much greater mass than you do, the force which the object exerts on you will

- ○ **A** be of magnitude F and in the same direction
- ○ **B** be of magnitude F and in the opposite direction
- ○ **C** be of much less magnitude than F
- ○ **D** be of much greater magnitude than F
- ○ **E** be zero

19 Newton's third law refers to "action-reaction forces". These forces always occur in pairs and

- A sometimes act on the same object
- B always act on the same object
- C may be at right angles
- D never act on the same object
- E always act at right angles

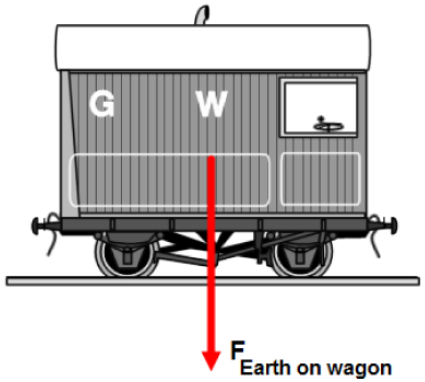
20 Action-reaction forces are

- A equal in magnitude and point in the same direction
- B equal in magnitude and point in opposite directions
- C unequal in magnitude but point in the same direction
- D unequal in magnitude and point in opposite directions
- E cancel each other

21 A car traveling at 40 m/s strikes a mosquito. Which of the following is the true statement?

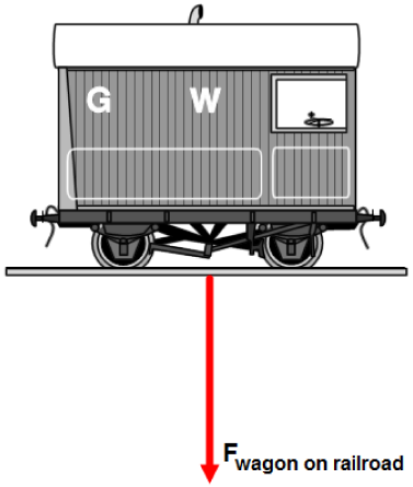
- ○ A The force on the mosquito is greater than the force on the car
- ○ B The force on the mosquito is equal to the force on the car
- ○ C The force on the mosquito is smaller than the force on the car
- ○ D The damage to the mosquito is equal to the damage to the car
- ○ E None from the above

22 The Earth pulls down on a railroad wagon with a force of 200 kN. Which of the following is the "reaction force"?



- ○ A The wagon pulls up the Earth with 200 kN
- ○ B The wagon pushes down the railroad with 200 kN
- ○ C The railroad pushes up the wagon with 200 kN
- ○ D The buoyant force pushes up the wagon with 200 kN
- ○ E The wagon pushes down the Earth with 200 kN

23 A railroad wagon pushes down on a railroad with a force of 200 kN. Which of the following is the "reaction force"?



- ○ A The wagon pulls up the Earth with 200 kN
- ○ B The wagon pushes down the railroad with 200 kN
- ○ C The railroad pushes up the wagon with 200 kN
- ○ D The buoyant force pushes up the wagon with 200 kN
- ○ E The wagon pushes down the Earth with 200 kN

24 Earth pulls downward on a pen, of mass m, which is sitting on a table; the magnitude of the force is mg. If that is called the action force, what is the reaction force?

- ○ **A** The table pushing up on the pen with a force equal to mg
- ○ **B** The pen pushing down on the table with a force equal to mg
- ○ **C** The table pushing down on the floor with a force equal to mg
- ○ **D** The pen pulling upward on Earth with a force equal to mg
- ○ **E** The pen pulling up on the table with a force equal to mg

25 A traffic light is suspended from a cable. Earth pulls downward on the traffic light with a force of 1500 N. If this is the "action force," what is the "reaction force"?

- ○ **A** The cable pulling upward on the traffic light with a 1500 N force
- ○ **B** The traffic light pulling downward on the cable with a 1500 N force
- ○ **C** The traffic light pulling upward on Earth with a 1500 N force
- ○ **D** Earth pulling downward on the cable with a 1500 N force
- ○ **E** The cable pulling up on Earth with a 1500 N force

26 A soccer player kicks a soccer ball with a force of 1300 N. The soccer ball hits the player with a force of

- ○ **A** less than 1300 N
- ○ **B** exactly 1300 N
- ○ **C** more than 1300 N
- ○ **D** 0 N
- ○ **E** none from the above

27 Mass and weight

- A Both have the same measuring units
- B Both have different measuring units
- C Both represent force of gravity
- D Both represent measure of inertia
- E None from the above

28 The acceleration due to gravity is higher on Jupiter than on Earth. The mass and weight of a rock on Jupiter compared to that on Earth would be

- ○ **A** same, more
- ○ **B** same, less
- ○ **C** more, more
- ○ **D** more, less
- ○ **E** same, same

