



Physical Science

Force and Motion

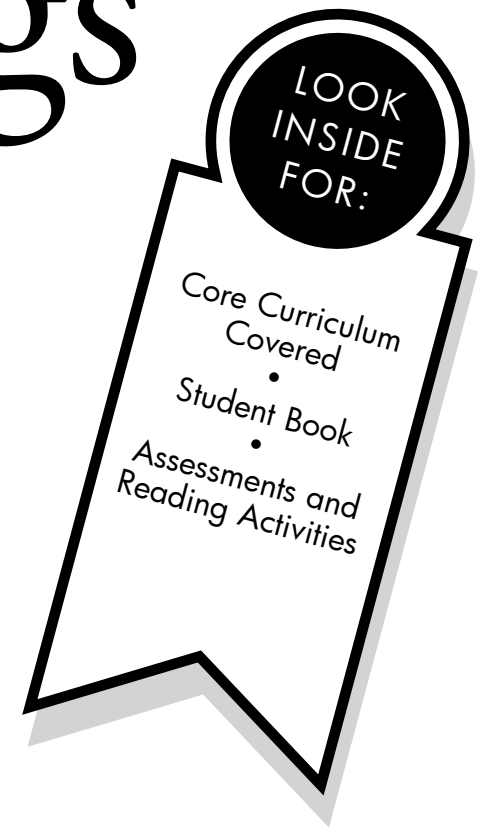
Basic Level

How Things Move

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How Things Move

What causes objects to move?

CORE CURRICULUM STATEMENTS

Energy and matter interact through forces that result in changes in motion.

The position of an object can be described by locating it relative to another object or the background (e.g., on top of, next to, over, under, etc.).

The position or direction of motion of an object can be changed by pushing or pulling.

The force of gravity pulls objects toward the center of Earth.

The forces of gravity and magnetism can affect objects through gases, liquids, and solids.

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Basic Level



Physical Science

Force and Motion

Student Book

How Things Move

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How Things Move

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CORE CURRICULUM STATEMENTS

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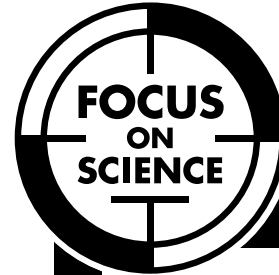
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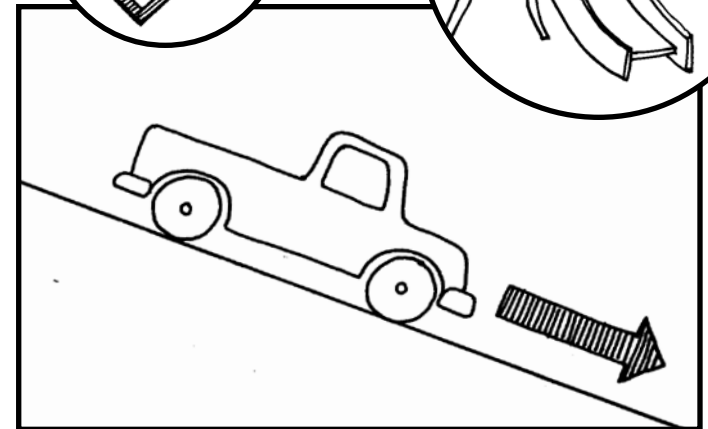
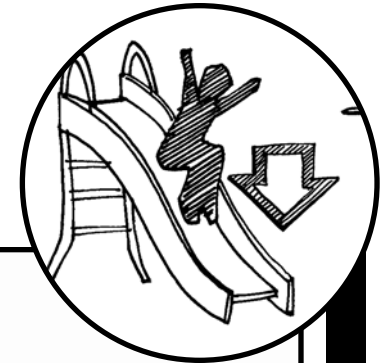
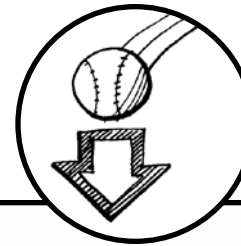


Physical Science

Force and Motion

How Things Move

by Tom Sibila





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Curriculum materials for your content standards

