Core Knowledge® Science

collecting
weather data

Weather Patterns

cloudy and warm

seasons

severe weather

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Weather Patterns

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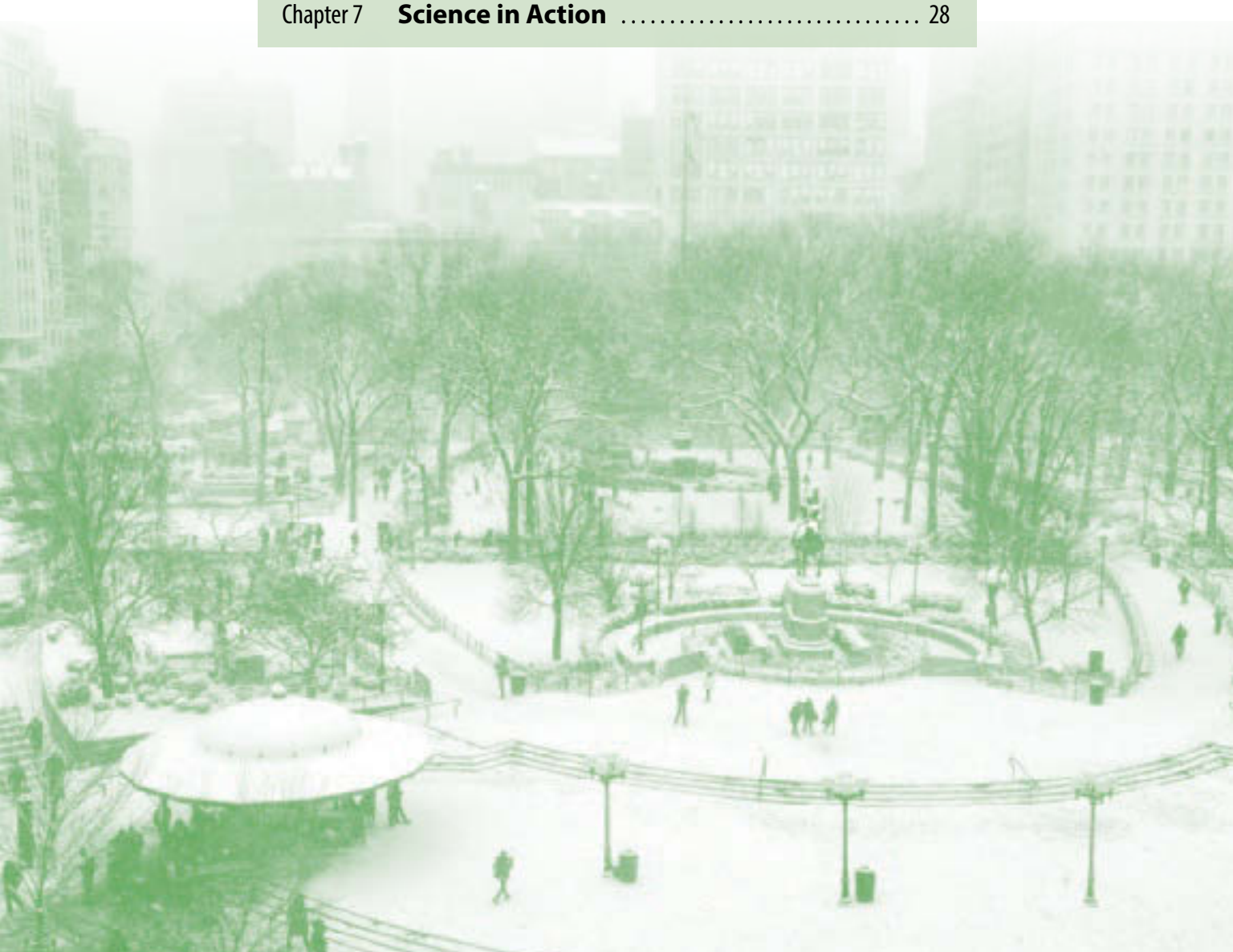


