Chapter 02
Force

Multiple Choice Questions

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

Section: 02.01 Force

2. A person weighs 146 pounds. The person's weight is (1 lb = 4.45 N)
A. 445 N.
B. 500 N.
C. 584 N.
D. 650 N.

Section: 02.01 Force

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

Section: 02.01 Force

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 are true?
A. object A and object B experience an electrical interaction
B. object A and object C experience a gravitational interaction
C. object C experiences an electrical interaction with itself
D. object A and object C experience an electrical interaction
E. object A and object B experience a gravitational interaction

Section: 02.01 Force

5. Three objects experience interactions. Object A has mass, object B has electrical charge, and object C has both mass and electrical charge. Object A and object B have a rope connected between them. Which of the following statements are true?
A. the electrical force on A due to B has the same magnitude as the gravitational force on B due to A
B. the gravitational force on C due to A has the same magnitude as the gravitational force on A due to C
C. the rope force on A due to B has the same magnitude as the electrical force on B due to A
D. the rope force on B due to A has the same magnitude as the gravitational force on A due to C

Section: 02.01 Force

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

Section: 02.01 Force

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

Section: 02.01 Force

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

Section: 02.01 Force

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

Section: 02.01 Force

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

Section: 02.01 Force

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.

Section: 02.01 Force

12. A rock of weight 17.5 N is immersed in a beaker of water while suspended from a spring scale with a reading of 9.00 N. The weight of the beaker and water together is 23.5 N. What is the net force of the beaker on the table?
A. 17.5 N
B. 23.5 N
C. 2.0 N
D. 41.0 N

Section: 02.02 Net Force

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

Section: 02.02 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 and 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

Section: 02.02 Net Force

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?

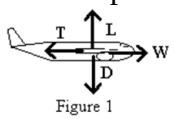


Figure 1

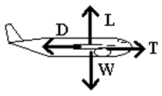


Figure 2

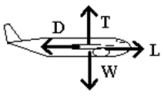


Figure 3

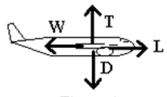


Figure 4

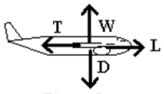


Figure 5

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

Section: 02.02 Net Force

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 wing. 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

Section: 02.02 Net Force

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 wing. 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

Section: 02.02 Net Force

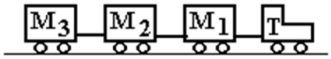
18. The net force on a moving object suddenly becomes zero. The object then
A. stops abruptly.
B. stops during a short time interval.
C. changes direction.
D. continues at constant velocity.
E. slows down gradually.

Section: 02.02 Net Force

19. A freight train consists of an engine and several identical cars on a 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 friction

Section: 02.02 Net Force

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. 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?



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

Section: 02.02 Net Force

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.

Section: 02.02 Net Force

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

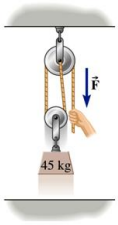
Section: 02.02 Net Force

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.

Section: 02.02 Net Force

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

Section: 02.02 Net Force

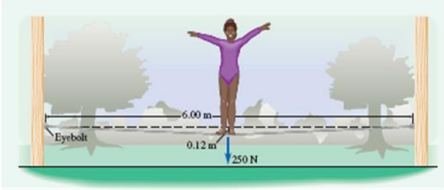
25. A force of 15 N toward the WEST is applied to a 4.0 kg box. Another force of 42 N toward the EAST is also applied to the 4.0 kg box. The net force on the 4.0 kg box is
A. 57 N toward the WEST.
B. 27 N toward the EAST.
C. 36 N toward the WEST.
D. 36 N toward the EAST.
E. 17 N toward the WEST.