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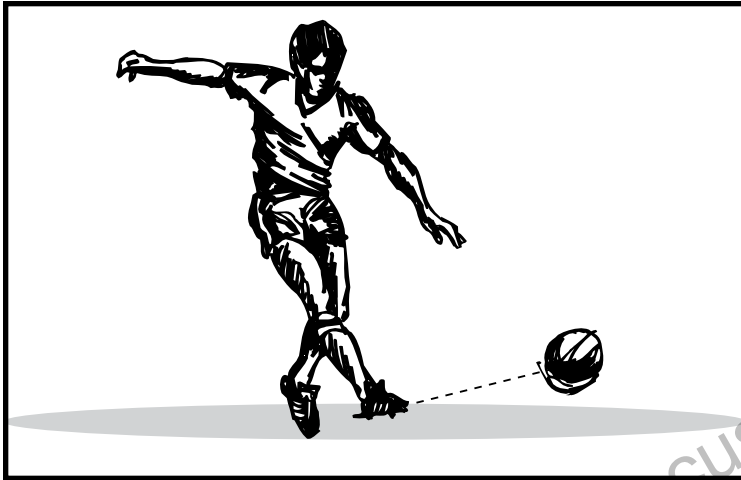
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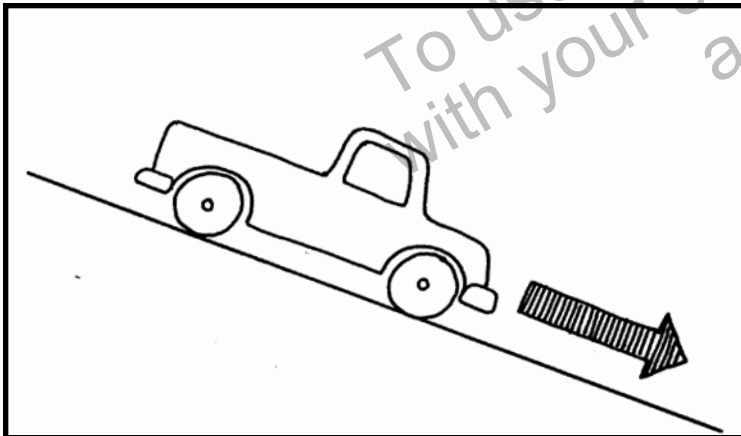
– Predict –

*What do you think you will
learn from reading this book?*

Objects Move When Forces Push or Pull on Them



This ball is being pushed by the boy's foot.



This car is being pulled down a hill by the force of gravity.

INTRODUCTION

What Is Motion?

A boy is on top of the slide. His friend is waiting at the bottom. The boy is above the girl. Then the boy slides down. His friend climbs up the ladder. She is now above the boy.

The boy and girl were in motion. A **force** acted on the girl and boy to put them in motion. Force comes from a push or a pull.

– Analyze –

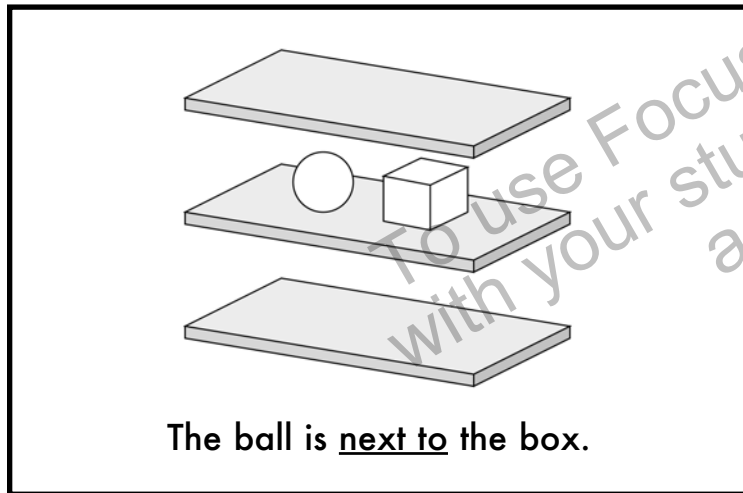
What words on this page describe the location of objects?

