



SCIENCE • GRADE 4

Science Content Standards

Earth Sciences: 4.A

Earth Sciences: 4.B

Below Level

# Rocks and Minerals

**FOCUS**curriculum

Curriculum materials for **your** content standards

33 Milford Drive, Suite 1, Hudson, OH 44236

(330) 656-9008 • [www.focuscurriculum.com](http://www.focuscurriculum.com)

LOOK  
INSIDE  
FOR:

California's  
Academic  
Content Standards  
Covered

•  
Reproducible  
Student Book

•  
Reproducible  
English-language  
Arts Activities

# Rocks and Minerals

## California's Content Standards Met

### GRADE 4 SCIENCE

**EARTH SCIENCES: 4**—The properties of rocks and minerals reflect the processes that formed them. As a basis for understanding this concept:

- a. Students know how to differentiate among igneous, sedimentary, and metamorphic rocks by referring to their properties and methods of formation (the rock cycle).
- b. Students know how to identify common rock-forming minerals (including quartz, calcite, feldspar, mica, and hornblende) and ore minerals by using a table of diagnostic properties.

### GRADE 4 ENGLISH LANGUAGE ARTS

#### 1.0 WORD ANALYSIS, FLUENCY, AND SYSTEMATIC VOCABULARY DEVELOPMENT

*Vocabulary and Concept Development 1.2*—Apply knowledge of word origins, derivations, synonyms, antonyms, and idioms to determine the meaning of words and phrases.

#### 2.0 READING COMPREHENSION

*Structural Features of Informational Materials 2.1*—Identify structural patterns found in informational text (e.g., compare and contrast, cause and effect, sequential or chronological order, proposition and support) to strengthen comprehension.

*Comprehension and Analysis of Grade-Level-Appropriate Text 2.2*—Use appropriate strategies when reading for different purposes (e.g., full comprehension, location of information, personal enjoyment).

*Comprehension and Analysis of Grade-Level-Appropriate Text 2.6*—Distinguish between cause and effect and between fact and opinion.



SCIENCE • GRADE 4

California Content Standards

Earth Sciences: 4.A

Earth Sciences: 4.B

Below Level

# Student Book

*Rocks and Minerals*

Print pages 5 – 18 of this PDF for the student book.

# How to Make the Student Book

- The student book is contained on pages 5–18 of this PDF. It begins on the next page.
- To make one student book, or a two-sided master copy that can be photocopied, you will print on both sides of seven sheets of 8.5" x 11" paper.
- Do a test printout of one book first to familiarize yourself with the procedure.
- Follow these instructions carefully.

## First—Select the Paper

Since you will be printing on both sides of the sheets of paper, select a good quality white paper. We recommend using at least a 22lb sheet.

## Second—Check Printer Settings

Be sure you have the correct page setup settings for your computer and printer. You will print these pages in landscape format.

## Third—Print EVEN Pages

Open the PDF of the book you want to print. Select print from your file menu. In your printer's dialogue box enter pages 5–18 to print. Then select EVEN pages only. It is important to print only the EVEN pages first. Click "Print" to print the even pages. (**Important note:** The first page that prints will be blank. DO NOT discard this page. It will be needed to print the cover in the next step.)

## Forth—Print ODD Pages

When the even pages have printed, flip the stack of pages over to print the odd pages. Place the stack back in your printer. Select print from the file menu again. In your printer's dialogue box, select ODD pages. Click "Print" to print the odd the pages.

## Fifth—Fold the Book

You now have a complete book. Check to be sure the pages are in the correct order with the book's cover as the top page. Then fold the stack of paper in half.

## Sixth—Staple the Book

Use an extended-length stapler to staple the pages together. Place three staples in the spine of the book.

Please note that printers vary in how they output pages. Do a test printing with one book and adjust the procedure as necessary.

If you want to make a one-sided master copy, print ALL pages 5–18 at once. Then select "one-sided to two-sided" on the copy machine.

