



TEACHER GUIDE

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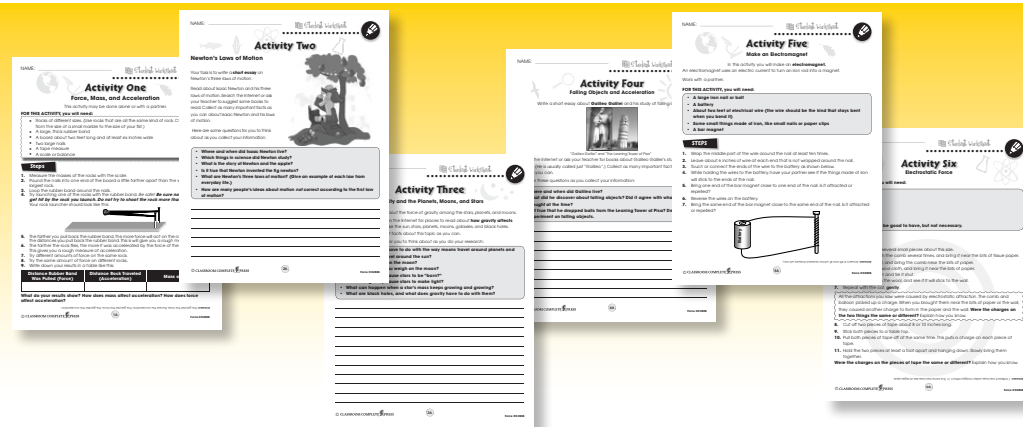
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FREE!

6 Bonus Activities!

3 EASY STEPS to receive your 6 Bonus Activities!

- Go to our website:
www.classroomcompletepress.com/bonus
- Click on item CC4508 – Force
- Enter pass code CC4508D





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.



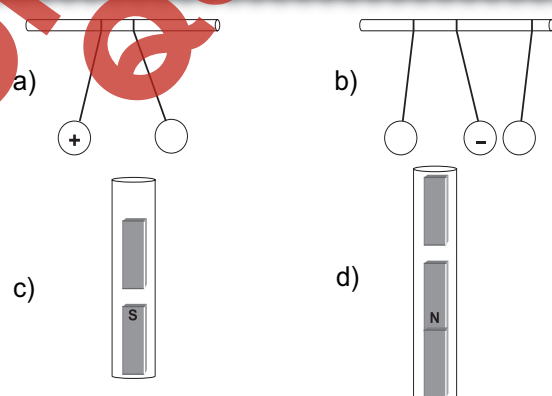
Other Forces That Act Without Touching

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? _____



Activity Three

Balanced and Unbalanced Forces

In this activity you will see how motion changes when forces are unbalanced. This is when the net force is *not* zero. You will also see that motion does not change when forces are balanced. This is when the net force *is* zero. The two forces you will combine to make the net force are the force of **gravity** and the **buoyant force**.

The **BUOYANT FORCE** is the force that pushes up on objects that are under water. When the buoyant force is *greater* than the force of gravity, the object will float. This is why wood floats.

FOR THIS ACTIVITY, you will need:

- A pot of water
- A spring scale
- Several of these objects:

a piece of wood a hollow ball, like a table tennis ball or a tennis ball
an egg a stone
a metal object, like a pair of pliers, a lead fishing weight, or a large bolt

- A spring scale looks like this:



