Test Bank for College Physics 5th Giambattista

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***College Physics, 9e* (Giambattista)**
Chapter 2 Force

1) When a person stands on a scale, which of the following is not a force exerted on the scale?
A) a contact force due to the floor
B) a contact force due to the person's feet
C) the weight of the person
D) the weight of the scale

Answer: D
Type: MC
Topic: Interactions and Forces
Accessibility: Keyboard Navigation
Chapter: 02

2) A person weighs 146 pounds (1 lb = 4.448 N). The person's weight in newtons is
A) 445 N.
B) 500 N.
C) 584 N.
D) 649 N.

Answer: D
Type: MC
Topic: Interactions and Forces
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: Measuring Forces

3) The force that holds charged atoms together is the
A) gravitational force.
B) electromagnetic force.
C) weak interaction.
D) strong nuclear force.

Answer: B
Type: MC
Topic: Fundamental Forces
Accessibility: Keyboard Navigation
Chapter: 02

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4) Three objects experience interactions. Object A has mass, object B has electrical charge, and object C has both mass and electrical charge. Which of the following statements is true?
A) object A and object B experience an electrical interaction
B) object A and object C experience a gravitational interaction
C) object A and object C experience an electrical interaction
D) object A and object B experience a gravitational interaction

Answer: B
Type: MC
Topic: Fundamental Forces
Accessibility: Keyboard Navigation
Chapter: 02

5) Three objects experience interactions. Object A has mass, object B has electrical charge, and object C has both mass and electrical charge. Which of the following statements is true?
A) the electrical force on A due to B has a greater magnitude than the gravitational force on B due to A
B) the electrical force on A due to B has a smaller magnitude than the gravitational force on B due to A
C) the gravitational force on C due to A has the same magnitude as the gravitational force on A due to C
D) the electrical force on C due to B has the same magnitude as the gravitational force on C due to B

Answer: C
Type: MC
Topic: Fundamental Forces
Accessibility: Keyboard Navigation
Chapter: 02

6) The force that holds the nucleus together is the
A) gravitational force.
B) electromagnetic force.
C) weak interaction.
D) strong nuclear force.

Answer: D
Type: MC
Topic: Fundamental Forces
Accessibility: Keyboard Navigation
Chapter: 02

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7) The force that causes an object to fall to Earth is the
A) gravitational force.
B) electromagnetic force.
C) weak interaction.
D) strong nuclear force.

Answer: A
Type: MC
Topic: Fundamental Forces
Accessibility: Keyboard Navigation
Chapter: 02

8) Which of the following is a vector quantity?
A) volume
B) force
C) speed
D) time
E) length

Answer: B
Type: MC
Topic: Interactions and Forces
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: Force Is a Vector Quantity

9) A person weighs 155 pounds. What is the person's weight in newtons?
A) 155 N
B) 689 N
C) 39.3 N
D) 392 N

Answer: B
Type: MC
Topic: Interactions and Forces
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: Measuring Forces

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10) A 20-kg sack of potatoes at the corner store weighs
A) 190 pounds.
B) 150 pounds.
C) 44 pounds.
D) 9.9 pounds.

Answer: C
Type: MC
Topic: Gravitational Forces
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: Gravitational Field Strength

11) If an object of mass 20 kg on Earth is sent to the Moon, it will have a mass of
A) 10 kg.
B) 20 kg.
C) 0.0 kg.
D) 4.0 kg.

Answer: B
Type: MC
Topic: Gravitational Forces
Accessibility: Keyboard Navigation
Chapter: 02

12) A rock of weight 17.5 N, suspended from a spring scale, is immersed in a beaker of water. The scale reads 9.00 N. The weight of the beaker and water together (without the rock) is 23.5 N. What is the magnitude of the net force of the beaker on the table after the rock has been submerged?
A) 17.5 N
B) 23.5 N
C) 32.0 N
D) 41.0 N

Answer: C
Type: MC
Topic: Inertia and Equilibrium: Newton's First Law of Motion
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: An Object in Equilibrium Moves with Constant Velocity

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13) A car is driving on a level highway. It is acted upon by the following forces: a downward gravitational force of 12 kN, an upward contact force due to the road of 12 kN, another contact force due to the road of 7 kN directed West, and a drag force due to air resistance of 5 kN directed East. What is the net force acting on the car?
A) 7 kN East
B) 24 kN up
C) 2 kN West
D) 5 kN East
E) 2 kN East

Answer: C
Type: MC
Topic: Inertia and Equilibrium: Newton's First Law of Motion
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: Net Force

14) A man who weighs 600 N is sitting in a chair with his feet on the floor and arms resting on the armrests. The chair weighs 100 N. Each armrest exerts an upward force of 25.0 N on his arms, and the seat exerts an upward force of 500 N. What force does the floor exert on his feet?
A) 75 N upward
B) 500 N upward
C) 525 N upward
D) 50 N upward
E) 0 N

Answer: D
Type: MC
Topic: Inertia and Equilibrium: Newton's First Law of Motion
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: An Object in Equilibrium Moves with Constant Velocity

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15) An airplane is traveling in level flight at a constant velocity. L is the lift, W is the weight, T is the thrust, and D is the drag. Which of the diagrams is the correct free-body force diagram for the airplane?