# Rocks and Minerals

## California's Content Standards Met

BL

### GRADE 4 SCIENCE

**EARTH SCIENCES: 4**—The properties of rocks and minerals reflect the processes that formed them. As a basis for understanding this concept:

- a. Students know how to differentiate among igneous, sedimentary, and metamorphic rocks by referring to their properties and methods of formation (the rock cycle).
- b. Students know how to identify common rock-forming minerals (including quartz, calcite, feldspar, mica, and hornblende) and ore minerals by using a table of diagnostic properties.

### GRADE 4 ENGLISH LANGUAGE ARTS

#### 1.0 WORD ANALYSIS, FLUENCY, AND SYSTEMATIC VOCABULARY DEVELOPMENT

**Vocabulary and Concept Development 1.2**—Apply knowledge of word origins, derivations, synonyms, antonyms, and idioms to determine the meaning of words and phrases.

#### 2.0 READING COMPREHENSION

**Structural Features of Informational Material 2.1**—Identify structural patterns found in informational text (e.g., compare and contrast, cause and effect, sequential or chronological order, proposition and support) to strengthen comprehension.

**Comprehension and Analysis of Grade-Level-Appropriate Text 2.2**—Use appropriate strategies when reading for different purposes (e.g., full comprehension, location of information, personal enjoyment).

**Comprehension and Analysis of Grade-Level-Appropriate Text 2.6**—Distinguish between cause and effect and between fact and opinion



SCIENCE • GRADE 4

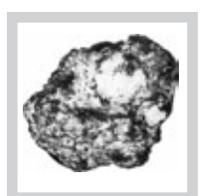
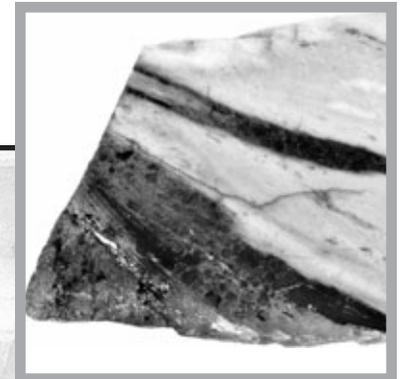
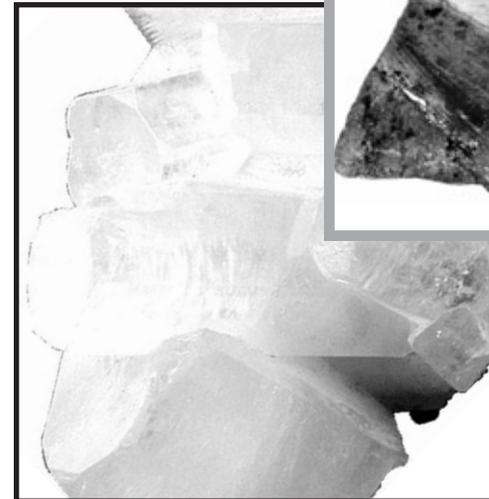
California Content Standards