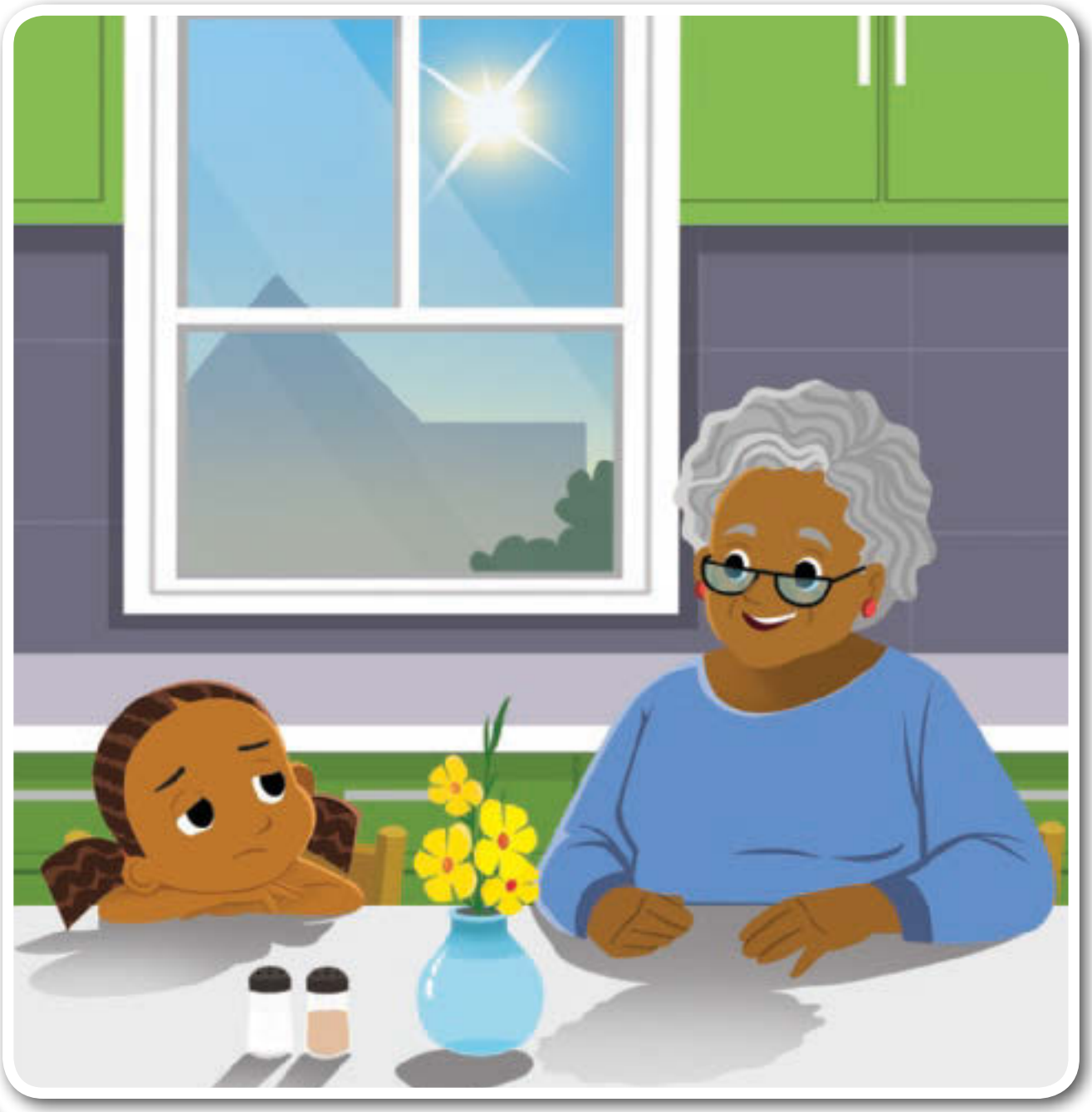
CHAPTER
1

The Heat Is On

It is a bright and sunny Wednesday morning. Hanna cannot believe her luck. School in Soltown is canceled today! It's not a snow day. The temperature is expected to reach almost 100 degrees Fahrenheit. The school buildings do not have air conditioning. It is too hot for students to be there.