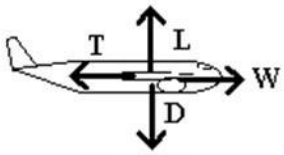


Figure 1

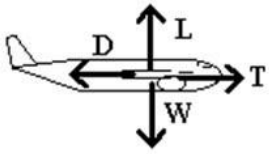


Figure 2

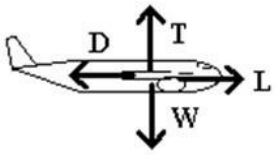


Figure 3

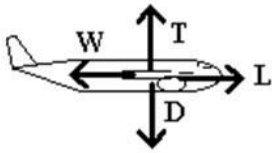


Figure 4

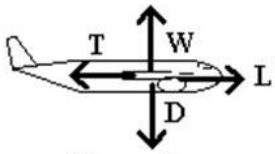


Figure 5

A) Figure 1
B) Figure 2
C) Figure 3
D) Figure 4
E) Figure 5

Answer: B
Type: MC
Topic: Inertia and Equilibrium: Newton's First Law of Motion
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: Free-Body Diagrams

16) An airplane is flying in horizontal flight at a constant velocity. The weight of the airplane is 40,000 N. The wings produce a lift force that is perpendicular to the wings and a drag force that is parallel to the wings. The engine produces a forward thrust force of 2,000 N. Which of the following statements is true?
A) The net force on the airplane is zero.
B) The net force on the airplane is forward.
C) The net force on the airplane is upward.
D) The net force on the airplane is downward.
E) The net force on the airplane is backward.

Answer: A
Type: MC
Topic: Inertia and Equilibrium: Newton's First Law of Motion
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: An Object in Equilibrium Moves with Constant Velocity

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17) An airplane is flying in horizontal flight at a constant velocity. The weight of the airplane is 40,000 N. The wings produce a lift force that is perpendicular to the wings and a drag force that is parallel to the wings. The engine produces a forward thrust force of 2,000 N. Which of the following statements is true?
A) The lift force on the airplane is zero.
B) The drag force on the airplane is zero.
C) The lift force on the airplane is 42,000 N upward.
D) The drag force on the airplane is 38,000 N downward.
E) The drag force on the airplane is 2,000 N backward.

Answer: E
Type: MC
Topic: Inertia and Equilibrium: Newton's First Law of Motion
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: An Object in Equilibrium Moves with Constant Velocity

18) The net force on a moving object suddenly becomes zero. The object then
A) stops abruptly.
B) stops during a short time interval.
C) changes direction.
D) continues at constant velocity.
E) slows down gradually.

Answer: D
Type: MC
Topic: Inertia and Equilibrium: Newton's First Law of Motion
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: An Object in Equilibrium Moves with Constant Velocity

19) A freight train consists of an engine and several identical cars on a straight, level track. Which of the following statements is true?
A) If the train is moving at constant speed, the engine must be pulling with a force greater than the train's weight.
B) If the train is moving at constant speed, the engine's pull on the first car must exceed that car's backward pull on the engine.
C) If the train is coasting, its inertia makes it slow down and eventually stop.
D) If the train is moving at constant speed, the engine's pull must be equal to the force of friction.

Answer: D
Type: MC
Topic: Inertia and Equilibrium: Newton's First Law of Motion
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: An Object in Equilibrium Moves with Constant Velocity

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20) In the figure an airport luggage carrying train with a tractor T is pulling three luggage carts M_1, M_2, and M_3, with constant velocity of 4.5 m/s. Unfortunately, the wheels on the carts have locked up and are sliding rather than rolling. If T = 300.0 kg, M_1 = 200.0 kg, M_2 = 100.0 kg, and M_3 = 100.0 kg, and the coefficient of kinetic friction for each is 0.4000, what is the force in the connection between the tractor T and cart M_1? Use g = 9.8 m/s.



A) 2941 N
B) 2744 N
C) 1568 N
D) 1862 N
E) 2439 N

Answer: C
Type: MC
Topic: Inertia and Equilibrium: Newton's First Law of Motion
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: An Object in Equilibrium Moves with Constant Velocity

21) Causing an object to start moving on a frictional surface requires
A) less force than is needed to keep it moving on the surface.
B) the same force as is needed to keep it moving on the surface.
C) more force than is needed to keep it moving on the surface.
D) a force equal to the weight of the object.
E) a force opposite to the normal force.

Answer: C
Type: MC
Topic: Contact Forces
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: Friction

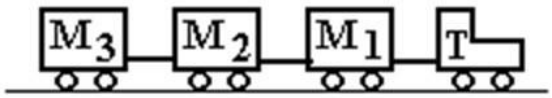
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22) Five children are pushing on a snowball; each pushes with a force of magnitude 10.0 N, and each is pushing at an angle of 45° relative to his neighbor. What is the magnitude of the net push on the ball?
A) 0 N
B) 24.1 N
C) 27.1 N
D) 17 N
E) 50 N

Answer: B
Type: MC
Topic: Vector Addition Using Components
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: Adding Vectors Using Components

23) In the figure, an airport luggage carrying train with a tractor T is pulling three luggage carts, M_1, M_2, and M_3 with constant velocity of 4.5 m/s. If T = 300 kg, M_1 = 200 kg, M_2 = 100 kg, and M_3 = 100 kg (there is no friction), then the force in the connection between the tractor T and cart M_1 is



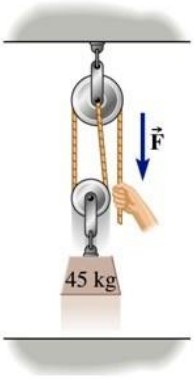
A) 980 N.
B) 560 N.
C) 280 N.
D) 140 N.
E) 0.00 N.

Answer: E
Type: MC
Topic: Inertia and Equilibrium: Newton's First Law of Motion
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: An Object in Equilibrium Moves with Constant Velocity

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24) The diagram below represents an ideal pulley system (no mass or friction). What is the force required to lift the 45 kg mass?



