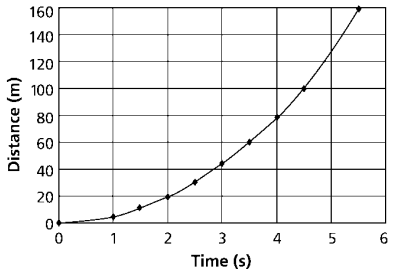
Q2 Study Guide

Multiple Choice
Identify the choice that best completes the statement or answers the question.

____ 1. During a science experiment, a student dropped a metal ball from a height of 150 m. The graph shows the distance the metal ball traveled from its initial position to where it hit the ground.



What information does the graph give you about the speed of the metal ball over time?

A. The ball travels at a constant speed.
B. The speed of the ball increases over time.
C. The speed of the ball decreases over time.
D. The speed of the ball increases at first, and then decreases as time increases.

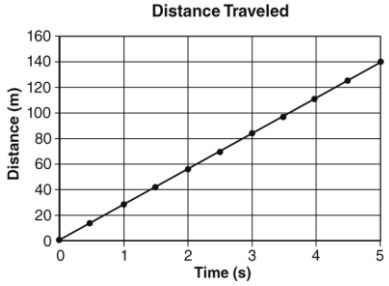
____ 2. In a swimming race, Miho swam the first 50 m in 42 s. She swam the second 50 m in 40 s. What was Miho's average speed during the race?

A. 0.82 m/s
B. 1.19 m/s
C. 1.22 m/s
D. 1.25 m/s

____ 3. An elevator traveled 15 floors (150 ft) at a speed of 4.5 m/s. What additional information is needed to determine the velocity of the elevator?

A. the direction the elevator traveled
B. how long the elevator was stationary
C. how many times the elevator stopped
D. the total mass of the elevator plus anything in it

____ 4. The graph below shows the distance a car traveled in 5 seconds while moving on a freeway.



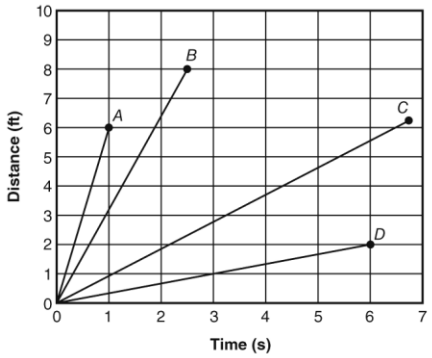
What was the car's average speed?

A. 0 m/s
B. 14 m/s
C. 28 m/s
D. 30 m/s

____ 5. Three runners compete in a 400-m race on an oval-shaped running track. At a certain time, one runner is 15 m behind the finish line. Which term describes the finish line?

A. total distance
B. relative motion
C. reference point
D. change in position

____ 6. A student allowed four different objects to roll down a ramp. He measured the distance each object rolled and the time until each object came to a stop. He plotted each point and connected it with a line from origin of the graph.



Which object had the greatest average speed?

A. object *A*
B. object *B*
C. object *C*
D. object *D*

____ 7. Montez read that bobcats can reach speeds of up to 30 mi/h. What does the speed of a bobcat indicate?

A. the time it takes to reach its maximum speed
B. the total amount of time it travels in one direction
C. the distance it travels to move between two points
D. the distance it can travel in a certain amount of time

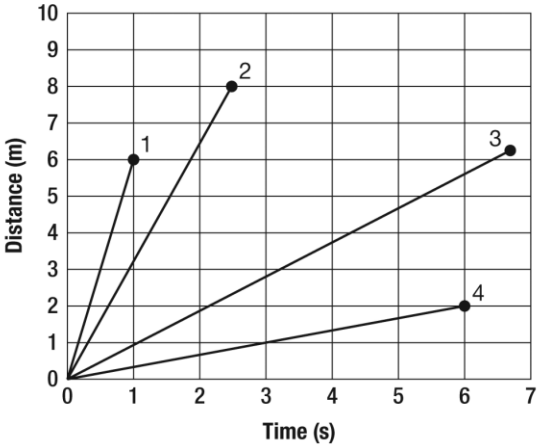
____ 8. Which two measurements are needed to determine the speed of an object?

A. position and time
B. distance and time
C. position and direction
D. distance and direction

____ 9. An airplane leaves New York to fly to Los Angeles. It travels 3,850 km in 5.5 hours. What is the average speed of the airplane?

