Directions:

**Daily Directions**
1. Read each passage.
2. Complete the following comprehension questions.
3. Students should complete approximately 5-6 pages per day.

Note- The work increases difficulty throughout the week.

Contact Information:

**Teacher Contact Information**

**School Contact Information**
What Are Some Natural Hazards?

A natural hazard is a harmful event caused by nature. Natural hazards have negative effects on people, places, and the environment. They destroy buildings, homes, and roads. They can also kill people, animals, and plants. Natural hazards are very dangerous for everything in their path.

Types of Natural Hazards

An earthquake is one type of natural hazard. Sometimes earthquakes cause tsunamis. A tsunami is a series of very long sea or ocean waves. The waves are very powerful when they hit coastal land. They can sweep people and buildings away. One of the worst tsunamis was the Indian Ocean tsunami of 2004. It was caused by a very powerful earthquake. Hundreds of thousands of people died.

One effect of a tsunami is very bad flooding. Floods are usually caused by severe weather, like bad rainstorms or hurricanes. A flood is a buildup of water on land that is normally dry. High levels of water can cause people to drown. Cars and buildings can be swept away.

Natural hazards like tsunamis, severe weather, and flooding can also lead to coastal erosion. Coastal erosion happens when events like these cause beaches and land on the coast to wear away. Coastal erosion causes damage to coastal homes and buildings.
Volcanoes are another natural hazard. When a volcano erupts, or explodes, hot magma, ash, and gases are released. The gases and ash get into the air. They make it hard to breathe. The ash is dangerous for planes and birds. It can even stop sunlight from reaching the ground. When magma reaches the ground, it kills any plants or animals in its path. It can also destroy buildings and homes. It can even bury towns.

**Why Do Natural Hazards Happen?**

Natural hazards have natural causes. Earthquakes are movements of the ground. They are caused by a sudden release of energy. This occurs when rocks along a fault move. A fault is a break in the rocks that make up Earth’s crust. An earthquake happens when the rocks on either side of the fault move. Severe weather happens when warm and cold fronts collide in the air. Volcanoes erupt when the Earth releases too much pressure below them. People have no control over any of these hazards.

**How to Cope with Natural Disasters**

There is no way to stop a natural hazard. But we can limit the harmful effects. We can build dams and sea walls to reduce flood and hurricane damage. We can also pay attention to signs and warnings. Small earthquakes and changes in gases are signs that a volcano might erupt. When people see these signs, they should evacuate, or leave, the area where the volcano is. People should also leave if a hurricane is predicted. People should have emergency plans in case an earthquake or severe weather occurs.
What Are Some Natural Hazards?

Match each description to the natural hazard it describes.

Definitions

___ 1. a series of giant sea or ocean waves
___ 2. movements of the ground
___ 3. the wearing away of beaches and land
___ 4. a buildup of water on land that is normally dry

Natural Hazards
A. coastal erosion
B. tsunami
C. flood
D. earthquake

Answer the questions below.

5. What are some negative effects of natural hazards?

________________________________________________________________________

________________________________________________________________________

6. How are tsunamis and floods related?

________________________________________________________________________

________________________________________________________________________
7. **Main Idea** How can we limit the impact of natural hazards?

8. **Vocabulary** Write a sentence using the term *evacuate*.

9. **Reading Skill: Cause and Effect** What causes an earthquake to occur?

10. **Critical Thinking: Draw Conclusions** California gets a lot of earthquakes. What can you conclude about where California is located?

11. **Inquiry Skills: Research** What natural hazards are common in your area? How does your community prepare for them?

12. **Test Prep** Volcanic explosions can cause
   - A towns to be buried.
   - B earthquakes to occur.
   - C people to be swept away.
   - D land to wear away.
How Does Weather Change Each Day?

The air you breathe is part of Earth’s atmosphere. The atmosphere is the layers of air that cover Earth’s surface. The air in the atmosphere is a mixture of gases. These gases have no color and no taste.

The sun warms both the surface of the Earth and the atmosphere. The atmosphere provides a lot of heat to the surface of the Earth. The atmosphere has weight, and it presses down on Earth’s surface.

**Changing Weather**

Weather is what Earth’s atmosphere is like in a certain place at a certain time. Weather includes temperature, wind, and water in the air. Scientists who study weather are called meteorologists.

Weather takes place in the lowest part of the atmosphere. Weather can change very quickly. The air in the lowest part of the atmosphere is always moving. It can bring clouds or colder air to an area. It can also bring changes in humidity. Humidity is how much water vapor is in the air.