A) 442 N
B) 393 N
C) 221 N
D) 147 N

Answer: C
Type: MC
Topic: Tension
Accessibility: Keyboard Navigation
Chapter: 02

25) A force of 15 N toward the WEST is applied to a 4.0 kg box. Another force of 42 N toward the EAST is also applied to the 4.0 kg box. The net force on the 4.0 kg box is
A) 57 N toward the WEST.
B) 27 N toward the EAST.
C) 36 N toward the WEST.
D) 36 N toward the EAST.
E) 17 N toward the WEST.

Answer: B
Type: MC
Topic: Graphical Vector Addition
Accessibility: Keyboard Navigation
Chapter: 02

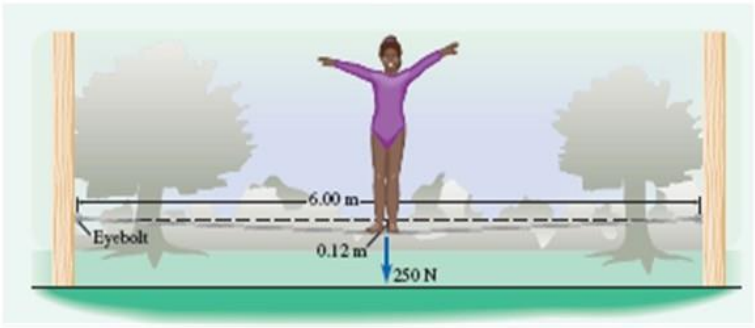
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26) If you add two vectors with magnitudes of 200 and 40, which of the following is a possible resultant magnitude?
A) 100
B) 260
C) 0
D) 200
E) 40

Answer: D
Type: MC
Topic: Graphical Vector Addition
Accessibility: Keyboard Navigation
Chapter: 02

27) Diane (weight 255 N) is practicing on a tightrope that is 6.00 meters long (when unstretched) and sags by 0.120 meters under her weight. When she is in the middle of the rope, what is the force (due to the rope) on each eyebolt holding the tightrope?



A) 1.62×10^3 N
B) 3.19×10^3 N
C) 6.38×10^3 N
D) 4.99×10^3 N

Answer: B
Type: MC
Topic: Tension
Accessibility: Keyboard Navigation
Chapter: 02

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28) Given that a vector extends from the origin to (−5.0 cm, 8.0 cm), find the magnitude of the vector.
A) 9.8 cm
B) 3.4 cm
C) 9.4 cm
D) −5.6 cm

Answer: C
Type: MC
Topic: Vector Addition Using Components
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: Components of a Vector

29) Given that a vector extends from the origin to (−5.0 cm, 8.0 cm), find the direction of the vector relative to the positive x-axis.
A) 32°
B) 58°
C) 148°
D) 122°

Answer: D
Type: MC
Topic: Vector Addition Using Components
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: Components of a Vector

30) Given that a force vector has components (120 N, −60.0 N), find the magnitude of the vector.
A) 140 N
B) 134 N
C) 180 N
D) 60.0 N

Answer: B
Type: MC
Topic: Vector Addition Using Components
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: Components of a Vector

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31) Given that a force vector has components (120 N, −60.0 N), find the direction of the vector relative to the positive x-axis.
A) 116°
B) 26.6°
C) −26.6°
D) 122°

Answer: C
Type: MC
Topic: Vector Addition Using Components
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: Components of a Vector

32) Vector *A* has a magnitude of 3.0 units and makes an angle of −90.0° with the positive x-axis. Vector *B* has a magnitude of 4.0 units and makes an angle of −120° with the positive x-axis. What is the magnitude of the vector sum *A* + *B*?
A) 1.0 units
B) 6.8 units
C) 7.0 units
D) 5.0 units

Answer: B
Type: MC
Topic: Vector Addition Using Components
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: Adding Vectors Using Components

33) Vector *A* has a magnitude of 3.0 units and makes an angle of −90.0° with the positive x-axis. Vector *B* has a magnitude of 4.0 units and makes an angle of −120° with the positive x-axis. What is the direction of the vector sum *A* + *B* relative to the positive x-axis?
A) −107°
B) 55°
C) −55°
D) −145°

Answer: A
Type: MC
Topic: Vector Addition Using Components
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Chapter: 02
Subtopic: Adding Vectors Using Components

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34) When an object is in translational equilibrium, which of these statements is not true?
A) The vector sum of the forces acting on the object is zero.
B) The object must be stationary.
C) The object has a constant velocity.
D) The speed of the object is a constant.

Answer: B
Type: MC
Topic: Inertia and Equilibrium: Newton's First Law of Motion
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: An Object in Equilibrium Moves with Constant Velocity

35) A space probe leaves the solar system to explore interstellar space. Once it is far from any stars, when must it fire its rocket engines?
A) all the time, in order to keep moving
B) only when it wants to speed up
C) only when it wants to slow down
D) only when it wants to turn
E) when it wants to speed up, slow down, or turn

Answer: E
Type: MC
Topic: Inertia and Equilibrium: Newton's First Law of Motion
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: Newton's First Law of Motion

36) A large massive rock is in contact with the Earth. Draw a force diagram for the rock and the Earth. Which of the following statements is true?
A) The gravitational force on the rock due to the Earth and the gravitational force on the Earth due to the rock are interaction partners.
B) The gravitational force on the rock due to the Earth and the contact force on the Earth due to the rock are interaction partners.
C) The contact force on the Earth due to the rock and the gravitational force on the Earth due to the rock are interaction partners.
D) The gravitational force on the Earth due to the rock and the contact force on the Earth due to the rock are interaction partners.