Hanna's parents have to work. She is spending the day with her grandmother. It is too hot to do anything outside. They stay inside where there is air conditioning. They play card games. They make snacks. They watch a show on television. Soon, Hanna is bored. "Can we go outside?" she asks her grandmother. "I know it's hot. But maybe we can go out for just a few minutes."

Grandma thinks for a minute. “I have an idea,” she says. She explains to Hanna that there is a farmers market in the town square. It is just a few blocks away. It would be a short walk. “We can pick up some vegetables to have with dinner,” Grandma says. “It will be nice to get some fresh air.” They will make sure to walk slowly and take plenty of water.



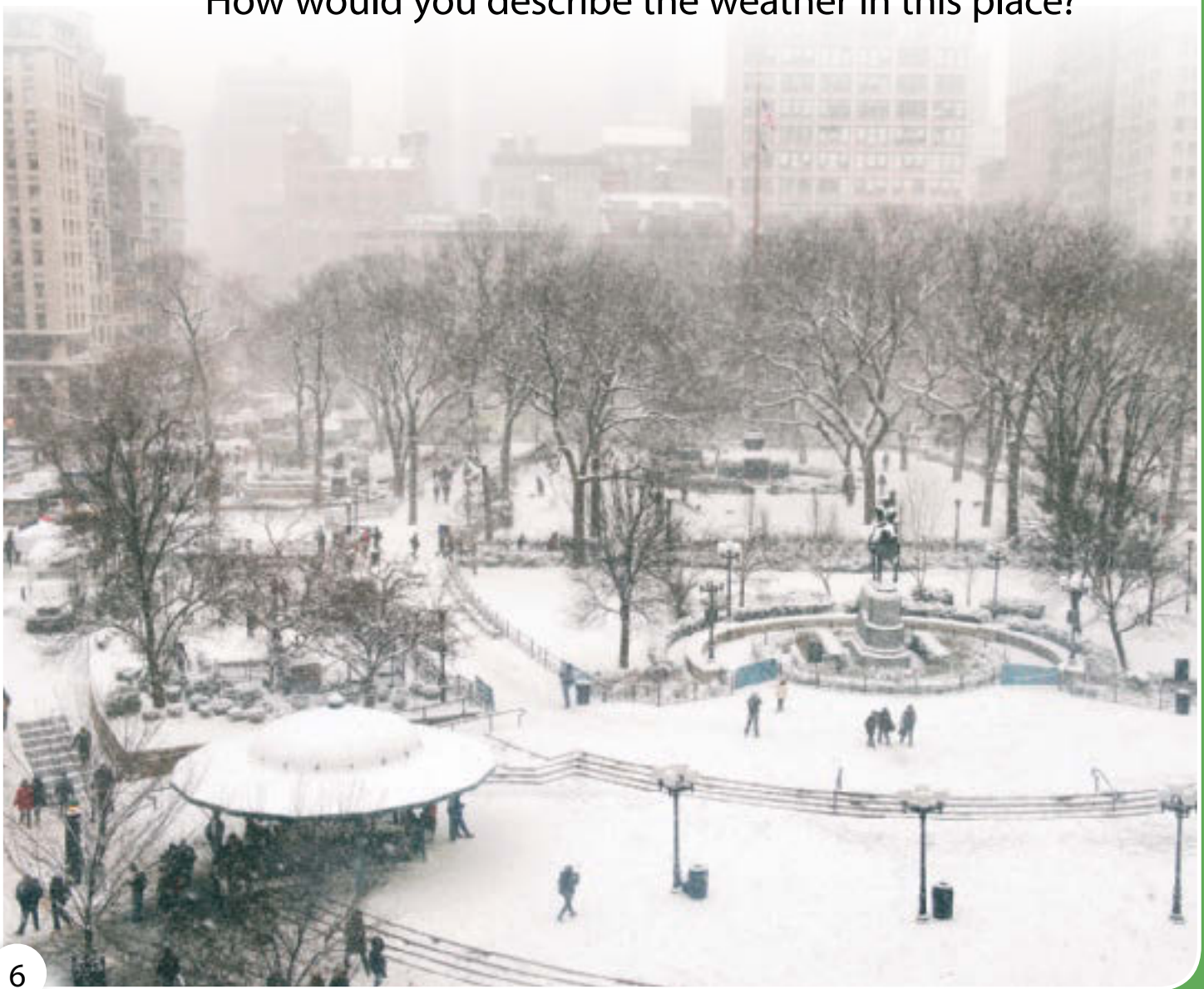
Hanna fills a large bottle with water and ice. She puts on her baseball cap to protect her face from the sun. Just as they are about to leave, Grandma grabs her umbrella from the closet. Hanna is confused. It is not raining outside. There are not even any clouds. It is one of the brightest, sunniest days she has ever seen! Why would Grandma need an umbrella?