A. 700 km
B. 700 hours
C. 700 km/hour
D. 7000 hours/km

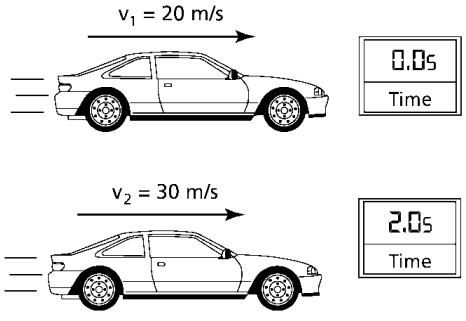
____ 10. This distance-time graph shows the speeds of four toy cars.



Which car is the fastest?

A. Car 1
B. Car 2
C. Car 3
D. Car 4

____ 11. Rheka conducted an experiment with a radio-controlled toy car. The sketches show her findings.



What is the average acceleration of the car?

A. 5 m/s^2
B. 10 m/s^2
C. 15 m/s^2
D. 20 m/s^2

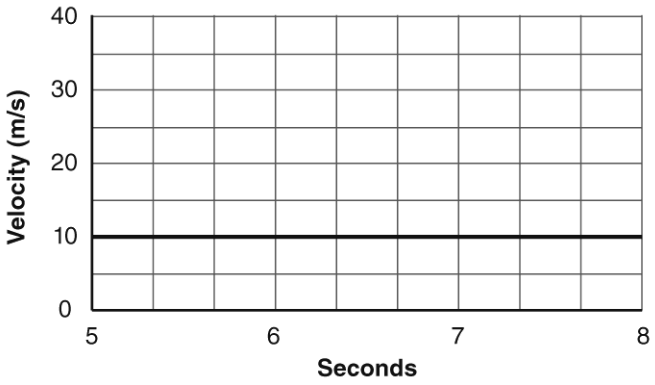
____ 12. A car travels in a straight line. The driver applies the brakes and comes to an abrupt stop. During braking, what happens to the velocity and acceleration vectors?

A. They point in opposite directions.
B. They point in the same direction.
C. They are at right angles to each other.
D. They create centripetal acceleration.

____ 13. Measuring acceleration requires appropriate units. Which are the SI units for acceleration?

A. N
B. m/s
C. m/s^2
D. kg·m/s

____ 14. Katrina rode her bicycle to the library. The following graph shows part of Katrina's ride after she started.



What was Katrina's acceleration during the time represented on the graph?

A. The acceleration was zero.
B. The acceleration was 10 m/s.
C. The acceleration was 10 m/s^2.
D. The acceleration was 3.3 m/s^2.

____ 15. How can you find the average acceleration of an object?

A. Multiply its mass by its speed.
B. Divide its distance by the time it took to travel that distance.
C. Subtract the final position from the initial position and multiply by change in time.
D. Subtract the initial velocity from the final velocity and then divide by the change in time.

____ 16. Which is an example of centripetal acceleration?

A. an object at rest
B. an object moving in a circle at 20 m/s
C. an object moving at 20 m/s backward, then 20 m/s to the right
D. an object moving in a straight line at a steady speed of 20 m/s forward

____ 17. An experimenter records data for the speed and time of rolling carts. Four different trials were conducted. The table shows the data for all four trials.

	Trial 1	Trial 2	Trial 3	Trial 4
Time (s)	**Speed (m/s)**	**Speed (m/s)**	**Speed (m/s)**	**Speed (m/s)**
0	2	4	10	1
1	5	4	9	2
2	10	4	8	8
3	15	4	7	20

In all trials, the cart accelerated. In three of the trials, the cart moved in a straight line. In which trial did the cart experience centripetal acceleration?

A. trial 1
B. trial 2
C. trial 3
D. trial 4

____ 18. Which of the following describes an object moving in a circle steadily?

A. change in speed only
B. change in direction only
C. no change in speed or direction
D. change in speed and change in direction

____ 19. Which term describes the tendency of a moving object to continue moving at the same velocity unless an unbalanced force acts on it?

A. inertia
B. friction
C. gravity
D. acceleration

____ 20. An index card is placed across the top of a drinking glass. A coin is then placed on top of the index card. A student quickly flicks the card sideways off the glass. Which of the following explains why the coin falls into the glass rather than moving to the side with the index card?

