UNIT 4

Weather, Climate, and the Water Cycle

Strong rains can quickly create flooding.

FLORIDA BIG IDEA 7

Earth Systems and Patterns

I Wonder Why

Sometimes, the weather is stormy and cold. At other times, it is sunny and hot. Why does the weather change?

Turn the page to find out.

Here's Why Weather changes because air moves constantly. Moving air changes local temperature and moisture—key factors affecting weather.

Essential Questions and Florida Benchmarks

SC.5.E.7.1 Create a model to explain the parts of the water cycle. Water can be a gas, a liquid, or a solid and can go back and forth from one state to another. **SC.5.E.7.2** Recognize that the ocean is an integral part of the water cycle and is connected to all of Earth's water reservoirs via evaporation and precipitation processes.

LESSON 1

ESSENTIAL **QUESTION**

What Is the Water Cycle?

Engage Your Brain

Find the answer to the following question in this lesson and record it here.

Where is all this water going?

_____

_____

_____

_____

ACTIVE **READING**

Lesson Vocabulary

List the terms. As you learn about each one, make notes in the Interactive Glossary.

_____

_____

_____

_____

Sequence

In this lesson, you'll read about a process of change called the water cycle. As you read about the water cycle, focus on the sequence, or order, of events in the process. Active readers stay focused on a sequence when they mark the transition from one step in a process to another.

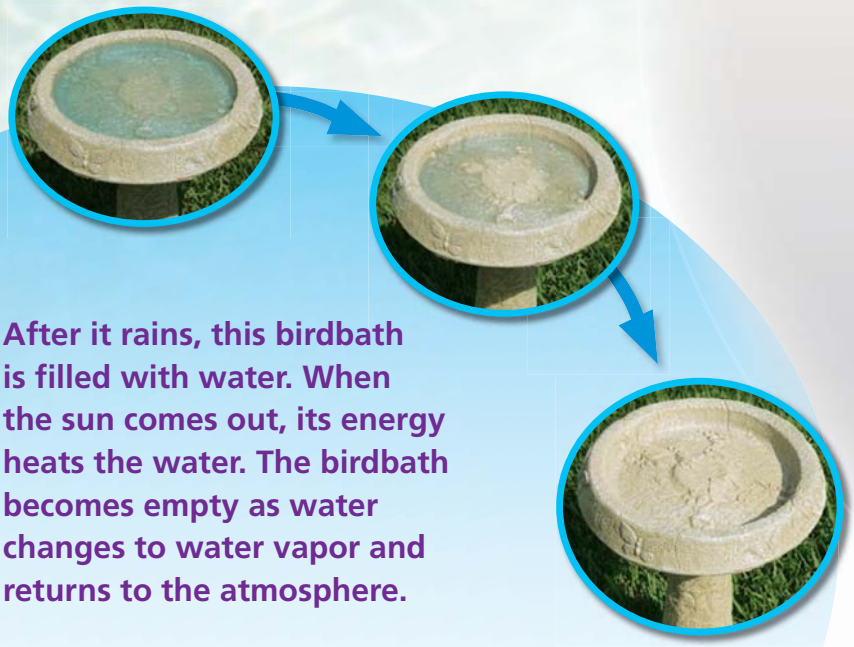
Water on the Move

The water that you drink may have once been under ground or high in the sky. How does water get from Earth's surface to the air and back again?

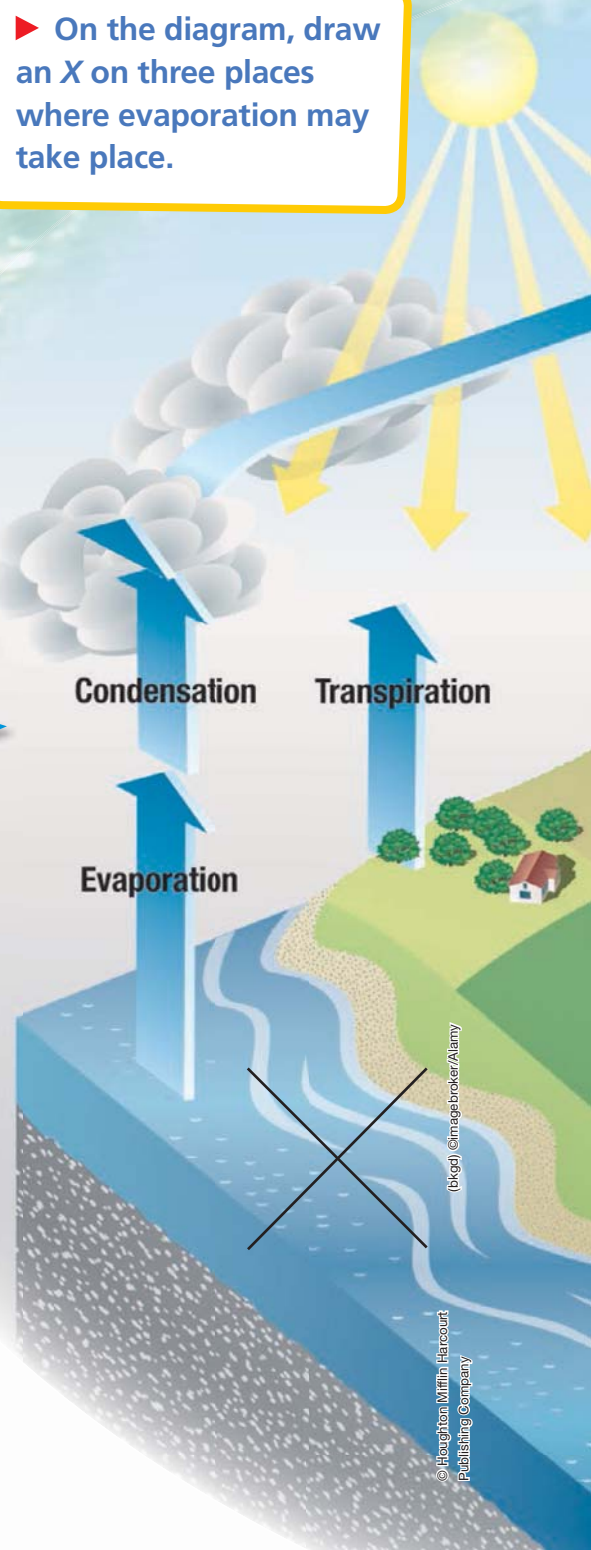
ACTIVE READING As you read the next page, underline the main idea and circle details that provide information about it.

▶ On the diagram, draw an *X* on three places where evaporation may take place.

Earth's water is always being recycled. It evaporates from bodies of water, the soil, and even from your skin. Water exits plants' leaves through a process called *transpiration*. In the air, winds and clouds can help move water from one place to another.



After it rains, this birdbath is filled with water. When the sun comes out, its energy heats the water. The birdbath becomes empty as water changes to water vapor and returns to the atmosphere.

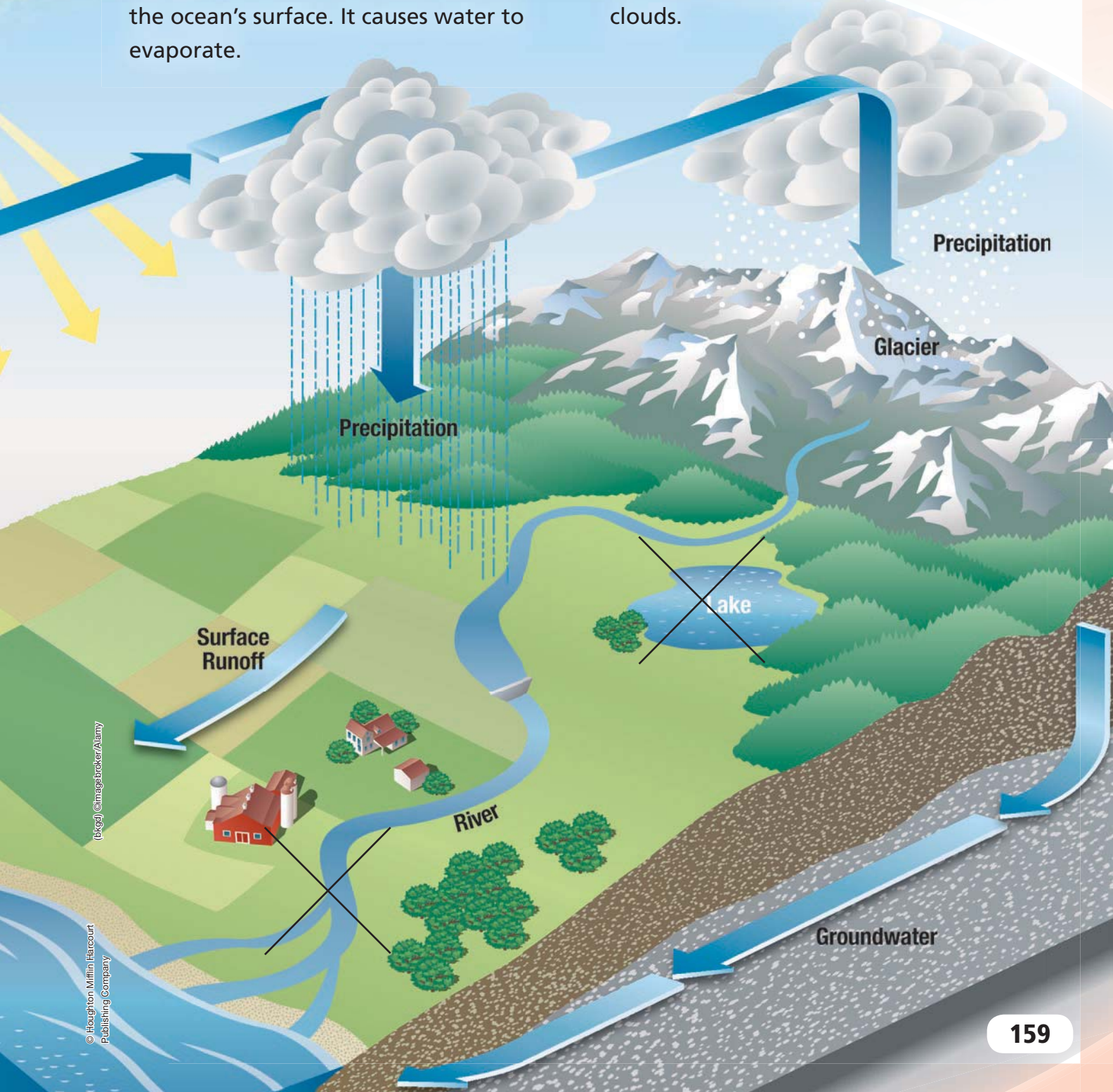


About three-fourths of Earth's surface is covered by water. Most of the water is stored in oceans. Water moves between Earth's surface and the atmosphere through a process called the **water cycle**.

The sun provides the energy for water to move through the water cycle. Sunlight heats up water particles near the ocean's surface. It causes water to evaporate.

Evaporation is the change from a liquid to a gas. When water evaporates, it forms an invisible gas called ***water vapor***.

Water vapor rises into the atmosphere. The **atmosphere** is the mixture of gases that surrounds Earth. In the atmosphere, water vapor cools to form clouds. At any time, about three-fifths of Earth's surface is covered by clouds.



What Goes Up Comes Down

What happens to water vapor after it rises into the air? How does it become puffy white clouds or raindrops that fall on your head?

ACTIVE READING As you read these pages, write numbers next to the sentences and phrases that show the order of events from evaporation to precipitation.

Water vapor condenses around salt and dust particles in the air to form these water droplets.

Condensation

Think again of the ocean. Water from the ocean's surface evaporates. As water vapor rises into the atmosphere, it cools. When water vapor loses enough energy, it condenses to form liquid water. **Condensation** is the change of a gas into a liquid.

There are tiny solid particles in the atmosphere. Water vapor condenses around these particles to form water droplets. A few water droplets are almost too small to see. However, when billions of droplets are close together, they form clouds.

Clouds can be made of water droplets, ice crystals, or both. They can form high in the sky or just above the ground. ***Fog*** is a cloud that forms near the ground.

Water vapor may condense on cool surfaces, too. It's why the cool glass below seems to "sweat." *Dew* is water droplets that form on objects near the ground.

Water droplets in a cloud collide and join together. It takes many droplets to form a single raindrop.

Precipitation

Air currents keep water droplets in the air. But as droplets and snow crystals grow inside clouds, they become too heavy and fall to Earth as precipitation. **Precipitation** is water that falls from clouds to Earth's surface. Rain, snow, and hail are all forms of precipitation.

Precipitation that falls into the oceans may quickly evaporate back into the atmosphere. Precipitation that falls on land may be stored, it may flow across the land, or it may be used by living things. Depending on where it falls, water from precipitation may move quickly or slowly through the water cycle.

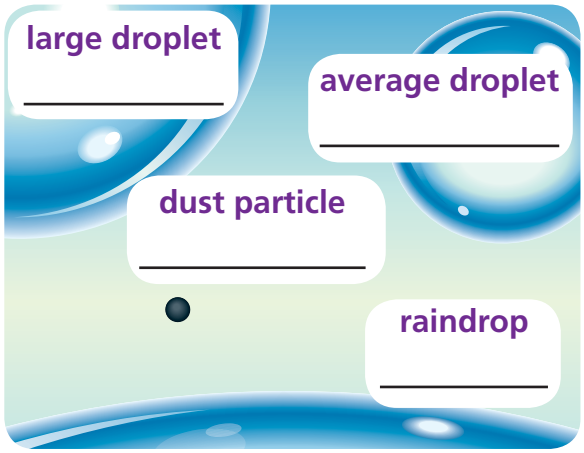
DO THE MATH

Order Fractions

A raindrop is many times bigger than a water droplet and a dust particle. The table shows the size of droplets and dust particles in relation to the size of raindrops. Order the fractions from least to greatest.

