

# Lessons 11–12

# Seasonal Weather Patterns

## Prepare

In Lessons 11 and 12, students analyze historical temperature and precipitation data to see if the trends in weather conditions described in Lesson 9 hold true over many years. In Lesson 11, students analyze data from multiple years and interpret the data to describe patterns in weather conditions for each season across multiple years. In Lesson 12, students compare their findings from Lesson 11 to the seasonal weather conditions they described in Lesson 9 to conclude that their location's weather follows the same seasonal patterns year after year. Students build on this conclusion to recognize that the climate of a location remains relatively stable over time.

### Student Learning

#### Knowledge Statement

Climate remains relatively stable over time.

#### Concept 2: Climate

##### Focus Question

How do people know what weather to expect?

##### Phenomenon Question

Does the weather follow the same pattern every year?

## Objectives

- Lesson 11: Interpret data to describe seasonal patterns in weather conditions over time.
- Lesson 12: Compare seasonal weather conditions to notice that the climate of a location remains relatively stable over time.

## Texas Essential Knowledge and Skills Addressed

- 3.2C **Construct maps**, graphic organizers, simple tables, charts, and bar graphs using tools and current technology **to organize, examine, and evaluate measured data**; and (Addressed)
- 3.2D **Analyze and interpret patterns in data to construct reasonable explanations based on evidence** from investigations. (Addressed)
- 3.8A **Observe, measure, record, and compare day-to-day weather changes in different locations at the same time that include air temperature, wind direction, and precipitation.** (Addressed)

## English Language Proficiency Standards Addressed

- 1H Develop and expand repertoire of learning strategies such as reasoning inductively or deductively, looking for patterns in language, and analyzing sayings and expressions commensurate with grade-level learning expectations.
- 4A Learn relationships between sounds and letters of the English language and decode (sound out) words using a combination of skills such as recognizing sound-letter relationships and identifying cognates, affixes, roots, and base words.

## Materials

|             |   | Lesson 11 | Lesson 12 |
|-------------|---|-----------|-----------|
| Student     | Science Logbook (Lesson 11 Activity Guide)  | ●         | ●         |
| Teacher     | Average monthly temperature, monthly precipitation, and total precipitation graphs (1 set of graphs per student pair) | ●         |           |
| Preparation | Science Logbook (Lesson 12 Activity Guides A and B)   |           | ●         |
| Student     | Class seasonal weather conditions chart from Lesson 9   | ●         | ●         |
| Teacher     | Anchor chart  |           | ●         |
| Preparation | Prepare average monthly temperature, monthly precipitation, and total precipitation graphs (see Lesson 11 Resource).  | ●         |           |

# Lesson 11

**Objective:** Interpret data to describe seasonal patterns in weather conditions over time.

## Launch 5 minutes

To begin, ask students to name a few of their favorite outdoor activities.

*Sample student responses:*

- I like to play soccer.
- My family goes skiing every year.
- I play on a basketball team.
- I like to go camping with my family.

Ask students what weather conditions and seasons are best for the activities they named.

*Sample student responses:*

- I start soccer practice in spring when the weather starts to get warmer.
- We go skiing in winter when there is snow in the mountains.
- My family goes camping in fall when it starts to cool down, but we don't go in the winter because it is too cold.

Highlight student responses that describe activities that are dependent on seasonal weather conditions. Remind students of the yearlong graphs they analyzed in Lesson 9, and display the seasonal weather conditions chart the class developed.

## Agenda

Launch (5 minutes)

Learn (35 minutes)

- Introduce Historical Weather Graphs (10 minutes)
- Analyze Historical Weather Data (25 minutes)

Land (5 minutes)

Sample class seasonal weather conditions chart from Lesson 9:

| Season                     | Lowest and Highest Average Monthly Temperature  | Seasonal Trend                                |
|----------------------------|---|---|
| Winter                     | Lowest: 31°F<br>Highest: 37°F   | The temperature was mostly stable each month. |
| Spring                     | Lowest: 34°F<br>Highest: 56°F   | The temperature got warmer each month.        |
| Summer                     | Lowest: 70°F<br>Highest: 72°F   | The temperature was mostly stable each month. |
| Fall                       | Lowest: 44°F<br>Highest: 67°F   | The temperature got cooler each month.        |
| Total Yearly Precipitation | Seasonal Trend  |   |
| 43 inches                  | Spring had the most precipitation.<br>Summer and fall had about the same amount of precipitation. |   |

Draw attention to some of the seasonal outdoor activities students described, and encourage students to think about whether they can predict if future weather conditions will allow for those activities next year. Ask questions such as these: Will it be warm enough to start outdoor soccer practice next spring? How do you know?