A. Newton’s first law of motion
B. Newton’s second law of motion
C. Newton’s third law of motion
D. Newton’s law of universal gravitation

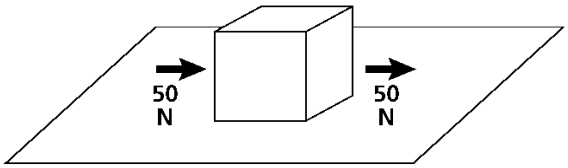
____ 21. Which of the following is an example of a force that acts at a distance?

A. An airplane experiences friction as it moves through air.
B. A book experiences a normal force as it rests on a table.
C. A soccer ball experiences a force as it is kicked across a field.
D. A magnet is pushed away when it is brought near the end of another magnet.

____ 22. Why is the magnetic force considered to be an action-at-a-distance force?

A. Magnets must be far apart in order to exert a force.
B. Magnets do not have to touch each other to experience a force.
C. Magnets push each other apart to increase the distance between them.
D. Magnets must be large in size in order to exert a force that is strong enough to notice.

____ 23. A box of books is on the floor. The following picture shows a push and a pull acting on the box.



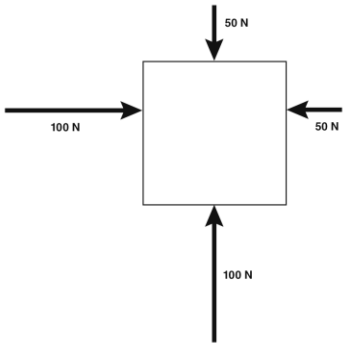
What is the net force toward the right on the box?

A. 0 N
B. 50 N
C. 100 N
D. 2,500 N

____ 24. Jessica has two balls. One ball has a mass of 1 kg. The other ball has a mass of 2 kg. She pushes each with a force of 100 N. How does the acceleration of the two balls compare?

A. The 1-kg ball accelerates the same as the 2-kg ball.
B. The 1-kg ball accelerates half as much as the 2-kg ball.
C. The 1-kg ball accelerates twice as much as the 2-kg ball.
D. The 1-kg ball accelerates four times as much as the 2-kg ball.

____ 25. Imagine a box floating in space. The following picture shows all the forces acting on this box.



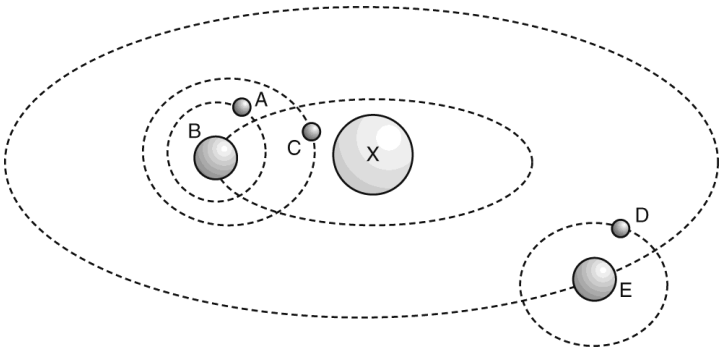
What is the vertical force on this box?

A. 50 N upward
B. 100 N upward
C. 50 N downward
D. 100 N downward

____ 26. A moving object collides with a stationary object. Which of the following statements is true according to Newton's third law of motion?

A. Each object exerts a force on the other, and the two forces are equal and in opposite directions.
B. Each object exerts a force on the other, and the two forces are the same in magnitude and direction.
C. Each object exerts a force on the other, and the two forces are proportional to the masses of the objects.
D. The moving object exerts a force on the stationary object, but the stationary object does not exert a force on the moving object.

____ 27. The dotted lines in the following picture show orbital paths of objects.



Which statement is true about all of the orbits shown?

A. The force of gravity is what holds each object in its orbit.
B. The size of an object determines the size of its orbit.
C. The size of both an object and the object it orbits are equal.
D. All orbiting objects follow an elliptical orbital path.

____ 28. What is gravity?

A. the force that pushes all objects toward Earth
B. the force that pulls all objects toward one another
C. a magnetic force that is strongest at Earth's poles
D. a stream of charged particles from the sun to Earth

____ 29. What is true of an object that is in free fall?

A. No forces are acting on it.
B. Only the force of gravity is accelerating it.
C. The forces of thrust and gravity balance one another.
D. The forces of air resistance and gravity balance one another.