Fractions	Ordered fractions
$\frac{1}{100}$	
$\frac{1}{1}$	
$\frac{1}{5000}$	
$\frac{1}{20}$	

Use the ordered fractions to correctly label the items on the diagram.



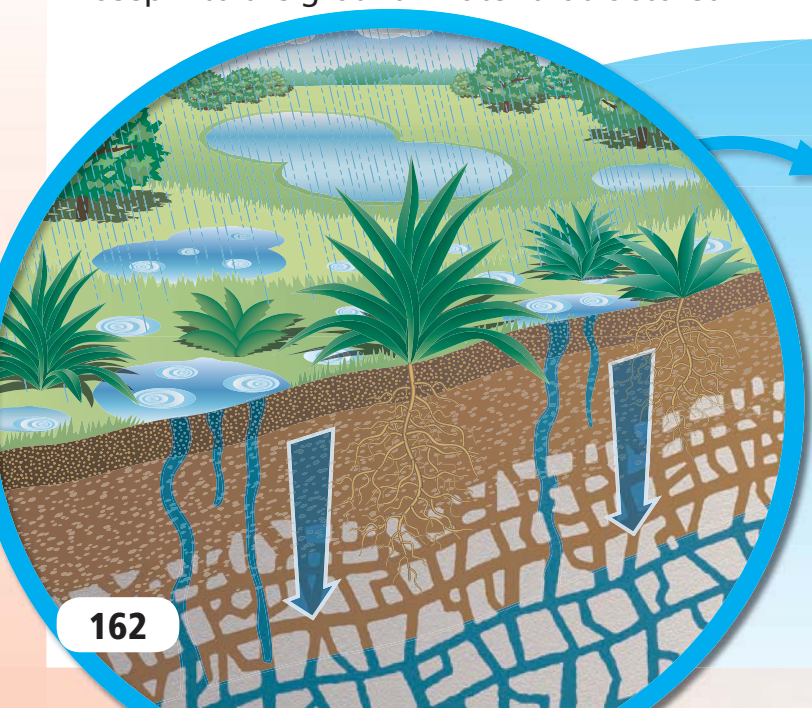
Where Does Water Go?

Most precipitation falls into oceans and evaporates back into the air. But some water takes a more roundabout path on its way through the water cycle.

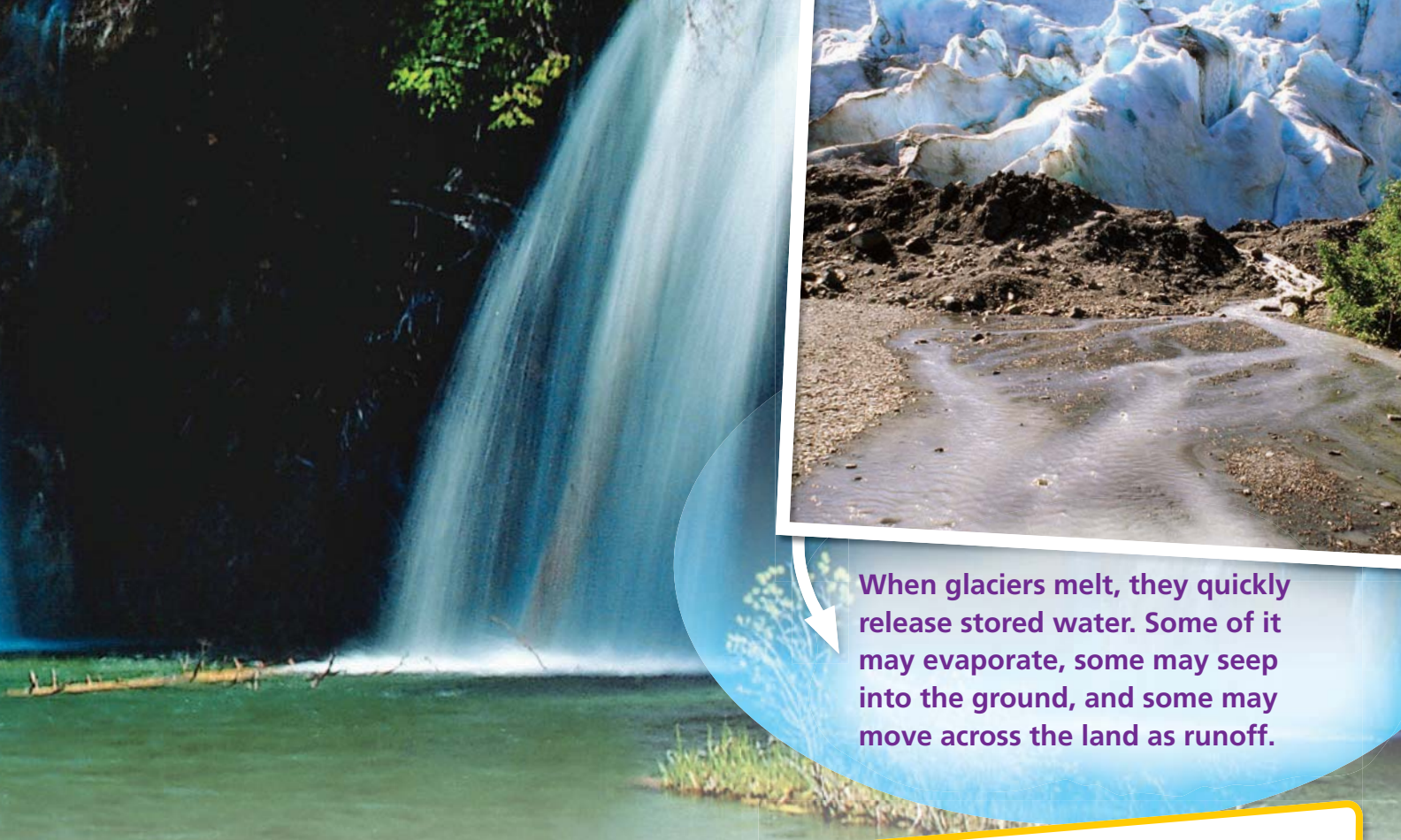
ACTIVE READING As you read these pages, find and circle new key terms you need to know.

Imagine a rainstorm. Heavy rain falls on the ground. Some of this water will evaporate from shallow puddles quickly. It goes from Earth's surface directly back into the atmosphere.

Much of the rainfall will not reenter the atmosphere right away. Some will seep into the ground. Water that is stored underground is called **groundwater**. Groundwater can be found near the surface or very deep underground. Some groundwater may eventually return to the surface at places such as natural springs. Then it moves on through the water cycle.



As rainwater soaks into the ground, it fills up spaces between soil particles and cracks in rocks. Water that seeps deep underground becomes groundwater. Groundwater moves very slowly—if at all!



When glaciers melt, they quickly release stored water. Some of it may evaporate, some may seep into the ground, and some may move across the land as runoff.

Not all of the water that falls on land evaporates right away or seeps into the ground. **Runoff** is water that cannot soak into the ground and instead flows across Earth's surface. Too much precipitation may cause runoff. Runoff often flows into streams, rivers, and lakes. It may also flood low-lying areas.

Precipitation that falls in cold places may become part of a glacier. A ***glacier*** [GLAY•sher] is a large, slow-moving mass of ice. Water can be stored in glaciers for a very long time. Eventually, though, glaciers melt. Meltwater from glaciers can form lakes, flow into oceans, or become groundwater. Melting glaciers can increase the amount of runoff in a place.

Runaway Water

The picture shows runoff on a city street. In the space below, describe what might happen to this runoff.

A Precious Resource

Can you name all the ways that you use water? Water is an important resource used by all living things. People often need to share and conserve their sources of fresh, clean water.

ACTIVE READING As you read these two pages, find and underline at least three facts about aquifers.

The Floridan Aquifer covers about 60,000 square kilometers. Billions of liters of water are pumped out of the Floridan Aquifer each day. Large cities, such as Savannah and Orlando, get water from this aquifer.

When you turn on a faucet, water flows out. Where does it come from? People can get fresh water from rivers or lakes. They can also get fresh water from aquifers. An ***aquifer*** [AH•kwuh•fuhr] is a body of rock that stores groundwater. People can drill into an aquifer and pump the water to the surface.

The water in aquifers can run low if people use more than can be replaced by precipitation. Human activities can also pollute aquifers. States that share aquifers work together to find solutions to these problems. They want to make sure there is enough fresh, clean water for everyone.

Where Does Your Water Come From?

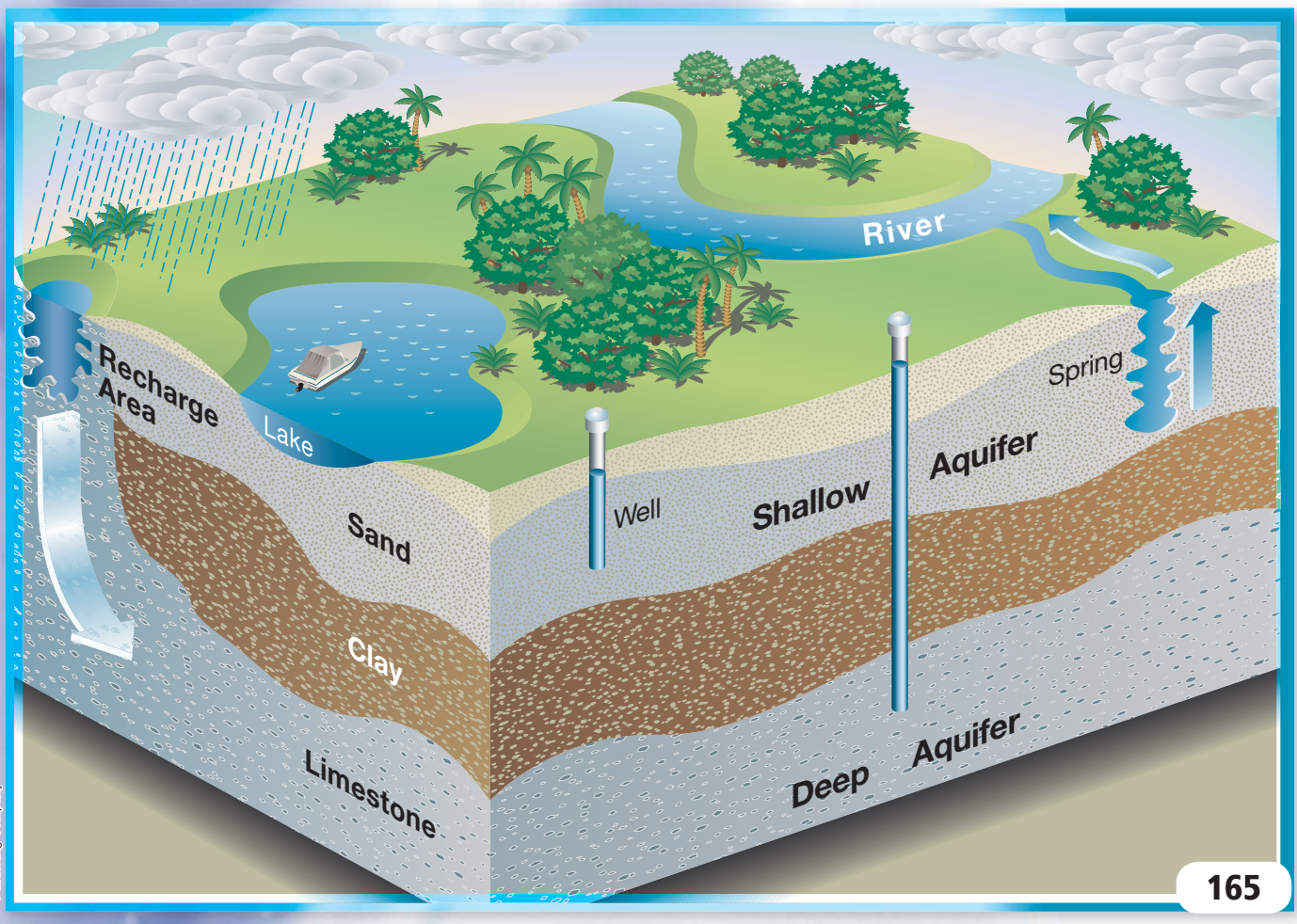
Find out the source of your water at school or at home.

_____

_____

People cannot live without water. We use water for many different purposes, including recreation.

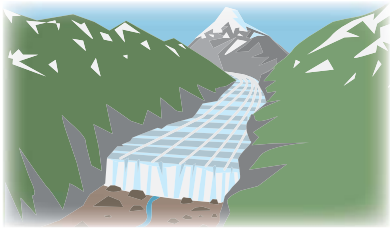
Aquifers are huge underground water reservoirs [REZ•er•vwarz]. Precipitation adds water to aquifers in places called *recharge areas*. The water in some aquifers slowly makes its way to rivers, springs, lakes, and oceans. It may take groundwater in an aquifer up to a year to travel only 25 cm.



Sum It Up »

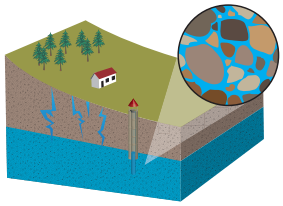
Write the term that matches each photo and caption.

1. Water can be stored for a long time in a large, slow-moving mass of ice. _____



2. Water can also be stored underground between the spaces in soil particles or cracks in rocks.

_____



3. During heavy rains, some water might not soak into the ground. Instead, it flows down slopes and across Earth's surface.

_____

Fill in the missing words to describe the water cycle.