Earth Sciences: 4.A

Earth Sciences: 4.B

# Rocks and Minerals

by Caitlin Scott





SCIENCE • GRADE 4

California Content Standards

Earth Sciences: 4.A

Earth Sciences: 4.B

# Rocks and Minerals

by  
Caitlin Scott

**FOCUS**curriculum

Curriculum materials for **your** content standards

Copyright © 2009 FOCUScurriculum

## Table of Contents

### Introduction:

What Are Rocks and Minerals? . . . . . 4

### Chapter 1:

Identifying Minerals . . . . . 6

Hardness . . . . . 6

Luster . . . . . 8

Cleavage . . . . . 9

Color . . . . . 9

Streak . . . . . 10

Specific Gravity . . . . . 10

### Chapter 2:

Types of Rocks . . . . . 12

Igneous Rocks . . . . . 13

Sedimentary Rocks . . . . . 14

Metamorphic Rocks . . . . . 15

Classifying Rocks . . . . . 16

### Chapter 3:

The Rock Cycle . . . . . 17

### Chapter 4:

Try This . . . . . 20

Glossary . . . . . 22

To Find Out More . . . . . 23

Index . . . . . 24

---

## INTRODUCTION

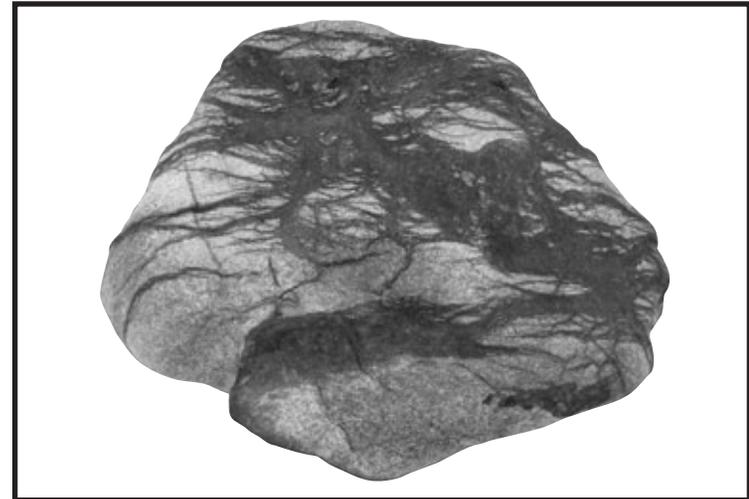
# What Are Rocks and Minerals?

Rocks are everywhere. Some are big. Some are small. You can put some in your pocket. Some are too big to pick up. Rocks are made of smaller parts. These parts are called minerals.

There are many types of minerals on Earth. About 100 are common. How can you tell if something is a mineral?

- They are natural. That means they are not made by people.
- They are inorganic. That means they are not alive.
- They are crystalline. That means they have a regular crystal pattern or shape.

*Remember these properties of minerals.  
Read them to yourself several times.*



*This rock is made up of several different minerals.  
It has an irregular shape.*



*This is the mineral quartz. It has a crystal shape.*

# Identifying Minerals

Scientists who study minerals are called **mineralogists**. They use hardness, luster, cleavage, color, streak, specific gravity, and other properties to tell minerals apart. You can also use these traits to learn about minerals.

## Hardness

The Mohs Scale of Hardness ranks how hard minerals are. The softest mineral is talc. People often make powder out of talc.

The hardest mineral is diamond. A diamond can scratch glass. Other minerals can scratch glass, too. Any mineral with a rank greater than 6 can scratch glass. Quartz has a rank of 7. It can scratch glass.

**mineralogists:** scientists who study minerals

## Mohs Scale of Hardness

Mohs Scale of Hardness	Mineral
1	Talc
2	Gypsum
3	Calcite
4	Fluorite
5	Apatite
6	Feldspar
7	Quartz
8	Topaz
9	Corundum
10	Diamond

*Will topaz scratch glass? Will gypsum?*

---

## Luster

Luster is shine. Some minerals shine like metal. They are called **metallic**. Some shine a lot. They might look like a new penny. Some shine just a little. They might look like an old dirty penny.

Other minerals do not shine. These are called **nonmetallic**. Some, like mica, look oily. Some look pearly. Some are clear. You can see right through them. Diamonds are clear, so is some quartz.

**metallic:** something that looks like metal  
**nonmetallic:** something that does not look like metal

---

## Cleavage

Cleavage is how a mineral breaks. Some break in two pieces. Some break in many pieces.

Some always break the same way. Scientists say these have “perfect” cleavage. Breaking these minerals helps you identify them.

Others minerals don't have perfect cleavage. Breaking doesn't help identify them.

## Color

Some minerals are just one color. If so, color is a clue to naming the mineral.

Some minerals can be many colors. If so, color doesn't help. Mica can be many colors.

**cleavage:** how something breaks

---

## Streak

When you rub some minerals on a special plate, they leave a streak. All minerals with a hardness of 6 or less leave a streak.

This helps people name these soft minerals. Calcite leaves a white streak. But the mineral hornblende does not leave a streak.