29 Which of the following is an example of a force which acts at a distance (without contact)?

- A Tension
- B Gravity
- C Static friction
- D Kinetic friction
- E Normal force

30 A ball is thrown straight up. At the top of its path, the magnitude of the net force acting on it is

- ○ A less than zero
- ○ B between zero and mg
- ○ C equal to mg
- ○ D greater than mg
- ○ E none from the above

31 A hammer and a pebble are dropped simultaneously from the same height. Neglect air resistance.

- A the hammer accelerates faster because it is heavier
- B the hammer accelerates slower because it has more inertia
- C the pebble accelerates faster because it has a smaller mass
- D they both accelerate at the same rate because they have the same weight to mass ratio
- E the pebble accelerates slower because it has a smaller mass

32 An elevator of mass M is pulled upwards at constant velocity by a cable. What is the tension in the cable (neglecting the mass of the cable)?

- A less than zero
- B between zero and Mg
- C equal to Mg
- D greater than Mg
- E zero

33 An elevator of mass M is pulled upwards by a cable; the elevator has a positive, but decreasing, velocity. What is the tension in the cable (neglecting the mass of the cable)?

- A less than zero
- B between zero and Mg
- C equal to Mg
- D greater than Mg
- E zero

34 An elevator of mass M is pulled upwards by a cable; the elevator has a positive, increasing, velocity. What is the tension in the cable (neglecting the mass of the cable)?

- A less than zero
- B between zero and Mg
- C equal to Mg
- D greater than Mg
- E zero

35 **Which force is directly responsible for your ability to walk, and to stop?

- A weight
- B kinetic friction
- C static friction
- D normal force
- E applied force

36 **Why is it so much more difficult to get a heavy table to start moving, than it is to keep it moving?

- A the normal force is greater for objects at rest
- B $\mu_s < \mu_k$
- C $\mu_s = \mu_k$
- D $\mu_s > \mu_k$
- E $\mu_s = 0$

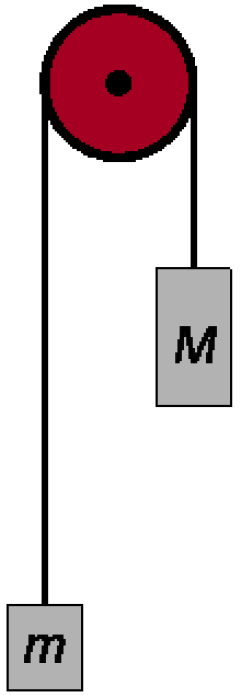
37 **A horizontal force is exerted on an object so that it accelerates at a constant rate across a rough horizontal surface (friction cannot be neglected). The applied force is then doubled; what happens to the object's acceleration?

- A It increases to more than double its original value
- B increases to exactly double its original value
- C It increases to less than double its original value
- D It increases somewhat
- E It drops to zero

38 **A box is being pushed by a constant force along a horizontal surface. If the object's velocity is constant, we can infer that there is _____ acting on the box

- A a frictional force
- B a net downward force
- C no frictional force
- D a net force upward
- E a net force in the acceleration direction

39 **In the Atwood machine, shown on the diagram, two masses M and m are suspended from the pulley, what is the magnitude of the acceleration of the system? (Ignore friction and the mass of the pulley. M > m)



○ **A** $\frac{(M-m)g}{M+m}$

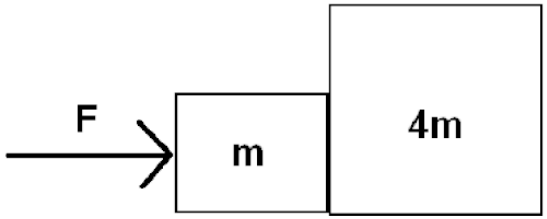
○ **B** $\frac{(M-m)g}{M-m}$

○ **C** $\frac{(M+m)g}{M+m}$

○ **D** $\frac{(M-m)g}{2M}$

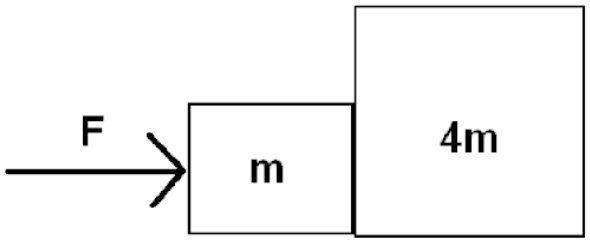
○ **E** $\frac{(M-m)g}{2m}$

**40 **In the figure to the right, two boxes of masses m and 4m are in contact with each other on a frictionless surface. What is the acceleration of the more massive box?



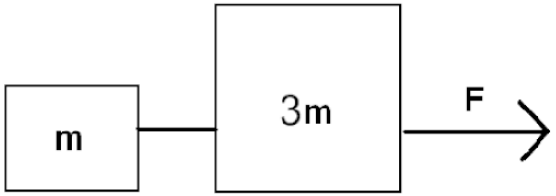
- A F/m
- B F/(2m)
- C F/(4m)
- D F/(5m)
- E F/(6m)

**41 **In the figure to the right, two boxes of masses m and 4m are in contact with each other on a frictionless surface. What is the force causing the acceleration of the more massive box?