CHAPTER 2

What Is Weather?

It is hot and sunny in Hanna's town. What is it like where you live? Is it warm and rainy? Is it cool and windy? Is it snowy and cold? These are just a few words that describe weather. Weather is what the air is like outside in one place at one time. Weather can change quickly. It can be very different from place to place.

How would you describe the weather in this place?



We use different words to describe different kinds of weather. You can use different words to describe the weather, too. Try it! What are three words you can use to describe the weather today?

The weather here is sunny, clear, and cold.

This weather is cloudy and warm.

It can even be rainy and windy at the same time!

Clouds can give you clues about the weather. Not all clouds mean it will rain.

White, puffy clouds may mean that the weather will be fair.

High, streaky clouds may mean a change in weather is on the way.

Low, gray clouds may mean lots of rain or snow is about to fall.

Tall clouds that are gray on the bottom may mean thunderstorms are coming.

Scientists collect and record information about the weather. They measure how hot or cold the air is. They measure how fast the wind blows. They check the direction the wind is blowing. They measure how much rain or snow falls. They measure how much moisture is in the air. These data help scientists predict what the weather may be like in the future. Scientists use a special balloon to get information about the weather.

Scientists use computers to record and analyze data.

CHAPTER 3

The Sun Heats Earth

Soltown is having a heat wave. Where is all the heat coming from? The sun! The sun is a star. It gives off light that heats up Earth. In summer, the light hits Earth more directly. It heats up the air and ground faster than in winter.

The sun is the closest star to Earth. It appears in the eastern sky every morning. It sets in the western sky every night.

Sometimes clouds block the sun. You cannot see the sun on cloudy days, but it is there. Some of its light is strong enough to get through the clouds. You can still tell that it is daytime.

The sun warms materials on Earth's surface.

It warms dirt, sand, and rock.

It warms the grass under your feet.

It warms water in lakes, oceans, and ponds.

It warms the air all around you.

Materials become warmer in sunlight than they do in shade. Shade is an area where sunlight is blocked. When an object blocks sunlight, a shadow forms. Blocking sunlight keeps objects in the shade cooler.

CHAPTER
4

People Work Together to Find Solutions

Hanna was confused about why Grandma wanted to use an umbrella on a warm, sunny day. Now she understands! The umbrella blocks the sun. It helps Grandma feel cooler.

Blocking sunlight keeps it from warming objects on Earth's surface. What are some ways you stay cool in hot weather?

People can work together to design solutions to solve problems caused by weather. They use materials to build their solutions. Then they test them to see whether they work. People designed these solutions to provide shade in warm, sunny places.

Cloth stretched over a playground keeps the place cooler for children.

People can enjoy a picnic in a cool space under this shelter.

Players can rest in the shade while they wait to play.

CHAPTER
5

Weather Changes from Season to Season

When the sun sets at night, it no longer warms Earth's air or ground. The temperature gets cooler. When the sun rises the next morning, the air begins to warm again. This is a pattern. It happens every day.