Answer: A
Type: MC
Topic: Interaction Pairs: Newton's Third Law of Motion
Accessibility: Keyboard Navigation
Chapter: 02

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37) A mass sits at rest on top of a table. Which two forces are interaction pair forces and thus are equal and opposite?
A) the force of gravity on the mass due to the Earth and the force of gravity on the Earth due to the mass
B) the force of gravity on the mass due to the Earth and the contact force on the table due to the mass
C) the contact force on the mass due to the table and the force of gravity on the Earth due to the mass
D) the force of gravity on the mass due to the Earth and the contact force on the mass due to the table

Answer: A
Type: MC
Topic: Interaction Pairs: Newton's Third Law of Motion
Accessibility: Keyboard Navigation
Chapter: 02

38) Interaction partners
A) are equal in magnitude and opposite in direction and act on the same object.
B) are equal in magnitude and opposite in direction and act on different objects.
C) appear in a free-body diagram for a given object.
D) always involve gravitational force as one partner.
E) act in the same direction on the same object.

Answer: B
Type: MC
Topic: Interaction Pairs: Newton's Third Law of Motion
Accessibility: Keyboard Navigation
Chapter: 02

39) What is the gravitational field strength on the surface of the Earth? ($G = 6.67 \times 10^{-11}$ N m^2/kg^2, the mass of the Earth is 5.98×10^{24} kg, and the radius of the Earth is 6.38×10^6 m.)
A) 3.40 N/kg.
B) 6.20 N/kg.
C) 9.80 N/kg.
D) 10.1 N/kg.
E) 20.3 N/kg.

Answer: C
Type: MC
Topic: Gravitational Forces
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: Gravitational Field Strength

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40) What is the gravitational field strength at the location of a satellite that is orbiting the Earth at an altitude of 5,000 km? ($G = 6.67 \times 10^{-11}$ N m^2/kg^2, the mass of the Earth is 5.98×10^{24} kg, and the radius of the Earth is 6.38×10^6 m.)
A) 9.55 N/kg.
B) 8.43 N/kg.
C) 3.08 N/kg.
D) 6.33 N/kg.
E) 5.28 N/kg.

Answer: C
Type: MC
Topic: Gravitational Forces
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: Gravitational Field Strength

41) The gravitational field at the Moon due to the Earth is approximately? ($G = 6.67 \times 10^{-11}$ N m^2/kg^2, the mass of the Earth is 5.98×10^{24} kg, and the distance to the Moon is 3.85×10^8 m)
A) 2.69×10^{-3} N/kg toward the Earth.
B) 2.69×10^{-3} N/kg away from the Earth.
C) 7.30×10^{-3} N/kg away from the Earth.
D) 7.30×10^{-3} N/kg toward the Earth.
E) 5.00×10^{-3} N/kg toward the Earth.

Answer: A
Type: MC
Topic: Gravitational Forces
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: Gravitational Field Strength

42) The gravitational field at the Earth due to the Moon is about? ($G = 6.67 \times 10^{-11}$ N m^2/kg^2, the mass of the Moon is 7.35×10^{22} kg, and the distance to the Moon is 3.85×10^8 m)
A) 2.90×10^{-5} N/kg away from the Moon.
B) 3.31×10^{-5} N/kg toward the Moon.
C) 4.01×10^{-5} N/kg toward the Moon.
D) 3.31×10^{-5} N/kg away from the Moon.
E) 7.50×10^{-5} N/kg away from the Moon.

Answer: B
Type: MC
Topic: Gravitational Forces
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: Gravitational Field Strength

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43) The Moon (mass 7.35×10^{22} kg) orbits the Earth (mass 5.98×10^{24} kg) at a distance of 3.85×10^{8} meters. Meanwhile, the Earth orbits the Sun (mass 1.99×10^{30} kg) at a distance of 1.50×10^{11} meters. When the Moon is directly between the Earth and the Sun, what is the gravitational field at the location of the Moon due to the Earth and the Sun combined? ($G = 6.67 \times 10^{-11}$ N m^2/kg^2)
A) 5.93×10^{-3} N/kg toward the Sun.
B) 5.93×10^{-3} N/kg toward the Earth.
C) 3.21×10^{-3} N/kg toward the Sun.
D) 3.21×10^{-3} N/kg toward the Earth.
E) 2.69×10^{-3} N/kg toward the Earth.

Answer: C
Type: MC
Topic: Gravitational Forces
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: Gravitational Field Strength

44) The Moon (mass 7.35×10^{22} kg) is orbiting about the Earth (mass 5.98×10^{24} kg) at a radius of 3.85×10^{8} meters. The magnitude of the force of gravity on the Moon due to the Earth is? ($G = 6.67 \times 10^{-11}$ N m^2/kg^2)
A) 9.20×10^{30} N.
B) 3.20×10^{28} N.
C) 6.70×10^{24} N.
D) 1.98×10^{20} N.
E) 4.10×10^{12} N.

Answer: D
Type: MC
Topic: Gravitational Forces
Accessibility: Keyboard Navigation
Chapter: 02

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45) An object with a mass of 200.0 kg is 500.0 km above the surface of the Earth. The magnitude of the force of gravity on the 200.0 kg mass is? ($G = 6.67 \times 10^{-11}$ N m^2/kg^2, the radius of the Earth is 6.38×10^6 m, and the mass of the Earth is 5.98×10^{24} kg)
A) 2.02×10^3 N.
B) 1.69×10^3 N.
C) 1.42×10^3 N.
D) 1.28×10^3 N.
E) 1.05×10^3 N.