____ 30. A skydiver jumps out of a plane. She falls downward at a very fast speed. When she opens her parachute, she slows down. What force pulled the skydiver to the ground?

A. friction
B. gravity
C. air resistance
D. parachute pull

____ 31. The following objects are placed 1 meter apart.

Which of the following is true of this scenario?

A. The gravitational force between the two objects is very strong because they are so close together.
B. The gravitational force between the two objects is very weak because their masses are so small.
C. No gravitational force exists between the two objects because they are not touching.
D. No gravitational force exists between the two objects because their masses are so small.

____ 32. Which of the following would exert the greatest gravitational force on a body?

A. a bar magnet
B. a molecule
C. a person
D. a planet

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B. a molecule
C. a person

D. a planet

____ 35. A fluid exerts 500 N of force over an area that measures 0.5 m^2. What is the pressure by exerted the fluid?

A. 250 Pa
B. 750 Pa
C. 1,000 Pa
D. 2,000 Pa

____ 36. Which of the following is air that moves from regions of high pressure to regions of low pressure?

A. rain
B. wind
C. snow
D. clouds

____ 37. A buoyant force allows a whale to float in ocean water. Which phenomenon causes the buoyant force?

A. Pressure increases as ocean depth increases.
B. Air above the ocean exerts a force on the water.
C. The temperature of ocean water decreases with depth.
D. The whale displaces a volume of water equal to its own volume.

____ 38. A student submerges a cube in a container of water. How can the student determine the buoyant force on the cube?

A. Determine the mass of the cube.
B. Calculate the volume of the cube.
C. Measure the weight of the water displaced by the cube.
D. Subtract the density of water from the density of the cube.

____ 39. A weather forecaster is determining the air pressure in order to describe the weather conditions. What characteristic of air is the weather forecaster analyzing?

A. how warm or cold the air is
B. the force it exerts on a given area
C. the amount of space between individual particles
D. how quickly the air is moving from one region to another

____ 40. Which of the following substances is not a fluid?

A. air
B. iron
C. water
D. helium gas

____ 41. Which statement about fluid pressure is true?

A. Areas of low pressure spin around regions of high pressure.
B. Areas of low pressure are warmer than areas of high pressure.
C. Fluids move from areas of low pressure to areas of high pressure.
D. Fluids move from areas of high pressure to areas of low pressure.

____ 42. The pressure produced by a fluid is 20 Pa. If the area over which the pressure is measured is 100 m^2, what is the force exerted by the fluid?

A. 2 N
B. 20 N
C. 200 N
D. 2,000 N

____ 43. Why might a submarine be crushed if it sinks too low in the ocean?

A. Water pressure increases with depth.
B. Temperature drops as depth increases.
C. Water becomes less dense at lower depths.
D. Sunlight is not able to reach deep parts of the ocean.

____ 44. Which example results from a difference in fluid pressure?

A. A child drinks milk through a straw.
B. A volleyball player hits a ball over a net.
C. An ice skater moves backward after pushing on a wall.
D. An orange falls down from the tree branch on which it was growing.

____ 45. What term describes the energy that is stored due to the height of an object from the ground?

A. kinetic energy
B. chemical energy
C. mechanical energy
D. gravitational potential energy

____ 46. Three children are lined up to run a 50-meter race. The children all weigh the same. They start running at the same speed, but child 1 runs fastest over the final 10 meters and crosses the finish line first. What is true about the kinetic energy of child 1 at the moment she crosses the finish line?

A. It is less than that of the other two children.
B. It is the same as that of the other two children.
C. It is greater than that of the other two children.
D. Child 1 has no kinetic energy at the moment she crosses the finish line.

____ 47. Two soccer balls are rolling across a field. Ball 1 has a mass of 1.0 kg, and ball 2 has a mass of 1.5 kg. Ball 1 is traveling at a speed of 4.0 m/s, and ball 2 is traveling at a speed of 5.0 m/s. What is the difference in kinetic energy between ball 1 and ball 2?

A. The kinetic energy is equal for both balls.
B. The kinetic energy of ball 1 is 8 J greater than ball 2.
C. The kinetic energy of ball 2 is 10.75 J greater than ball 1.
D. The kinetic energy of ball 2 is 18.75 J greater than ball 1.