Patterns of weather can also take longer to repeat. For example, heat waves like Hanna is experiencing only happen in the summertime where she lives. The weather is usually cooler where she lives. But when summer comes around again, so do the hot temperatures.

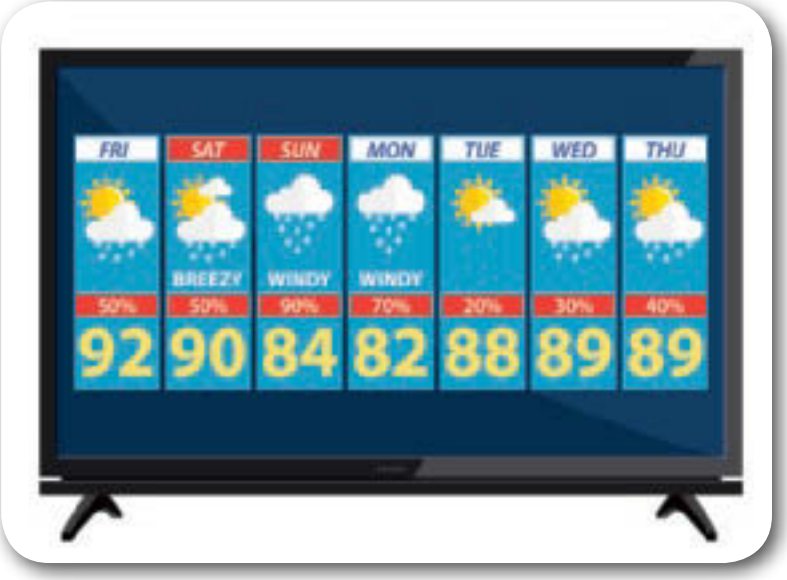
Patterns of weather happen year after year. These are seasons. Different seasons have different kinds of weather. The different seasons do not look just like these pictures in all places. But all places do have their own yearly patterns of seasons.

Winter months have the coolest days. Winter where you live might not be cool enough to snow, but it is cooler than summer. The days start to become warmer in spring. Summer has the warmest days. The days start to become cooler again in fall.

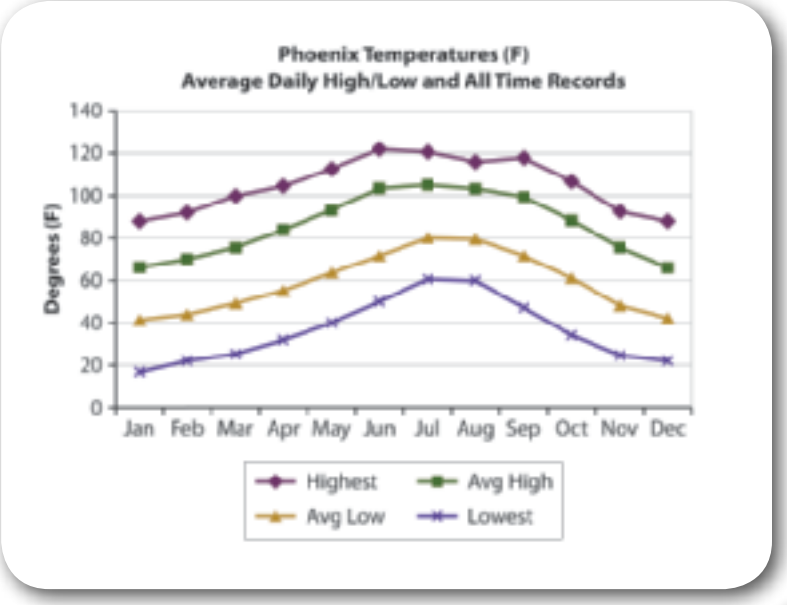
Changing weather affects living things. In the fall in a lot of places, trees lose their leaves. Plants turn brown and stop growing. In the spring, new leaves grow on the trees. Plants turn green and grow new leaves. Flowers bloom. Many animals become inactive in colder weather. Young are born in the spring as weather warms.