![Thermometer, Rain Gauge, Weather Vane, Anemometer](image-url)
Moving air is called wind. Scientists use tools called anemometers to measure wind speed. They also measure the wind’s direction with weather vanes.

Another important part of weather is the air temperature. Temperature is how hot or cold something is. You use a thermometer to measure temperature. Temperature can be measured two ways. One way is in degrees Celsius. The other way is in degrees Fahrenheit.

Precipitation is also part of weather. Rain, sleet, snow, and hail are all types of precipitation. The temperature of the air is what causes different types of precipitation. A rain gauge is used to measure how much precipitation has fallen.

**Clouds**

Clouds can be many different shapes and sizes. Different types of clouds are different temperatures. They are also different heights. Many clouds in the sky are two or more cloud types put together.

Cumulus clouds are thick and white. They have fluffy tops and flat bottoms. Small cumulus clouds usually indicate that it will not rain.

Cirrus clouds are thin and wispy. They are high in the sky. These clouds also indicate that it will not rain.

Another type of cloud is stratus clouds. These clouds form flat layers in the sky. Sometimes stratus clouds are high and thin. Then they indicate cloudy, dry weather. Sometimes stratus clouds are low and heavy. Then they indicate that a light rain may fall.

Cumulonimbus clouds are large and gray and indicate that it will probably rain. If the cumulonimbus clouds are also very tall, it indicates that a thunderstorm may occur.
How Does Weather Change Each Day?

Write answers to the questions on the lines below.

1. What is the atmosphere?

2. What is weather, and where does it take place?

3. What is temperature?

Fill in the blanks in the table below.

<table>
<thead>
<tr>
<th>Weather Instrument</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Thermometer" /></td>
<td>thermometer</td>
</tr>
<tr>
<td><img src="image" alt="Rain Gauge" /></td>
<td>rain gauge</td>
</tr>
<tr>
<td><img src="image" alt="Wind Direction" /></td>
<td>measures wind direction</td>
</tr>
<tr>
<td><img src="image" alt="Wind Speed" /></td>
<td>measures wind speed</td>
</tr>
</tbody>
</table>
8. Main Idea What are two parts of weather?

9. Vocabulary Define the term meteorologist.

10. Reading Skill: Main Idea and Details Name two ways to measure temperature.

11. Critical Thinking: Apply Identify a type of cloud. Describe the kind of weather this cloud type usually means.

12. Test Prep The atmosphere is
   A an instrument that measures wind speed.
   B water that falls from clouds to Earth’s surface.
   C the layers of air that surround Earth.
   D a type of cloud that brings heavy rain.
What Is Climate?

What if you were going to Alaska in the winter? Would you pack shorts and T-shirts? Would you pack a winter coat to go to Hawaii? Of course not! That’s because Alaska has a very cold climate. Hawaii has a warm climate. It helps to know the climate of a place. Then you know what to pack when you visit.

Climate is the average weather in a place over many years. Climate is not the same as weather. Every year, Alaska has cold weather for many months. So Alaska has a cold climate. But on a summer day, it might be warm enough to wear shorts.

Climate depends on average temperature and precipitation. In Hawaii, the average temperature is warm. There is a lot of rain. So Hawaii has a warm, wet climate. Alaska is often cold. It gets a lot of rain and snow. So Alaska has a cold, wet climate.
Latitude

Climate depends on latitude. Latitude is how far north or south a place is from the equator. The equator is an imaginary line around Earth. It is halfway between the North Pole and the South Pole. Places close to the equator are warm. Places far from the equator are cold.

Areas close to the equator have a tropical climate. A tropical climate is very warm and wet. A rainforest has a warm, wet climate.

Places that are halfway between the equator and the poles have a temperate climate. Summers are warm or hot. Winters are cool or cold.

The climate is very cold near the North and South Poles. It is often very dry. These places have a polar climate. Winters are long and cold. Summers are short and cool.

Places in the same climate zone, or area, can have different climates. The temperate zone has dry climates, such as deserts. It also has wet climates, such as wetlands. How high or low the land is also makes a difference in the climate. Mountains have colder climates than do low areas.

You cannot tell the climate of a place by the weather on one day. Scientists look at the weather from many years to learn the climate for a place.
What Is Climate?

Look at each place marked on the globe. Decide if the climate is polar, temperate, or tropical. Circle your answer.

1. Argentina  Polar  Temperate  Tropical
2. Honduras    Polar  Temperate  Tropical
3. California  Polar  Temperate  Tropical
4. Greenland  Polar  Temperate  Tropical
5. Ecuador    Polar  Temperate  Tropical
6. **Main Idea**  How are weather and climate different?

7. **Vocabulary**  What is the equator?