## Specific Gravity

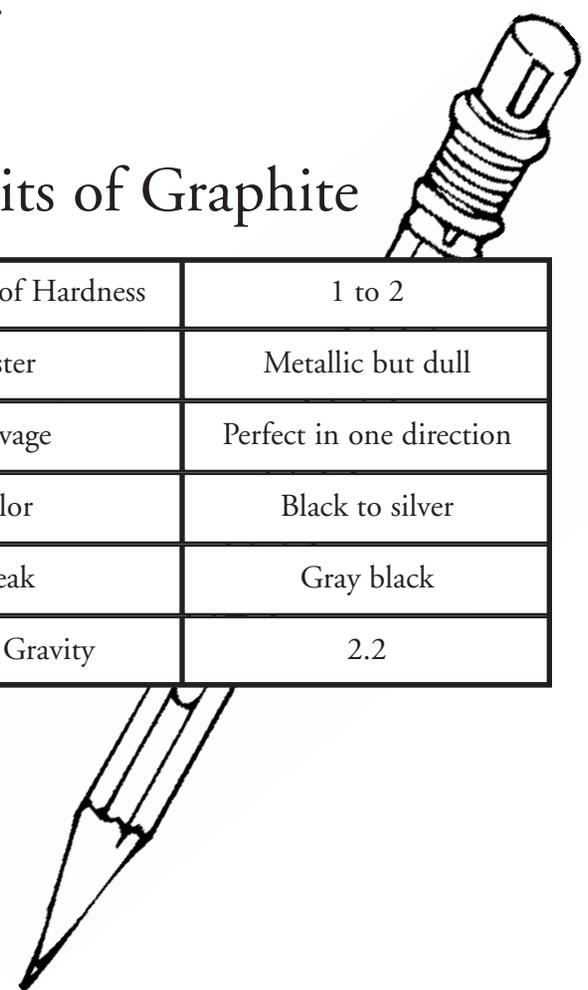
Specific gravity is a measure of size and weight of a mineral. Two minerals can be the same size but have different weights. Or two minerals can have the same weight and be different sizes. Each mineral has its own specific gravity value. Measuring specific gravity can help people identify many minerals.

**specific gravity:** a measure of size and weight

---

Your pencil lead is made of the mineral graphite. The table below shows the traits of graphite.

## Traits of Graphite



Mohs Scale of Hardness	1 to 2
Luster	Metallic but dull
Cleavage	Perfect in one direction
Color	Black to silver
Streak	Gray black
Specific Gravity	2.2

## Types of Rocks

Most minerals join together to form rocks.

These are the rock families:

- igneous
- sedimentary
- metamorphic

People in the same family look alike.

Rocks are the same way. The rocks in each family look alike.

*Remember the three rock families.  
Read their names to yourself several times.*

---

## Igneous Rocks

What do igneous rocks look like?

The rocks do not have layers or lines in them. Many are dark. The grains in the rock may be big or small. These grains look mixed together. Some igneous rocks have air bubbles in them.



*Pumice is an igneous rock. It has lots of air bubbles in it.*

---

## Sedimentary Rocks

What do sedimentary rocks look like?  
They are pressed into layers. You can see what the weather was like when the rock formed. If it was rainy, you might see ripple marks. If it was dry, you might see cracks where mud dried out.

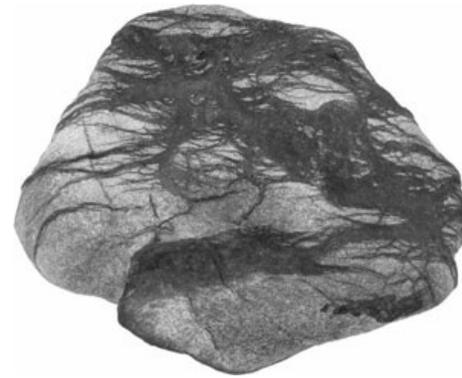


*Sedimentary rock is pressed into layers.*

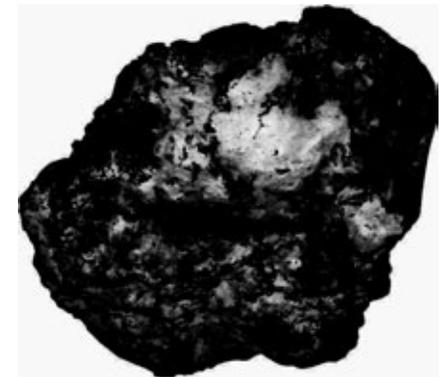
---

## Metamorphic Rocks

What do metamorphic rocks look like?  
The grains are tightly packed. This makes some look striped. Others look solid or have tiny dots.