The water cycle shows how water moves from Earth's surface to the 4. _____ and back again. The 5. _____ provides the energy for the water cycle. Water on the surface of the ocean heats up. During 6. _____ , it changes from a liquid to a gas. As 7. _____ rises into the atmosphere, it cools. During 8. _____ , it changes from a gas to a liquid. Billions of water droplets form a 9. _____ . When the droplets get too large for air currents to keep them up, they fall to Earth's surface as 10. _____ .

Brain Check

LESSON 4

Name _____

Vocabulary Review

1 Use the clues to fill in the missing letters of the words.

1. g _ _ _ _ _ w _ _ (10) _ Water stored underground
2. _ o _ d _ _ _ _ _ _ _ _ The changing of water from a gas to a liquid
3. _ a _ _ _ _ (7) c _ _ The movement of water from Earth's surface to the atmosphere and back again
4. _ t _ _ _ p _ _ _ (4) Mixture of gases that surrounds Earth
5. _ r _ (8) i _ _ _ _ t _ _ _ Water that falls from clouds to Earth's surface
6. (5) u _ _ _ _ Water that flows across Earth's surface
7. g (9) _ (6) i _ _ A huge mass of frozen water that moves slowly
8. _ r _ n _ _ i _ _ (3) _ _ _ The process in which plants return water vapor to the atmosphere
9. (1) _ t _ _ _ a _ _ _ Water as a gas
10. _ v _ _ o _ (2) t _ o _ The changing of water from a liquid to a gas

Bonus: Solve the Riddle!

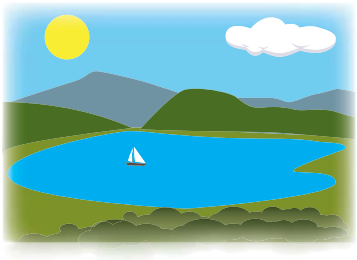
Use the circled letters in the clues above to solve the riddle.

What is water's favorite way to travel?

On a $\overline{1}$ $\overline{2}$ $\overline{3}$ $\overline{4}$ $\overline{5}$ $\overline{6}$ $\overline{7}$ $\overline{8}$ $\overline{9}$ $\overline{10}$

Apply Concepts

2 The sentences below show the steps that lead to the formation of a cloud. Number the steps to place them in the proper order.



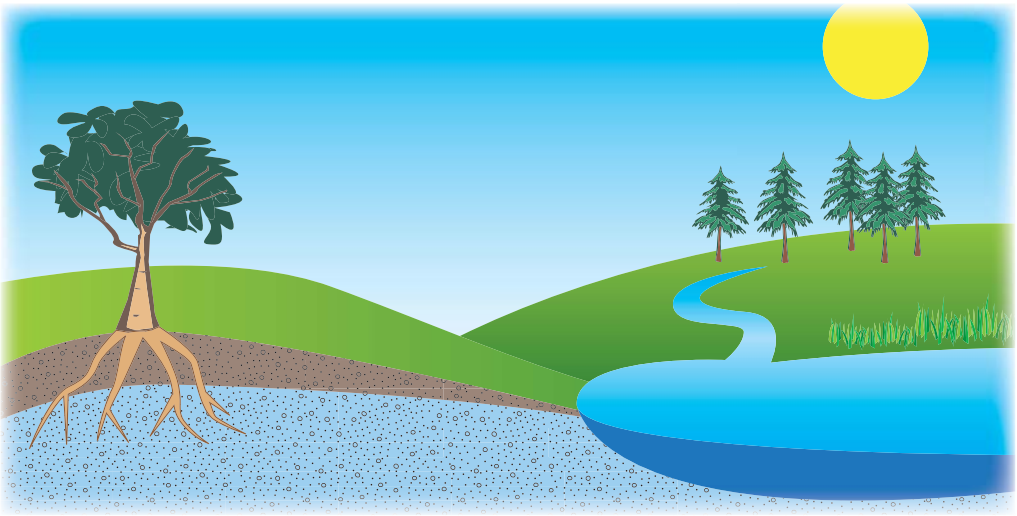
____ Water vapor cools and condenses around tiny particles.

____ Water is heated by the sun.

____ Water evaporates into the air.

____ Billions of water droplets join together.

3 In the picture below, show how groundwater can return to the atmosphere. Use arrows to show how the water moves and use wavy lines to show evaporation.



4 What would happen if water could not condense in the atmosphere?

_____

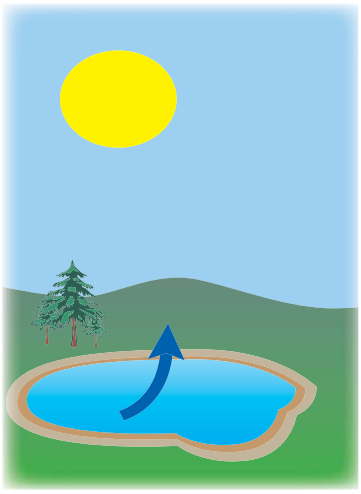
_____

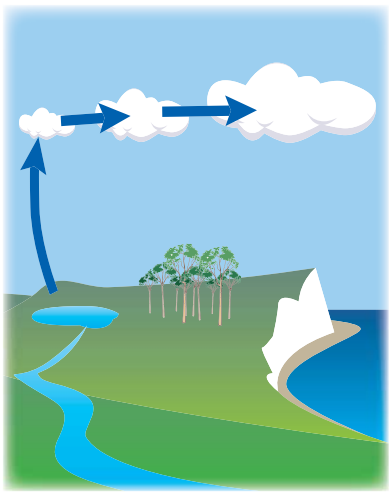
_____

_____

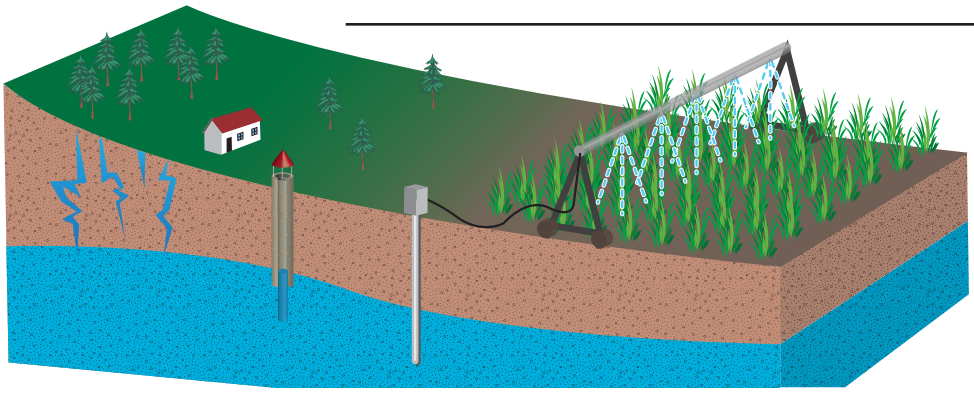
5 In the spaces below, draw and label examples of water in the atmosphere as a solid, a liquid, and a gas. Hint: Wavy lines may be used to represent water vapor.

6 Label each of the following scenes as an example of evaporation, precipitation, or condensation. Then briefly describe what happens during each process.





7 The picture shows stored water being used to irrigate crops. Circle and label the source of the water. How may this stored water be renewed?



8 During an ice age, water is stored in glaciers. The picture below shows land area before and after an ice age. How are the land area and the oceans affected during an ice age?

Take It Home! See *ScienceSaurus*® for more information about water on Earth.

SC.5.E.7.1 Create a model to explain the parts of the water cycle… **SC.5.E.7.2** Recognize that the ocean is an integral part of the water cycle and is connected to all of Earth's water reservoirs via evaporation and precipitation processes. **SC.5.N.1.1** … plan and carry out scientific investigations… **SC.5.N.1.5** … authentic scientific investigation frequently does not parallel the steps of "the scientific method."

INQUIRY LESSON 2

Name _____

ESSENTIAL **QUESTION**

What Happens During the Water Cycle?

Materials

- 2 plastic containers
- modeling clay
- measuring spoons
- measuring cup
- salt
- water dropper
- plastic wrap
- 2 rubber bands
- 2 small weights

EXPLORE

What role does the ocean play in the water cycle?

Before You Begin—Preview the Steps

1. Label the plastic containers A and B. Make two identical clay landform models. Include a lake in each model.
2. Place the landform models on one end of each container. Each model should take up about 1/4 of the space in its container.
3. Stir 2 teaspoons of salt into 2 cups of water. Pour the salt water into the empty area in container A. Add 3 drops of fresh water to the lake in each container.
4. Cover both containers with plastic wrap. Use a large rubber band to hold the plastic wrap in place.
5. Place a small weight on the plastic wrap above the land in each model. Place both containers on a sunny windowsill.
6. Two hours later, observe the models. Record your observations.

Set a Purpose

How do models help you study processes, such as the water cycle?

Think About the Procedure

Why did the landform models take up only one-fourth of the containers?

Why did you add salt to the water?

Why did you put the containers on a sunny windowsill?

Name _____

Record Your Data

In the space below, write or draw your results.

Observations of Model	
Model without ocean water	Model with ocean water

Draw Conclusions

How did your models work?

_____

_____

_____

_____

Claims • Evidence • Reasoning

1. Make a claim about the role oceans play in the water cycle. Provide evidence to support your claim.

2. Suppose you kept the models under a lamp overnight. Make a claim about what would happen to the models. Explain your reasoning.

3. What evidence do you have about the role of the plastic wrap in the model? What does the plastic wrap represent?

4. Make a claim about what would happen if you left the models uncovered in the sunlight. Explain your reasoning.

5. Make a claim about what would happen if you left the models outdoors in a place with freezing temperatures. Explain your reasoning.

SC.5.E.7.3 Recognize how air temperature, barometric pressure, humidity, wind speed and direction, and precipitation determine the weather in a particular place and time. **SC.5.E.7.4** Distinguish among the various forms of precipitation (rain, snow, sleet, and hail), making connections to the weather in a particular place and time.

LESSON 3

ESSENTIAL QUESTION

How Do We Measure Weather?

Engage Your Brain

Find the answer to the following question in this lesson and record it here.

What is the weather like in this place and what tools could be used to measure it?

_____

_____

_____

_____

_____

ACTIVE READING

Lesson Vocabulary

List the terms. As you learn about each one, make notes in the Interactive Glossary.

_____

_____

_____

_____

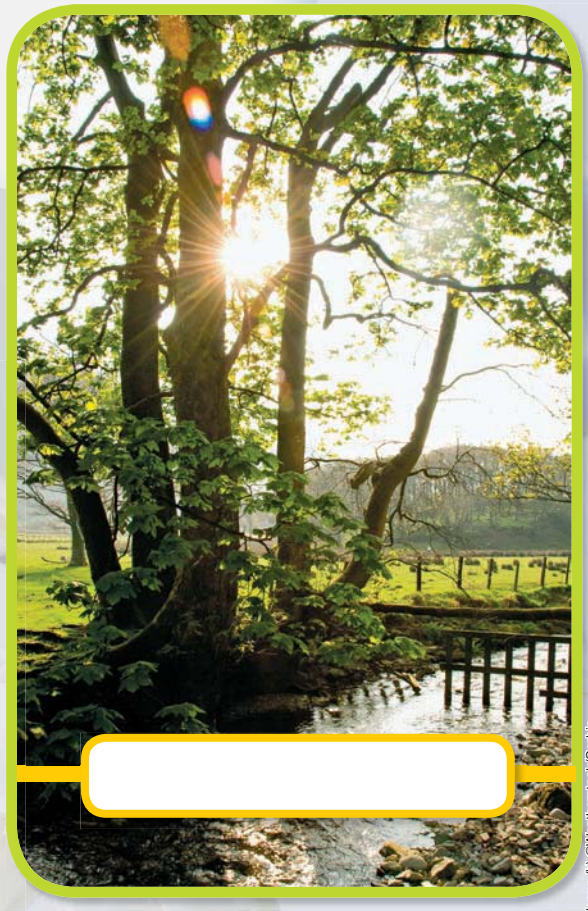
Compare and Contrast

In this lesson, you will read about types of weather and the tools used to measure it. An author often compares and contrasts related things. Active readers ask themselves, How are these things alike? How are they different?

FPO

What's the Weather Like?

Crack! Boom! These are the sounds of a thunderstorm. Thunderstorms are one kind of weather. What other kinds of weather can you think of?



ACTIVE READING As you read these pages, connect two images that show similar types of weather.

Look outside. What is the weather like? It might be sunny or rainy. It might be stormy or windy. It might be hot or cold. **Weather** is what the atmosphere is like at a given time and place. Weather can change from day to day, or even from hour to hour.

Meteorologists [mee•tee•uh•RAHL•uh•jists] are scientists who study weather. They measure factors such as air temperature, amount of cloud cover, and how much precipitation falls from the sky. They analyze their measurements to make a weather report.