force: a push or pull that changes the movement of an object

Locating Positions of Objects

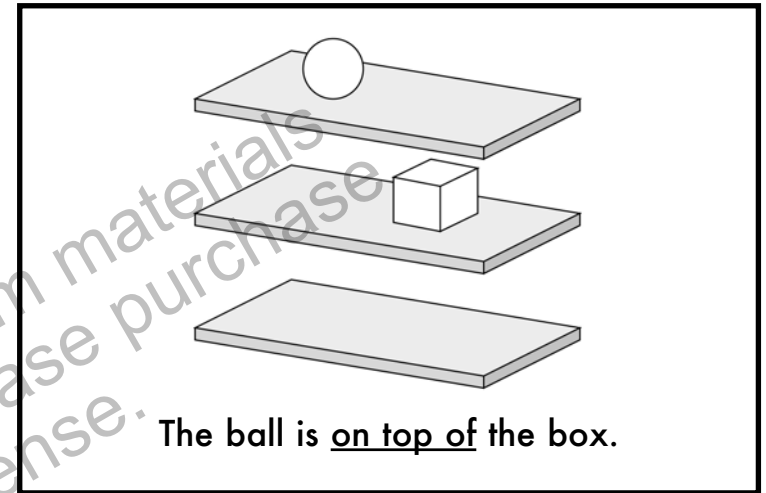
A force moves an object. It changes the position of the object **relative** to other objects.

For example, in this picture the ball is next to the box.

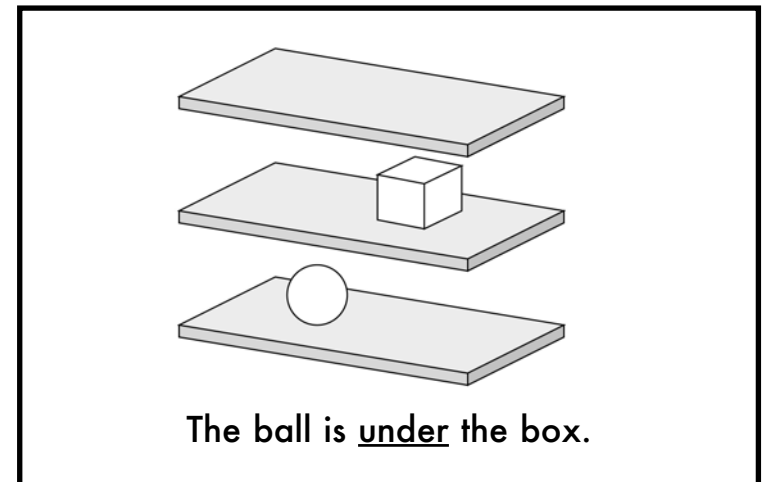


relative: compared to others

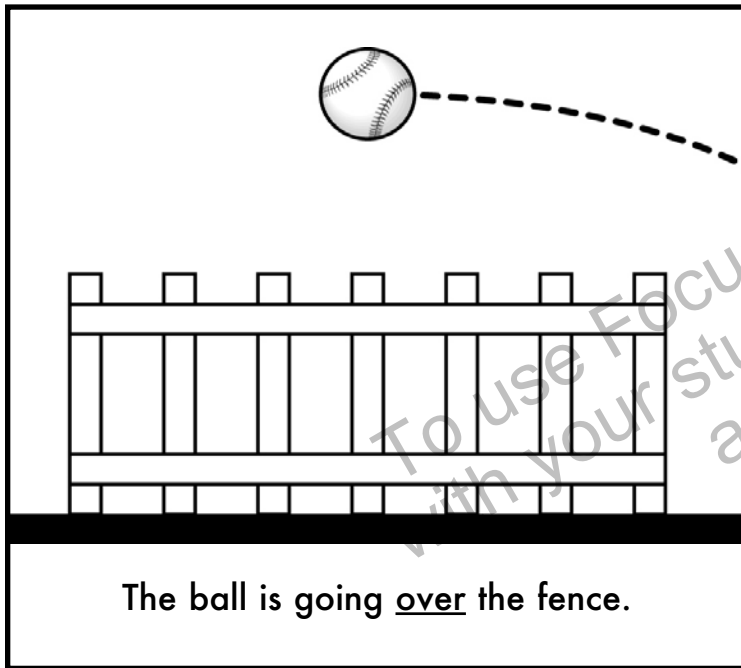
You could move the ball to be on top of the box.