____ 48. Which of the following has elastic potential energy?

A. a vase sitting on a shelf

B. a stretched rubber band
C. a child moving down a slide
D. sugars stored in the molecules of food

____ 49. How is the energy in the food we eat an example of chemical potential energy?

A. It isn't; food stores kinetic energy.
B. It isn't; chemical potential energy is only found in fossil fuels.
C. Food is broken down and then moves through the digestive system.
D. The chemical bonds in the food store energy that is released when we eat it.

____ 50. A child has a mass of 35 kg. The child is running across a field and has a speed of 3 m/s^2. What is the kinetic energy of the child?

A. 315 J
B. 157.5 J
C. 52.5 J
D. There is not enough information to determine the kinetic energy.

____ 51. Which of the following has the most kinetic energy?

A. a 25-kg fish tank sitting on a table
B. a 50-g fish swimming in a fish tank
C. a 7,500-kg car parked on a steep hill
D. a 50-kg boulder suspended from a cliff

____ 52. A child pushes a toy car down a hill. The child has a mass of 20 kg. The car has a mass of 1.6 kg and a speed of 7.4 m/s^2. When the car has a gravitational potential energy of 30 J, what is the mechanical energy of the car?

A. 13.8 J
B. 43.8 J
C. 73. 8 J
D. There is not enough information to compute the mechanical energy of the car.

____ 53. Which of the following is an example of the conversion of kinetic energy into gravitational potential energy?

A. a person parachuting out of an airplane
B. a car racing around an oval track
C. a person skiing down a hill
D. a person walking up a hill

____ 54. A student uses a simple machine to help lift a load. When 40 N of input force is applied to the machine, it is able to lift 160 N. What is the mechanical advantage of the machine?

A. 3
B. 4
C. 40
D. 160

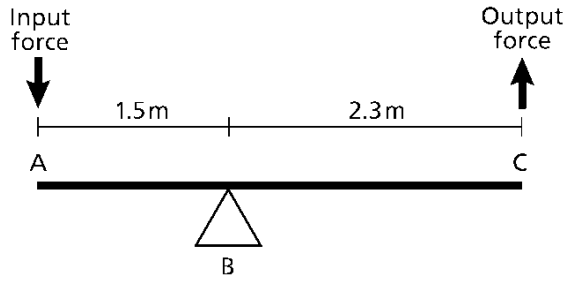
____ 55. A fixed pulley has a mechanical advantage of 1. Why are fixed pulleys useful machines?

A. The output force is greater than the input force.
B. They decrease overall work.
C. They make the load lighter.
D. They change the direction of the force.

____ 56. Which is the correct way to calculate the ideal mechanical advantage of a wheel and axle if the input force is applied to the wheel?

A. divide the radius of the axle by the radius of the wheel
B. divide the radius of the wheel by the radius of the axle
C. multiply the radius of the wheel by the radius of the axle
D. subtract the radius of the axle from the radius of the wheel

____ 57. The diagram below shows a type of lever, with several features labeled.

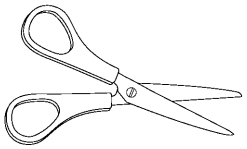


How would you determine the ideal mechanical advantage of the lever?

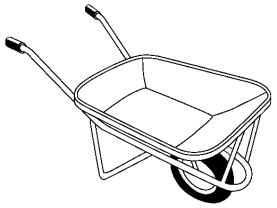
A. divide 1.5 m by 2.3 m
B. divide 2.3 m by 1.5 m
C. multiply 2.3 m by 1.5 m
D. subtract 1.5 m from 2. 3 m

____ 58. The images below show three common devices that are examples of simple machines.

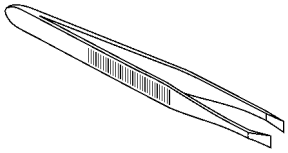
A



B



C



Why are scissors considered a first class lever?

A. They aren't. Scissors are a third class lever.
B. They aren't. Scissors are a second class lever.
C. The fulcrum is between the input force (applied at the handles) and output force (applied to the blades).
D. The input force (applied at the handles) is between the fulcrum and the output force (applied to the blades).

____ 59. A worker moves a heavy load into a house with the aid of an inclined plane. If the plane has a length of 6.2 meters and a height of 1.7 meters, what is its ideal mechanical advantage?

A. 3.65
B. 7.9
C. 10.54
D. 0.27

____ 60. A worker moves a heavy load into a house with the aid of an inclined plane. If the plane has a length of 6.2 meters and an ideal mechanical advantage of 3.65, what is the height of the inclined plane?

