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Motion

• Reading Comprehension	
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Other Forces That Act Without Touching

1. Put a check mark (✓) next to the answer that is most correct.

- a) Which forces can either attract (pull) or repel (push)?
- A magnetic and electrostatic
 - B electrostatic and gravity
 - C gravity and magnetic
 - D friction and gravity
- b) Which kind of metal is attracted to a magnet?
- A aluminum
 - B copper
 - C iron
 - D silver
- c) What are the poles of a magnet called?
- A left and right
 - B plus and minus
 - C north and south
 - D metal and nonmetal

2. Circle the word True if the statement is true. Circle the word False if it is false.

- a) The Earth is a large magnet.
True False
- b) Electrical charges are either minus or zero.
True False
- c) Things made of iron are attracted to magnets.
True False
- d) A magnet can pick something up off the ground without touching it.
True False
- e) Electrical charges can attract each other but cannot repel.
True False



Other Forces That Act Without Touching

Like gravity, magnetic force and electrostatic force can also act without touching. Magnetic force is the force between magnets, and electrostatic force is the force between things with electrical charges. Gravity only pulls, but magnetic and electrostatic forces can push or pull. Pulling together is called attraction, and pushing apart is called **repelling**.



Magnets have two ends, called the **north pole** and the **south pole**. When the north pole of one magnet is brought near the south pole of another magnet, the magnets attract each other, and they stick together. Things made of iron, like nails and paper clips, also stick to magnets. When two north poles or two south poles are brought together, the magnets repel each other, and they move apart.

You may have heard of Earth's North and South Poles. These places are called poles because the Earth is actually a huge magnet.

Electrical charges are either **positive** or **negative**. Things with a positive

Name three things that you could pick up with a magnet.



charge are marked with a plus (+), and things with a negative charge are marked with a minus (-). Electrostatic forces act much like magnetic forces. Opposite charges attract, and like charges repel. After a balloon is rubbed on cloth, the balloon will then stick to the wall. The balloon has become charged, and electrostatic force is holding it to the wall.

Force is greater for stronger magnets and for larger charges. Force gets smaller as the charges or magnets get farther apart. In these ways, magnetic and electrostatic forces are a lot like the force of gravity.



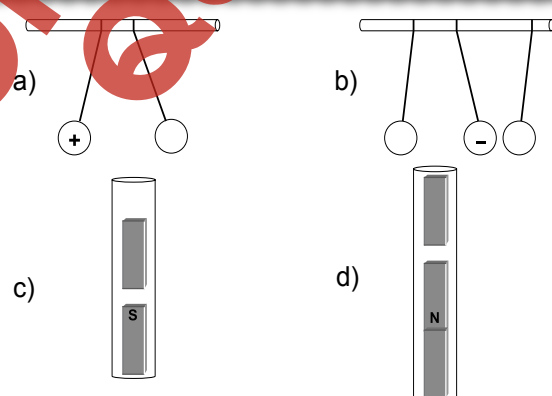
Other Forces That Act Without Touching

1. Tell which force goes with each sentence. In the spaces to the left, write **G** if it is about GRAVITY. Write **M** if it is about MAGNETIC force. Write **E** if it is about ELECTROSTATIC force.

- | | | |
|----|----------------------|--|
| a) | <input type="text"/> | A north pole is attracted to a south pole. |
| b) | <input type="text"/> | It pulls, but it can't push. |
| c) | <input type="text"/> | This could be used to separate pins from toothpicks. |
| d) | <input type="text"/> | Plus repels plus, and minus repels minus. |
| e) | <input type="text"/> | It makes all falling objects speed up. |

2. In the pictures below the balls on strings have electrical charges. The bars are magnets that have been dropped into glass tubes.

Write the sign for the charges on the balls that are blank. Write + for a POSITIVE charge. Write - for a NEGATIVE charge. Show the names of the magnet poles that are not already shown. Write **N** on the NORTH POLE ends of the magnets. Write **S** on the SOUTH POLE ends of the magnets.



Other Forces That Act Without Touching

Answer the questions in complete sentences.

