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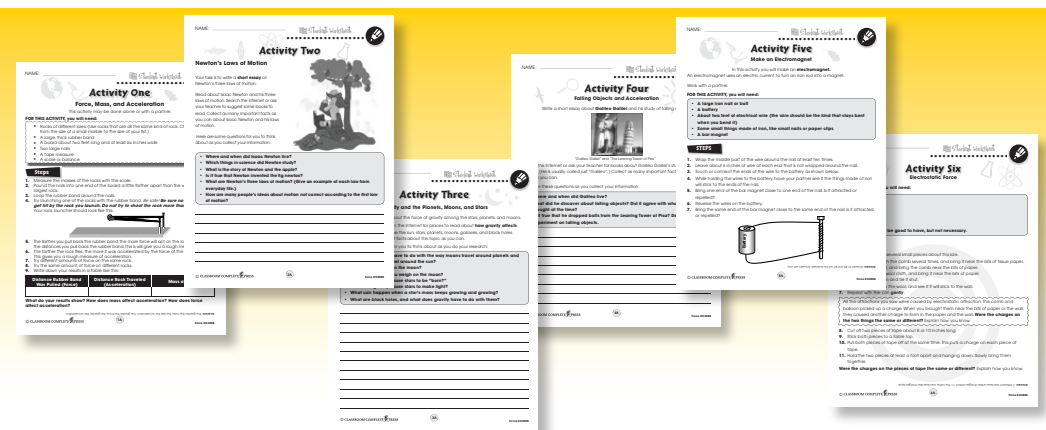
EASY-MARKING™ ANSWER KEY 19

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- Go to our website:
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What Is Force?

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

a) Force is the same as energy.

True False

b) Forces can either push or pull.

True False

c) Gravity pushes us toward the Earth.

True False

d) When something is sliding down a hill, friction makes it slide faster.

True False

e) Friction and gravity are both forces.

True False

2. Write each word beside its meaning.

force friction gravity pull push

- _____ a) the force of the Earth pulling things toward its surface
- _____ b) a force that moves things closer
- _____ c) a push or a pull
- _____ d) the force that moves things farther apart
- _____ e) the force between things sliding past each other



What Is Force?

A force is a push or a pull. When you push on your pencil, you are **exerting** a force. When you pull a carrot out of the ground, you are exerting a force.



Forces act on you every day from all directions. You exert forces on many things every day. You must exert force to ride a bicycle. Your foot exerts a pushing force on the pedal. When the pedals move, they pull on the chain. The chain makes the back wheel turn. The wheel pushes on the ground, and you and the bicycle move forward.

When you use the bike's brakes, the bike stops because of another force called **friction**. Why does the bike stay on the ground instead of floating off into the sky? This isn't as silly as it sounds. The bike is held down by another force called **gravity**. We will learn about friction, gravity, and other forces later.



Why don't things on Earth's surface float off into space?

Some things *sound* forceful that are not forces. Power, work, speed, mass, and energy are *not* kinds of force. Each of these is measured in a different way than force.

To tell about a force, we must tell both the amount of the force, and the direction in which it is acting. We can show both with an arrow. The arrow points in the direction the force is acting, and the length of the arrow shows the amount of force. The picture shows some of the forces acting when a person rides a bicycle.



What Is Force?

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

a) Which of these is a force?

- A energy
- B gravity
- C power
- D work

b) Which of these tells what force is?

- A being able to do work
- B any kind of push or pull
- C anything that has energy
- D something that is moving

c) What do we call the force that makes a car come to a stop when the driver puts on the brakes?

- A friction
- B gravity
- C mass
- D speed

2. a) **Circle** the words that are kinds of force.

energy friction gravity mass power

pull push speed work

b) **Cross out** the words that are *not* kinds of force.

energy friction gravity mass power

pull push speed work



What Is Force?

Answer the questions in complete sentences.

3. Write a sentence that describes all forces.

4. Forces can be shown as an arrow. What **two** things does an arrow show us about a force?

Extension & Application

5. A worker is pushing heavy carts.



At least four forces are acting on the cart. Describe or name **two** of the forces.

Draw **arrows** to show the two forces you named above. Draw the arrows on the picture.



Activity One

The Force of Friction

Learn about the force of friction between different surfaces.