FPO

▶ **Label the kind of weather shown in each photo on these pages. Then select one of the photos, and write a caption for it in the space below.**

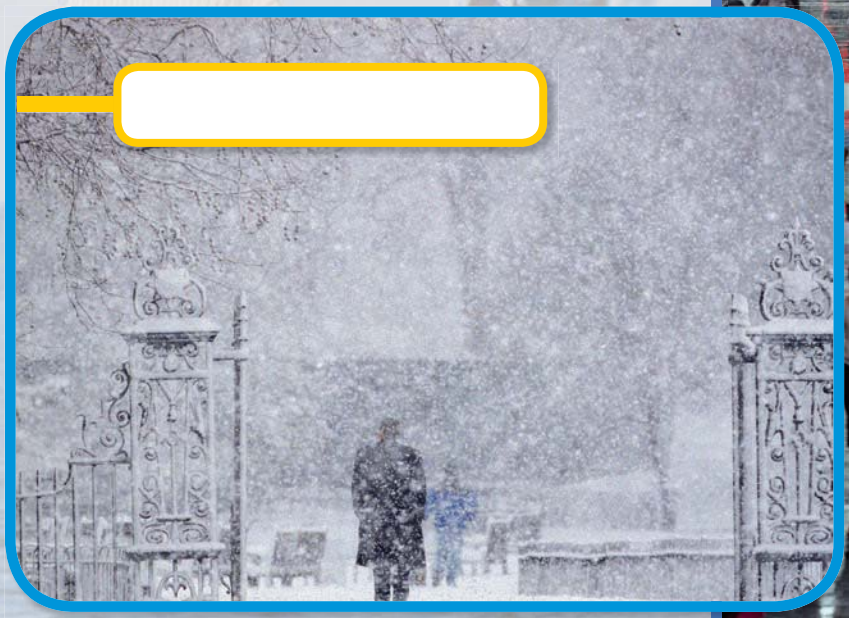
_____

_____

_____

Weather reports tell you what the weather will be like. They help you plan your day. For example, if the weather is cloudy and cold, you need to wear warm clothing to go outside. But if the weather is sunny and warm, you could wear a T–shirt and sandals.

Weather reports are helpful in other ways. Planes cannot fly in severe weather, so airports use weather reports to help schedule flights. Weather reports also help farmers care for their crops. They need to water their crops in dry weather. They need to protect their crops from freezing in cold weather.



Watching the Weather

You likely have used a thermometer before. Some of the tools shown on these pages might not be as familiar as a thermometer. But all are used to measure weather.

2

ACTIVE READING Before you read, turn the main heading into a question. As you read these pages, underline the sentences, terms, or phrases that answer your question.

1

Meteorologists use tools to study the weather. You can use some of these tools, too, at home or at school.

- Weather balloons are used to carry weather tools high up into the atmosphere. Instruments attached to the balloon measure temperature, wind speed, and other weather conditions.
- A *wind vane* measures wind direction. It points in the direction from which the wind blows. Wind direction can be given as *N* for north, *S* for south, *E* for east, *W* for west, or as a combination such as *NE* for northeast.
- An **anemometer** measures wind speed. It has cuplike arms that spin when the wind blows. Wind speed is measured in kilometers per hour (km/hr).

- A **barometer** measures air pressure. It has a sealed metal chamber that expands and contracts when air pressure changes. Air pressure may be measured in inches of mercury (in. Hg) or in millibars (mb).
- A *hygrometer* measures the amount of water vapor in the air, or **humidity**.

The higher the temperature, the more water vapor air can hold. The amount of water vapor in the air compared to what it can hold at a given temperature is called *relative humidity*. Relative humidity is given as a percentage.

Which Tool Is Which?

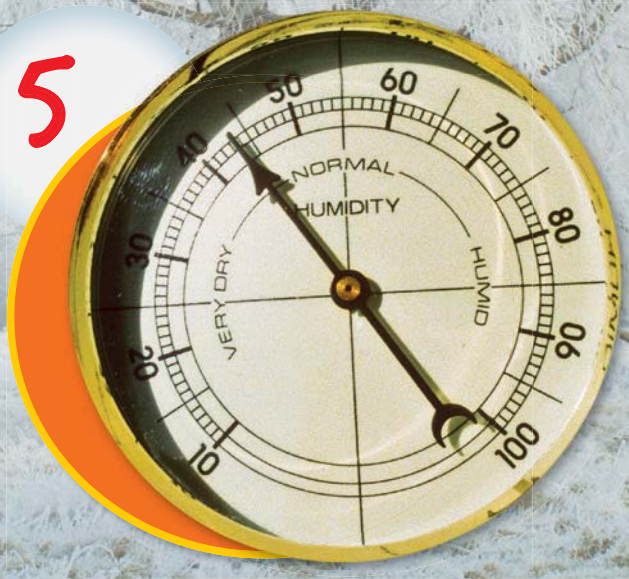
▶ **Look at the pictures on these pages. Identify the tool next to each number, and explain what it measures. Record your answers in the chart below.**

	Tool	What It Measures
1		
2		
3		
4		
5		

3

4

5



Lying Low, Reaching High

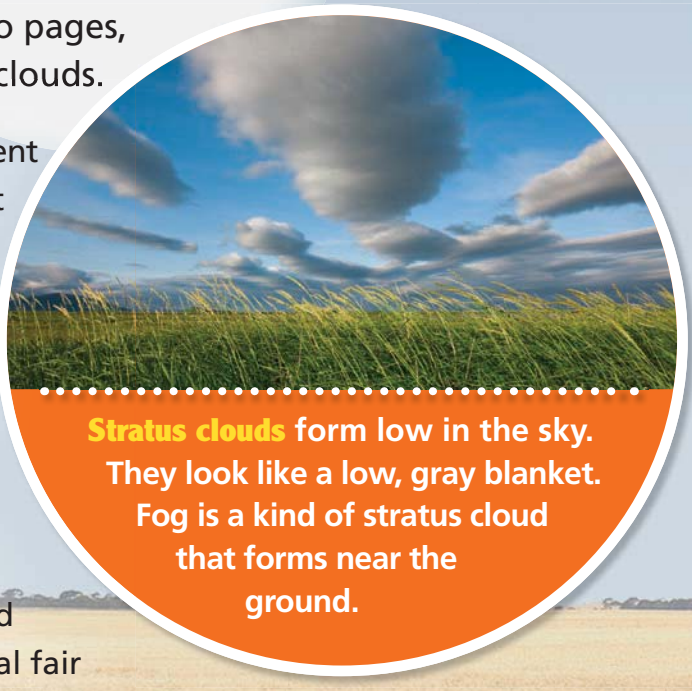
You might see a cloud in the sky and think it looks like a fluffy dog. How would you go about classifying all the different clouds in the sky?

ACTIVE READING As you read these two pages, underline two characteristics used to classify clouds.

Clouds have different shapes and form at different heights in the atmosphere. Shape and height are two characteristics used to classify clouds.

Based on their shapes, clouds can be classified as stratus, cirrus, or cumulus.

- *Stratus* [STRAT•uhs] clouds form flat layers that cover most of the sky. They may signal rain.
- *Cirrus* [SIR•uhs] clouds are thin, white, and feathery. They are often signs of fair weather.
- *Cumulus* [KYOO•myuh•luhs] clouds are puffy and white. They may have flat bases. They can signal fair weather or stormy weather.

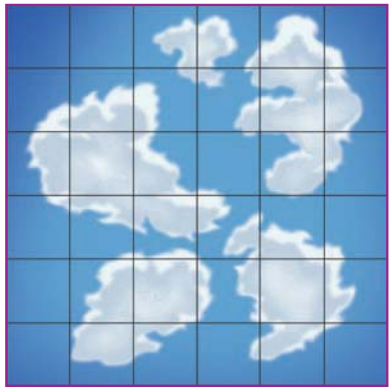


Stratus clouds form low in the sky. They look like a low, gray blanket. Fog is a kind of stratus cloud that forms near the ground.

DO THE MATH

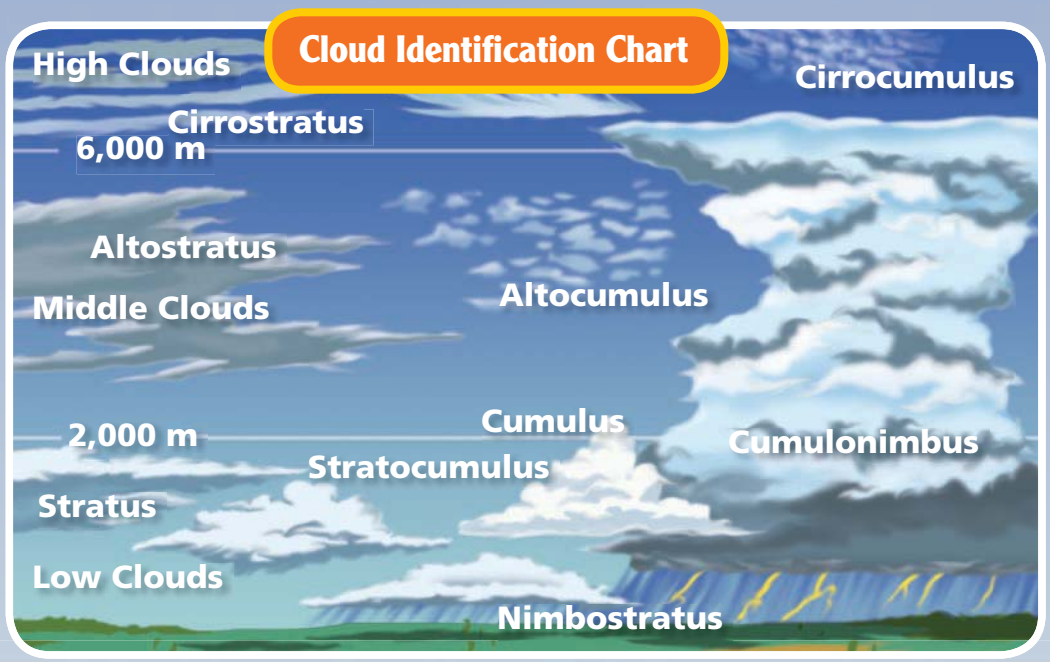
Estimating Fractions

Meteorologists look at the clouds in the sky to estimate cloud cover. Estimate the fraction of cloud cover in this model of the sky.



_____

_____



The chart on this page shows how clouds can also be classified by their heights.

- Low clouds are those formed below about 2,000 m (6,500 ft). Temperatures at this height are not very cold, so the clouds are mostly made of water droplets.
- Middle clouds are formed between 2,000 and 6,000 m (6,500 and 20,000 ft). Temperatures here can be cold, so the clouds are sometimes made of ice crystals. Altostratus [al•toh•STRAT•uhs] and altocumulus [al•toh•KYOO•myuh•luhs] are examples of middle clouds.
- High clouds are formed above 6,000 m (20,000 ft). High clouds are often made of ice crystals because of the cold temperatures at these heights.

Notice that the tall cumulonimbus [kyoo•myuh•loh•NIM•buhs] cloud stretches from low heights to high heights. This kind of cloud has a flat top, and it often produces thunderstorms.

Cumulus clouds are usually made of water droplets. They resemble cotton puffs and often form at lower elevations. Sometimes they grow very tall and wide.

Cirrus clouds often form high in the atmosphere, where temperatures are cold. They are made up of ice crystals. They are often a sign that the weather is about to change.

It's Pouring
Solids and Liquids

Some precipitation falls as gentle flakes of snow.
Some precipitation falls as big drops of water.
Why isn't all precipitation the same?

ACTIVE READING As you read these two pages, underline the sentences that may help you contrast different kinds of precipitation.

Precipitation is solid or liquid water that falls from clouds to Earth's surface. Whether precipitation is solid or liquid may depend on the air temperature. Air temperature changes with the seasons, with elevation, and with location. Rain, snow, sleet, and hail are kinds of precipitation.

- *Rain* is liquid precipitation that falls through warm or cool air. It is the most common kind of precipitation.
- *Snow* is solid precipitation that falls through cold air.
- *Sleet* is precipitation that freezes near the ground. It often begins as rain or snow.
- *Hail* is solid precipitation made of layers of ice. It usually falls during thunderstorms.

Measuring Rain

▶ Look at the picture of the rain gauge. It shows the amount of rain that fell in an area. How much rain fell?

_____

(bkgd) ©AFP/Getty Images; (girl under umbrella) ©Steve Satushek/Getty Images; (rain guage) (b) ©Ted Foxx/Alamy

Rain can start out high in the atmosphere as snow. A typical drizzle drop is about 0.1 mm in diameter. A raindrop that falls during a heavy storm can be as large as 6 mm in diameter. A rain gauge measures the depth of rain that falls in an area.

Sleet is made up of small pellets of ice. It may form when snow partially melts as it falls through a warm layer of air and freezes in a cold layer of air near the ground.

Hail forms inside large thunderclouds. First, wind carries raindrops high into the colder part of the cloud. The raindrops freeze and then fall through the lower, warmer part of the cloud. There, a new layer of moisture sticks to the hail particles, and wind carries them up again. This cycle repeats and the hail particles grow larger until they fall to the ground.

Snow forms when water vapor in the atmosphere turns directly into a solid. Like raindrops, when snow crystals become too large for air currents to keep them up, they fall to Earth. Snow falls in cold temperatures.

Sum It Up

Write the term that matches each photo and caption.

