

1 pt After reading about velocity and acceleration you've probably drew the following important conclusions: 1) an object is speeding up if and only if the velocity and the acceleration have the same sign; 2) an object is slowing down if and only if the velocity and acceleration have opposite signs; and 3) an object's velocity is constant if and only if its acceleration is zero. Based on these truths decide which of the following cars has a westward acceleration?

▷ A car traveling eastward and speeding up.

1. ☐ A True ☐ B False

▷ A car traveling westward at constant speed.

2. ☐ A True ☐ B False

▷ A car traveling westward and slowing down.

3. ☐ A True ☐ B False

▷ A car traveling eastward and slowing down.

4. ☐ A True ☐ B False

1 pt A force is applied to a mass, and the mass accelerates. If the same force is applied to a mass that is twice as massive as the previous one, how does the acceleration of the larger mass compare to that of the smaller mass?

5. ☐ A smaller by a factor of 1/4
☐ B larger by a factor of 4
☐ C equal
☐ D larger by a factor of 2
☐ E smaller by a factor of 1/2

1 pt A box of mass $m = 1$ kg sits at rest on a rough surface. The coefficient of static friction is 0.4 between the box and the surface. What does this mean, in terms of the minimum force necessary to get the box moving? (in the responses below, g is the acceleration due to gravity)

6. ☐ A a horizontal force which exceeds mg is needed
☐ B a horizontal force which equals mg is needed
☐ C a horizontal force which exceeds $0.4mg$ is needed
☐ D a horizontal force which exceeds 0.4 Newtons is needed
☐ E a horizontal force which equals $0.4mg$ is needed

1 pt

On an aircraft carrier, a jet can be catapulted from 0 to 148 mi/h in 2.02 s. If the average force exerted by the catapult is 9.30×10^5 N what is the mass of the jet?
(in kg)

7. ☐ A 2.14×10^4 ☐ B 2.84×10^4 ☐ C 3.78×10^4
☐ D 5.02×10^4 ☐ E 6.68×10^4

1 pt A net force of 253 N accelerates a bike and rider at 2.20 m/s^2 . What is the mass of the bike and rider?
(in kg)

8. ☐ A 80 ☐ B 90 ☐ C 102 ☐ D 115 ☐ E 130

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1 pt If the coefficient of kinetic friction between a 33.7 kg crate and the floor is 0.304, what horizontal force is required to keep moving the crate at a steady speed across the floor?
(in N)

9. ☐ A 4.11×10^1 ☐ B 5.14×10^1 ☐ C 6.43×10^1
☐ D 8.03×10^1 ☐ E 1.00×10^2

1 pt What horizontal force is required if μ_k is zero?
(in N)

10. ☐ A 0 ☐ B 7 ☐ C 8 ☐ D 10 ☐ E 13

1 pt

The coefficient of static friction between a block and a horizontal floor is 0.360, while the coefficient of kinetic friction is 0.124. The mass of the block is 4.68 kg. A horizontal force is applied to the block and slowly increased. What is the value of the applied horizontal force at the instant that the block starts to slide?

(in N)

11. ☐ A 7.02 ☐ B 9.33 ☐ C 1.24×10^1
☐ D 1.65×10^1 ☐ E 2.20×10^1

1 pt What is the net force on the block after it starts to slide?

(in N)

12. ☐ A 8.48 ☐ B 9.58 ☐ C 1.08×10^1
☐ D 1.22×10^1 ☐ E 1.38×10^1

1 pt

Calculate the normal force exerted on a 2.95 kg book resting on a surface inclined at 31.2° above the horizontal.
(in N)

13. ☐ A 1.94×10^1 ☐ B 2.19×10^1 ☐ C 2.48×10^1
☐ D 2.80×10^1 ☐ E 3.16×10^1

1 pt Which of the following is always true about a system that is NOT in equilibrium?

▷ The instantaneous velocity cannot be zero.

14. ☐ True ☐ False

▷ The net force is zero.

15. ☐ True ☐ False

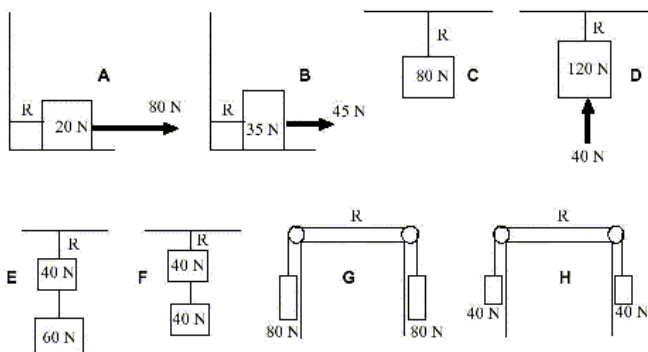
▷ The velocity of the system is changing.

16. ☐ True ☐ False

▷ The system is at rest.

17. ☐ True ☐ False

1 pt The eight figures show various situations where blocks of different weights are attached by ropes to rigidly fixed objects or to other blocks, which are attached to fixed objects. The situations differ in a number of ways, as the figures show. The weights of the blocks are given in the figures, as well as the magnitudes and directions of any other forces that may be acting. Our interest is solely in the rope that is designated R in each figure.



Which of the following statements are true about the situations depicted in the figures above?

▷ The tension in the rope is greater in picture A than in picture H

18. ☐ True ☐ False

▷ The tension in the rope is equal in all pictures

19. ☐ True ☐ False

▷ The tension in the rope is smaller in picture H than in picture F

20. ☐ True ☐ False

▷ The tension in the rope is zero in pictures G and H

21. ☐ True ☐ False

▷ The tension in the rope in picture G is 160 N

22. ☐ True ☐ False

1 pt A block of mass M is sliding down an inclined plane and is accelerating. Which of the following statements are true?

▷ The surface cannot have any friction because the block is accelerating

23. ☐ True ☐ False

▷ The normal force of the plane is equal to the component of Mg perpendicular to the plane

24. ☐ True ☐ False

▷ The acceleration of the block must be less than g

25. ☐ True ☐ False

▷ The frictional force must be zero

26. ☐ True ☐ False

▷ If the block's mass were doubled, its acceleration would be doubled

27. ☐ True ☐ False

1 pt A roller coaster is towed up an incline at a steady speed of 0.490 m/s by a chain parallel to the surface of the incline. The slope is 3.14 %, which means that the elevation increases by 3.14 m for every 100 m of horizontal distance. The mass of the roller coaster is 419 kg. Neglecting friction, what is the magnitude of the force exerted on the roller coaster by the chain?

(in N)

28. ☐ 6.88×10^1 ☐ 8.05×10^1 ☐ 9.41×10^1

☐ 1.10×10^2 ☐ 1.29×10^2