How do scientists predict what the weather might be like tomorrow? They keep track of the weather over many days and look for patterns. The information they record is called data. These data are displayed on maps and graphs. Looking at data that way helps patterns show up. Patterns help scientists predict what weather will be like tomorrow and in the future.

Weather forecasting can help people plan. Which day do you think would be best for a trip to the park?



Which months were warmest? Which were coolest?



CHAPTER 6

Weather Can Be Severe

Sometimes weather can become severe. Severe weather is dangerous. It can happen at any time of year. It can happen in any place. There are many different kinds of severe weather. All severe weather can cause damage to people, land, and property.

Some kinds of severe weather are common in certain areas. Hurricanes are storms that form over the ocean and can move to land. In the United States, they are most common in areas along the Atlantic and Caribbean coast.

Hurricanes have very strong winds and heavy rain. They can damage buildings, trees, and land.

Tornadoes are rotating columns of air that move over land. They are dangerous storms that can destroy anything in their path. Tornadoes can happen anywhere. They are most common in the midwestern and southeastern parts of the United States.

Thunderstorms contain rain and thunder. Many produce lightning and hail. Lightning is electricity. It can strike anything on the ground—even people. It is important to stay inside during a thunderstorm.

Blizzards are severe storms that are most common in the winter. They have heavy snow and strong winds. Trees and power lines can fall during blizzards. Roads and sidewalks become covered with snow. People have trouble getting from place to place.

The heat wave that happened in Hanna's town is a kind of severe weather, too. Heat is dangerous for anyone who is outside. People find ways to stay cool during a heat wave. Heat and lack of rain also can lead to drought. Drought happens when an area stays very dry for a long time. Droughts can affect plants and animals.

Looking at patterns in weather data helps scientists predict, or forecast, when severe weather will happen. Weather forecasting can help people plan. It can help people know when to move to a safe place. Does your family have a safety plan for severe weather?

People can build shelters to stay safe during severe storms. Early-warning systems help people know if a tornado is approaching. When a storm is near, people can go into underground shelters to stay safe.

CHAPTER 7

Science in Action

Meeting a Weather Scientist

The heat wave in Soltown is finally over! Hanna and her grandma have been enjoying cooler walks to the farmers market. But now the townspeople have something new to think about: a possible hurricane! The big storm is over the ocean. It still has a week to travel before it reaches land. It could change course. But the residents of Soltown are paying close attention to its path.

Hanna's teacher wants to help her students learn more about hurricanes. She explains to them that she has scheduled a video chat with a meteorologist named Noah. A meteorologist is a scientist who studies weather. Noah specializes in hurricanes.

Noah tells the class that he is also called a “hurricane hunter.” The children giggle. How can you hunt a hurricane? Noah explains that he flies with a pilot high above a hurricane and close to the quiet area in the center of the storm. When he flies near the hurricane, he is “hunting” for information.

The plane that Noah is in has special instruments. They measure the hurricane's wind and rain. The measurements tell scientists how weak or strong the hurricane is.