1. This kind of cloud is usually found high in the sky. It is often made of ice crystals and signals fair weather.

_____

2. This kind of cloud is found low in the sky. It often forms flat layers and produces rainy weather.

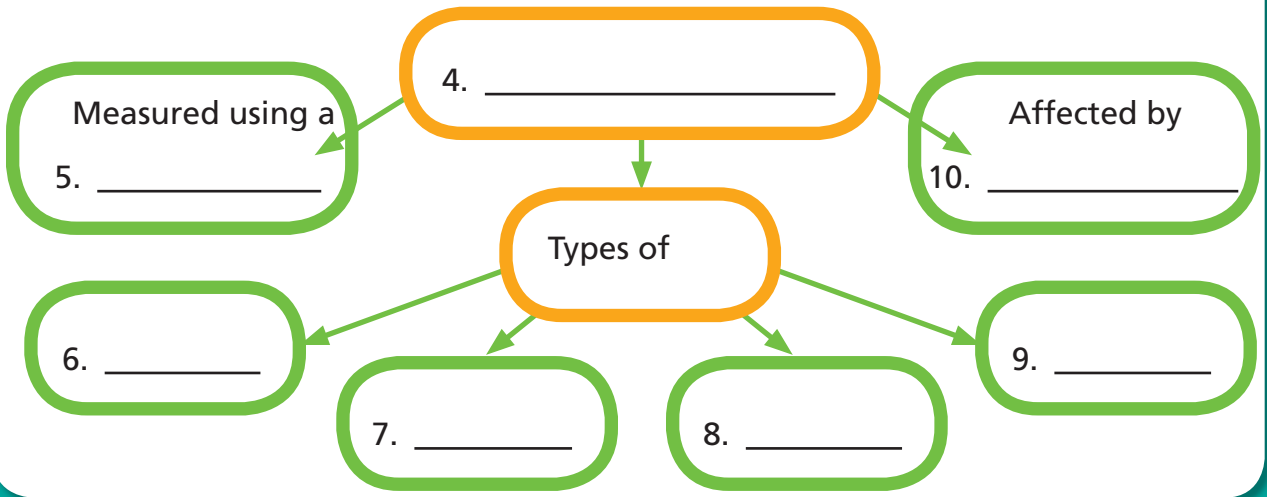
_____

3. This kind of cloud is often found low in the sky. It has a flat base and can signal fair or rainy weather.

_____

Use the terms below to fill in the graphic organizer about precipitation.

rain gauge **precipitation** **snow** **rain** **air temperature** **hail** **sleet**



Brain Check

Name _____

Vocabulary Review

Unscramble each word to match its definition.

1. **diytimuh**: A measure of the amount of water vapor in the air	
2. **threwae**: State of the atmosphere at a given place and time	
3. **teromerab**: Tool that measures air pressure	
4. **etomermane**: The water in a puddle changes to a gas through this process.	
5. **cruisr**: Thin, white, and feathery cloud	
6. **gfo**: Cloud that forms near the ground	
7. **lahi**: Precipitation made of layers of ice	

WORD BANK

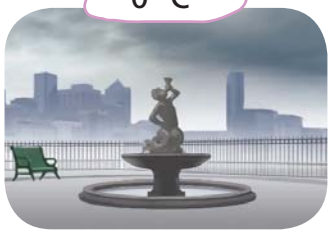
barometer* weather* humidity* cirrus
hail anemometer* fog *Key Lesson Vocabulary

Apply Concepts

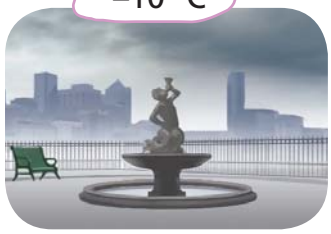
1 Complete the scene by drawing the type of precipitation that is most likely to fall based on the given air temperature. Label each scene with the type of precipitation.

25 °C

0 °C



–10 °C



2 In the space below, draw the type of cloud that signals thunderstorms. Write a description of the cloud and the type of precipitation it produces.

3 Draw a circle around the weather tool you would use to measure air pressure. Draw an X over the weather tool you would use to measure wind speed. Draw a square around the weather tool you would use to measure wind direction.

Take It Home!

Share what you have learned about weather with your family. Go outside and look at the clouds. Describe the kinds of clouds that you see. Explain what kind of weather they usually signal.

SC.5.N.2.1 Recognize and explain that science is grounded in empirical observations that are testable; explanation must always be linked with evidence.

S.T.E.M.

ENGINEERING & TECHNOLOGY

Stormy Weather:

Beaufort Wind Scale

If you were a sailor on a ship, being able to measure wind speed would be very important. In the past, wind speed was estimated by observating its effect on things. Today, we use tools to measure wind speed. Read on to find out about ways to measure wind speed.

In 1805, Sir Francis Beaufort developed a scale to classify wind speed. This scale assigned levels based on sailors' observations. For example, a Force 3 wind describes a gentle breeze in which ships move steadily across the water. Force 6 describes a strong breeze that produces large waves, whitecaps, and spray. And Force 11 describes a violent storm.

You can observe a flag to see how wind blows. A windsock shows the relative direction and speed of winds. The windsock droops during low wind speed. It flies straight out from the pole during high wind.

Use the text and reference materials to complete the table.

Beaufort Wind Force	Average Wind Speed (km/h)	Description	Beaufort Wind Force	Average Wind Speed (km/h)	Description
0	0	Calm		56	Near Gale
	3	Light Air			Gale
	9	Light Breeze		82	Severe Gale
		Gentle Breeze			Storm
	24	Moderate Breeze		110	
		Fresh Breeze	12	124	Hurricane
6	44				

Today, wind speed is measured using anemometers.

This anemometer uses cuplike devices to measure wind speed. The faster the wind blows, the faster the cups spin. The cups are attached to sensors that measure the actual wind speed.

This digital anemometer uses spinning fans to generate magnetic pulses. Then the instrument translates these pulses into measurements of the wind speed.

An ultrasound anemometer has pairs of sound speakers and microphones. Electronic circuits measure the time it takes for sound to travel from each speaker to its microphone. The anemometer uses the data collected to determine wind speed as well as wind direction.

Design Your Future

Use observations to design your own scale to measure something such as temperature, cloud cover, or amount or strength of rainfall. Write the process for using the scale and then try it out.

ENGINEERING DESIGN CHALLENGE

Design It:

Build a Wind Vane

Meteorologists use many tools to measure and predict weather. One of the most basic tools is called a wind vane. This tool points in the direction from which the wind blows. Knowing the wind's direction helps meteorologists make better weather predictions.

Some wind vanes have a base that shows the directions north, east, south, and west to help identify wind direction. How can you build a wind vane? Remember, an effective wind vane swivels easily when the wind direction changes!

What to Do:

1. Research different types of wind vanes.
2. Identify everyday materials you could use to build a wind vane. List them here.
3. Think about the best ways to put these materials together to make a wind vane.
4. Identify the design criteria your wind vane must meet.
5. Make a diagram of your design.
6. Build and test your design.
7. Analyze the results of your test. Improve your wind vane until it meets your design criteria. What improvements did you make?
8. Use your wind vane to learn about weather in your community. What did you learn?
9. Keep a record of your work in your Science Notebook.

ESSENTIAL **QUESTION**

How Do Weather Patterns Help Us Predict Weather?

Engage Your Brain

Find the answer to the following question in this lesson and record it here.

What do you think will happen when the dark cloud moves over this place?

_____

_____

_____

_____

ACTIVE READING

Lesson Vocabulary

List the terms. As you learn about each one, make notes in the Interactive Glossary.

_____ _____

_____ _____

_____

Signal Words: Details

This lesson gives many details about predicting weather. Active readers look for signal words to identify examples and facts about a topic. Some words and phrases that signal details are for *example*, *also*, and *in fact*.

Windy Weather

You can't see air. But you can feel it each time the wind blows. What exactly is wind, and why does it blow?

ACTIVE READING As you read this page, circle common, everyday words that have a different meaning in science.

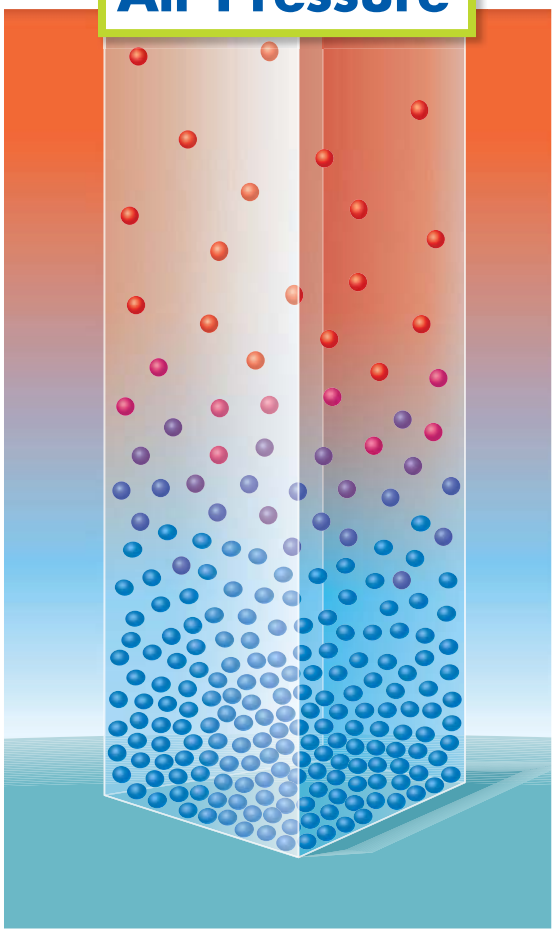
Air is made of matter. It has mass and volume. It presses on you from all sides. To understand wind, you must know more about air pressure. **Air pressure** is the weight of the atmosphere on Earth's surface.

The sun does not heat all parts of Earth's surface evenly. This uneven heating of Earth's surface causes differences in air pressure. The differences in air pressure cause air to move. **Wind** is moving air. In general, wind blows from areas of high pressure to areas of low pressure.

Lows

▶ What are two characteristics of air in a low pressure area?

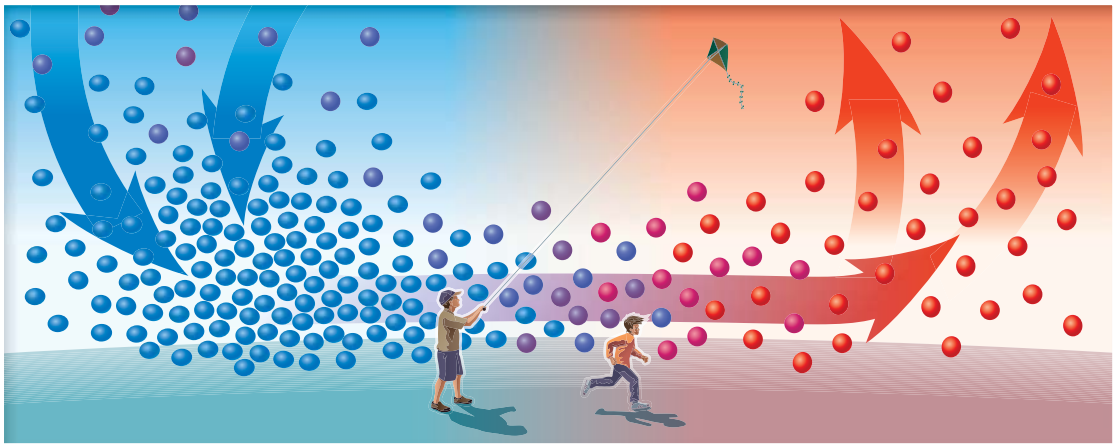
Air Pressure



Local Winds **Land heats up more quickly than water does. This means that during the day, the air above the land is warmer and has a lower density than the air above the water. Because of these differences, the warm air over the land rises and cool air over the water moves inland to replace it. This is called a *sea breeze*.**

At night, the land loses heat faster than the water does. The cool air over the land has a greater pressure than the warm air over the water. So, the cool air moves out to sea to replace the rising warm air. This is called a *land breeze*.

The weight of air particles at the top of the atmosphere presses down on the air particles underneath. So, air pressure is greater near Earth's surface than high above it.



Temperature can affect air pressure. In cold temperatures, where air particles move close together and sink, the air pressure is high. In warm temperatures, where air particles move apart and rise, the air pressure is low. Across Earth's surface, air moves from high-pressure to low-pressure areas.

Battling Bodies of Air

When you take a shower, the air inside the bathroom becomes warm and wet. When you open the bathroom door, the warm, wet air meets cool, dry air. You've made a front! Read on to find out more about fronts and how they affect weather.

ACTIVE READING As you read these two pages, draw boxes around each type of front that is described.

Meteorologists call a large body of air that has the same temperature and moisture properties throughout an **air mass**. The properties of an air mass depend on where it forms. An air mass that forms over warm land will be warm and dry. An air mass that forms over cold water will be cold and wet.

In the United States, winds often blow from west to east. The winds carry air masses from one place to another. Sometimes, two air masses with different properties meet. The boundary between the two air masses is called a **front**.

Different fronts bring different types of weather. A cold front forms where a cold air mass moves under a warm air mass. Severe weather often forms along cold fronts. Sunny skies and cooler air that can be wet or dry usually follow a cold front. A warm front forms where a warm air mass moves over a cold air mass. Light rains and snow showers are common along warm fronts. Behind a warm front, warmer temperatures and cloudy skies are common.

How Will the Weather Change?

▶ Look at the map to the right. In which direction is the cold front moving, and what kind of weather might it bring?

Warm air is lifted steeply upward along a cold front. Water vapor in the air cools and condenses into large cumulonimbus clouds. Hailstorms are possible.

Warm air rises and cools slowly along a warm front. Cloudy skies can extend over large areas. Steady rain or snow can fall.

Weather forecasters use symbols to show fronts. The triangles and half-circles on these symbols point in the direction the front is moving.

Mapping the Weather

A flashing red hand on a traffic signal means *don't walk*. You use symbols each time you cross a busy street. Weather forecasters use symbols, too, to show weather conditions.

ACTIVE READING As you read these two pages, circle clue words or phrases that signal a detail such as an example or an added fact.