You could also move the ball to be under the box.



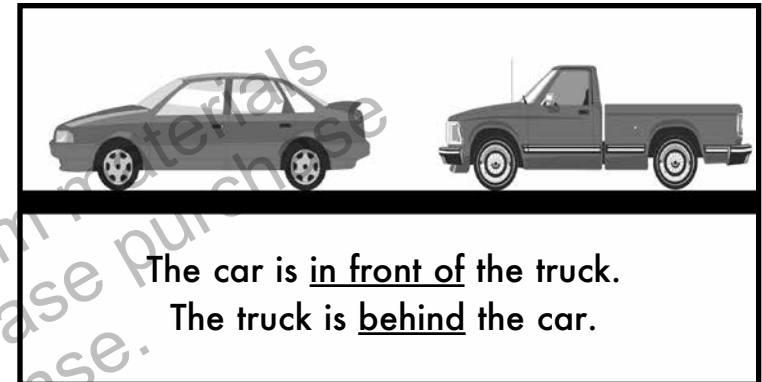
How do we describe the location of objects? We compare them to the position of other objects. What is the location of the baseball compared with the fence?



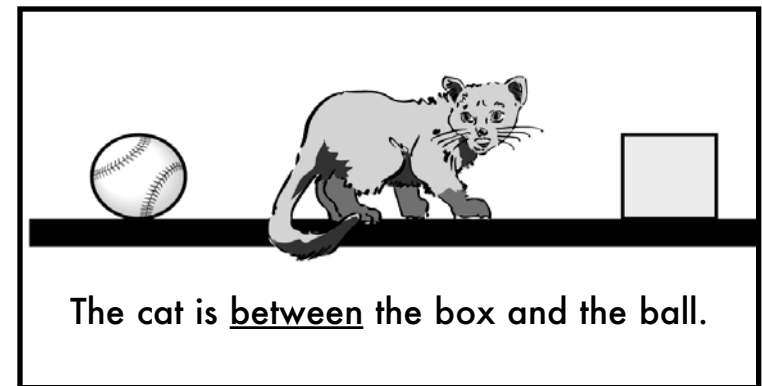
– Extend –

What other words describe the location of objects? Brainstorm a list with a friend.

In the drawing below, we compare the location of the car with the position of the truck in two ways.



Below, we compare the location of a cat with two objects. Can you make other comparisons from this drawing?

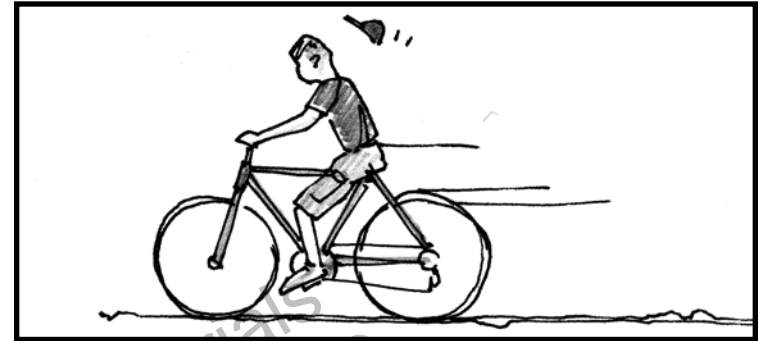


Pushes and Pulls

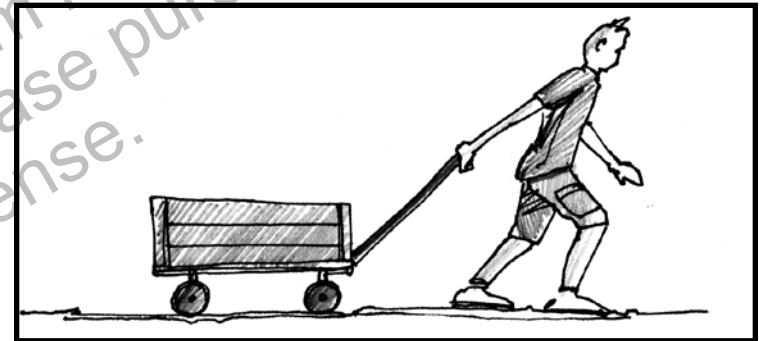
You learned that motion is caused by force. A force is a push or a pull. Pushes and pulls usually move things.