*These metamorphic rocks were formed by pressure.*



*How are igneous and metamorphic rocks similar?  
How are they different?*

---

## Classifying Rocks

There are many ways to classify rocks. The chart below is one example. Draw this chart in your notebook and use it to investigate and classify the rocks in your area.

Rock	Type	Description
Limestone	Sedimentary	<ul style="list-style-type: none"><li>• tiny grains in layers</li><li>• feels gritty</li><li>• reddish tan or gray</li></ul>
Conglomerate	Sedimentary	<ul style="list-style-type: none"><li>• small rocks and pebbles stuck together</li><li>• various colors</li><li>• feels rough and lumpy</li></ul>
Pumice	Igneous	<ul style="list-style-type: none"><li>• light grey</li><li>• looks like a sponge</li><li>• lightweight</li><li>• feels rough</li></ul>

*Compare the properties of the three rocks listed in the chart. How are they similar? How are they different?*

---

## CHAPTER 3

# The Rock Cycle

You have learned about rock families. But the rocks in rock families can change. This takes a long time. The process is called “the rock cycle.”

Here is an example. There is igneous rock on top of a mountain. Slowly, wind and water break up the rock. The tiny particles look like sand or dirt. They wash downhill. They come to rest and pile up in layers. These tiny bits of igneous rock become sedimentary rock.

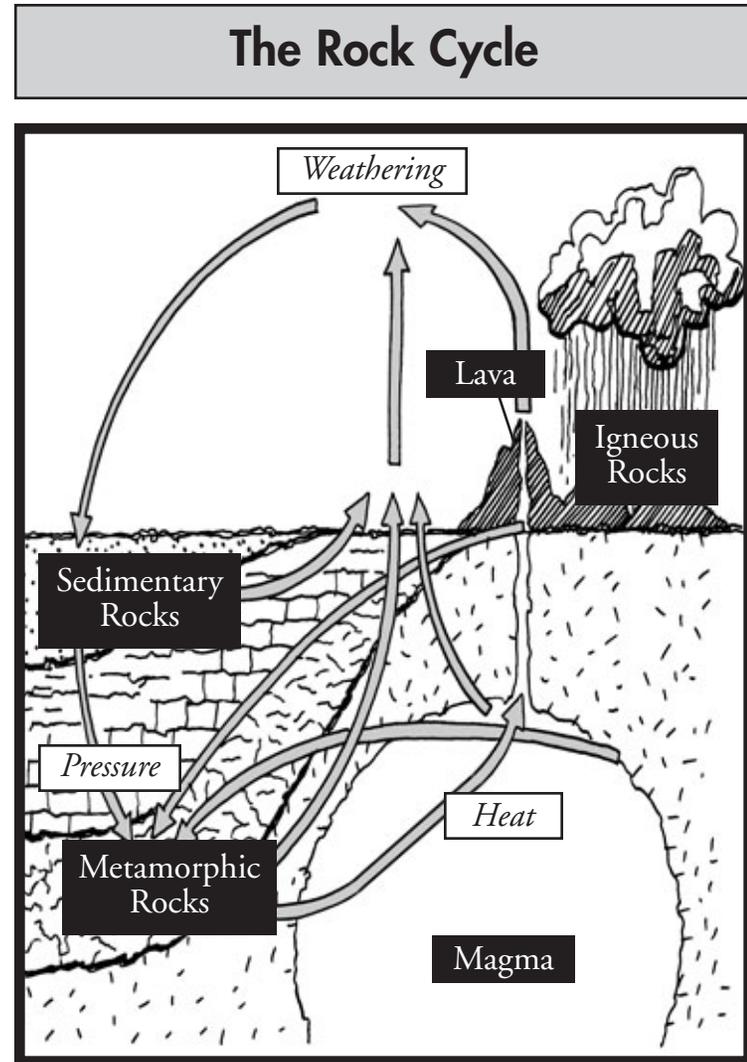
More rock forms on top of this sedimentary rock. It gets buried. After a long time, the rock is pressed down hard. This **pressure** turns the rock into metamorphic rock.