Predicting the Weather

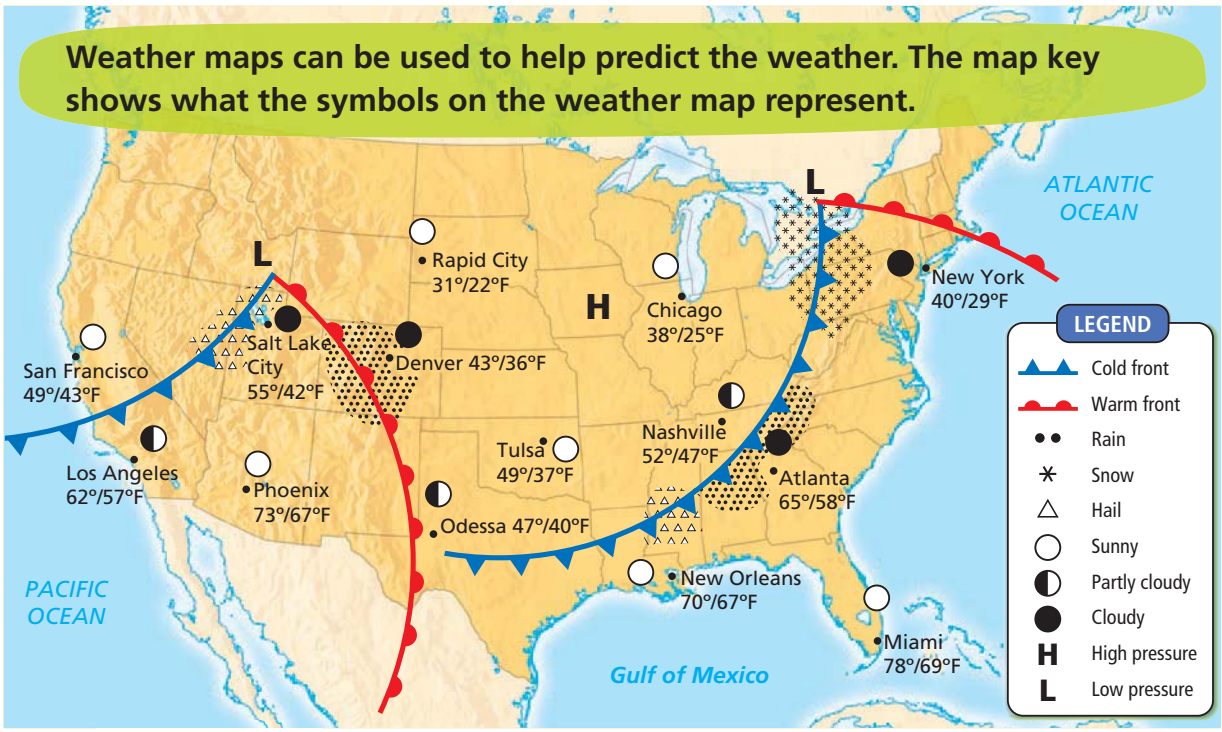
▶ **Use the weather map on the right to describe the weather for the city of Denver and to predict how it will change .**

Maps are useful tools. A **weather map** is a map that uses symbols to show weather data. You already know the symbols for cold fronts and warm fronts. Weather maps also use symbols to show areas of high pressure (H) and areas of low pressure (L). They might also show temperature, cloud cover, and wind direction for different places.

How do meteorologists get the data they need to make weather maps? They use weather tools such as thermometers, barometers, and anemometers. These tools are placed in weather stations. A *weather station* is a structure that has tools for measuring and recording weather data at a given location. Weather stations are found all across the United States.

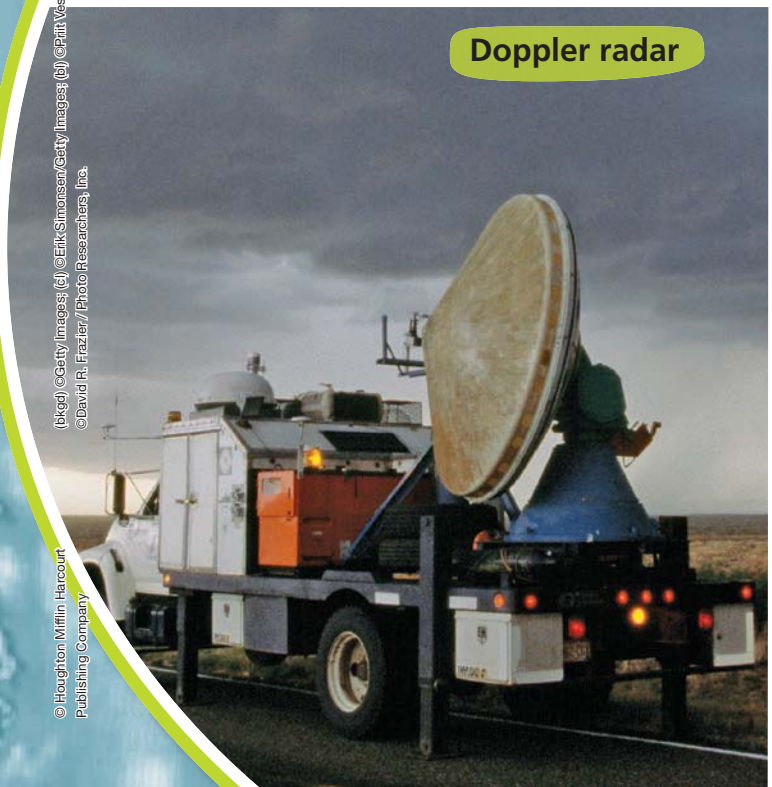
Meteorologists also get weather data from other sources. Satellites high above Earth send back information about cloud cover and storms. Doppler radar uses radio waves to track storms. Meteorologists look for patterns in the data they collect. For example, high pressure often brings fair weather. Low pressure often brings stormy weather. A weather report is based on the patterns that meteorologists find in the data they collect.

Weather maps can be used to help predict the weather. The map key shows what the symbols on the weather map represent.

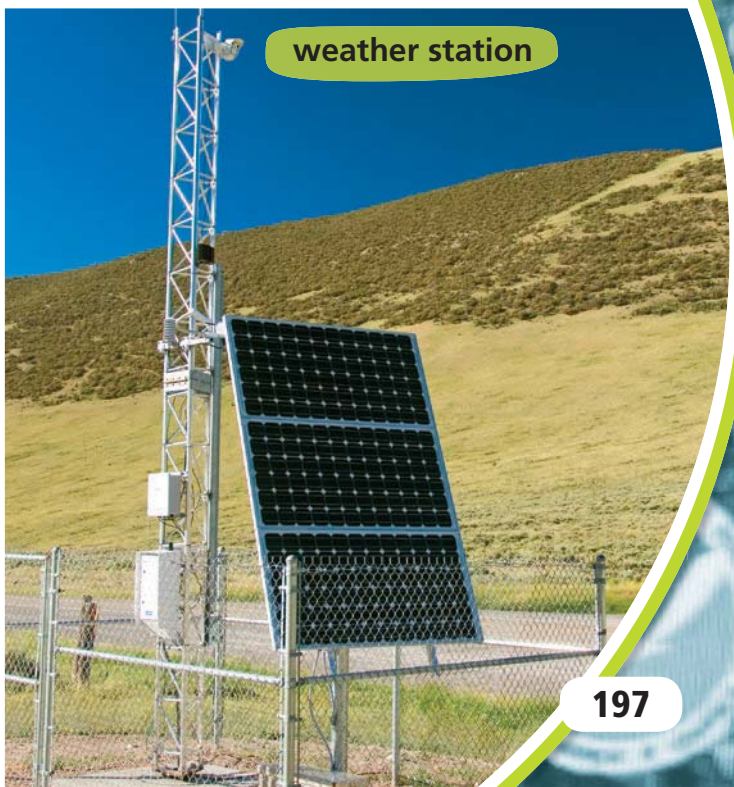


weather satellite

Meteorologists use satellites, Doppler radar, computer models, and weather stations to make weather reports. Using all of these tools, meteorologists are able to accurately track and predict the weather.



Doppler radar



weather station

Why It Matters

When Disaster Strikes

Tornadoes. Hurricanes. Blizzards. Sometimes, the weather can turn dangerous. What should you do to stay safe when bad weather strikes?

ACTIVE READING As you read these two pages, circle two sentences that describe how to stay safe during a disaster.

A hurricane is a low-pressure storm. Its center, or eye, is calm. But wind speeds around the eye can be as fast as 250 km/hr. The strong winds cause much of the damage that a hurricane brings.

Thunder is crashing overhead. You look outside. You see a whirling column of air that stretches from a dark cloud to the ground. It's a tornado! Tornadoes, hurricanes, and blizzards are types of severe weather.

- A *tornado* has a funnel shape. Its strong winds can toss cars into the air. It can form from violent thunderstorms.
- A *hurricane* is a strong storm that forms over warm ocean water. When a hurricane moves over land, it can cause flooding, tornadoes, and thunderstorms. It is the most powerful storm of all.
- A *blizzard* is a strong winter storm. Blizzards have high winds and heavy snowfall.

Preparedness plans help people stay safe when disasters strike. Before and after a disaster, volunteers help provide assistance for people in need. They might help to sandbag riverbanks to prevent flooding or deliver water and food to those who need it.

Meteorologists track severe weather. They rank the storms by how strong the winds are or how much damage the storms might cause. They put out warnings so that people can seek shelter before a storm hits.

If possible, you should always go indoors when a storm is near. To prepare for severe weather, you can help your family put together an emergency kit. Your kit should have water, flashlights, batteries, canned food, first-aid supplies, and a radio. Listen to the radio for storm warnings.

DO THE MATH

Solve Word Problems

The table shows how much water people of different ages should drink each day. Suppose a family wants to be sure they have enough water in case a natural disaster strikes. The family includes a mother, a father, a 10-year-old son, and a 6-year-old daughter. About how many gallons of water should they store to cover their needs for 3 days?

Remember: 16 cups equal 1 gallon.

Age Range	Amount of Water Needed Each Day
1 to 3 years	4 cups
4 to 8 years	5 cups
9 to 13 years	8 cups
14 years to adult	10 cups

Sum It Up »

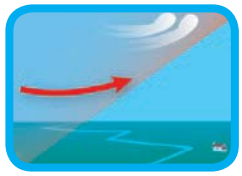
Read the summary statements. Then match each statement with the correct picture.

1

1. During the day, cool, dense air from the ocean moves inland, replacing warm air over the land.
2. A cold air mass moves under a warm air mass.
3. During the night, cool, dense air over land moves out to sea, replacing warm air over the ocean.
4. A warm air mass moves gently over a cold air mass.

A

B

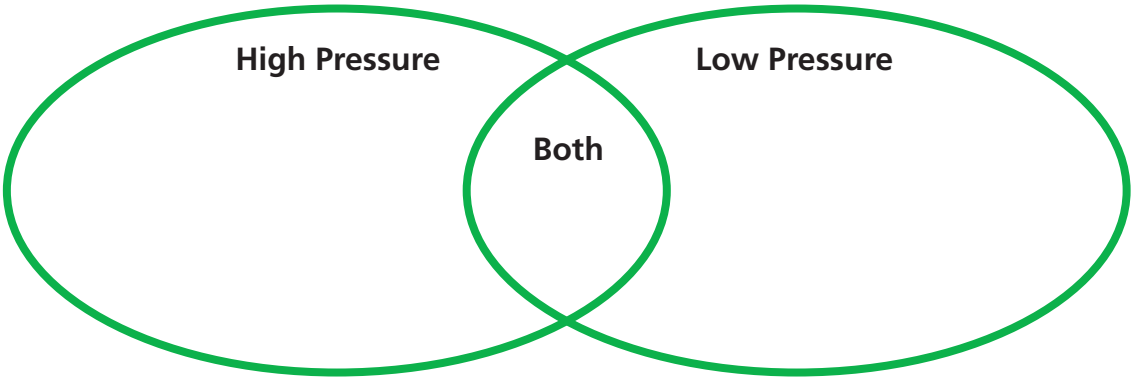


C

D

Fill in the Venn diagram about air pressure by writing the correct number in each category.

5. Shown as *L* on a weather map
6. Brings fair weather
7. Measure of the weight of the atmosphere on Earth's surface
8. Shown as *H* on a weather map
9. Brings stormy weather



Brain Check

Name _____

Vocabulary Review

1 **Draw a line from each term to its definition or description.**

1. wind*	A. Body of air with the same properties throughout
2. sea breeze	B. Structure that houses weather tools
3. front*	C. Boundary between two different air masses
4. air mass*	D. Map that shows weather conditions
5. weather map*	E. Measure of the weight of the atmosphere on Earth's surface
6. weather station	F. Breeze that blows from the sea to the land
7. air pressure*	G. Moving Air

*Key Lesson Vocabulary

Apply Concepts

2 The symbols below show weather data for a place. Write what each symbol stands for. Predict the kind of weather a place near the *H* will have.