You cannot see forces. They are **invisible**. But, you can see their effects. You can see a friend ride a bike. You can tug on a wagon to move it forward. You can see a leaf fall from a tree.

invisible: not able to be seen



This boy is pushing the pedals to move the bicycle.



This boy is pulling the wagon to move it forward.



This leaf is being pulled to the ground.

Forces can also act on objects that are already moving. You can kick a moving soccer ball to make it go faster and farther. When you kick the ball, you increase the force acting on the ball.



If you kick a soccer ball that is already moving, it will move faster and farther.

Push a friend on a swing. Your friend starts to move. Push again a little harder. Your friend goes even faster and higher.



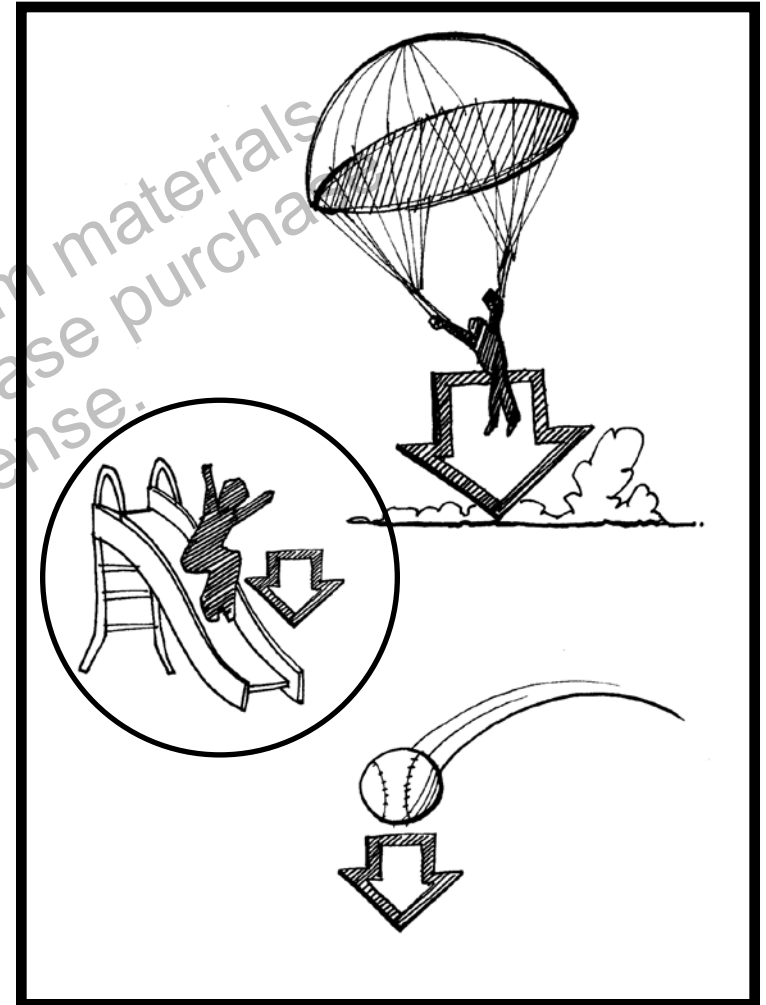
*The harder you push, the more force you use.
The swing will move faster and higher.*

Gravity

Acorns fall from trees. Water pours over a waterfall. Rocks tumble down a mountain.

All of this motion is the result of the force of gravity. Gravity is a pull that objects have on other objects. All objects on Earth are pulled toward the center of Earth.