Section: 02.02 Net Force

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

Section: 02.03 Vector Addition

27. Diane (weight 255 N) is practicing on a tightrope that is 6.00 meters long and sags by 0.120 meters. When she is in the middle of the rope, what is the force 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

Section: 02.03 Vector Addition

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

Section: 02.03 Vector Addition

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

Section: 02.03 Vector Addition

30. Given that a force vector extends from the origin to (120 N, -60.0 N), find the magnitude of the vector.
A. 140 N
B. 134 N
C. 180 N
D. 60.0 N

Section: 02.03 Vector Addition

31. Given that a force vector extends from the origin to (120 N, -60.0 N), find the direction of the vector referenced to the positive x-axis.
A. 116°
B. 26.6°
C. -26.6°
D. 122°

Section: 02.03 Vector Addition

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 and angle of -120° with the positive x-axis. What is the magnitude of the vector sum of $A + B$?
A. 1.0 units
B. 6.1 units
C. 4.0 units
D. -6.8 units

Section: 02.03 Vector Addition

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 and angle of -120° with the positive x-axis. What is the direction of the vector sum of *A* + *B* referenced to the positive x-axis?
A. -107°
B. 55°
C. -55°
D. -145°

Section: 02.03 Vector Addition

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

Section: 02.04 Inertia and Equilibrium

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

Section: 02.04 Inertia and Equilibrium

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 action-reaction pairs
B. the gravitational force on the rock due to the earth and the contact force on the earth due to the rock are action-reaction pairs
C. the contact force on the earth due to the rock and the gravitational force on the earth due to the rock are action-reaction pairs
D. the gravitational force on the earth due to the rock and the contact force on the earth due to the rock are action-reaction pairs
E. the contact force on the earth due to the rock and the contact force on the rock due to the earth are action-reaction pairs

Section: 02.05 Interaction Pairs

37. A mass sits at rest on top of a table. Which two forces are action-reaction 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 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 contact force on the mass due to the table and the force of gravity on the earth due to the mass
E. the force of gravity on the mass due to the earth and the contact force on the mass due to the table

Section: 02.05 Interaction Pairs

38. Third law 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.

Section: 02.05 Interaction Pairs

39. The gravitational field on the surface of the earth is ($G = 6.67 \times 10^{-11}$ N m^2/kg^2, mass of the earth is 5.98×10^{24} kg, radius of the earth is 6.38×10^6 meters)
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.

Section: 02.06 Gravitational Forces

40. The gravitational field at a satellite that is orbiting about the earth at an altitude of 5,000 km is ($G = 6.67 \times 10^{-11}$ N m^2/kg^2, the mass of the earth is 5.98×10^{24} kg)
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.

Section: 02.06 Gravitational Forces

41. The gravitational field at the moon due to the earth is (the mass of the earth is 5.98×10^{24} kg, 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.

Section: 02.06 Gravitational Forces

42. The gravitational field at the earth due to the moon is (the mass of the moon is 7.35×10^{22} kg, the distance to the moon is 3.85×10^{8} m)
A. 2.90×10^{-5} N/kg toward the moon.
B. 3.31×10^{-5} N/kg away from the earth.
C. 4.01×10^{-5} N/kg toward the moon.
D. 5.91×10^{-5} N/kg away from the earth.
E. 7.50×10^{-5} N/kg toward the moon.

Section: 02.06 Gravitational Forces

43. The moon with a mass of 7.35×10^{22} kg is orbiting about the earth with a mass of 5.98×10^{24} kg at a radius of 3.85×10^{8} meters. The earth is orbiting about the sun with a mass of 1.99×10^{30} kg at a radius of 1.50×10^{11} meters. The gravitational field on the moon due to the earth and the sun when it is between them is ($G = 6.67 \times 10^{-11}$ 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. 3.21x 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.

Section: 02.06 Gravitational Forces

44. The moon with a mass of 7.35×10^{22} kg is orbiting about the earth with a mass of 5.98×10^{24} kg at a radius of 3.85×10^{8} meters. 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.

Section: 02.06 Gravitational Forces

45. An object with a mass of 200.0 kg is 500.0 Km above the surface of the earth. The force of gravity on the 200.0 kg mass is ($G = 6.67 \times 10^{-11}$ N m^2/kg^2, radius of the earth is 6.38×10^6 m, mass of 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.

Section: 02.06 Gravitational Forces

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. 1.62×10^{-7} N
C. 1.62×10^{-6} N
D. 1.67×10^{-5} N
E. 1.67×10^{-4} N

Section: 02.06 Gravitational Forces

47. What is the gravitational force between two nuclei, each of mass 3.20×10^{-27} and separated by a distance of 10.6×10^{-11} 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

Section: 02.06 Gravitational Forces

48. The weight of a 1.00 kg on the surface of the moon is ($G = 6.67 \times 10^{-11}$ N m^2/kg^2, R of the moon is 1.74×10^6 m, 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.