Remind students that their descriptions of seasonal weather conditions are based on only one year of data, and introduce the Phenomenon Question **Does the weather follow the same pattern every year?** Ask students how they might be able to answer this question.

Sample student responses:

- I think we need to look at more weather data.
- Maybe we can look at graphs from other years to see if the weather is the same.
- We need to look at more data to see if there is a pattern.

Highlight student responses that describe a need for additional data, and explain that it may help to look at data from other years to begin to answer the Phenomenon Question.

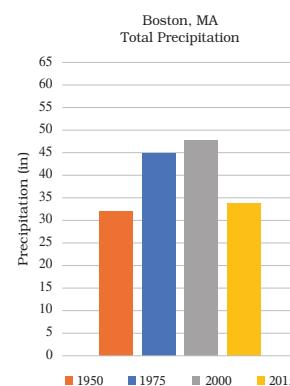
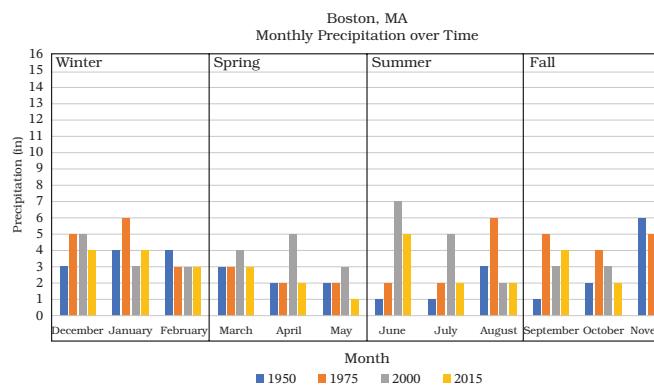
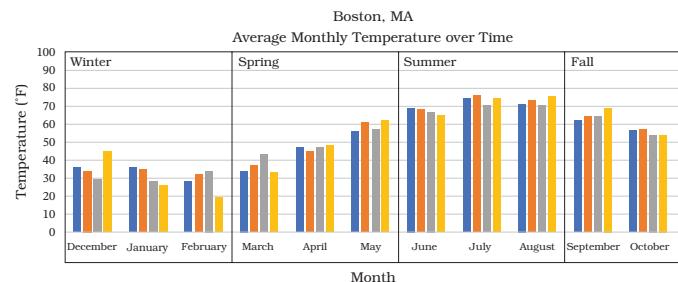
# Learn

35 minutes

## Introduce Historical Weather Graphs 10 minutes

Tell students they will analyze local temperature and precipitation data for the following years: 1950, 1975, 2000, and 2015. Display one copy of each prepared graph.

*Sample prepared graphs:*



Ask students to observe the key on one of the graphs, and ask them what they think the different-colored bars represent. Confirm that the graphs show data for four years and that each year is represented by a different color.

Point out that each bar on both the average monthly temperature graph and the monthly precipitation graph represents one month of data for a particular year. Tell students that each bar on the total precipitation graph, however, shows the total precipitation for the entire year. Explain that the scale for this graph is different from the scale for the monthly precipitation graph, and help students determine that the scale uses an interval of five. Also, remind students, as needed, that total yearly precipitation is calculated by adding together all the monthly values for that year, and emphasize the relationship between the two precipitation graphs.

Further support students in reading the graphs by narrowing student focus to one bar on the average monthly temperature graph and modeling for students how to read a single data point. Be sure to identify the value of the data point as well as the corresponding month and year (e.g., 57°F was the average temperature for May of 2000). Invite several students to determine the value, month, and year of a few other data points on the graph. As needed, have students practice reading more data points until they are comfortable with the process. 

## Analyze Historical Weather Data 25 minutes

Explain that students will work with a partner to analyze the three graphs to determine what weather conditions were like in each season of the graphed years.

Students should record the following:

- The lowest average monthly temperature and the highest average monthly temperature for each season
- Any seasonal patterns in temperature (e.g., whether the average temperature changed throughout the season or whether it stayed mostly stable)  
- The lowest yearly total precipitation and the highest yearly total precipitation
- Any seasonal patterns of precipitation 



### Differentiation

Some students may benefit from using an index card to isolate each bar or set of bars on the graph. This allows students to narrow focus to a single value or set of values.