8. **Reading Skill: Compare and Contrast**  Describe how the climates of a hot desert and a tropical rainforest are alike and different.

9. **Critical Thinking: Draw Conclusions**  A person has never seen snow. What can you conclude about the climate where she lives?

10. **Inquiry Skill: Research**  Find weather data for your area. What are the yearly weather patterns? How would you describe the climate of your area?

11. **Test Prep**  It is usually very warm and wet all year in a _________ climate.

   A  temperate
   B  desert
   C  polar
   D  tropical
Chapter 8
Weather and Data
Performance Standards covered: 3-ESS2-1, 3-ESS2-2

Essential Questions:
- What causes day and night?
- What causes the seasons?
- How do we measure the weather?
- What are different types of climate around the world?

Key Term Activity at the end of the chapter.

Part 1: Math and Weather Data

Before we study weather and climate, let's look at some of the ways meteorologists study and show information. **Meteorology** is the study of **weather**. **Meteorologists** are scientists who study weather.

Meteorologists use math when they study weather and climate. They use averages. An **average** is a way of finding what is usual or happens most often, using math. All instances of whatever is being measured are added up and then divided by the number of times it happens. An average is usually the middle point of whatever is being measured.

You will learn to do averages when you are older. Here is an example of how averages work. Let's say you wanted to get the average amount of rain in Slidell for the first week in July. You would measure the inches of rain each day, including zeros for days with no rain. Then, after the week ended, you would add up the inches of rainfall. You would get a total. Then you would divide that total by the number of days in a week (7 days).

Averages are useful because they show what is likely. They help people plan. July is the rainiest month in the year in Slidell. People planning to be outside in July for games and parties should also plan on rain.

Averages can also give us a way to see if something might be wrong. If something is too different from an average, there might be a problem. If Slidell got very little rain in July, that would worry meteorologists. But remember, very little in life is exactly average. People aren't average and neither is weather.

Meteorologists want people to be able to understand information about the weather. Sometimes they use **pictographs**. **Pictographs** are symbols. They stand for words. They are like emojis about information. TV weather forecasts use pictographs.
Activity: Pictographs

Match the pictograph to the weather.

- partially sunny
- cloudy
- thunderstorms
- sunny
- rain
- snow

Activity: Create a Forecast

Watch the weather forecast on TV if you can, or listen to it in the classroom. Make a weather forecast for tomorrow. Include pictographs.

Meteorologists use graphs to show their data (information). A graph is a picture about data. Bar graphs show information as bars of different sizes. They compare different sizes, amounts, or temperatures.
Figure 8.1 shows the average high temperature in Shreveport in January, April, August, and October in degrees Fahrenheit.

![Figure 8.1](image)

Temperatures in Shreveport

**Activity: Bar Graphs**

Make a bar graph using this data for the average low temperature in Shreveport:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>36</td>
</tr>
<tr>
<td>April</td>
<td>54</td>
</tr>
<tr>
<td>August</td>
<td>72</td>
</tr>
<tr>
<td>October</td>
<td>55</td>
</tr>
</tbody>
</table>

**Part 2: The Seasons**

Many places on Earth have four seasons: winter, spring, summer, and autumn (fall). Louisiana has four seasons. Winter is the coldest season where we live. Summer is the hottest season. Spring happens between winter and summer. It is when plants begin to grow. Spring is often rainy. Fall happens between summer and winter. It is when trees and some other plants lose their leaves for the winter. Each season lasts three months. Figure 8.2 shows the days the seasons start.

<table>
<thead>
<tr>
<th>Seasons</th>
<th>Starting Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winter</td>
<td>December 21 or 22</td>
</tr>
<tr>
<td>Spring</td>
<td>March 20 or 21</td>
</tr>
<tr>
<td>Summer</td>
<td>June 20 or 21</td>
</tr>
<tr>
<td>Fall</td>
<td>September 22 or 23</td>
</tr>
</tbody>
</table>

**Figure 8.2**

Starting Dates for Seasons

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Some places that are warm all year get only two seasons: wet and dry. The wet season is called the **monsoon season**. How the Earth moves in space may seem unimportant. But it affects you every day and every night. The movement of the earth gives us night and day and our seasons.

**Earth’s Rotation Causes Day and Night**

The Earth orbits the Sun. An **orbit** is the path an object in space like a moon or a planet takes around another object in space. An orbit repeats over and over again. The moon orbits the Earth, and the Earth orbits the Sun. It is like a dance. It takes the Earth 365 days to make one trip around the Sun. This is why one year is equal to 365 days.

The Sun sends light and heat to the Earth through rays. Without the Sun, the Earth would be in complete darkness.