Section: 02.06 Gravitational Forces

49. The tallest 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?
A. 0.0030 m/s^2
B. 0.020 m/s^2
C. 0.035 m/s^2
D. 0.025 m/s^2
E. 0.030 m/s^2

Section: 02.06 Gravitational Forces

50. The moon with a mass of 7.35×10^{22} kg is orbiting about the earth with a mass of 5.98×10^{24} kg at a radius of 3.85×10^8 meters. The earth is orbiting about the sun with a mass of 1.99×10^{30} kg at a radius of 1.50×10^{11} meters. The force of gravity on the moon when it is between the earth and the sun is ($G = 6.67 \times 10^{-11}$ 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.

Section: 02.06 Gravitational Forces

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

Section: 02.06 Gravitational Forces

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 solid objects.
E. the net force acting on a system.

Section: 02.07 Contact Forces

53. A mass sits at rest on top of a table. Which two forces that are not action-reaction pair forces 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

Section: 02.07 Contact Forces

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.

Section: 02.07 Contact Forces

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

Section: 02.07 Contact Forces

56. A 750 N box moves at a constant velocity on a floor with a coefficient of static friction = 0.800 and coefficient of kinetic friction = 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

Section: 02.07 Contact Forces

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.

Section: 02.07 Contact Forces

58. A block is at rest on a wooden ramp. The coefficient of static friction between the block and ramp is 0.35. What is the angle between the ramp and the horizontal direction when the box first begins to slide?
A. 17°
B. 19°
C. 29°
D. 20°
E. 22°

Section: 02.07 Contact Forces

59. A 750 N box rests on a floor with a coefficient of static friction = 0.800 and coefficient of kinetic friction = 0.600. What is the force of friction if a horizontal force of 550 N is applied to the box?
A. 600 N
B. 450 N
C. 750 N
D. 550 N
E. 440 N

Section: 02.07 Contact Forces

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

Section: 02.07 Contact Forces

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

Section: 02.07 Contact Forces

62. In order to slide a 70.0 kg box across the floor at a constant speed, you must push horizontally with a force of 351 N. What is the coefficient of kinetic friction?
A. 0.149
B. 0.584
C. 0.337
D. 0.512
E. 0.678

Section: 02.07 Contact Forces

63. A force of 451 N is applied to 111 kg box that has a coefficient of static friction of 0.450. What is the force of friction on the box?
A. 490 N
B. 0.00 N
C. 108 N
D. 451 N
E. 203 N

Section: 02.07 Contact Forces

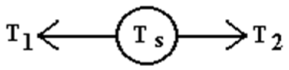
64. A 90.0 N crate of apples sits at rest on a ramp that runs from the ground to the bed of a truck. The ramp is inclined at 20° to the ground. What is the force exerted on the crate by the ramp?
A. 86.9 N
B. 84.6 N
C. 75.8 N
D. 30.8 N
E. 38.5 N

Section: 02.07 Contact Forces

65. Using an angle of 30° to supply the force required to slide a box along a floor with a coefficient of friction of 0.30, which would require the least force to move it?
A. pull it with a rope
B. push it
C. either push or pull
D. not enough information to solve

Section: 02.07 Contact Forces

66. A rope is connected to a scale on the left and exerts a force T_1 and a rope is connected to the same 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.

Section: 02.08 Tension

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

Section: 02.08 Tension

68. A sled weighs 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 if 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

Section: 02.08 Tension

69. A sled weighs 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 if 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

Section: 02.08 Tension

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.

Section: 02.09 Fundamental Forces

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

Section: 02.09 Fundamental Forces

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.

Section: 02.09 Fundamental Forces

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

Section: 02.09 Fundamental Forces

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.

Section: 02.03 Vector Addition

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. Not enough information is given.

Section: 02.03 Vector Addition

76. A force of 3.8N 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 6.1N. 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.

Section: 02.03 Vector Addition

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^{o} below the +x axis
B. 56.5^{o} below the -x axis
C. 33.5^{o} below the -x axis
D. 28.9^{o} below the +x axis
E. None of the choices are correct.