FOR THIS ACTIVITY, you will need:

- A wooden board about two feet long and six or more inches wide
- A yard stick, meter stick, or measuring tape
- Tape
- Sandpaper
- Several of the following:

A block of wood	A sheet of paper	A brick
An ice cube	A piece of glass	A flat stone

Something made of plastic. Any other flat objects with different kinds of surfaces that are small enough to fit on the board

STEPS:

1. On a blank piece of paper, make a table with three columns like this:

Surface 1	Surface 2	Height of Board

2. Place any one of the objects on the board, near one end.
3. Slowly raise the end of the board nearest the object until the objects starts to slide down the board.
4. Measure the height to which you raised the board.
5. Write the results in the table. For example if you tried the stone first, you would write "wood" (for the board), "stone", and the height of the board when the stone started to slide.

It is important to understand that the **higher** you must raise the board to make the objects move, the **greater** is the force of friction between the object and the board.

6. Try as many combinations as you can. Try taping different materials to the board, like paper, carpet, or sandpaper. You could also tape different materials to the brick or block of wood. Try smoothing the surface of the board or the block of wood with the sand paper to see if that makes a difference.

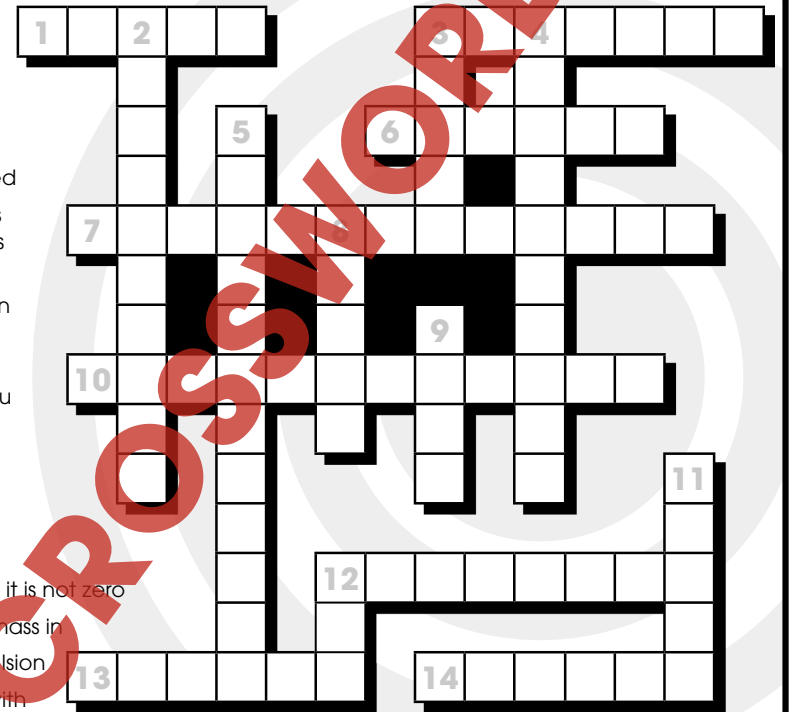
Write a list of things you learned about surfaces and the force of friction.



Crossword Puzzle!

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 _____



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



Comprehension Quiz

25

Part A

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

7

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.

3

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.

NAME: _____

After You Read 



What Is Force?

Answer the questions in complete sentences.

3. Write a sentence that describes all forces.

4. Forces can be shown as an arrow. What **two** things does an arrow show us about a force?

Extension & Application

5. A worker is pushing heavy carts.



At least four forces are acting on the cart. Describe or name **two** of the forces.

Draw **arrows** to show the two forces you named above. Draw the arrows on the picture.

10

3.
A force is a push or a pull.

4.
An arrow shows the direction in which the force acts and the strength/amount/magnitude of the force.

5.
Two of: gravity (down), normal force (up), friction (back), air resistance (back), mechanical push (forward)

Answers will vary
11.
Answers will vary.

1.
Mass does not affect air resistance.
Surface increases air resistance.

3.
a) No
b) No
c) No
(Helium balloons are acted on by the buoyant force of air.)

10

2.
The greater the speed of rising or sinking, the greater the net force. Closest to being balanced on the egg

5.
Yes, weight is different in the water. Buoyant force is weight in air minus weight in water.

13.

7.
Magnet has more force

14

Across:

- 1. south
- 3. gravity
- 6. matter
- 7. electrostatic
- 10. acceleration
- 12. negative
- 13. magnet
- 14. weight

Down:

- 2. unbalanced
- 3. grams
- 4. attraction
- 5. deceleration
- 8. repel
- 9. mass
- 11. exert
- 12. net

15



EASY MARKING ANSWER KEY