Answer: B
Type: MC
Topic: Gravitational Forces
Accessibility: Keyboard Navigation
Chapter: 02

46) What is the gravitational force between two 5.00 kg masses that are 10.0 cm apart from center to center? ($G = 6.67 \times 10^{-11}$ N m^2/kg^2)
A) 1.67×10^{-8} N
B) 1.67×10^{-7} N
C) 1.62×10^{-6} N
D) 1.62×10^{-5} N
E) 1.67×10^{-4} N

Answer: B
Type: MC
Topic: Gravitational Forces
Accessibility: Keyboard Navigation
Chapter: 02

47) What is the gravitational force between two nuclei, each of mass 3.20×10^{-27}kg, which are separated by a distance of 1.06×10^{-10} m? ($G = 6.67 \times 10^{-11}$ N m^2/kg^2)
A) 6.08×10^{-45} N
B) 6.08×10^{-44} N
C) 6.08×10^{-43} N
D) 6.08×10^{-42} N

Answer: B
Type: MC
Topic: Gravitational Forces
Accessibility: Keyboard Navigation
Chapter: 02

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48) The weight of a 1.00 kg object on the surface of the Moon is? ($G = 6.67 \times 10^{-11}$ N m^2/kg^2, the radius of the Moon is 1.74×10^6 m, and the mass of the Moon is 7.35×10^{22} kg)
A) 9.80 N.
B) 7.59 N.
C) 1.62 N.
D) 0.981 N.
E) 0.548 N.

Answer: C
Type: MC
Topic: Gravitational Forces
Accessibility: Keyboard Navigation
Chapter: 02

49) The highest spot on Earth is Mt. Everest, which is 8850 m above sea level. If the radius of the Earth (to sea level) is 6370 km, how much does the magnitude of g change between sea level and the top of Mt. Everest? ($G = 6.67 \times 10^{-11}$ N m^2/kg^2, and the mass of the Earth is 5.98×10^{24} kg.)
A) 8.11 m/s^2
B) 7.06 m/s^2
C) 4.72 m/s^2
D) 0.110 m/s^2
E) 0.0273 m/s^2

Answer: E
Type: MC
Topic: Gravitational Forces
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: Gravitational Field Strength

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50) The Moon (mass 7.35×10^{22} kg) orbits the Earth (mass 5.98×10^{24} kg) at a distance of 3.85×10^{8} meters. Meanwhile, the Earth orbits the Sun (mass 1.99×10^{30} kg) at a distance of 1.50×10^{11} meters. When the Moon is directly between the Earth and the Sun, what is the gravitational force on the Moon due to the Earth and the Sun combined? ($G = 6.67 \times 10^{-11}$ N m^2/kg^2)
A) 4.36×10^{20} N toward the Sun.
B) 4.36×10^{20} N toward the Earth.
C) 2.36×10^{20} N toward the Sun.
D) 2.38×10^{20} N toward the Earth.
E) 1.98×10^{20} N toward the Earth.

Answer: C
Type: MC
Topic: Gravitational Forces
Accessibility: Keyboard Navigation
Chapter: 02

51) A boy with a mass of 55 kg walks into a room and sees a girl 8.0 m in front of him who has a mass of 40 kg. What is his gravitational attraction to her?
A) 2.0×10^{8} N
B) 2.3×10^{-9} N
C) 2.2×10^{-11}N
D) 2.4×10^{-8} N
E) 2.1×10^{9} N

Answer: B
Type: MC
Topic: Gravitational Forces
Accessibility: Keyboard Navigation
Chapter: 02

52) When a force is called a "normal" force, it is
A) the usual force expected given the arrangement of a system.
B) a force that is perpendicular to the surface of the Earth at any given location.
C) a force that is always vertical.
D) a contact force perpendicular to the contact surfaces between two objects.
E) the net force acting on a system.

Answer: D
Type: MC
Topic: Contact Forces
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: Normal Force

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53) A mass sits at rest on top of a table. Which two forces that are *not* action-reaction partners are equal and opposite?
A) the force of gravity on the mass due to the Earth and the force of gravity on the earth due to the mass
B) the contact force on the mass due to the table and the contact force on the table due to the mass
C) the force of gravity on the mass due to the Earth and the contact force on the table due to the mass
D) the force of gravity on the mass due to the Earth and the contact force on the mass due to the table
E) the contact force on the mass due to the table and the force of gravity on the Earth due to the mass

Answer: D
Type: MC
Topic: Interaction Pairs: Newton's Third Law of Motion
Accessibility: Keyboard Navigation
Chapter: 02

54) Within a given system, the internal forces
A) are always balanced by the external forces.
B) all add to zero.
C) are only determined by subtracting the external forces from the net force on the system.
D) determine the motion of the system.
E) are measured with a gravimeter.

Answer: B
Type: MC
Topic: Interaction Pairs: Newton's Third Law of Motion
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: Internal and External Forces

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55) A box that weighs 300 N is pulled by a rope across a level surface with a constant velocity. The rope makes an angle of 30.0 degrees above the horizontal, and the tension in the rope is 100 N. What is the magnitude of the normal force from the floor on the box?
A) 86 N
B) 300 N
C) 50 N
D) 250 N
E) 0 N

Answer: D
Type: MC
Topic: Contact Forces
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: Normal Force

56) A 750 N box moves at a constant velocity on a floor with a coefficient of static friction μ_s = 0.800 and coefficient of kinetic friction μ_k = 0.600. What horizontal force is required to keep the box moving?
A) 600 N
B) 550 N
C) 500 N
D) 450 N
E) 750 N

Answer: D
Type: MC
Topic: Contact Forces
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: Friction

57) A friction force
A) is a contact force that acts parallel to the contact surfaces.
B) is a normal force between contact surfaces.
C) is a scalar quantity since it can act in any direction along a surface.
D) does not depend on the nature of the surfaces.