_____

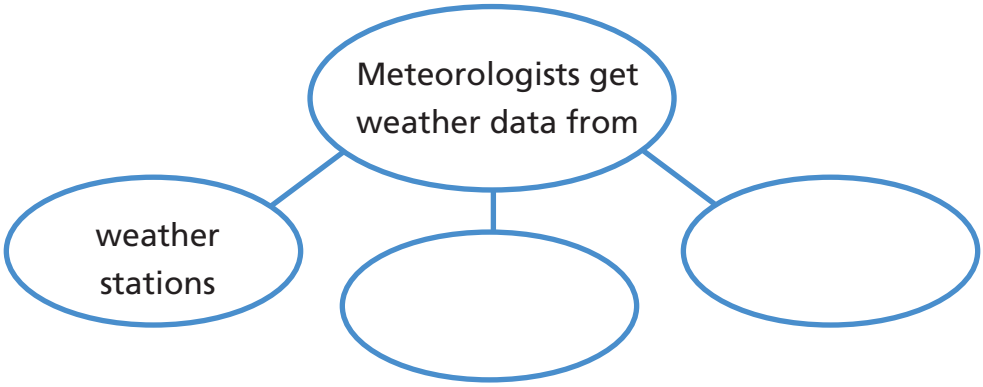
_____

_____

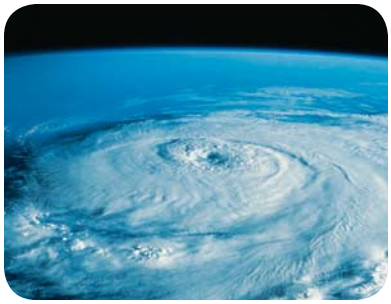
_____

_____

3 Fill in the graphic organizer below to show how meteorologists get data to predict the weather.



4 Label the kinds of severe weather shown in the pictures below.

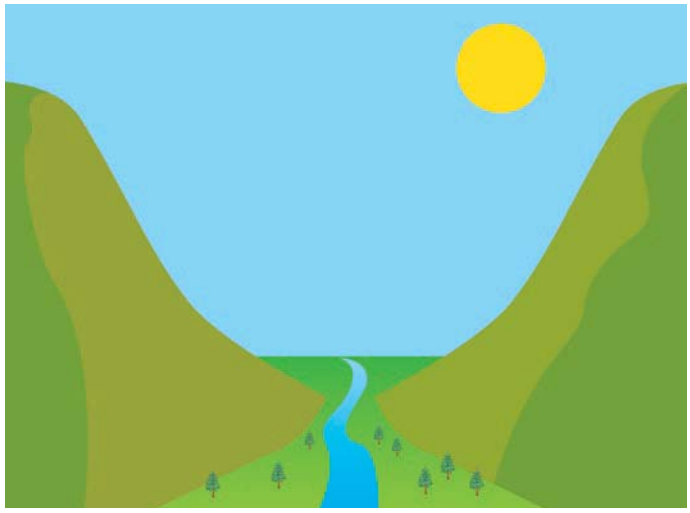


_____ _____ _____

5 Heated air inside a hot-air balloon causes it to rise into the sky. When the air cools, the balloon returns to the ground. When is the hot-air balloon behaving like an air mass in a high-pressure area? In a low-pressure area?

6 Label each picture with the type of air mass that would form over it.

7 Mountain and valley breezes are similar to land and sea breezes. During the day, the sun heats up a mountain's side more quickly than the valley below. In the picture below, draw arrows to show wind direction during the day.



8 Put a check mark (√) next to each item that should be part of an emergency kit.

Items	Emergency Kit
1. air conditioner	
2. portable radio	
3. electric blanket	
4. bottled water	
5. first-aid supplies	

Take It Home! Share with your family what you've learned about preparing for bad weather. Work with a family member to make a safety plan. Gather supplies for an emergency kit. Review the plan with family members.

Name _____

ESSENTIAL **QUESTION**

How Can We Observe Weather Patterns?

Materials

- thermometer
- barometer
- rain gauge
- wind vane
- cloud chart
- hygrometer
- anemometer

EXPLORE

Meteorologists use weather tools to observe and measure weather. They look for patterns in the data they collect to make weather predictions. How can we use these same tools to find weather patterns?

Before You Begin—Preview the Steps

1. With your teacher's help, practice taking measurements using weather tools. Make sure you know what each tool measures. Also, review the units of measurement for each tool.
2. As a class, select a place on the school grounds to set up a weather station. The place should be sheltered from the sun.
3. Set up the weather station using the tools listed in the materials section.
4. As a class, take turns and work in teams to measure weather data at the same times each day for five days. Use the cloud chart to identify cloud types. Record your weather observations.
5. After the fifth day, look for patterns in your observations. Predict the weather for the following three days.

Set a Purpose

Why is it helpful to observe the weather?

Think About the Procedure

Why should the chosen location for your weather station be sheltered from the sun?

Why would it be useful to measure the weather conditions at the same time every day?

Name _____

Record Your Data

Record your observations in the table below.

DAY	Weather Observations
	Weather Predictions

Draw Conclusions

How can we observe weather patterns?

Claims • Evidence • Reasoning

1. Describe weather patterns you can identify in your data.

2. Based on your data, make a claim about which weather conditions were most likely to change before the weather changed. Explain your reasoning.

3. What were your weather predictions? On which weather pattern did you base them?

4. Make a claim about whether your predictions were accurate. Provide evidence to support your claim.

5. What would have made your weather predictions more accurate?

SC.5.E.7.5 Recognize that some of the weather-related differences, such as temperature and humidity, are found among different environments.... **SC.5.E.7.6** Describe characteristics ... of different climate zones as they relate to latitude, elevation, and proximity to bodies of water.

LESSON 6

ESSENTIAL **QUESTION**

What Factors Affect Climate?

Engage Your Brain

Find the answer to the following question in this lesson and record it here.

Giraffes live in warm places. How can there be snow near a giraffe's home?

_____

_____

_____

_____

ACTIVE **READING**

Lesson Vocabulary

List the terms. As you learn about each one, make notes in the Interactive Glossary.

_____ _____

_____ _____

Visual Aids

A map adds information to the text that appears on the page with it. Active readers pause their reading to study maps and decide how their information adds to the text.

Climate vs. Weather

During the summer, the weather might be sunny one day and cloudy the next. But for most places, temperatures in the summer stay warm. The weather changes, but the overall weather pattern stays the same.

ACTIVE READING As you read the next two pages, draw a star next to what you consider to be the most important sentence, and be ready to explain why.

Your area has certain weather patterns during the year. These patterns make up the climate where you live. **Climate** is the long-term weather patterns of a place.

Climate is different from weather. *Weather* describes what the atmosphere is like at a given time and place. For example, on average, a desert might get only a few centimeters of rain each year. The desert has a dry climate. But the weather in the desert might be rainy one day and dry the next.

Scientists find the climate of an area by averaging weather conditions over a long period of time. They study an area's temperature, wind speed, wind direction, cloud cover, air pressure, and amount of precipitation. They find the average of these conditions for each month or year. They look at 30 years or more of data to determine the climate of an area.

DO THE MATH

Analyze Data

Use the data in the table to make a line graph. Then compare all the graphs to answer the questions below.

1. During which months in 2005 was Fargo's precipitation more than 20 mm below its long-term average?

_____

2. During which months in 2005 was Fargo's average temperature closest to its long-term average? Which month is most different?

_____

_____

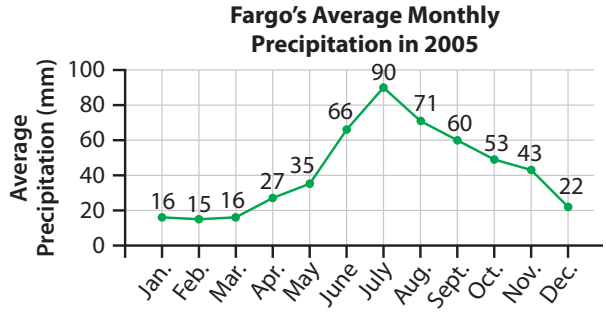
_____

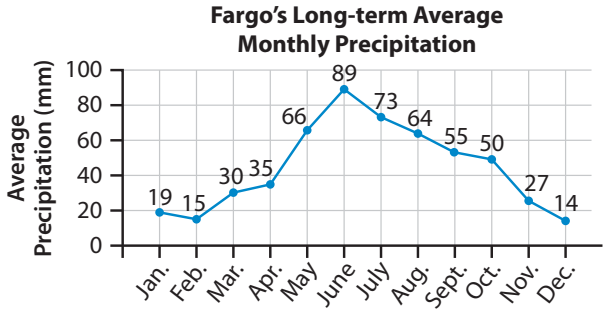
_____

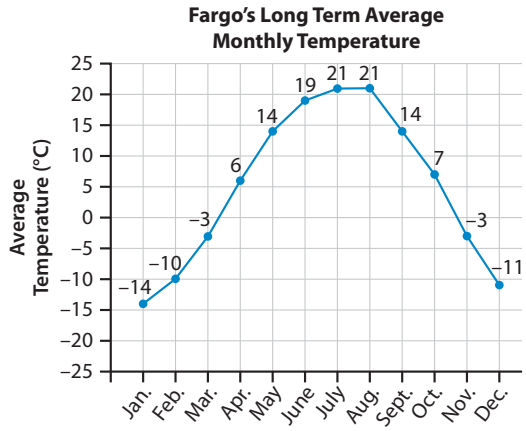
_____

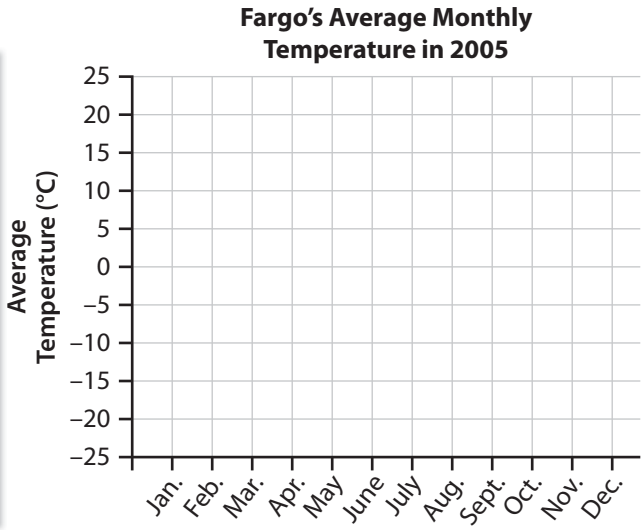
Average Monthly Temperature for Fargo, North Dakota, in 2005

Month	Average Temp. °C	Month	Average Temp. °C
Jan	–13.0	July	22.0
Feb	–10.0	Aug	20.0
Mar	–2.0	Sept	14.0
Apr	7.0	Oct	7.0
May	14.0	Nov	–2.0
June	18.0	Dec	–8.0









Hot, Cold, and Medium

Is it hot year-round where you live? Or is it cold? What is the climate where you live? Look through these pages and find out!

KEY	
Temperate	
Tropical	
Polar	

ACTIVE READING As you read these two pages, underline the sentence that describes the temperature in each climate zone.

Places can be grouped into different climate zones. A **climate zone** is an area that has similar average temperatures and precipitation throughout. Three of Earth's climate zones are *tropical, temperate,* and *polar*.

Tropical climates are generally warm. They occur near the equator. The **equator** is the imaginary line that divides Earth into its northern and southern hemispheres, or halves.

Temperate climates are found in middle latitudes, between the tropical and the polar climate zones. **Latitude** is a measure of how far north or south a place is from the equator.

Polar climates are generally the farthest from the equator. They have cold temperatures year-round and low amounts of precipitation.

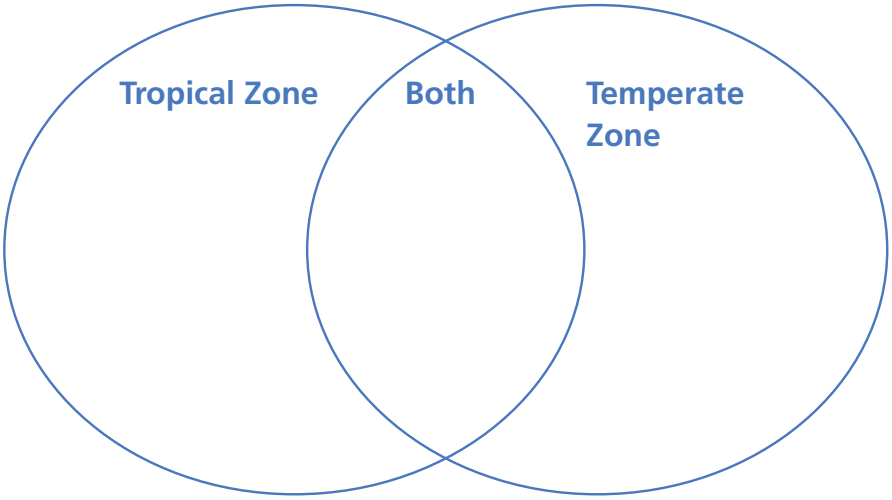
©Chris Pancewicz/Alamy

Temperate climate zones have moderate temperatures and varying precipitation. For most of the year, the temperature ranges from 10 °C to 18 °C. They usually have four distinct seasons. Much of the United States is found in this zone.

Polar climate zones are generally covered in ice and snow year-round. They are found near the poles, where the sun is never high in the sky. The temperature rarely rises above 10 °C and there is little precipitation. Few plants and animals live in this zone.

Comparing Climates Zones

▶ Fill in the Venn diagram below to compare and contrast tropical and temperate climate zones.



Tropical climate zones are near the equator. There, the sun is directly overhead nearly all year. The sun's position causes intense heating of Earth's surface. Generally, the temperature is greater than 18 °C. The amount of precipitation varies greatly in this zone.We can find lush, diverse forests in this climate zone.

Why Climates Differ

Why does it rarely snow in Florida? Why isn't Alaska warm year-round? What things make one climate different from another?

ACTIVE READING As you read this page, draw one line under a cause. Draw two lines under the effect.

Different factors affect the kind of climate a place has. These factors include distance from the equator, elevation, proximity to bodies of water, and landforms.

Most places that are close to the equator have warmer climates than places that are farther away. But if a place has a high elevation, it will have a cool climate even if it is on the equator. That's why snowy mountaintops can be found in tropical places.

Oceans and large lakes affect climate, too. Water heats up and cools down more slowly than land does. So places near the coast often are cooler in summer and warmer in winter than places far from the ocean. Landforms, such as mountains, can affect the rain pattern of large areas.

The different colors on the oceans show water temperature. The warmest water is colored red, and the coolest is blue. The *Gulf Stream* is a warm ocean current. It flows up from near the equator, along the east coast of North America, and across the Atlantic Ocean toward northern Europe. It deeply affects the temperature and precipitation amounts of nearby coastal areas.