**pressure:** the force of something pressing down on something else

---

Pressure pushes metamorphic rock deeper in Earth. After millions of years the metamorphic rock comes to a hot layer under the surface of Earth. It heats up and melts. This melting changes the metamorphic rock into magma or molten rock.

When magma is pushed to Earth's surface through an opening such as a volcano, it is called lava. When lava cools, it becomes igneous rock and the rock cycle begins again.



*Over time, rocks change from igneous, to sedimentary, to metamorphic, and then back to igneous again. This is the rock cycle.*

CHAPTER 4

Try This

Ask your teacher to give you samples of the following minerals—quartz, feldspar, mica, calcite, and hornblende. Try matching each mineral to the properties listed on one of the charts.

1. Name of Mineral:

Mohs Hardness Scale	7
Luster	Glassy
Cleavage	Weak in 3 directions
Color	Clear most common
Streak	White
Specific Gravity	2.65

2. Name of Mineral:

Mohs Hardness Scale	6.5
Luster	Glassy to dull
Cleavage	Perfect in one direction; nearly perfect in another; forms nearly right angled prism
Color	White or gray
Streak	White
Specific Gravity	2.7

3. Name of Mineral:

Mohs Hardness Scale	2.5
Luster	Glassy to pearly
Cleavage	Perfect in one direction
Color	White, silver, yellow, brown, green
Streak	White
Specific Gravity	2.8

4. Name of Mineral:

Mohs Hardness Scale	3
Luster	Glassy to dull
Cleavage	Perfect in three directions
Color	Generally white or colorless
Streak	White
Specific Gravity	2.7

5. Name of Mineral:

Mohs Hardness Scale	5.5
Luster	Glassy
Cleavage	Perfect in two directions
Color	Dark green to black
Streak	Gray to greenish gray
Specific Gravity	3.0

---

## Glossary

**cleavage**—how something breaks

**metallic**—something that looks like metal

**mineralogists**—scientists who study minerals

**nonmetallic**—something that does not look like metal

**pressure**—the force of something pressing down on something else

**specific gravity**—a measure of size and weight

---

## To Find Out More . . .

Want to learn more about rocks and minerals?

### Try these books

*The Best Book of Fossils, Rocks, and Minerals* by Chris Perrault. King Fisher, 2000.

*The Rock Factory: A Story about the Rock Cycle* by Jacqui Bailey. Picture Window Books, 2006.

### Access these Web sites

The Mineralogy Society: Mineralogy for Kids  
[http://www.minsocam.org/MSA/K12/K\\_12.html](http://www.minsocam.org/MSA/K12/K_12.html)

The Mineral and Gemstone Kingdom  
<http://www.minerals.net/index.htm>

### Write for more information

Mineralogical Society of America  
3635 Concorde Pkwy Suite 500  
Chantilly, VA 20151-1125 USA

Hershel Friedman  
The Mineral and Gemstone Kingdom  
17 Valencia Dr.  
Monsey, N.Y. 10952

---

# Index

cleavage, 9

color, 9

graphite, 11

hardness, 6–7

igneous rocks, 12, 13

luster, 8

metamorphic rocks, 12, 15

rock cycle, 17–19

sedimentary rocks, 12, 14

specific gravity, 10

streak, 10

Below Level



ENGLISH-LANGUAGE ARTS • GRADE 4

California Content Standards
Vocabulary and Concept Development: 1.2
Structural Features of Informational Materials 2.1
Comprehension and Analysis of Grade-Level-Appropriate Text: 2.2
Comprehension and Analysis of Grade-Level-Appropriate Text: 2.6

# English-language Arts Activities

*Rocks and Minerals*

Print pages 20–24 of this PDF for the reading activities.

# Read for a Purpose

## TRY THE SKILL

Here are the main reasons for reading:

- to gain information or understanding
- to learn how to do something
- to be entertained

For example, you read this book to gain information. You found out three ways that rocks are formed, and you learned about the properties of rocks. You did not learn how to do something.