Answer: A
Type: MC
Topic: Contact Forces
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: Friction

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58) A block is at rest on a wooden ramp. The coefficient of static friction between the block and ramp is 0.35. If the ramp is gradually elevated on one side, at what angle (between the ramp and the horizontal) will the block first begin to slide?
A) 17°
B) 19°
C) 29°
D) 20°
E) 22°

Answer: B
Type: MC
Topic: Contact Forces
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: Friction

59) A 750 N box rests on the floor. The coefficient of static friction between the box and the floor is 0.800, and the coefficient of kinetic friction is 0.600. If a horizontal force of 550 N is applied to the box, what will be the magnitude of the force of friction on the box due to the floor?
A) 600 N
B) 450 N
C) 750 N
D) 550 N
E) 440 N

Answer: D
Type: MC
Topic: Contact Forces
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: Friction

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60) A 755 N box rests on a floor with a coefficient of kinetic friction of 0.600 and a coefficient of static friction of 0.800. What horizontal force is required to start the box moving?
A) 755 N
B) 453 N
C) 254 N
D) 653 N
E) 604 N

Answer: E
Type: MC
Topic: Contact Forces
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: Friction

61) In order to slide a 753 N box across the floor at a constant speed, you must push horizontally with a force of magnitude 452 N. What is the coefficient of kinetic friction?
A) 1.66
B) 0.600
C) 0.660
D) 0.580
E) 1.65

Answer: B
Type: MC
Topic: Contact Forces
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: Friction

62) In order to slide a 70 kg box across the floor at a constant speed, you must push horizontally with a force of magnitude 351 N. What is the coefficient of kinetic friction?
A) 0.15
B) 0.58
C) 0.34
D) 0.51
E) 0.68

Answer: D
Type: MC
Topic: Contact Forces
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: Friction

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63) A force of magnitude 451 N is applied horizontally to 111 kg box, which is at rest on the floor. The coefficient of static friction between the box and the floor is 0.450. What is the magnitude of the force of friction from the floor on the box?
A) 490 N
B) 0.00 N
C) 108 N
D) 451 N
E) 203 N

Answer: D
Type: MC
Topic: Contact Forces
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: Friction

64) A 90.0 N crate of apples sits at rest on a ramp that runs from the ground to the bed of a truck. The ramp is inclined at 20° to the horizontal. What is the normal force exerted on the crate by the ramp?
A) 86.9 N
B) 84.6 N
C) 75.8 N
D) 30.8 N
E) 38.5 N

Answer: B
Type: MC
Topic: Contact Forces
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: Normal Force

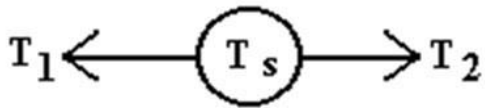
65) Which would require the least force to move a box along a floor with a coefficient of friction of 0.30?
A) pull it with a rope at an angle of 30° above the horizontal
B) push it at an angle of 30° below the horizontal
C) EITHER pull it with a rope at an angle of 30° above the horizontal OR push it at an angle of 30° below the horizontal
D) not enough information to solve

Answer: A
Type: MC
Topic: Contact Forces
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: Friction

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66) A rope is connected to a spring scale on the left and exerts a force T_1. Another rope is connected to the scale on the right and exerts a force T_2. The scale shows a reading of T_s = 120 N. The values of T_1 and T_2 are



A) T_1 = 80 N, and T_2 = 80 N.
B) T_1 = 120 N, and T_2 = 120 N.
C) T_1 = 240 N, and T_2 = 240 N.
D) T_1 = 80 N, and T_2 = 120 N.

Answer: B
Type: MC
Topic: Tension
Accessibility: Keyboard Navigation
Chapter: 02

67) One person holds a spring scale while another pulls until the scale reads 32 N. What is the force that the person holding the scale applies?
A) 32 N
B) 16 N
C) 64 N
D) 48 N
E) 0.0 N

Answer: A
Type: MC
Topic: Tension
Accessibility: Keyboard Navigation
Chapter: 02

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68) A sled has a mass of 10.0 kg. It is held in place on a frictionless 20.0 degree slope by a rope attached to a stake at the top of the slope. Find the tension in the rope, assuming it is parallel to the slope.
A) 47.9 N
B) 37.4 N
C) 94.1 N
D) 33.5 N
E) 23.8 N

Answer: D
Type: MC
Topic: Tension
Accessibility: Keyboard Navigation
Chapter: 02

69) A 120 N traffic light is located at the midpoint of a cable between two poles. The cable makes an angle of 30° to the horizontal at each pole. What is the tension in the cable? Ignore the mass of the cable.
A) 60.0 N
B) 90.0 N
C) 140 N
D) 110 N
E) 120 N

Answer: E
Type: MC
Topic: Tension
Accessibility: Keyboard Navigation
Chapter: 02

70) The fundamental force that governs the motion of the planets is the
A) strong force.
B) weak force.
C) electromagnetic force.
D) gravitational force.

Answer: D
Type: MC
Topic: Fundamental Forces
Accessibility: Keyboard Navigation
Chapter: 02

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71) The fundamental force that binds the electrons to the nuclei to form atoms is the
A) strong force.
B) weak force.
C) electromagnetic force.
D) gravitational force.