We have days and nights because the Earth **rotates** (spins) in its orbit. As the Earth spins, different parts of the Earth face the Sun at different times. It is day in the part of the Earth facing the Sun. The part turned away from the Sun is in darkness. It is night. Then, as the Earth spins, the places where it is day and night change. The Earth never stops spinning. If the Earth did not spin, it would always be day on one side of the Earth and always night on the other. It takes the Earth 24 hours to make one complete rotation. This is why one day is equal to 24 hours. Figure 8.3 shows day and night.

Like all planets, the Earth is round. The top of the Earth is the North Pole. The bottom of the Earth is the South Pole. Yet the Earth does not stand up straight as it rotates and orbits. Instead, it tilts. All planets tilt. The North Pole is not exactly at the top of the Earth.

The Earth rotates around a pretend line called an axis. The **axis** goes from the North Pole through the Earth to the South Pole. The axis tilts like the Earth. The axis always points toward the North Star, which is above the North Pole.
Figure 8.4 shows how the Earth orbits around the Sun during the year. Notice how Earth's axis always points to the North Star in its orbit. It always points in the same direction.

Around the middle of the Earth, there is almost no difference in temperature among the seasons. The middle of the Earth always gets sunlight. It is always warm. The middle of the Earth is the tropical ecosystem.

Louisiana is much closer to the equator than northern states or Canada. That's why Louisiana is warmer in the winter than Minnesota or Winnipeg.

The equator is a pretend line that divides the Earth into a northern half and a southern half. The equator runs around the middle of the Earth in the tropics. The equator always gets the most sunlight.

We live in the northern half or northern hemisphere of the Earth. Sometimes the Earth's axis is tilted toward the Sun. This is when it is summer in the northern hemisphere. During summer, the hours of daylight are longer than the hours of nighttime. More sunlight makes temperatures warmer. When the axis leans away from the Sun, it is winter in the Northern Hemisphere. During winter, the hours of nighttime are longer than the hours of daytime. The weather is colder.
The seasons are the opposite in the southern hemisphere. When the northern hemisphere is tilted toward from the Sun, the southern half gets less sunlight. This means cooler temperatures and winter. For example, June through August is winter in Australia, an island country in the southern hemisphere.

When the Earth is halfway between summer and winter in its orbit, it is fall in the northern hemisphere. When it is halfway between winter and summer, it is spring in the northern hemisphere. During fall and spring, day and night are equally long.

**Challenge Question**

Look again at Figure 8.4. When the northern hemisphere is tilted away from the Sun, the southern hemisphere tilts toward the Sun. What season is it in the southern hemisphere?

**Practice 8.1**

1. The Earth ______ on its axis one time every 24 hours, producing day and night.
   - A. revolves
   - B. rounds
   - C. rotates
   - D. orbits

2. The Earth ______ around the Sun one time every 365 days.
   - A. tilts
   - B. rotates
   - C. rounds
   - D. orbits

3. What is the most important in determining our seasons?
   - A. the Earth's rotation
   - B. the Earth's orbit
   - C. the length of day and night
   - D. the tilt of the Earth's axis

4. What would happen if the Earth took twice as long to revolve around the Sun?
   - A. The length of day and night would be shorter.
   - B. The length of day and night would be longer.
   - C. The length of a year would be longer.
   - D. The length of a year would be shorter.
Part 2: Measuring Weather

Temperature

Temperature is how hot or cold something is. Temperature is measured in degrees. A thermometer is used to measure temperature. In the US, we use the Fahrenheit scale. It is written with the degree symbol: ° and F. Water freezes at 32°F. It snows when the weather temperature is 32°F. Normal body temperature is 98.6°F. When a person is too hot or too cold, it can be a sign they are sick.

Old-fashioned thermometers like the thermometer shown in Figure 8.5 measure temperature using a liquid. Modern thermometers are digital. They use sensors to create an electrical signal. They only need a very slight contact force.

Precipitation

Precipitation is water that falls from the sky. It can fall as rain, sleet (frozen rain), or snow.

A rain gauge measures the amount of rain that falls in one place. This tool is an open cylinder or tube. Sometimes it has a funnel at the top. It measures the total rainfall. Rainfall is measured in millimeters (mm) or inches (in). Rain gauges are set outside in open areas to catch the rain that falls to the ground.

A rain gauge measures rainfall for a specific place. When meteorologists want to learn how much rain has fallen in an area like a town, they take the average rain measured by rain gauges in different places in the area. However, rain gauges are not always reliable (trustworthy). Objects can fall into the rain gauge or on top of it. If this happens, the measurements are not reliable.