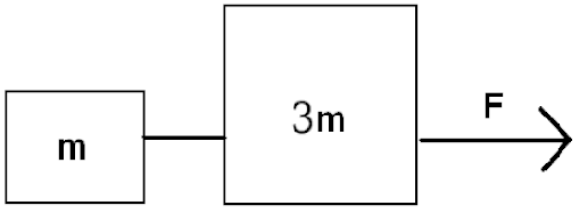
- A 4F
- B 3F/2
- C 5F/4
- D 4F/5
- E F/6

**42 **In the figure to the right, two boxes of masses m and 3m are connected by a string while a force F is pulling on the more massive box; what is the acceleration of the less massive box?



- A F/m
- B F/(2m)
- C F/(4m)
- D F/(5m)
- E F/(6m)

43 **In the figure to the right, two boxes of masses m and 3m are connected by a string while a force F is pulling on the more massive box; what is the tension force in the string between the boxes?

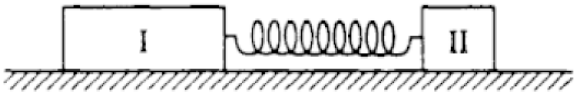


- A F/m
- B F/2
- C F/4
- D F/5
- E F/6

44 **A system of two blocks is accelerated by an applied force of magnitude F on the frictionless horizontal surface. The tension in the string between the blocks is:

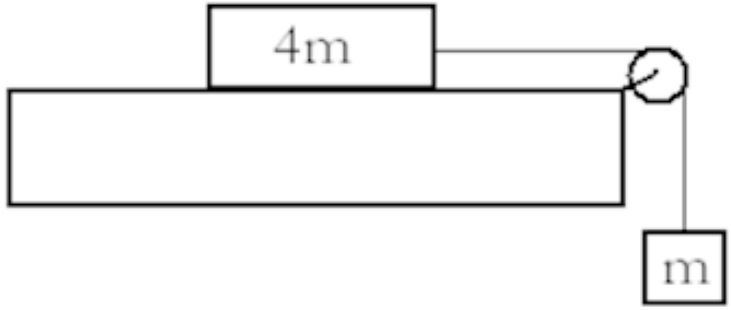
- A 3F
- B 5F
- C 3/8 F
- D 1/3 F
- E 1/5 F

45 Two blocks are attached by a compressed spring and are initially held at rest on a frictionless surface. The blocks are then released simultaneously. If block I has four times the mass of block II, which of the following quantities is the same for both blocks as the spring pushes the two blocks away from each other?



- A Speed
- B Velocity
- C Acceleration
- D Displacement
- E Force on each block

46 A block of mass 4m can move without friction on a horizontal table. This block is attached to another block of mass m by a string that passes over a frictionless pulley. If the masses of the string and the pulley are negligible, what is the magnitude of the acceleration of the descending block?



- A g/5
- B g/4
- C g/3
- D 2g/3
- E g

47 A locomotive is pulling an empty freight car with a constant acceleration on a horizontal surface. The mass of the locomotive is five times the mass of the car. Which statement is true about the force applied by the car on the locomotive?

A 5 times greater than the force of the locomotive on the car

B 5 times less than the force of the locomotive on the car

C Zero since they move with a constant acceleration

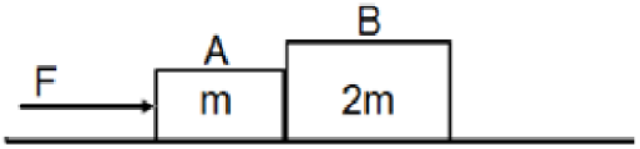
D Equal to the force of the locomotive on the car

E More information is required

48 **A block with initial velocity of 3 m/s slides 9 m across a rough horizontal surface before coming to rest. What is the coefficient of kinetic friction?

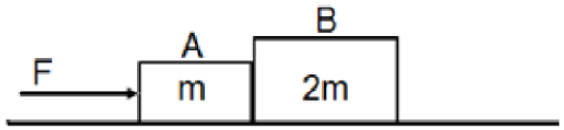
- ○ A 0.10
- ○ B 0.50
- ○ C 0.30
- ○ D 0.05
- ○ E 0.01

49 **In the diagram shown above, two blocks A and B with masses m and 2m are in contact on a horizontal frictionless surface. A force F is applied to block A. What is the acceleration of the system two blocks?



- A F/m
- B F/2m
- C F/3m
- D F/4m
- E F/5m

50 **In the diagram shown above, two blocks A and B with masses m and 2m are in contact on a horizontal frictionless surface. A force F is applied to block A. What is the force exerted by block A on block B?



- A F/2
- B F/3
- C 3F/2
- D 2F/3
- E F/5