3. What are the names of the electrostatic charges? Which pairs repel? Which pairs attract?
4. What are the names of the magnetic poles? Which pairs repel? Which pairs attract? What else is attracted to magnets besides other magnets?

Extension & Application

5. a) Use the chart on the next page to show what you have learned about the forces of friction, air resistance, gravity, magnets, and electrostatic charges. Write **Yes** or **No** in each box. Do not write in the black boxes.
- b) Which of the forces is always pulling on you? _____
- c) Which of the forces helps you walk up a steep hill? _____
- d) Which force could be used to separate steel cans from aluminum cans? _____



Treasure Map Game

This activity is for two people or two teams of people.

FOR THIS ACTIVITY, you will need:

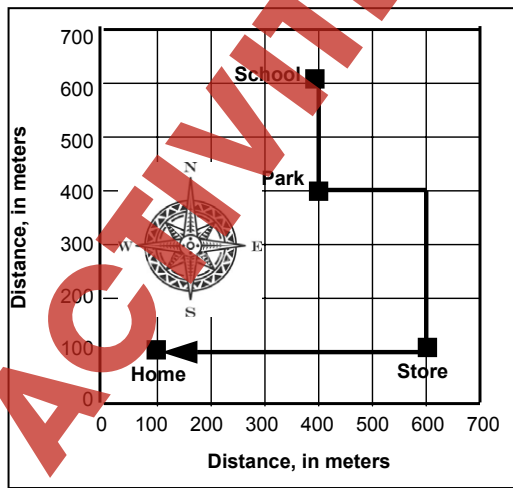
- paper
- a pencil
- a compass
- a long tape measure

You will try to find your way as if you were walking on a large graph, like the one to the right. The goal is to find a prize by following directions or reading a map.

STEPS:

1. One person or team makes a map like the one above, or writes directions for finding a prize.
2. First decide on a path from a starting point to a place where a prize will be hidden.
3. Measure distances with the tape measure along each section of the path. The directions should all be either NORTH, EAST, SOUTH, or WEST. Use the compass to find the directions. Have about four sections in the path.
4. The directions might be something like this: "Go 30 feet north, turn left, and go 90 feet west. Turn left again, and go 60 feet south. Turn right, and go 60 feet west. Do you see the prize?" The directions can be written or they can be shown on a map.
5. The other person or team tries to find the prize by following the map or the directions. They use a compass but *not* the measuring tape. They will find distances by counting their steps. Before they start they will have to measure the length of one step. Then they will figure out how many steps to take for each distance on the map.
6. Take turns hiding a prize and looking for it.

Here is another way to do the game: One person hides the prize and makes the map. All the other people try to follow the map to the prize. The winner is the person who ends up closest to the prize. The winner gets to hide a prize next.



Crossword Puzzle!

Word List

- acceleration
- resistance
- distance
- medium
- friction
- frequency
- seismic
- gravity
- velocity
- deceleration
- pitch
- graph
- mass
- motion
- rotations
- speed
- wavelength

Across

1. A force that resists motion.
5. A measure of how much stuff is in something.
6. The frequency of a musical note.
7. The distance between the high points of two waves.
10. A speeding up motion
12. Spins
14. Speed in a given direction.
15. The kind of waves caused by earthquakes.
16. Divide it by time to get speed.

Down

2. Falling things are slowed down by air _____.
3. Steady speed is a straight, sloping line on a _____ of distance and time.
4. A slowing down motion.
5. A change of position.
8. The force that makes things fall.
9. The number of vibrations per second.
11. What waves travel through.
13. Distance divided by time.



Comprehension Quiz

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Part A

Circle the word True if the statement is true. Circle the word False if it is false.