Today, weather balloons are used to send weather instruments up into the atmosphere. An instrument is a tool to measure data. Weather balloons carry modern thermometers and other science instruments. They send information back to Earth. The instruments are in a package attached to the balloon. The package has a parachute to make sure it does not hurt anything or anyone when it falls to Earth. If the package is from a National Weather Service balloon, it has a prepaid envelope to mail the package back so it can be used again.
Activity: Rain Gauges

It has been raining all day. You want to know how much it has rained. You run outside to look at your rain gauges. Color the empty rain gauges to show how much rain fell. Use a green colored pencil or crayon. The level of rain is given below each rain gauge.

Rainfall total at your house: 1 inch
Rainfall total at your school: 3 inches

Why were there different rainfall amounts in different locations (house vs. school)?
When you got home, you noticed a leaf had fallen on top of your rain gauge.
What does this mean? Which rain gauge measurement is more reliable? Why?

Wind

Wind is moving air. A weathervane is an instrument showing which way the wind is blowing. It shows the direction of the force of the wind and which way air masses or storms will move.

Weather vanes are placed on high objects that are more exposed to the wind. A rooftop is a good place for a weather vane. Sometimes the top of a weather vane is shaped like an animal. The wind blows and turns the weather vane. Arrows on the weather vane show the direction of the wind. A weather vane points in the direction the wind comes from. For example, let’s say the wind blows from east to west. The weather vane points toward the east.
Wind speed is measured with an **anemometer**. This might be a hard word to pronounce, but it is a simple instrument. An anemometer has cups attached to the end of four arms. The cups catch the wind and turn. A dial that is attached to the bar holding the cups tells the wind speed. Winds are light when the weather is calm. Winds are strong during stormy, severe weather.

The force of the wind is measured in miles per hour (mph). The winds in the strongest hurricanes travel over 156 mph. When Hurricane Katrina reached the Louisiana coast, its winds hit at 125 mph.

**Satellites**

Satellites in orbit around the Earth are used to predict and measure weather. Satellites send pictures of large masses of air back to Earth. How these air masses move can be very helpful in tracking and predicting weather. Satellites in space can measure precipitation on Earth. Satellites also have a “skin” with sensors to take temperatures of places on Earth.

**Practice 8.2**

1. The wind is moving from south to north. Which way is the weather vane pointing?
   - A north
   - B west
   - C south
   - D east

2. What is used to measure the amount of rain?
   - A weather vane
   - B rain gauge
   - C anemometer
   - D thermometer
3. Where is the best place for a weather vane?
   A. on a rooftop that is exposed to the wind
   B. on the ground under trees and other objects
   C. on a branch of a really tall tree
   D. inside next to an open window

4. How does an anemometer work?
   A. It points to the direction of the wind.
   B. It measures Fahrenheit degrees using sensors
   C. It measures Fahrenheit degrees using liquid.
   D. It measures wind speed by spinning cups that turn a dial.

**Part 3: Dangerous Weather**

Louisiana has many types of dangerous weather. You can watch weather forecasts on TV or listen to the radio to learn about dangerous weather headed your way.

**Floods**

Even rain can be dangerous. Rain can cause floods. A **flood** is a large amount of water that covers dry land in a short time. Floods can also happen after hurricanes.

**Flood Safety**

Flood watches mean a flood could happen. A flood warning means a flood will happen.

Don't try to cross flood water. Six inches of flood water can knock a person—a student or an adult—off their feet. If the water is above your ankles, turn around and go away from the water.

Two feet of water will make a car float. Cars are not boats. If you are in a car, get out and get to higher ground. Look out for snakes in the water.

Higher ground means the highest floor in your house.

**Preventing Floods**

People build **levees** to prevent floods. Levees are raised banks on the sides of a river. They are usually made of dirt. Figure 8.11 shows a levee made of dirt.
Chapter 8  Weather and Data

The very first French settlers in Louisiana built levees. People have been building them ever since. When water floods over a levee, the water is said to overtop the levee.

Rules have been made for new levees. New levees should be built three feet higher than a river is expected to flood during a flood so terrible that it does not happen often. That type of flood is called a hundred year flood. Hundred year floods do not happen regularly every hundred years. “Hundred year” means they are very rare. They might happen 50 years apart or 200 years apart.

Cities and towns use walls called floodwalls instead of levees. Floodwalls are made from concrete or stone.

**Thunderstorms**

*Thunderstorms* are storms with thunder and lightning. All lightning creates thunder, but sometimes the storm is too far away for you to hear it. There are usually strong winds and rain with thunderstorms. As you have learned, lightning happens when static electricity builds up in the clouds. The electrical charge in the clouds wants to get to the opposite charge on the ground. Lightning travels from the cloud to the ground.