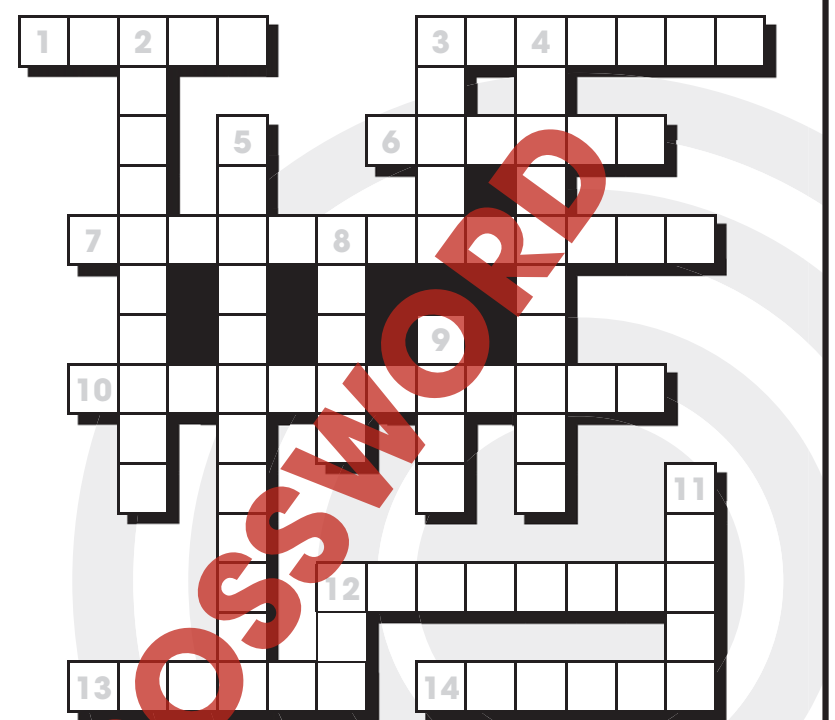
STEPS:

1. Put each of the objects in the pot of water, hold the object on the bottom, and let go.
2. Does it float or sink?
 - If it **floats**, how fast does it move to the top?
 - If it **sinks**, how fast does it sink?
 - What does the speed of rising or sinking tell you about the **direction** and **amount** of the net force?
 - On which object is the net force closest to being balanced?
3. Tie a string to each of the objects that sank.
4. Weigh them on the spring scale.
5. Now weigh them again while they are hanging in the water.
 - Is the weight different in water?
 - How much **buoyant force** is acting on the object?



Crossword Puzzle!

electrostatic
deceleration
gravity
exert
south
repel
weight
grams
matter
unbalanced
negative
mass
acceleration
net
magnet
attraction



Down

2. What a net force is if it is not zero
3. What you measure mass in
4. The opposite of repulsion
5. The kind of motion with decreasing speed
8. Push away
9. Something all matter has
11. Gravity can _____ a force at a distance
12. Combining all the forces acting on something gives the _____ force

Across

1. If it's not the north pole it must be the _____ pole
3. It's what makes you fall
6. What scientists call "stuff"
7. The kind of force between electrical charges
10. The kind of motion with increasing speed
12. This kind of charge is marked with a minus sign
13. It can pick up an iron nail
14. The force of Earth's gravity pulling on you is your _____



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. A force is a push or a pull.
True **False**
2. Air resistance is a force that acts at a distance.
True **False**
3. Gravity repels, but it does not attract.
True **False**
4. Friction is a contact force.
True **False**
5. Combining the forces acting on an object gives the net force.
True **False**
6. The more mass a thing has, the more a force will change its motion.
True **False**
7. The north pole of a magnet will be attracted to the south pole of another magnet.
True **False**

Part B

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

1. Which of these is a force?
 A energy
 B friction
 C mass
 D work
2. Which is the force of attraction between the masses of *any* two objects?
 A gravity
 B friction
 C air resistance
 D magnetic force
3. Which is true of any object acted on by an unbalanced force?
 A It is not moving.
 B Its net force is zero.
 C Its motion is changing.
 D It is moving at a steady speed.

SUBTOTAL: /10

Galileo Galilei and
The Leaning Tower of Pisa

It has been said Galileo discovered how objects fall by dropping balls of different masses from the Leaning Tower of Pisa. Actually he rolled balls down a ramp.



More Than One Force



Answer the questions in complete sentences.