A. 1.7 m
B. 3.65 m
C. 9.85 m
D. 22.6 m

____ 61. A friend told you about a new pulley she used to lift some objects. She said, "The best part is it makes me do less work." What should you say to your friend to help correct this statement?

A. Nothing, the statement is already correct.
B. Machines don't make you do less work, they make you do more work.
C. Machines don't make you do less work, but they can change the way the work is done.
D. Machines do make you do less work, and they also help you do it in a shorter amount of time.

____ 62. Screw 1 and screw 2 are identical in every way but the distance between their spiral treads. The treads are closer together on screw 1 and farther apart on screw 2. Which screw provides the greater mechanical advantage?

A. screw 1, because the treads are closer together
B. screw 2, because the treads are farther apart

C. Because both screws have spiral treads, they both have the same mechanical advantage.
D. Because both screws are the same length, they both have the same mechanical advantage.

____ 63. A ramp is an example of which type of simple machine?

A. a lever
B. a wheel and axle
C. an inclined plane
D. a block and tackle pulley

____ 64. A faucet is an example of a simple machine, a wheel and axle. The faucet wheel has a radius of 5 cm. The axle has a radius of 0.5 cm. The input force is applied to the faucet wheel. What is the mechanical advantage of this simple machine?

A. 0.1
B. 1
C. 5
D. 10

____ 65. Consider the following two situations:
1. A girl kicks a ball across a field.
2. A boy holds a suitcase by his side.
Which of the following responses is correct about the two situations?

A. Work is done is both situations.
B. No work is done in either situation.
C. Work is done in the first situation, but not the second.
D. Work is done in the second situation, but not the first.

____ 66. The table shows different forces and distances that employees in a factory used to lift boxes.

Employee	Force (N)	Distance (m)
Ayanna	24	1.5
Rafael	18	2.5
Cassie	25	1.0
Michael	16	2.0

Which employee did the most work while lifting boxes?

A. Cassie
B. Rafael
C. Ayanna
D. Michael

____ 67. A lightbulb uses 2,000 J of energy in 1 min and 20 s. What is the power of the lightbulb?

A. 25 W
B. 50 W
C. 60 W

D. 100 W

____ 68. Which of the following is an example of energy being used to do work?

A. A woman sits on the edge of a bench.
B. A soccer ball rests at the top of a hill.
C. A boy holds a fishing pole over the water.
D. A girl climbs up a ladder holding a paint can.

____ 69. Dr. Hernandez and Dr. Osman measure the power of a new type of lightbulb. Both researchers find the energy measurement as 90 J for a time of 30 s. However, Dr. Hernandez determines that the power is 3 J/s, and Dr. Osman says that the power is 2700 J/s. Why do the results differ?

A. Dr. Osman has an incorrect numerical value but a correct unit.
B. Dr. Hernandez has the correct numerical value but an incorrect unit.
C. The units are correct for Dr. Osman's results but Dr. Hernandez divided the units instead of multiplying them.
D. The units are correct for Dr. Hernandez's results but Dr. Osman multiplied the units instead of dividing them.

____ 70. A group of wind turbines operates in an open field. Which statement about the wind turbines is true?

A. The wind turbines produce movement of air that does work.
B. The wind turbines do work by using electricity to produce power.
C. The wind turbines cannot do work because they are fixed in one spot.
D. The wind turbines do work generating electricity by harnessing wind energy.

____ 71. A student is planning a camping trip and wants to take a few electronic devices along. Her flexible portable solar panel converts electromagnetic energy from the sun into electrical energy at a rate of 21,600 J/h. Which devices could she charge with it at one time?

Device	Power Needed
Cell phone charger	2 W
PDA charger	5 W
AA/AAA battery charger	7 W

A. all three devices
B. the AA/AAA battery charger
C. both the cell phone charger and the PDA charger together
D. the PDA charger or the cell phone charger separately, but not both together

____ 72. Four movers pushed different boxes across a floor for the same distance. The table shows how much force each mover used, the time it took to move the box, and the mass of the box.

Mover	Force (N)	Time (s)	Mass of Box (kg)

Akira	155	5	15
Maddie	120	10	15
Jayden	90	3	18
Hamid	160	10	22

Which mover did the least work moving a box?

A. Akira
B. Hamid
C. Jayden
D. Maddie

____ 73. A girl uses 60 J of energy to move a box from the floor to a shelf. How much power does she use if it takes her 3 s to move the box?