Thunderstorms quickly end. But while they are happening, they are dangerous. Thunderstorms happen most often in the spring and summer. They happen in the late afternoon when the temperature is the hottest.

**Thunderstorm Safety**

If you are outside swimming or boating, get off the water right away. Electricity likes water.

If you are outside, go indoors.

If you can't get to a building, get into a car and roll up the windows.

If you can't get inside a building or car, don't be the tallest thing around. And don't be near the tallest thing around. Stay away from tall trees, poles, or towers that are standing outside by themselves. Stay away from areas with seats or shelters made from metal like bleachers or dugouts. Lightning likes metal.

If you are outside and your hair starts standing on end, drop to the ground. Your hair is reacting to static electricity. Lightning is about to strike.

Indoors, stay off the porch. Don't use an old-fashioned phone with a cord. Don't use electrical appliances like toasters. Don't take a bath.

Wait 30 minutes after the last thunder or lightning to go outside.
Keeping People Safe from Thunderstorms

Weather forecasts predict thunderstorms. Meteorologists look for weather that might create thunderstorms. If thunderstorms are likely in an area, they will announce a severe thunderstorm watch. If a thunderstorm is spotted, they announce a severe thunderstorm warning. Severe means powerful.

Lightning is the dangerous part of thunderstorms. Lightning is hotter than the surface of the Sun. Lightning is attracted to things like water and metal that will carry an electric current. Lightning is attracted to tall objects.

You may know Benjamin Franklin’s name. He was very important in US history. He wanted to help Americans. He led Americans who wanted to be free and create their own country. He got France to help Americans during the Revolutionary War. He was also a scientist.

Benjamin Franklin invented the lightning rod. He called his lightning rods “points.” He made rods 8 to 10 feet long. Lightning rods give lightning an easy path to the ground. When lightning rods are put on tall buildings, statues, and objects that lightning would strike, the lightning goes for the lightning rod instead. The lightning rod carries the lightning to the ground.

Although most homes today do not have lightning rods, tall buildings have built-in lightning protection. They may use lightning rods or cables that attract lightning and go through the house to the rods buried in the ground (see Figure 8.13).

![Figure 8.13] Lightning Rod

Tornadoes

Tornadoes are clouds of spinning air. The spinning cloud creates a funnel. A funnel is shaped like a tube but is wider at the top and narrower at the bottom. A funnel guides material into a narrow opening. That’s why funnels are sometimes used in rain gauges. But what tornadoes guide into their funnels are homes, cars, trees, and anything else in their path. Their winds may reach speeds of 250 mph. They may be a half mile wide. Tornadoes are also called twistets.

![Figure 8.14] Tornado

Tornadoes happen in thunderstorms. Tornadoes usually do not last longer than 30 minutes. Louisiana sees a lot of tornadoes because it is one of the first states where warm air from the Gulf of Mexico meets air from Canada. Tornado season begins in Louisiana in early spring. In all the United States,
there are usually about 900 tornadoes a year. Figure 8.15 shows where tornadoes happen.

**Tornado Activity in the United States**

![Map of tornado activity in the United States](image)

*Figure 8.15*

Most people injured in tornadoes are hit by flying glass and other parts of buildings.

**Tornado Safety**

If you are indoors, go to the lowest part of the building. If the building is all on the same level, go to an inside room without windows like a bathroom or a closet. If you can, get under a strong table.

Cars and mobile homes are not safe during tornadoes. Cars are not fastened to the ground. Mobile homes are not fastened to the ground strongly enough to stand up to the lifting force of tornado wind.

If you are outside and cannot get inside a building, lie down in the lowest area you can find, such as a ditch. Cover your head as shown in Figure 8.16.

**Keeping People Safe from Tornadoes**

Meteorologists use radar and satellites to predict tornadoes. If they see that weather conditions might create tornadoes, they announce a **tornado watch**. The area in a tornado watch can be as big as several states. A tornado watch means a tornado
might happen. A **tornado warning** means a meteorologist or a public official like a police officer has seen a tornado. A tornado warning means "take cover now!" But the average warning time for a tornado is still just a little over 10 minutes. People have very little time to get to a room without windows or to a tornado shelter.

Tornado shelters are built to keep people safe during tornadoes. They can be above ground or underground. They are built from concrete and steel. Mobile home parks should have tornado shelters.