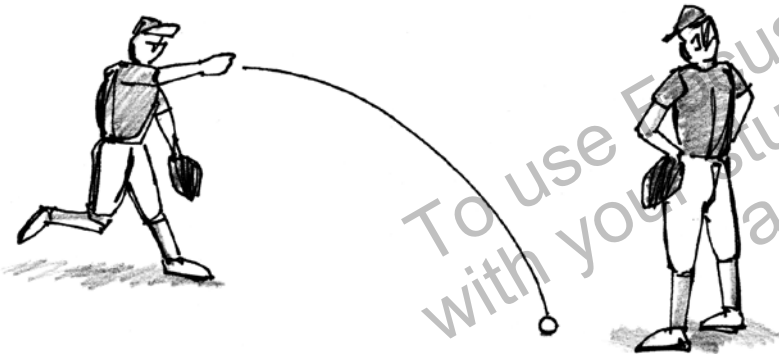
The Force of Gravity



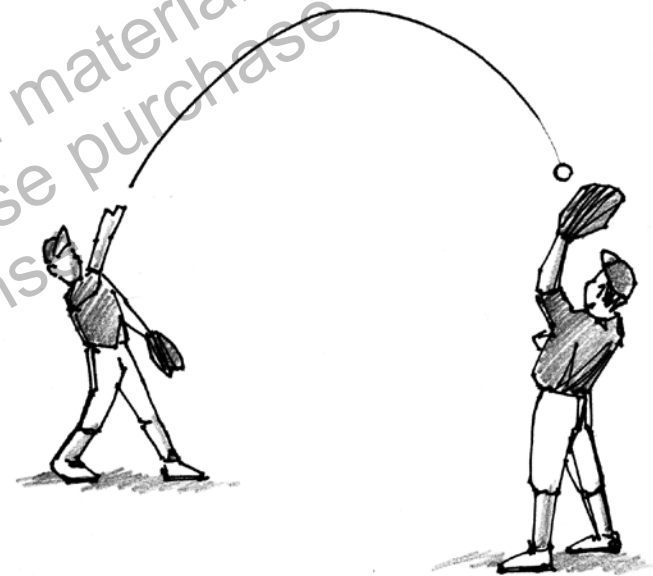
The force of gravity pulls all objects on Earth toward the planet's center.

Have you ever thrown a ball to a friend, but the ball did not reach him or her? What happened?

When you threw the ball, you used a force. It made the ball move forward. But, the ball did not move in a straight line. It moved lower and lower the farther it traveled. Why?



The force of gravity pulls the ball down. If you throw the ball upward and with enough force, it will reach your friend.



Next time you see something moving, remember that a force pushed or pulled it to put it in motion.

Glossary

force—a push or pull that changes the movement of an object

invisible—not able to be seen

relative—compared to others

To Find Out More . . .

Want to learn more about how things move?

Try these books

Force & Motion by Peter Lafferty.
Dorling Kindersley, Inc. 1992

Speed and Acceleration by Richard Spilsbury. Heinemann Library, 2007.

Access these Web sites

The Little Shop of Physics

<http://littleshop.physics.colostate.edu/>

Fizzics Fizzle! An Interactive Guide to Physics

<http://library.thinkquest.org/16600/>

Write for more information

National Student Research Center
606 Lafitt Street
Mandeville, Louisiana 70448

National Academy of Engineering
500 Fifth Street, NW
Washington, DC 20001

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Assessments

How Things Move

Print pages 18–20 of this PDF for the assessments.

Check Understanding

Shade the circle next to the correct answer.

1. All objects on Earth are pulled down due to

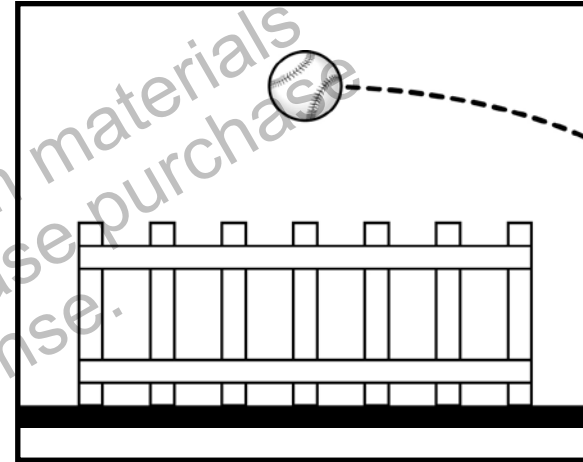
- Ⓐ gravity
- Ⓑ pushes
- Ⓒ pulls
- Ⓓ motion

Note that question 2 has only three choices.

