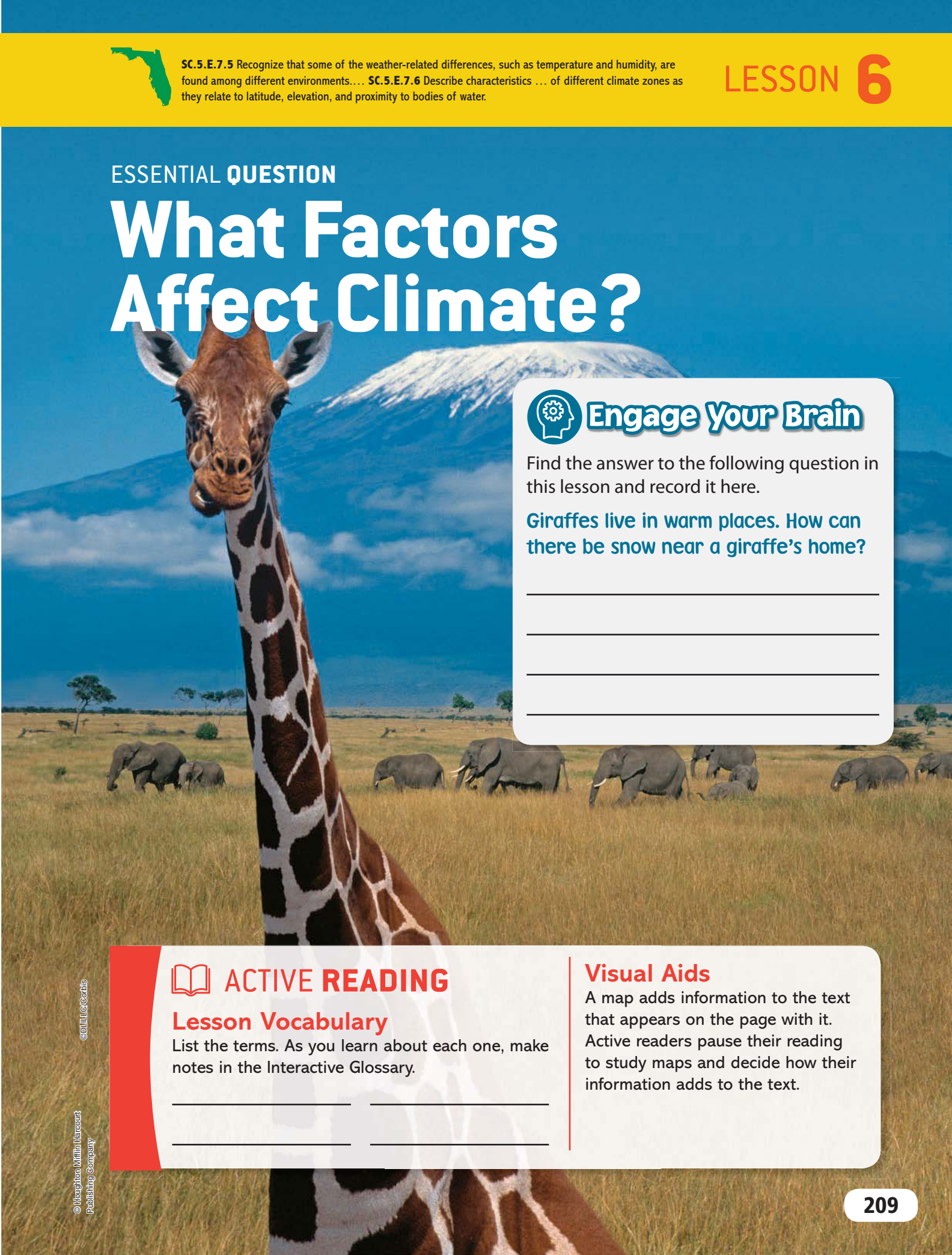
ESSENTIAL **QUESTION**

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?