**Hurricanes**

Like tornadoes, **hurricanes** are made by spinning clouds. They happen when the temperature is warm enough to "grow" them. But hurricanes are very different from tornadoes. They are storms that only form over water. They can last as long as three weeks. They can be hundreds of miles wide. Hurricane winds usually reach speeds under 175 mph. About 10 hurricanes form in the Atlantic Ocean each year. Hurricane season in the East lasts from June through November.

A **storm surge** happens when hurricane winds blow the ocean water upward over the coast. The wind causes the ocean water level to rise higher than it would be at any other time. When storm surges reach land, they cause floods. Figure 8.17 shows a storm surge.

![Figure 8.17](image)

**Keeping People Safe from Hurricanes**

Because they form in the ocean and last a long time, meteorologists can predict some things about hurricanes—their strength (how fast their winds are blowing) and where they will make landfall. When a hurricane hits land, it is said to make **landfall**. If a storm surge happens, it happens during landfall.

Hurricane winds can break glass and blow roofs off houses. Many places have laws requiring new buildings to be designed to survive hurricanes. To design is to plan how something will be done or made and how it will look. To keep roofs from blowing away in hurricane winds, the roof is fastened through the walls down to the bottom of the house. In a house not designed to stand up to hurricanes,
the roof is fastened just to the top part of the walls of the house. Hurricane shutters can be added to houses so people do not have to go out and buy wood to cover their windows. Doors and windows can also be made to stand up to flying debris. They must be strong enough not to break when a big piece of wood hits them at 34 mph.

Practice 8.3

1. When a hurricane makes landfall, that means it
   A. has destroyed trees.
   B. has reached land.
   C. is no longer a hurricane.
   D. is increasing in power.

2. How can meteorologists see tornadoes? Select the two answers that are correct.
   A. weather balloons
   B. radar
   C. satellites
   D. They wait outside.

3. When are thunderstorms more likely to happen?
   A. in the winter
   B. in the spring
   C. in the spring and summer
   D. in the summer and fall

4. New rules call for levees to be built
   A. 20 feet high.
   B. 50 feet high.
   C. higher than the average flood.
   D. higher than a hundred-year flood.

Part 3: Climate

Many people pay attention to the weather. People watch weather forecasts (predictions of what the weather will be like) on TV or their cell phones. Weather is temperature (how hot or cold it will be), how cloudy it is, and whether a storm will happen. Sunny, windy, cloudy, stormy... these are terms we use to describe the weather. In Louisiana, people want to know about thunderstorms, hurricanes, and tornadoes. They want to be prepared for dangerous weather.

In other, colder places, in the winter, people want to know about snowstorms. Climate is the science word for the weather in a region over many years. Snow fell in New Orleans in the winter of 2017. However, snow is not a part of the climate in New Orleans. Snow does not happen often.
Weather can be very different in different places in our country and the world. It can be hot in Louisiana and cold in Canada. Weather can also change suddenly. Climate does not change quickly. Climates change over thousands or millions of years.

There are three major climates in the world. Climates are part of ecosystems. Sometimes the same type of ecosystem, like a forest or grassland, can have a different climate depending on where the ecosystem is located on Earth.

Places located near the North or South Poles have a polar climate. It is always cold in polar climate. The tundra is the ecosystem with a polar climate. Places near the equator have a tropical climate. In a tropical climate, the temperature is always above 64° F. It is always warm.

Temperate climates are not too cold or hot. Louisiana has a temperate climate.

Dry climates are places where it is always dry. Dry climates include deserts and some grasslands.

Temperate climates with rain and seasons are named for their location. Climates close to the tropics are called subtropical. Climates further away from the tropics are called continental. Continental means of a continent. Continents are huge regions of land. There can be many countries on continents.

To describe climates with rain and seasons, meteorologists add the word humid. Humid means damp or wet. All of Louisiana has a humid subtropical climate.

Compare Climates
If we traveled almost straight north from Baton Rouge to Canada, we could visit Winnipeg, Canada.

Winnipeg is in the same time zone as Louisiana. It is in the middle of Canada in the Canadian prairies. Its land is flat like the land in Louisiana. Winnipeg is in the province of Manitoba in Canada. A province is like a state. Manitoba has forests and farms. They grow wheat, oats, and potatoes. Like Louisiana, Winnipeg has four seasons.
However, Winnipeg is much closer to the North Pole. Wind blows from the tundra where the North Pole is located. It blows cold air to Winnipeg in the winter. Winnipeg has a humid continental climate.