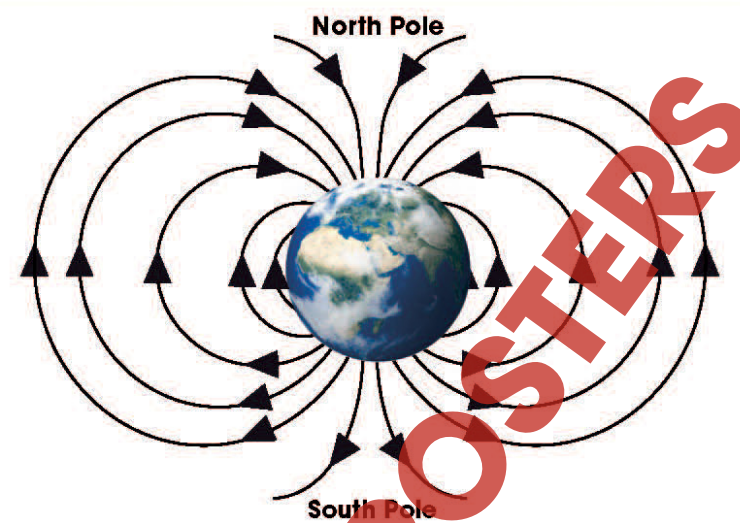
- 1) When a force causes something to move, work is done.
True False
- 2) Work is power.
True False
- 3) A candle is a simple machine.
True False
- 4) A lever pivots on its fulcrum.
True False
- 5) A doorknob is a wheel and axle.
True False
- 6) A wedge is a kind of lever.
True False
- 7) We don't have to do as much work when we use a simple machine.
True False

Part B

Put a check mark (✓) next to the answer that is most correct.

1. Which two things do we need to know to find how much work is done?
 - A time and distance
 - B distance and force
 - C force and energy
 - D energy and time
2. Which of these simple machines usually doesn't move when it is being used?
 - A lever
 - B pulley
 - C inclined plane
 - D wheel and axle
3. Which of these is a simple machine?
 - A match
 - B pencil
 - C watch
 - D wedge

Earth's Magnetic Field



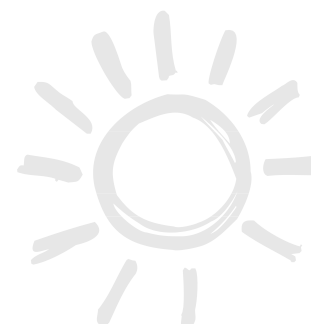
These are the magnetic lines of force of Earth's magnetic field.



Earth's magnetic field causes the aurora borealis, also called the northern lights.



What Is Motion?



Answer the questions in complete sentences.

3. Tell what **rotation** means, and describe something that is rotating.

4. Tell what **vibration** means, and describe something that is vibrating.

5. In your own words, tell what **motion** is.

6. What is the difference between **acceleration** and **deceleration**? Give one example of each.

Extension & Application

7. A car travels 200 miles in 4 hours at a constant speed. What is the speed of the car in miles per hour? Show your work.

8. Jordan throws a ball 30 feet into the air, and the ball falls back to the ground. Use the words "**acceleration**" and "**deceleration**" to tell how the ball changed its motion between the time Jordan threw it and the time it hit the ground.

3. Rotation means spinning. Answers will vary (e.g. a top, the Earth, a merry-go-round).

4. Vibration means moving back and forth or up and down. Answers will vary (e.g. guitar string, insect wings, jackhammer)

5. Motion is change of position.

6. Acceleration is speeding up, deceleration is slowing down. Examples will vary.

7. $200 \div 4 = 50$ miles per hour.

8. Decelerating going up, accelerating coming down

1. a) True

b) True

c) False

d) False

e) True

2. a) C

b) A

c) B

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1. Answers will vary (e.g. sun, star, planet, moon)

2. Answers will vary (e.g. clouds, planes, meteor)

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1. a) False

b) True

c) False

d) True

e) True

2. a) C

b) D

c) B

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3. You would feel acceleration as you left the first floor, and you would feel deceleration as you arrived at the tenth floor.

4. Answers will vary. You couldn't feel the train's motion because it was smooth and there was no background or other objects to compare to. AND When you walked through the train you could compare your changing position to other objects/to the background.

5. a) Rotating, traveling around the sun

b) Answers will vary. Air moves with the Earth. The motion is smooth. We take Earth as our reference for motion.

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EASY MARKING ANSWER KEY