2. When a student pushes an apple across the table, the apple is

- Ⓐ invisible
- Ⓑ in motion
- Ⓒ in the same location

3. The picture below shows a ball and a fence.



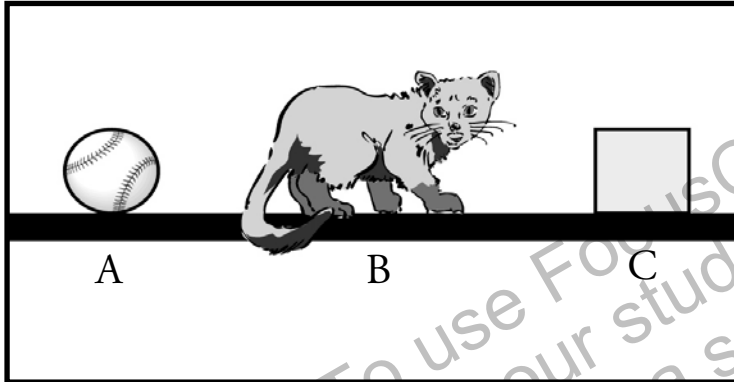
What is the position of the ball relative to the fence?

- Ⓐ The ball is below the fence.
- Ⓑ The ball is next to the fence.
- Ⓒ The ball is above the fence.
- Ⓓ The ball is inside the fence.

Check Understanding

Shade the circle next to the correct answer or write your answer on the lines provided.

4. The picture below shows a ball, a cat, and a box. The objects are labeled A, B, and C.



Which object is in front of the cat?

Object letter: _____

Which object is behind the cat?

Object letter: _____

Note that question 5 has only three choices.

5. A girl throws a ball to her friend. But, the ball does not reach her friend. She must throw the ball

- Ⓐ higher and harder
- Ⓑ higher and slower
- Ⓒ lower and harder

How Things Move

Assessment Scoring Guidelines

1. Answer A is correct.
2. Answer B is correct.
3. Answer C is correct.
4. C; A
5. Answer A is correct.

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English Language Arts Activities

How Things Move

Print pages 22–26 of this PDF for the reading activities.

Make Inferences

TRY THE SKILL

To make an inference, you think about what you have read and what you already know. Then you reach a decision. Read this passage:

Yesterday, the trees lost almost all of their leaves. Today the ground is covered in orange, red, and yellow leaves.

What inference can you make?

You learned in this book that objects move because of pushes and pulls. Those objects include leaves. What do you know that can cause leaves to fall off trees? Gravity and wind can do it.

Now you can infer that yesterday the weather was windy. The wind pushed the autumn leaves off the trees. Gravity pulled them down to the ground.

Read this passage. Then make an inference.

A boy places a ball on top of a hill. He goes inside for lunch. When he returns, the ball is at the bottom of the hill.

What inference can you make?

Use the Table of Contents

TRY THE SKILL

The table of contents is located at the beginning of the book. It tells you what the book is about. It tells you where to find information about a topic in the book.

Look at the table of contents below. Use it to answer the questions.

Introduction:

What Is Motion? 5

Chapter 1:

Locating Positions
of Objects 6

Chapter 2:

Pushes and Pulls 10

Chapter 3:

Gravity 14

1. Which chapter will tell you about gravity?

- (A) Introduction
- (B) Chapter 1
- (C) Chapter 2
- (D) Chapter 3

2. On what page does Chapter 2 begin?

- (A) Page 5
- (B) Page 6
- (C) Page 10
- (D) Page 14

3. What is the title of the Introduction?

- (A) What Is Motion?
- (B) Locating Positions of Objects
- (C) Pushes and Pulls
- (D) Gravity

Antonyms

TRY THE SKILL

Antonyms are words that have opposite meanings. Some examples of antonyms are:

cold and hot

find and lose

huge and tiny

strong and weak

Read the paragraph. Look for the antonyms.