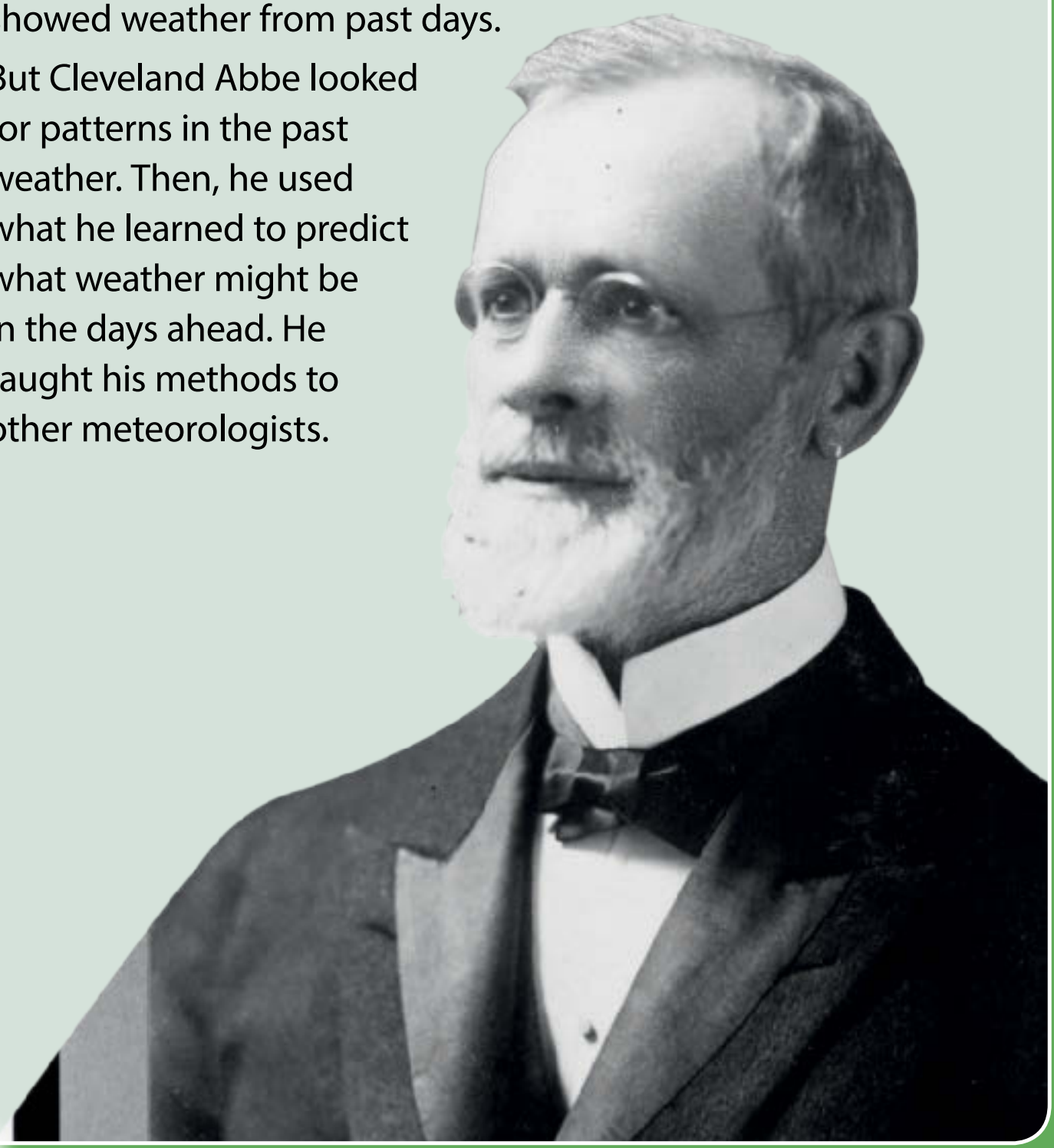
Noah makes these flights several times per day. He compares the data from each flight. He uses the data to predict which way the hurricane will move. Meteorologists like Noah predict when and where the storm will reach land. They help people know if they need to prepare.

Noah says he became a weather scientists because he read about a famous meteorologist from the past.

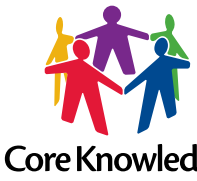
Cleveland Abbe

In the 1800s, scientists did not have planes or computers. They did not use observations to predict weather and share predictions with the public. They only made maps that showed weather from past days.

But Cleveland Abbe looked for patterns in the past weather. Then, he used what he learned to predict what weather might be in the days ahead. He taught his methods to other meteorologists.



The National Weather Service shares weather information with the public. Today, meteorologists warn about severe weather before it happens. People in the path of hurricanes can prepare their homes. They have time to get to a safe place. The National Weather Service was formed in 1871. Cleveland Abbe was its first lead meteorologist.



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