The author hoped the content interests you, so you would be entertained. So the main reason you read this book was to gain information. A less important reason was to be entertained.

When you are choosing what to read, pay attention to titles. They can help you decide whether an article or book will fit your purpose in reading.

Read the list of titles. Then write the correct letters beside each purpose for reading.

- A. *The Rock Cycle*
- B. *Rocky Strikes Out*
- C. *The Rock Hunter's Guide to Collecting*
- D. *Turning Rocks into Gems*
- E. *Earth's Most Valuable Rocks*
- F. *Lost in Dead Man's Cave!*

1. Which two titles would you read for information?  
\_\_\_\_\_
2. Which two titles would you read to learn how to do something? \_\_\_\_\_
3. Which two titles would you read to be entertained?  
\_\_\_\_\_

# Cause and Effect

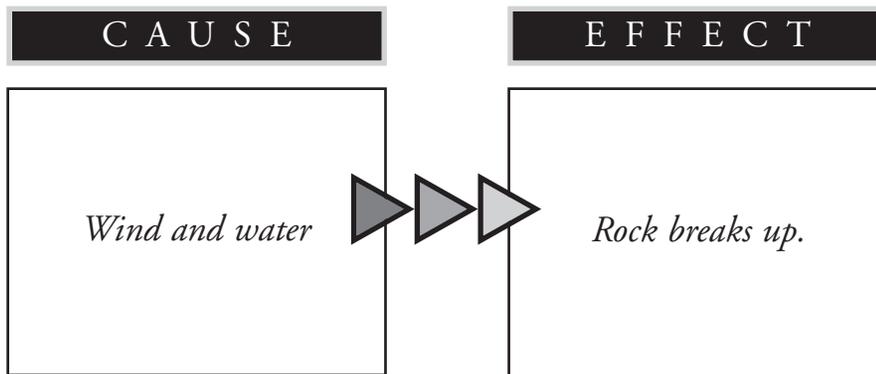
## TRY THE SKILL

To find out an effect, you ask, “What happened?”  
To find out a cause, you ask, “Why did that happen?” Read this passage from the book:

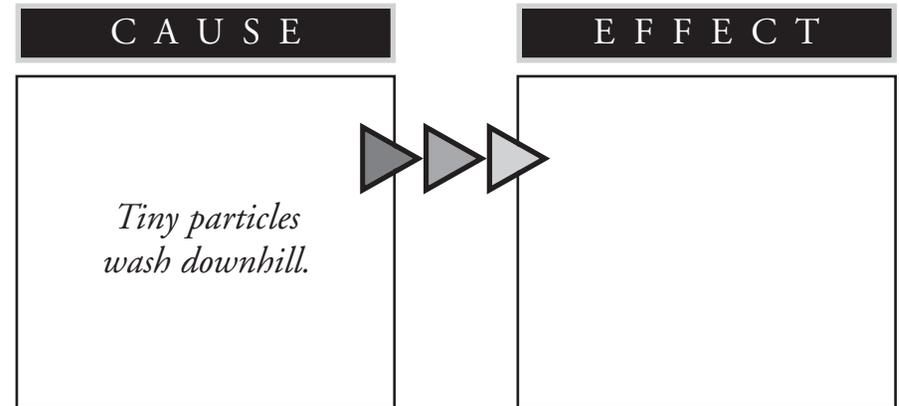
There is igneous rock on top of a mountain. Slowly, wind and water break up the rock. The tiny particles look like sand or dirt. They wash downhill. They come to rest and pile up in layers. These tiny bits of igneous rock become sedimentary rock.

More rock forms on top of this sedimentary rock. It gets buried. After a long time, the rock is pressed down hard. This pressure turns the rock into metamorphic rock.