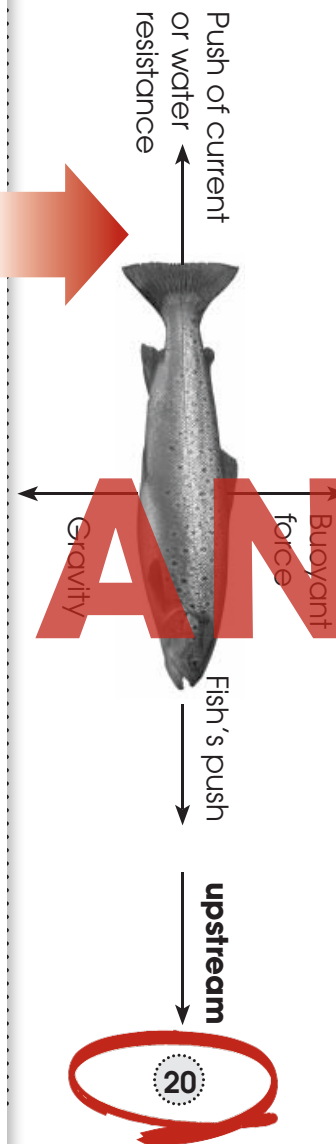
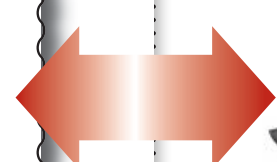
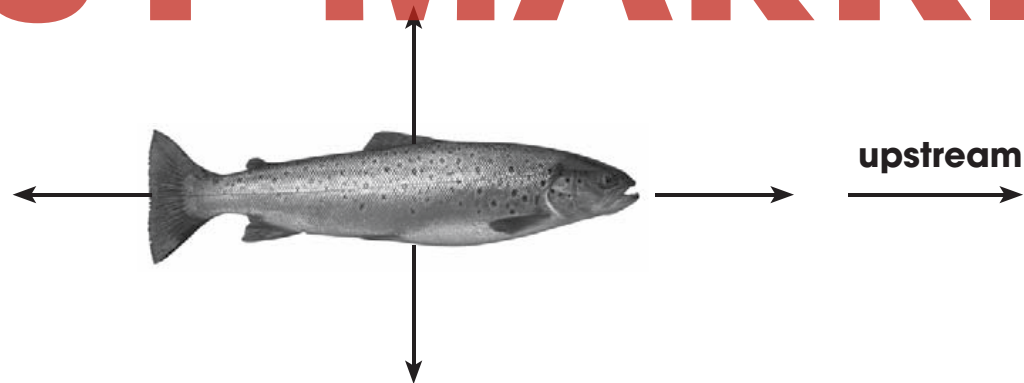
3. What do the words **net force** mean?

4. A large rock on top of a windy hill has four different forces acting on it, but it is not moving. What is the net force on the rock?

Extension & Application

5. A fish is swimming up a river against the current.

The fish is acted on by four forces. One of these is the **buoyant force**, which is the force that pushes up on things that are in water. Show the **four** forces on the fish by drawing an **arrow** for each force. Write the **names** of the forces next to the arrows.



3. The force you get when you combine (or add together) all forces acting on something.

4. Zero

5.

1. a) True

b) False

c) True

d) True

e) False

2. a) B

b) C

c) A

21

No, because he is speeding up/accelerating

23

1. a) A

b) B

c) B

2.

a) balanced b) net
c) acceleration/ deceleration
d) deceleration/ acceleration
e) direction
f) net

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3.

Answers will vary.
Example: Car traveling at a steady speed. Force of the wheels pushing on the road, friction, air resistance.

4.

Answers will vary.
Example: A falling object, gravity, air resistance.

5.

B: unbalanced; ↓; gravity & air resistance; changing
C: unbalanced; ↓; gravity & air resistance; speeding
D: unbalanced; ↑; gravity, buoyancy & water resistance; slowing
E: unbalanced; ↑; gravity, buoyancy & water resistance; changing
F: unbalanced; ↑; gravity, buoyancy & water resistance; speeding

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EASY MARKING ANSWER KEY