An index card may also be used to more easily read the value of a single data point. Instruct students to use the edge of the index card to line up the top of a bar to the scale. Students can then more accurately estimate the value of the bar by observing where on the scale the bar reaches.



### Teacher Note

The word *trend* was used in Lesson 9 as students were only looking at data for a single year. The word *pattern* is introduced here as students are looking at data for multiple years. Students can start to see that there is a pattern over time.



### Teacher Note

Students may find that there are anomalous months during certain years when the average temperature was much hotter or much colder than in other years. When describing seasonal patterns, help students focus on general patterns by looking at what the month was typically like in most years.



### Teacher Note

Depending on students' location, there may not be a distinct seasonal pattern for precipitation. If this is the case, encourage students to indicate that they do not observe a seasonal pattern.

**Teacher Note**

In Lesson 9, students determined the lowest and highest average temperature for three data points in each season. In this lesson, students will follow the same procedure for 12 data points. Some students may need support as they work with these additional data points. Consider modeling how to determine the lowest and highest average temperatures during winter for the years graphed. For example, in the sample graph provided, the lowest average temperature for winter is 19°F and the highest average temperature for winter is 45°F.

Divide students into pairs, and distribute a set of graphs to each student pair. Explain that students should work with their partner to analyze the graphs and record their analysis in their Science Logbooks (Lesson 11 Activity Guide). As student pairs work, circulate to provide support as needed.

*Sample student response:*

| Season  | Lowest and Highest Average Monthly Temperature                                   | Seasonal Pattern                              |
|---|--|---|
| Winter  | Lowest: 19°F<br>Highest: 45°F  | The temperature was mostly stable each month. |
| Spring  | Lowest: 33°F<br>Highest: 62°F  | The temperature got warmer each month.        |
| Summer  | Lowest: 65°F<br>Highest: 76°F  | The temperature was mostly stable each month. |
| Fall  | Lowest: 44°F<br>Highest: 69°F  | The temperature got cooler each month.        |
| Lowest and Highest Total Yearly Precipitation | Seasonal Pattern   |   |
| Lowest: 32 inches<br>Highest: 48 inches       | Precipitation occurred throughout the year.<br>We didn't see a seasonal pattern. |   |

**Differentiation**

Some students may benefit from additional support in combining and summarizing data to notice patterns. Consider working one-on-one or in small groups by first modeling how to read and describe data for one month or one year. Build off these descriptions to summarize the weather conditions during each season across several years (1H).



### Check for Understanding

As student pairs notice patterns in seasonal weather conditions, observe where students are in their ability to read and interpret data.

#### Evidence

Look for evidence that all students

- accurately read and record the data shown on each graph, and
- correctly interpret the data to describe seasonal patterns over time.

#### Next Steps

As student groups work to notice patterns in weather conditions throughout each season, ensure that students are accurately analyzing and interpreting the data. Inaccurate analysis in this lesson will influence further analysis in the following lesson.

## Land

5 minutes

Ask students to share any patterns they noticed as they analyzed the graphs.

- What patterns in average temperature did you notice? What about patterns in amount of precipitation?
  - In each year, summer was always the hottest season.
  - It always got warmer each month in the spring.
  - The average temperature was pretty similar for each month of every year.
  - There was a similar amount of precipitation every year.
- How could we find out if the patterns we noticed today match the seasonal weather conditions we described in Lesson 9?
  - I think we need to compare the patterns we noticed today to the seasonal weather conditions we described in Lesson 9.
  - Maybe we can look at our descriptions from Lesson 9 to see if the weather conditions are the same.



#### Teacher Note

When examining the graphs, students may notice anomalies in average temperature and amount of precipitation for the location where they live. Use anomalous data points as opportunities to stretch student thinking about causes for possible outliers in data. Motivate student interest by asking questions such as these (1H):

- What do you think could have caused so much precipitation in one month?
- Why did these data points stand out to you?
- How could we find out if this data set is normal for our area?

Agree to compare the patterns noticed in today's lesson to the seasonal weather conditions described in Lesson 9.

## Optional Homework

Students ask a family member or neighbor what their favorite season is. Students ask why that is their favorite season and if weather conditions are related to the choice.