<table>
<thead>
<tr>
<th>Winnipeg, Canada</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average High</td>
<td>Average Low</td>
<td>Days with Rain</td>
<td>Days with Snow</td>
<td>Amount of Snow on Ground</td>
</tr>
<tr>
<td>January</td>
<td>8</td>
<td>-9</td>
<td>1</td>
<td>12</td>
<td>7&quot;</td>
</tr>
<tr>
<td>February</td>
<td>15</td>
<td>-2</td>
<td>1</td>
<td>8</td>
<td>8&quot;</td>
</tr>
<tr>
<td>March</td>
<td>30</td>
<td>12</td>
<td>3</td>
<td>7</td>
<td>5&quot;</td>
</tr>
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<td>5</td>
<td>3</td>
<td>1&quot;</td>
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<td>41</td>
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<tr>
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<td>55</td>
<td>11</td>
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<td>2</td>
<td>9</td>
<td>2&quot;</td>
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<tr>
<td>December</td>
<td>14</td>
<td>-2</td>
<td>1</td>
<td>11</td>
<td>4&quot;</td>
</tr>
</tbody>
</table>

Temperatures with a minus sign (-) are below zero. That is very cold.

Compare the Winnipeg climate with New Orleans' climate.

<table>
<thead>
<tr>
<th>New Orleans, Louisiana</th>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average High</td>
<td>Average Low</td>
<td>Days with Rain</td>
<td>Days with Snow</td>
<td>Amount of Snow on Ground</td>
</tr>
<tr>
<td>January</td>
<td>63</td>
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<td>August</td>
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<td>November</td>
<td>72</td>
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<td>6</td>
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</tr>
<tr>
<td>December</td>
<td>65</td>
<td>48</td>
<td>6</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Figure 8.20

Figure 8.21
Activity: Matching Game

Materials needed: 72 blank 3 x 5 cards
Write the type of weather data (average high temperature, average low temperature, amount of rain), the month, and the temperature or amount of rain on each card. Deal the cards out in the class. Each student must decide whether the card matches New Orleans or Winnipeg.

The Louisiana Climate
Louisiana has short, mild winters and humid, hot, long summers. The Gulf of Mexico determines the weather in Louisiana. The Gulf of Mexico keeps southern Louisiana cooler than the north in the summer. In the winter, it is the opposite. The Gulf of Mexico keeps the south warmer in the winter than the north. In the north, snow usually falls one to three times in the winter.

Why does snow fall in Louisiana? Cold air from Canada must stay cold enough so that the water in the air coming in to our state from the Gulf of Mexico freezes into snow. It is very unusual when snow falls in Louisiana. But snow is part of the climate of Canada.

Louisiana has more rain than most places in the US. Four of the top ten rainiest cities in the country are in Louisiana. They are: New Orleans, Lafayette, Baton Rouge, and Lake Charles. Louisiana gets more thunderstorms than any other state except Florida. Louisiana gets over 60 days with thunderstorms a year. Louisiana also gets tornadoes.

Hurricanes are part of the weather in New Orleans. There is a hurricane season, from June to September.

Practice 8.4

1. Which can change suddenly?
   A. climate
   B. weather
   C. seasons
   D. continents

2. William records the seasons in his town. He uses monthly averages of temperature and precipitation to do this. What is he observing?
   A. the weather
   B. the climate
   C. the clouds
   D. the water cycle
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3  What kind of climate does Louisiana have?
   A  polar
   B  dry
   C  humid continental
   D  humid subtropical

4  What are the four seasons?

Bonus question: Think like a Scientist
Design and draw a picture of a super house with protections against dangerous weather.
Chapter 8 Key Term Activity

Word Bank

<table>
<thead>
<tr>
<th>weather</th>
<th>thermometer</th>
<th>tornadoes</th>
</tr>
</thead>
<tbody>
<tr>
<td>axis</td>
<td>floods</td>
<td>tropical climate</td>
</tr>
<tr>
<td>equator</td>
<td>hundred year flood</td>
<td>hurricanes</td>
</tr>
</tbody>
</table>

**Weather**
Scientists sometimes use pretend lines to explain science. The ______________ running around the middle of the Earth and the ______________ through the Earth from the North Pole to the South Pole are two examples.
Scientists also have to create tools to measure things, such as hot or cold it is, using a(n) ______________. Knowing wind speed and wind direction help predict ______________ in the atmosphere.
By using imaginary lines to give locations of places and tools to measure activity in the atmosphere, we can get warnings about dangers like the ______________ that almost never happen.

**Climate**
Different dangers happen in different climates. We would not expect the water of ______________ in a dry climate. We would not watch out for snowstorms in a(n) ______________.
Watching out for thunderstorms that can create ______________ and the cloud storms over the ocean that become ______________ are probably two of the most important jobs meteorologists do.

Key terms are defined in the book’s glossary.
Answer to Key Term Activities and Chapter Reviews are found in the Teacher’s Guide.