A. 15 W
B. 20 W
C. 90 W
D. 180 W

____ 74. A girl uses 60 J of energy to move a box from the floor to a shelf. If she uses 20 W of power to move the box, how many seconds did it take her to move the box?

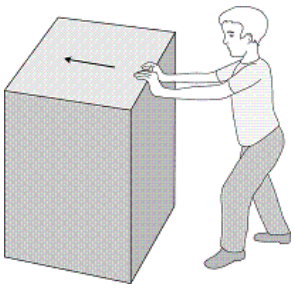
A. 2
B. 3
C. 30
D. 120

____ 75. Energy is the ability to do work. In which of these examples does using energy cause work to be done?

A. A girl kicks a ball across a field.
B. A boy holds a suitcase by his side.
C. A pitcher holds a ball in his glove.
D. A woman reads instructions for assembling her bicycle.

Short Answer

1. Marek is trying to push a box of sports equipment across the floor. The arrow on the box is a vector representing the force that Marek exerts.



What are the forces acting upon the box?

2. What does the formula $F = ma$ mean, and which of Newton's three laws does it describe?

3. Describe the law of universal gravity.

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Upon what two factors does the magnitude of the gravitational force between two objects depend?

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4. Describe the proportional relationships between the gravitational force and mass and distance.

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Will doubling mass or doubling distance have a greater affect on the gravitational force? Explain.

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5. Explain why fluids exert pressure.

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Predict how the pressure of a fluid would be affected by heating a fluid.

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6. Explain what additional information you would need to calculate the mechanical energy of a book that was lifted to a height of 3.0 meters. In your answer, write out any formulas you need to compute mechanical energy.

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7. Discuss three different simple machines. Identify the machine by name, then give an example of how that machine is used in real life.

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8. Discuss four different simple machines. Identify the machine by name, then give an example of how that machine is used in real life. Then, describe how one of your examples changes the way work is done.

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9. What is mechanical efficiency, and how is it calculated?

10. Work is defined as the use of force to move an object in the direction of that force and is equal to the force times the distance the object moved. How do energy and power relate to work?

Essay

1. What is the difference between the speed of an object, the velocity of an object, and the acceleration of an object?

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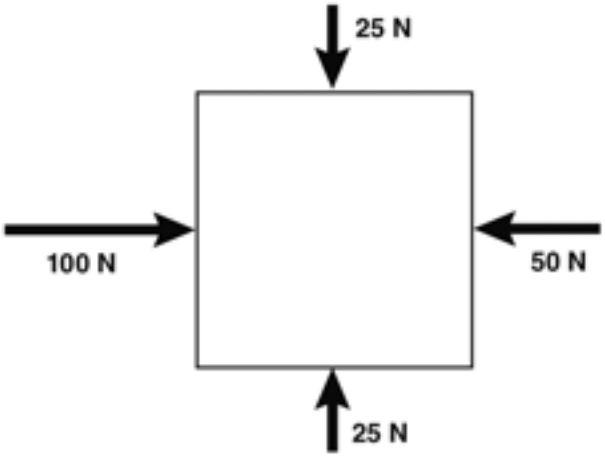
3. The following diagram shows the forces acting on a box.



Explain how you calculate the net force in any direction on the box.

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Suppose an upward force of 15 N is added to the box. What will be the net vertical force on the box?

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What force could be applied to the box to make the net force in the horizontal direction zero? Explain.

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Suppose a force of 25 N to the right is added to the box. What will be the net force to the right?

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4. Explain how an inclined plane makes loading a piano into a truck easier. Refer to the changing potential energy and kinetic energy of the piano as it (a) sits on the ground, (b) is being moved into the truck, and (c) sits in the truck.

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Other

1. The _____ of an object describes the speed and the direction in which it is going.
2. The change in the velocity of an object is defined as its _____.
3. The _____ on an object is the combination of all the forces acting on the object.
4. An object that is traveling around another body in space is in _____ around that body.
5. The _____ is the upward force that fluids exert on all matter.
6. The stored energy that an object has due to its position, condition, or chemical composition is called _____.
7. A(n) _____ is a device that helps people do work by changing the way work is done.
8. A machine's _____ is the ratio of the machine's output force to its input force.
9. A(n) _____ is a simple machine that consists of a solid bar that pivots at a fixed point.
10. _____ is the use of force to move an object in the direction of the force