If you kick a ball with a lot of force, it will go fast. If you kick a ball with a little force, it will go slow.

What are the antonyms?

Fast and *slow* are antonyms.

Read the paragraph from *How Things Move*. Underline the antonyms.

A boy is on top of the slide. His friend is waiting at the bottom. The boy is above the girl. Then the boy slides down. His friend climbs up the ladder. She is now above the boy.

Think of other antonyms that have to do with location. Write them in the space below.

Cause and Effect

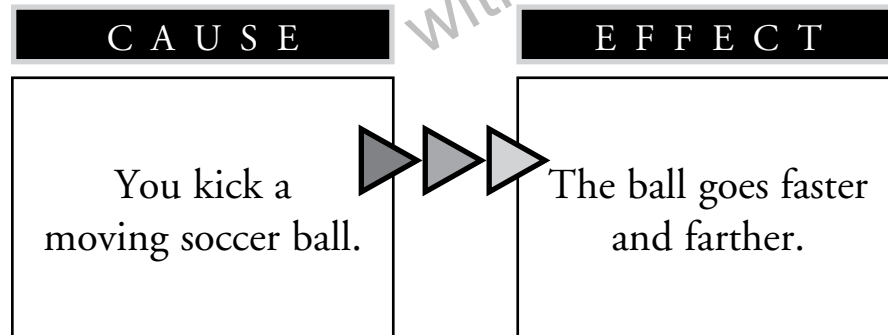
TRY THE SKILL

To find out an effect you ask, “What happened?” To find out a cause, you ask, “Why did that happen?” Identifying cause and effect helps you understand what you read.

Read this passage from the book.

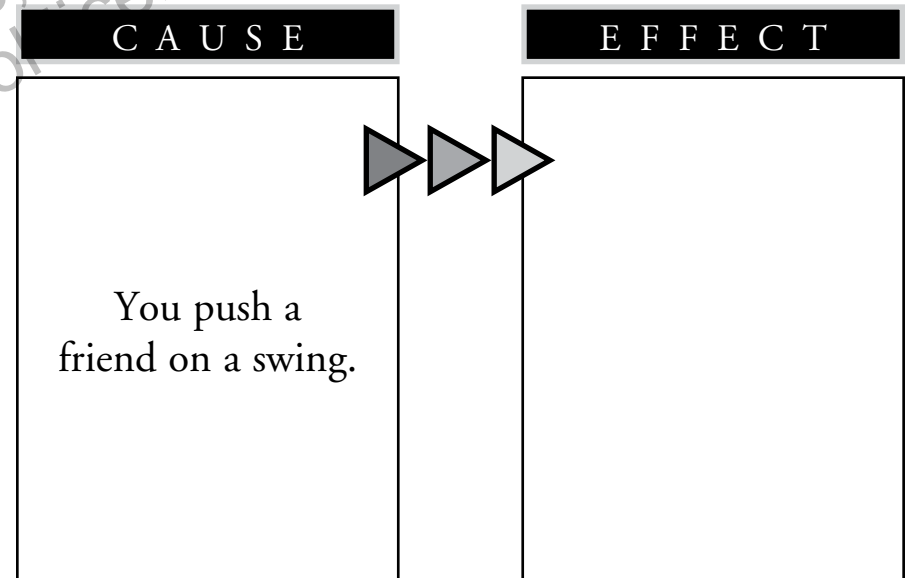
You can kick a moving soccer ball to make it go faster and farther. When you kick the ball, you increase the force acting on the ball.

This graphic explains the cause and effect.



Read this passage. Then complete this graphic organizer.

Push a friend on a swing. Your friend starts to move. Push again a little harder. Your friend goes even faster and higher.



Answer Key

Make Inferences

Inference: Gravity caused the ball to roll down the hill.

Use the Table of Contents

1. D
2. C
3. A

Antonyms

A boy is on top of the slide. His friend is waiting at the bottom. The boy is above the girl. Then the boy slides down. His friend climbs up the ladder. She is now above the boy.

Other antonyms could include above and below, behind and in front of, under and over.

Cause and Effect

Effect: Your friend starts to move.