

# Weather Forecasting

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<b>Strand</b>	Matter
<b>Topic</b>	Investigating weather
<b>Primary SOL</b>	6.6 The student will investigate and understand the properties of air and the structure and dynamics of Earth’s atmosphere. Key concepts include e) the relationship of atmospheric measures and weather conditions; and f) basic information from weather maps, including fronts, systems, and basic measurements.
<b>Related SOL</b>	6.6 The student will investigate and understand the properties of air and the structure and dynamics of Earth’s atmosphere. Key concepts include b) pressure, temperature, and humidity.

## Background Information

Weather maps provide a valuable way to visualize data in order to predict the weather. Weather maps use special symbols that stand for the various pressure areas and fronts and their boundaries. The curved lines on a weather map show areas of equal air pressure (isobars) and temperature (isotherms).

An *isobar* is a line connecting locations with equal barometric pressures. Isobar maps show where pressures are relatively high and low and where pressure changes are gradual or dramatic over a distance.

An *isotherm* is a line connecting locations with equal temperatures. Isotherm maps show where temperatures are relatively high and low and where temperature changes are gradual or dramatic over a distance.

When forecasters say that a *low-pressure area or system* is moving toward your region, this usually means that cloudy weather and precipitation are coming. Low-pressure systems have different intensities, with some producing a gentle rain and others producing strong winds and heavy precipitation. The centers of all storms are areas of low air pressure. Air rises near low-pressure areas. As air rises, it cools and often condenses into clouds and creates precipitation. In the Northern Hemisphere, low-pressure area winds circulate in a counterclockwise direction. Cold air will likely be found north and west of the low-pressure area, while warm air is found south and east of the system.

When you hear a weather forecaster say that a *high-pressure area or system* will dominate the weather, it usually means your region has several partly to mostly sunny days in store with little or no precipitation. Air tends to sink near high-pressure centers, inhibiting precipitation and cloud formation. This is why high-pressure systems tend to bring sunny days with calm weather. Air flows clockwise around a high-pressure system in the Northern Hemisphere.

A *warm front* is the boundary between warm and cool or cold air, where the warm air is replacing the cold air. Warm fronts often form to the east of low-pressure centers as warm air from the south is pushed northward by counterclockwise winds. As warm, light air advances northward, it rides over the cold, heavy air ahead of it. The warm water vapor in the air rises, cools, and

condenses into clouds that typically produce long periods of precipitation as the cold air below it slows the progress of the warm front. On a weather map, the warm front marks the boundary between warm and cold air at the Earth's surface. It is shown as a red line with curved half-circles that point in the direction the warm front is moving.

A *cold front* is the boundary between warm and cold air, where the cold air is replacing the warm air. Showers and thunderstorms often develop ahead of a cold front in the warm, unstable air ahead of the front. Winter cold fronts often bring frigid air, while summer cold fronts often bring dry air. As a cold front moves into an area, the heavier, cool air pushes under the lighter, warm air it is replacing. The warm air cools as it rises. If the rising air is humid enough, water vapor will condense into clouds and may create precipitation. In summer, a cold front could trigger thunderstorms with hail and damaging winds and even tornadoes. On a weather map, the cold front is shown as a blue line with triangles that point in the direction the cold front is moving.

### **Materials**

- U.S. maps (regional or national)
- Collection of weather reports from newspaper or Internet covering, four consecutive days
- Sheets of paper, each showing an oversized weather map symbol (Include those for cloudy, sunny, and thunderstorms, in addition to those on the vocabulary list)

### **Vocabulary**

*cold front, high-pressure area, high-pressure system, isobar, isotherm, low-pressure area, low-pressure system, warm front*

### **Student/Teacher Actions (what students and teachers should be doing to facilitate learning)**

Before undertaking this lesson, students should have become knowledgeable about the concepts of air pressure, temperature, and humidity.

1. Have students make a vocabulary foldable, including each vocabulary word, its definition, a sentence that uses it, and a picture of the concept.
2. Introduce weather maps and their symbols, how to map the movements of cold and warm fronts, and how to interpret and predict the effects of the fronts on observable weather conditions. Encourage students to indicate next to each vocabulary word the appropriate symbol.
3. Distribute to selected students sheets of paper with large weather map symbols. As you call out weather conditions, have students holding the matching symbols stand up. For example, have students with the appropriate symbols stand to indicate that a warm or cold front is coming and other stand to indicate what kind of weather will result.
4. Have students work individually or in small groups to interpret basic weather maps and make forecasts based on the weather data provided.

### **Assessment**

- **Questions**
  - What information do you find on weather maps?
  - What other information is given in a weather report?
  - What patterns do you notice on your maps? Explain.

- Are there any fronts on your maps? If so, what are they? How do you know?
- How did the fronts move? How far did they travel from one day to the next?
- As the fronts approached, what changes in the sky conditions probably occurred?
- **Journal/Writing Prompts**
  - Write sentences to incorporate weather forecasting symbols to the associated vocabulary.
  - Describe in symbols the weather report provided by the teacher.
  - Explain why meteorologists are not always correct in their forecasts even though they use all available data, past and present, to make them.
- **Other**
  - Ask students, “Why are weather forecasts important?” List responses, and continue brainstorming reasons that knowing what the weather will be for today, tomorrow, or beyond is often very important to people. Ask, “How would our lives be different if all weather forecasts were incorrect? How would life change if there were no weather forecasts?”
  - Have students participate in a weather symbol exercise.
  - Have students compare three to five days of weather predictions to the actual weather conditions during those days. Have them determine whether the predictions were totally correct, totally incorrect, or partially correct and incorrect, and have them explain why.

### **Extensions and Connections (for all students)**

- Remind students that technology has helped to produce better, more reliable weather forecasts. This improved technology has allowed meteorologists to predict violent weather more accurately and has helped people to prepare for dangerous weather events such as hurricanes, severe thunderstorms, tornados, and blizzards. Have students research and prepare an interesting presentation to the class about the current technology (e.g., satellites, radar, computer modeling, instrumental aircraft) used by meteorologists to make weather predictions accurate.
- Have the class become part of the “GLOBE Program” to record and report a variety of weather and other data to the GLOBE database, which is accessible worldwide.
- Have students collect weather-related data over an extended period of time and enter that data into ArcView (desktop GIS for mapping, data integration, and analysis) to display color-coded GIS maps of their data.

### **Strategies for Differentiation**

- Have students label a national or regional map (the larger the better) with weather symbol labels, depicting the day’s weather forecast.
- Have students perform a weather forecast in front of a large regional map, using appropriate vocabulary to describe current and impending weather conditions.
- Utilize an interactive white board to enhance visual understanding of weather maps.
- Use video clips from Internet sources such as *Discovery Education*, the national weather center, or local weather Web sites to enhance students’ understanding of weather forecasting.
- Have students watch time-lapsed weather maps from [www.weather.com](http://www.weather.com).

- Invite a meteorologist to discuss his/her occupation.
- Take students to visit a weather forecasting channel or weather station.
- Have students write a story about a trip to an area of their choice, such as the beach or the mountains, that is known for a particular type of weather.
- Have students provide the information for the daily weather forecast to be presented as part of the morning announcements.