Section: 02.03 Vector Addition

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

Section: 02.04 Inertia and Equilibrium

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

Section: 02.04 Inertia and Equilibrium

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 surface of the parking lot. What is the angle relative to the vertical of the contact force applied by the ground.
A. 15^o
B. 16^o
C. 74^o
D. 75^o
E. 90^o

Section: 02.04 Inertia and Equilibrium

81. A box is pushed across a horizontal table at constant speed. Of the forces on it, which pair do we know are equal in magnitude because of Newton's 3rd Law?
A. Normal force on the box and the weight of the box.
B. Normal force on the box and the normal force on the table by the box.
C. The force of kinetic friction on the box and the force applied to the box by the one pushing it.
D. None of these are 3^{rd} Law pairs.

Section: 02.05 Interaction Pairs

82. A box sits on a countertop, stationary. 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 that of the box on the boy because of Newton's third law.
B. We know the weight and normal force are equal in magnitude 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 force of the boy on the box is equal in magnitude to that of the girl on the box because the box is in equilibrium.

Section: 02.05 Interaction Pairs

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. 19 N
C. 51 N
D. Without knowing the force the wind applies, the question cannot be answered.

Section: 02.05 Interaction Pairs

84. A crate travels through a factory on a 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.

Section: 02.07 Contact Forces

85. A crate travels through a factory on a conveyor belt that is inclined at some non-zero angle above the horizontal at a constant speed. If air resistance is negligible, what forces are active on the box?
A. Normal force and weight
B. Normal force, weight, static friction, force of the conveyor belt
C. Normal force, weight, static friction, kinetic friction.
D. Normal force, weight, static friction

Section: 02.07 Contact Forces

86. Your friend applies a horizontal force to your 2.0 kg physics textbook, which rests stationary against a vertical wall. The static and kinetic friction coefficients between the book and the wall are 0.20 and 0.25, respectively. With what force must your friend push on the book in order that it doesn't slip down the wall?
A. 2.5 N
B. 3.9 N
C. 4.9 N
D. 2.0 N
E. 19.6 N

Section: 02.07 Contact Forces

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 friction between the coin and book cover?
A. 2.0 N
B. 2.5 N
C. 3.9 N
D. 4.9 N
E. The question cannot be answered without knowing the coin's mass.

Section: 02.07 Contact Forces

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.

Section: 02.08 Tension

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

Section: 02.08 Tension

90. 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.

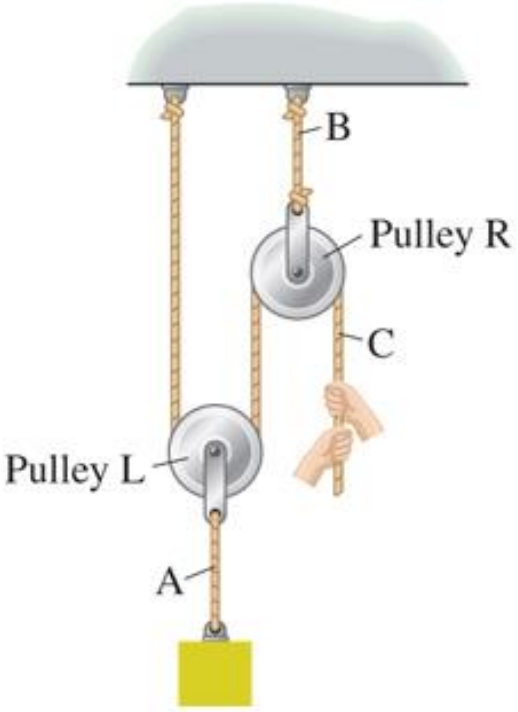
Section: 02.08 Tension

91. A 1.75 kg picture frame is hung on the wall by means of a string. The string is attached to the corners of the picture frame and makes an isosceles triangle with height 4.00 cm and base 37.0 cm. What is the tension T in the string?

A. 80.0 N
B. 17.2 N
C. 79.4 N
D. 8.6 N
E. 159 N

Section: 02.08 Tension

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 725 N, what are the weight of the load attached to rope segment A and the force that the worker exerts on the rope segment C, respectively?



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

Section: 02.08 Tension

93. The fundamental force that is the principal cause of what we experience as frictional forces is:
A. strong force
B. electromagnetic force
C. weak force
D. gravitational force

Section: 02.09 Fundamental Forces

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.

Section: 02.07 Contact Forces