Answer: C
Type: MC
Topic: Fundamental Forces
Accessibility: Keyboard Navigation
Chapter: 02

72) The fundamental force that is the weakest of the four is the
A) strong force.
B) weak force.
C) electromagnetic force.
D) gravitational force.

Answer: D
Type: MC
Topic: Fundamental Forces
Accessibility: Keyboard Navigation
Chapter: 02

73) The fundamental force that has the shortest range is the
A) strong force.
B) weak force.
C) electromagnetic force.
D) gravitational force.

Answer: B
Type: MC
Topic: Fundamental Forces
Accessibility: Keyboard Navigation
Chapter: 02

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74) A force of 15.2 N directed along the positive *x*-axis combines with a second force to produce a total force vector of magnitude 17.9 N. What is the magnitude of the second vector?
A) 2.7 N
B) 9.5 N
C) 23.5 N
D) Not enough information is given.

Answer: D
Type: MC
Topic: Graphical Vector Addition
Accessibility: Keyboard Navigation
Chapter: 02

75) A force of 3.8 N directed along the positive *x*-axis combines with a second force directed along the positive *y*-axis to produce a total force vector of magnitude 6.1 N. What is the magnitude of the second vector?
A) 2.7 N
B) 9.5 N
C) 23.5 N
D) 4.8 N
E) Not enough information is given.

Answer: D
Type: MC
Topic: Vector Addition Using Components
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: Adding Vectors Using Components

76) What is the *x*-component of a force vector of magnitude 27.0 N directed at 73° clockwise from the negative *y*-axis?
A) +7.9 N
B) −7.9 N
C) −25.8 N
D) −8.3 N
E) +25.8 N
F) +8.3 N

Answer: E
Type: MC
Topic: Vector Addition Using Components
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: Components of a Vector

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77) The *y*-component of a force vector is −15.0 N, while its magnitude is 27.2 N. Which could be the vector's direction?
A) 61.1° below the +*x*-axis
B) 56.5° below the −*x*-axis
C) 33.5° below the −*x*-axis
D) 28.9° below the +*x*-axis
E) None of the choices are correct.

Answer: C
Type: MC
Topic: Vector Addition Using Components
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: Components of a Vector

78) An airplane flies with a constant speed at an angle of 25 degrees above the horizontal, in a straight line. Which statement below is *not* true?
A) The net force on the plane is zero.
B) The lift is the same magnitude as the weight.
C) The plane has a constant velocity.
D) The thrust is greater in magnitude than the drag.

Answer: B
Type: MC
Topic: Inertia and Equilibrium: Newton's First Law of Motion
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: An Object in Equilibrium Moves with Constant Velocity

79) An airplane flies with a constant speed at an angle of 25 degrees below the horizontal, in a straight line. Which statement below is *not* true?
A) The thrust is greater in magnitude than the drag.
B) The weight is greater in magnitude than the lift.
C) The net force on the plane is zero
D) The plane has constant velocity.

Answer: A
Type: MC
Topic: Inertia and Equilibrium: Newton's First Law of Motion
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: An Object in Equilibrium Moves with Constant Velocity

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80) A box weighing 550 N slides at constant speed across a flat parking lot, under the influence of a stiff wind. The wind applies a force of 155 N parallel to the ground. What is the angle relative to the vertical of the contact force applied by the ground?
A) 75°
B) 74°
C) 90°
D) 16°
E) 15°

Answer: D
Type: MC
Topic: Inertia and Equilibrium: Newton's First Law of Motion
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: An Object in Equilibrium Moves with Constant Velocity

81) A box is pushed across a horizontal table at a constant speed. Of the forces acting, which pair do we know are equal in magnitude because of Newton's third law?
A) The normal force on the box and the weight of the box.
B) The normal force on the box and the normal force on the table from the box.
C) The force of kinetic friction on the box and the external pushing force applied to the box.
D) None of these are interaction pairs.

Answer: B
Type: MC
Topic: Interaction Pairs: Newton's Third Law of Motion
Accessibility: Keyboard Navigation
Chapter: 02

82) A box rests on a frictionless countertop. A boy pushes horizontally to the right on the box, and a girl pushes on it to the left, yet it remains stationary. Which of the following statements is *false*?
A) We know the force of the boy on the box is equal in magnitude to the force of the girl on the box, because the box is in equilibrium.
B) We know the force of the boy on the box is equal in magnitude to the force of the box on the boy, because of Newton's third law.
C) We know the weight and normal force are equal in magnitude because the box is in equilibrium.
D) We know the weight and normal force are equal in magnitude because of Newton's third law.

Answer: D
Type: MC
Topic: Interaction Pairs: Newton's Third Law of Motion
Accessibility: Keyboard Navigation
Chapter: 02

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83) A box is pushed across a horizontal table by a boy applying a force of 32 N to the box. A force of friction of magnitude 19 N acts opposite the direction of motion. A stiff wind also opposes the box's motion. What force does the box exert on the boy's hand?
A) 13 N
B) 32 N
C) 51 N
D) Without knowing the force the wind applies, the question cannot be answered.

Answer: B
Type: MC
Topic: Interaction Pairs: Newton's Third Law of Motion
Accessibility: Keyboard Navigation
Chapter: 02

84) A crate travels through a factory on a straight, horizontal conveyor belt at a constant speed. If air resistance is negligible, what forces are active on the box?
A) Normal force, weight, static friction.
B) Normal force, weight, force of the conveyor belt
C) Normal force, weight, force of the conveyor belt, static friction
D) Normal force and weight.