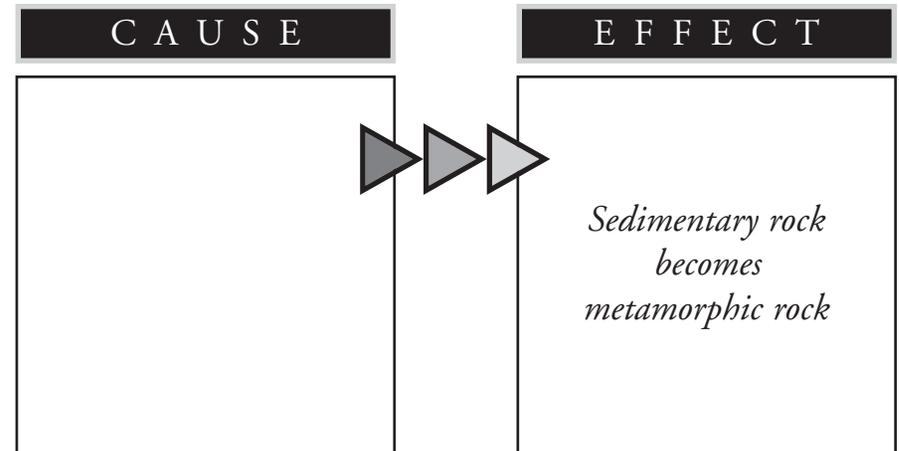
This graphic explains what happened.



Read the passage again. Then complete this graphic.  
Tell how the cause affected the igneous rock.



Now complete this graphic. Tell why Indians on reservations had to find ways to get along together.



# Sequential Order

## TRY THE SKILL

Sequential order is the order in which something happens. Understanding order helps you understand what you read. You can describe the order with words such as, *first*, *then*, *next*, and *finally*.

Read this passage from *Rocks and Minerals*. Put the steps in order.

There is igneous rock on top of a mountain. Slowly, wind and water break up the rock. The tiny particles look like sand or dirt. They wash downhill. They come to rest and pile up in layers. These tiny bits of igneous rock become sedimentary rock.

How do igneous rocks turn into sedimentary rocks? A graphic organizer can help you name the steps.

Step 1	First, wind and water break off tiny parts of the rock.
Step 2	Then, they wash downhill.
Step 3	Next, when they come to rest, they pile up.
Step 4	Finally, they become sedimentary rock.

Read this passage from *Rocks and Minerals*. How do sedimentary rocks turn into metamorphic rocks?

More rock forms on top of this sedimentary rock. It gets buried. After a long time, the rock is pressed down hard. This pressure turns the rock into metamorphic rock.

Try to name the steps in the process. Use the graphic organizer to help you.

Step 1	
Step 2	
Step 3	
Step 4	

# Antonyms and Synonyms

## TRY THE SKILL

**Antonyms are two words with opposite meanings.**  
**Synonyms are two words with the same meaning.**

**Reread these paragraphs from *Rocks and Minerals*.**

Luster is shine. Some minerals shine like metal. They are called metallic. Some shine a lot. They might look like a new penny. Some shine just a little. They might look like an old dirty penny.

Other minerals do not shine. These are called nonmetallic.

**Can you find the antonyms?**

*Metallic* and *nonmetallic* have opposite meanings.  
They are antonyms.

**Can you find the synonyms?**

*Luster* and *shine* have the same meaning.  
They are synonyms.

**Read the paragraphs. Answer the questions.**

The Mohs Scale of Hardness ranks how hard mineral are. The softest mineral is talc. The hardest mineral is diamond.

1. Which are antonyms?

- Ⓐ scale and rank
- Ⓑ softest and hardest
- Ⓒ talc and diamond

After millions of years the metamorphic rock comes to a hot layer under the surface of Earth. It heats up and melts. This melting changes the metamorphic rock into magma or molten rock.

2. Which are synonyms?

- Ⓐ heats and melts
- Ⓑ changes and comes
- Ⓒ magma and molten rock

# Answer Key

## Try This (Student Book)

1. Quartz
2. Feldspar
3. Mica
4. Calcite
5. Hornblende

## Read for a Purpose

1. A, E
2. C, D
3. B, F

## Cause and Effect

**Effect:** They pile up in layers and become sedimentary rock

**Cause:** After a long time, the sedimentary rock is pressed down hard.

## Sequential Order

1. First, rock forms on top of this sedimentary rock.
2. Then, it gets buried.
3. Next the rock is pressed down hard.
4. Finally, the pressure turns the rock into metamorphic rock.

## Antonyms and Synonyms

1. B
2. C