The elevation of the mountain causes climate zones. As you go up in Earth's atmosphere, the air gets colder. So, the climate at the base of a mountain might be very hot, but as you go up, it gets colder and colder until you reach a zone where no trees grow at all. That is why mountains near the equator can have tropical rain forests at their base, but snow with no trees at all at the top.

North Atlantic Ocean

Gulf Stream

A rain-shadow effect can happen when wet air that formed over the ocean rises up the side of a mountain. Clouds form and precipitation takes place on the ocean side of the mountain, giving it a wet climate. The air, now dry, moves down the far side of the mountain. This side has a dry climate. It's in a *rain shadow*.

Predicting Change

▶ Town A is located near the coast, along which a warm ocean current flows. Predict what would happen to the climate of Town A if the ocean current stopped flowing.

Cool Drier

Wind

Ocean

Warm Wet

Hot Dry

Why It Matters

Climate and the Environment

Why do polar bears live in cold places, while elephants live in warm places? How does climate affect the living and nonliving things in a place?

ACTIVE READING As you read this page, find and underline examples of how climate affects living and nonliving things.

Climate affects where organisms can live. A polar bear has a thick layer of fat that keeps it warm in the polar climate where it lives. Maple trees have broad leaves to capture sunlight during the warm summer months. They shed their leaves during the cold, dry winter to prevent water loss.

Climate also affects the nonliving parts of the environment. Over time, wind-driven waves can reshape a continent's coastline. Rain, wind, and changes in temperature can cause rock to break. The broken bits of rock can mix with dead plant and animal matter to form soil.

Polar bears

Desert: A desert is a dry environment. Temperatures may vary greatly in deserts. It can be very hot during the day and cold at night. Living things in deserts need to be able to survive on little water. Cactuses have a waxy coating that helps them store water.

Swamp: Swamps can be covered by fresh water, salt water, or both. Swamps occur in places where the ground cannot soak in all the preciptation or runoff that reaches the area. Temperatures may be very hot in swamps for part of the year. But swamps may also occur in places that have cold winters. Many types of plants and animals live in swamps.

Tropical rain forest: Tropical rain forests have a lot of precipitation through the year and have warm to hot temperatures throughout the year. They receive nearly the same amount of sunlight year-round. Vegetation covers most of the land in tropical rain forests. It provides food and shelter for many animals.

▶ What effects might a long time with no rain have on these three environments?

Sum It Up »

Complete the outline below to summarize the lesson.

I. Climate

A. (1) _____

B. determined by the long-term average precipitation and temperature

II. Main climate zones

A. (2) _____

1. warm year-round
2. can be wet or dry
3. found near the equator

B. Temperate

1. (3) _____
2. different amounts of precipitation
3. found in middle latitudes

C. Polar

1. usually little precipitation
2. (4) _____
3. found in high latitudes

III. (5) _____

A. bodies of water
B. landforms
C. elevation
D. distance from the equator

Fill in the missing words to tell how scientists determine the climate of a place.

Climate is different from 6. _____ , which describes what the atmosphere is like at a given time and place. Scientists find the climate of a place by averaging weather conditions over a 7. _____ period of time. They study an area's temperature, wind speed, wind direction, cloud cover, air pressure, and amount of 8. _____ .
They find the 9. _____ of these conditions for each month of the year. They look at 10. _____ years or more of data to find the climate of a place.

Name _____

Vocabulary Review

1 Use the clues to unscramble the words in the box. Use the word bank if you need help.

1. **qaroeut**: the imaginary line that divides Earth into the northern and southern hemispheres, or halves	
2. **ertmpeate emlciat**: has moderate temperatures	
3. **taliecm noze**: an area with the same kind of climate conditions	
4. **dutlatei**: distance of a place from the equator	
5. **lopricta itleamc**: is warm year-round	
6. **rewaeth**: state of the atmosphere at a certain time and place	
7. **ropal atmlcie**: is cold year-round	
8. **catmile**: long-term weather patterns of a place	

latitude*	temperate climate	climate zone*	polar climate
climate*	equator*	tropical climate	weather

*Key Lesson Vocabulary

Apply Concepts

2 The pictures below show different kinds of clothing to wear in the fall. In which climate zone would you wear each piece of clothing? Write your answers on the lines under the pictures.

_____ _____ _____

3 Correctly label each statement below with a C if it refers to climate and a W if it refers to weather.

a. In Antarctica, the average yearly temperature is below freezing. ___

b. Cherrapunji, India, may be the rainiest place on Earth. ___

c. It hasn't rained for two weeks in Macon, Georgia. ___

d. Today's air temperature was the highest this week. ___

4 In the picture below, add arrows to show how air moves to form a rain shadow. Add labels showing where you would find a dry climate and a wet climate.

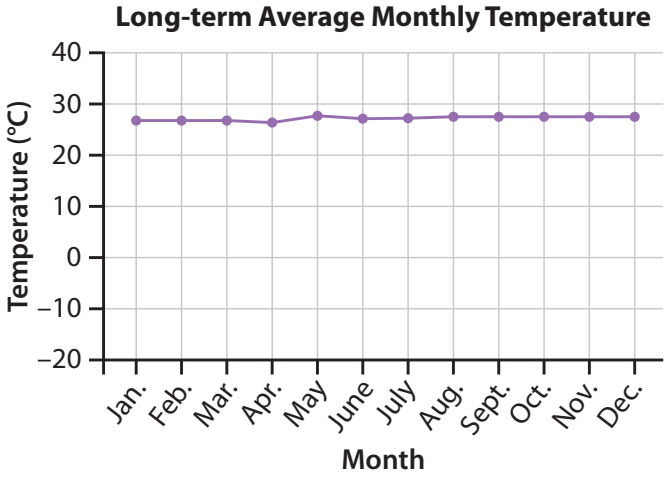
5 Label the climate zones in the map below.

A _____

B _____

C _____

6 The graph below shows the long-term average monthly temperature of a place. In which climate zone is this place likely to be found? Explain.



_____

_____

7 Suppose the climate of a rain forest changes. Its temperature is now always near or below freezing, but its precipitation remains high. Draw and describe what this place would look like after a few years.

8 The picture shows a landform. Label where the climate will be the coolest and where it will be the warmest on the landform.

Take It Home!

Share what you have learned about climate with your family. Find out about the kinds of homes people build in different climates. Work with a family member to make a model of a home in a different climate.

SC.5.E.7.2 Recognize that the ocean is an integral part of the water cycle and is connected to all of Earth's water reservoirs via evaporation and precipitation processes.

10 THINGS YOU SHOULD KNOW ABOUT Hydrologists

1. Hydrology is the study of the quality and movement of water. A hydrologist is a person who uses hydrology in their everyday work.
2. The word *hydrology* comes from the Greek words *hydro* meaning "water" and *logos* meaning "study".
3. To make sure it is safe, hydrologists test the water you drink for pollutants.
4. Hydrologists need to know how soils and rocks may affect water quality.
5. They also care about the quality of the water in rivers, streams, and oceans.
6. Hydrologists can help decide where to dig wells for underground water.
7. A hydrologist can help farmers figure out how to get water for their crops.
8. Hydrologists help design dams to produce electricity and prevent floods.
9. They can use their knowledge to help predict floods and droughts.
10. A hydrologist can help design sewers and drainage systems.

(inset) ©Colin Cuthbert/Newcastle University/Science Source; ©Comstock/Getty Images

Show What You Know About Hydrologists

Answer these five questions about hydrologists.

1. What part of a hydrologist's work do you find most interesting?

2. What do hydrologists study?

3. How do hydrologists help us?

4. Write the question that goes with the answer below.

5. Write and answer your own question about hydrologists.

UNIT 4 Benchmark Review

Name _____

Vocabulary Review

Use the terms in the box to complete the sentences.

precipitation
evaporation

1. The climate of a particular place is determined by temperature and _____.

2. Oceans receive freshwater from rain and rivers, but ocean levels do not change much because of constant _____ of water from the ocean's surface.

Science Concepts

Fill in the letter of the choice that best answers the question.

3. Deanna measured the temperature and humidity every afternoon for four days. She recorded the results in the table below.

Day	Temperature	Relative humidity (%)
Monday	28 °C (82 °F)	90
Tuesday	27 °C (81 °F)	79
Wednesday	24 °C (75 °F)	70
Thursday	28 °C (82 °F)	69

Which day could Deanna conclude was the most hot and humid?

(A) Monday
(B) Wednesday
(C) Tuesday
(D) Thursday

4. Kendell wants to determine if there is a trend in air temperature changes during April. Which of the following procedures should he follow?

(F) Measure the temperature every hour for 1 day.
(G) Measure the temperature at noon every day in April.
(H) Measure the temperature at the same time each Monday.
(I) Measure the temperature on the first and last day of April.

5. Most of the clouds in a photograph of a mountain scene are cirrus clouds. Where do cirrus clouds form?

(A) around mountains
(B) at high elevations
(C) near the ground
(D) over the oceans

6. The table below describes some weather conditions at two different weather stations.

	Station 1	Station 2
Temperature	10 °C (50 °F)	20 °C (68 °F)
Precipitation	3 cm	2 cm
Wind	3 km/hr west	8 km/hr east
Cloud cover	overcast	mostly cloudy

Which statement is correct?

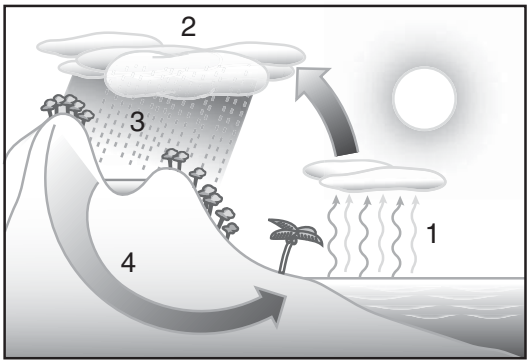
Ⓕ Station 1 is experiencing more rain than station 2.

Ⓖ Both stations are experiencing freezing conditions.

Ⓗ Station 1 is experiencing stronger winds than station 2.

Ⓘ Both stations have wind traveling in the same direction.

7. The diagram below shows the water cycle.

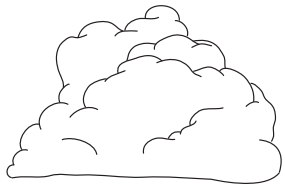


At which point does precipitation happen?

Ⓐ 1 Ⓒ 3

Ⓑ 2 Ⓓ 4

8. Which of the following is a cumulus cloud?

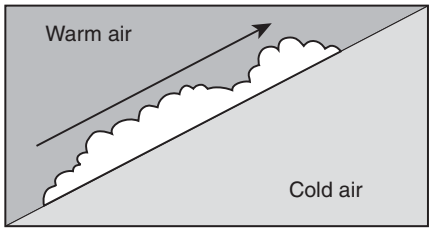
Ⓕ 

Ⓖ 

Ⓗ 

Ⓘ 

9. The following diagram shows a location where two air masses meet.



What is the weather like at this type of front?

Ⓐ cloudy and rainy

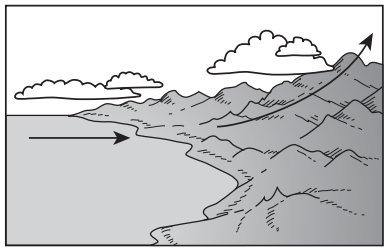
Ⓑ clear and cold

Ⓒ clear and warm

Ⓓ windy and cold

Name _____

10. The following diagram shows the pattern of air movement in a coastal area.



Which type of wind is illustrated in the diagram?

(F) valley breeze
(G) sea breeze
(H) land breeze
(I) mountain breeze

11. Where in a tropical climate are you most likely to find cooler weather and snow?

(A) at the top of a tall mountain
(B) at sea level near a cold ocean current
(C) in cloudy places near the center of the continent
(D) at the base of a mountain range that blocks air flow

12. Scientists study many factors that allow them to predict weather. Which factor **most directly** affects the movement of air?

(F) air pressure
(G) relative humidity
(H) precipitation
(I) temperature

13. Darnell read that the central part of Argentina has a climate that is very similar to that of the central part of the United States.

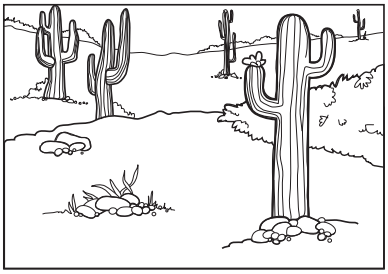
What information on the map provides the best explanation for the climates' similarities?

(A) Both countries are located to the east of the Pacific Ocean.
(B) There are large mountains in the western parts of both countries.
(C) The central parts of both countries are about the same distance from the equator.
(D) Both countries are very large compared to many of the countries in the Americas.

Apply Inquiry and Review the Big Idea

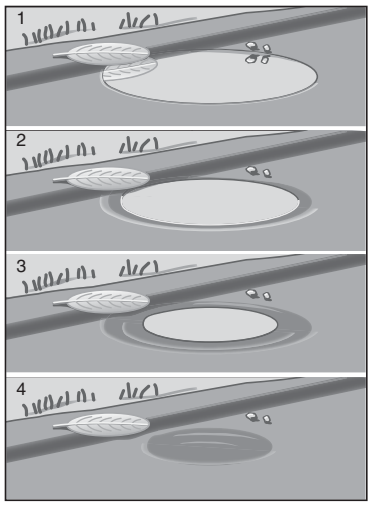
Write the answers to these questions.

14. Jamie sketched the following picture of the landscape he saw while he was on vacation. It included cacti and barren rock.



What can you conclude about what kinds of plants can grow in this climate? Explain how you know.

15. The figure below shows how a puddle changes during the day.



Make a claim about the process that is taking place. Support your claim with evidence.