_____

_____

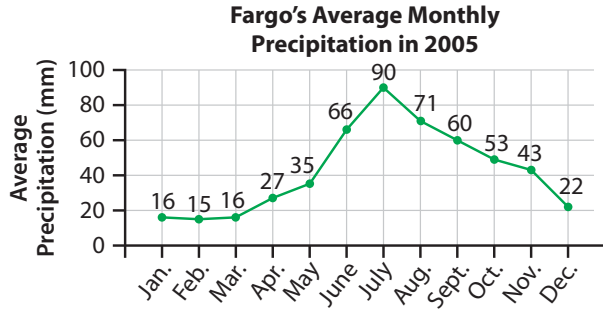
_____

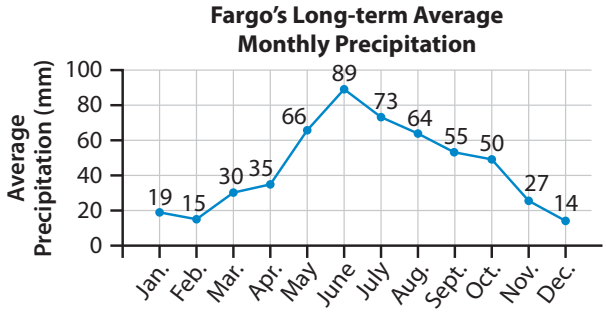
_____

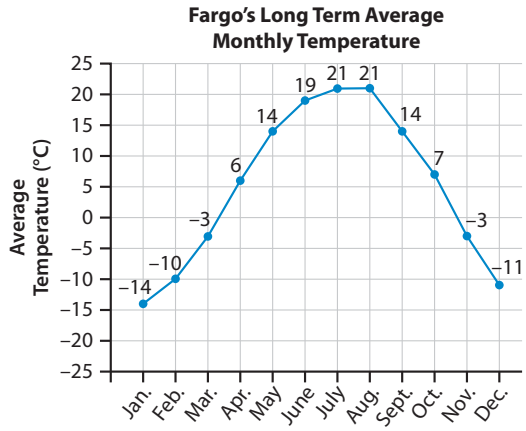
_____

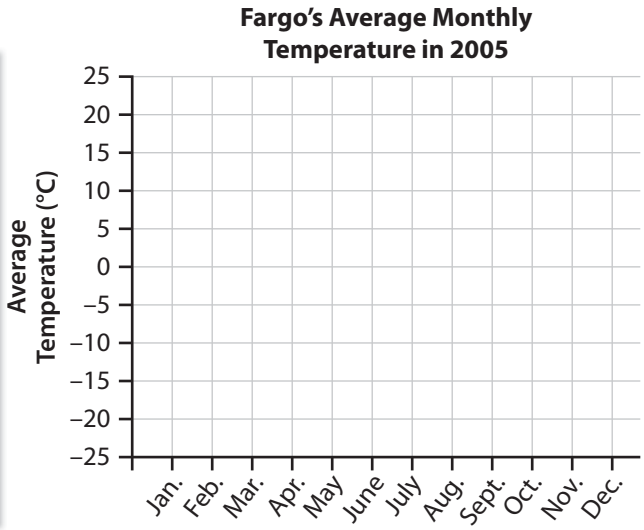
Average Monthly Temperature for Fargo, North Dakota, in 2005

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.

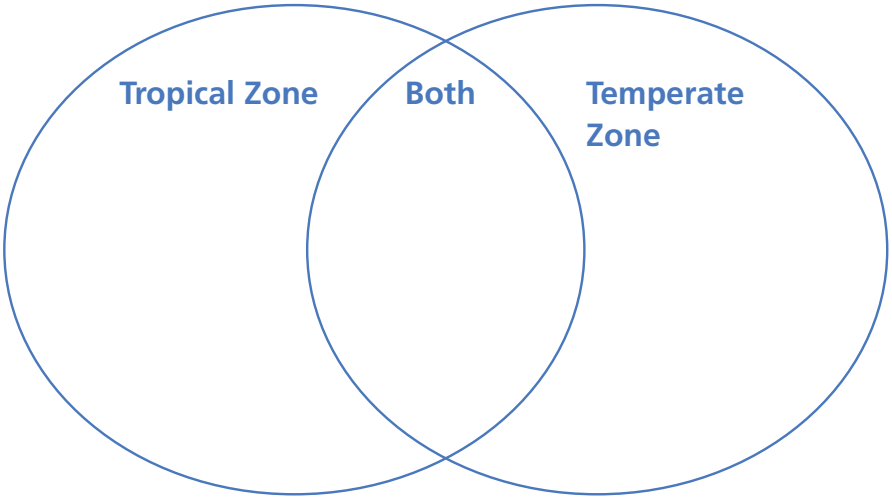
Polar climates are generally the farthest from the equator. They have cold temperatures year-round and low amounts of precipitation.

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?