Answer: D
Type: MC
Topic: Inertia and Equilibrium: Newton's First Law of Motion
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: An Object in Equilibrium Moves with Constant Velocity

85) A crate travels through a factory on a conveyor belt (without slipping) at a constant speed. The conveyer belt is inclined at some non-zero angle above the horizontal. If air resistance is negligible, what forces are active on the box?
A) Normal force, weight, static friction, kinetic friction
B) Normal force, weight, static friction
C) Normal force, weight, static friction, force of the conveyor belt
D) Normal force and weight

Answer: B
Type: MC
Topic: Contact Forces
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: Friction

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86) Your friend applies a horizontal force to your 2.0-kg physics textbook, holding it stationary against a vertical wall. The static and kinetic friction coefficients between the book and the wall are 0.20 and 0.15, respectively. With what force must your friend push on the book in order for it not to slip down the wall?
A) 39 N
B) 20 N
C) 19.6 N
D) 25 N
E) 98 N

Answer: E
Type: MC
Topic: Contact Forces
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: Friction

87) You find a coin resting on your physics book cover and notice that when you open the cover, the coin slips exactly when the cover reaches 25 degrees above the horizontal. What is the coefficient of static friction between the coin and book cover?
A) 2.1
B) 0.91
C) 0.37
D) 0.47
E) The question cannot be answered without knowing the coin's mass.

Answer: D
Type: MC
Topic: Contact Forces
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: Friction

88) Two dogs are pulling on opposite ends of a bone, each with a force of 150 N, in opposite directions along the length of the bone. What is the tension in the bone?
A) 0 N
B) 150 N
C) 300 N
D) More information is needed to answer this question.

Answer: B
Type: MC
Topic: Tension
Accessibility: Keyboard Navigation
Chapter: 02

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89) A mountain climber lies flat on the surface of a glacier (assumed frictionless), which is inclined at 30 degrees to the horizontal. He remains stationary because he is holding on to a rope that is attached to a spike in the ice further up the slope. The rope is parallel to the surface of the ice. If the force of the ice on the climber is 210 N, what is the tension in the rope?
A) 121 N
B) 105 N
C) 182 N
D) 364 N
E) 242 N

Answer: A
Type: MC
Topic: Tension
Accessibility: Keyboard Navigation
Chapter: 02

90) A force of 15.2 N directed along the positive *x*-axis combines with a second force of magnitude 14.8 N and unspecified direction. What is the minimum possible magnitude of the resultant total force?
A) Not enough information is given.
B) 0.4 N
C) 14.8 N
D) 3.5 N
E) 15.0 N
F) 21.2 N

Answer: B
Type: MC
Topic: Graphical Vector Addition
Accessibility: Keyboard Navigation
Chapter: 02

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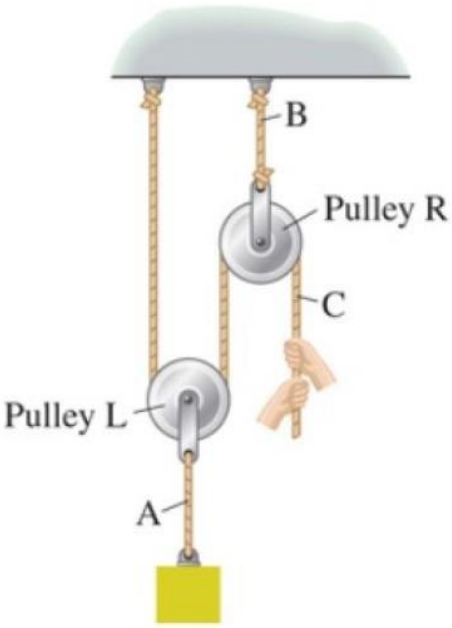
91) A 1.75-kg picture frame is hung on the wall by means of a horizontal string on the back of the frame. The string is attached to screws on the sides of the frame, which are separated by a distance of 37.0 cm. When hung from a nail on the wall, the string is displaced at its center by a vertical distance of 4.00 cm. What is the tension T in the string?
A) 8.6 N
B) 40.6 N
C) 159 N
D) 17.2 N
E) 79.4 N

Answer: B
Type: MC
Topic: Tension
Accessibility: Keyboard Navigation
Chapter: 02

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92) A worker lifts a heavy load using a two-pulley system as in the figure. If the tension in the rope segment labeled A is 1450 N, what are the weight of the load and the force that the worker exerts on the rope, respectively?



A) 363 N, 725 N
B) 725 N, 363 N
C) 1450 N, 725 N
D) 1450 N, 1450 N
E) Insufficient information is given to answer this question.

Answer: C
Type: MC
Topic: Tension
Accessibility: Keyboard Navigation
Chapter: 02

93) The fundamental force that is the principal cause of what we experience as friction is the
A) gravitational force
B) electromagnetic force
C) weak force
D) strong force

Answer: B
Type: MC
Topic: Fundamental Forces
Accessibility: Keyboard Navigation
Chapter: 02

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94) The static friction force on an object
A) can never be greater than the kinetic friction force on it under the same circumstances.
B) can never accelerate the object.
C) can never be greater than the normal force on it.
D) can never be greater than the object's weight.
E) None of the choices are correct.

Answer: E
Type: MC
Topic: Contact Forces
Accessibility: Keyboard Navigation
Chapter: 02
Subtopic: Friction

95) Two objects attract each other gravitationally. If the distance between their centers doubles, the gravitational force
A) is a half.
B) doubles.
C) is a fourth.
D) quadruples.

Answer: C
Type: MC
Topic: Gravitational Forces
Accessibility: Keyboard Navigation
Chapter: 02

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