

**BEFORE YOU READ**

**After you read this section, you should be able to answer these questions:**

- What instruments are used to forecast weather?
- How do you read a weather map?

**National Science Education Standards**

ES 1i, 1j

**What Is a Weather Forecast?**

Weather affects how you dress and how you plan your day. Severe weather can put people in danger. Therefore, accurate weather forecasts are important. A *weather forecast* is a prediction of weather conditions over the next few days. Meteorologists make weather forecasts using information on atmospheric conditions.

Meteorologists use special instruments to collect data. Some of these instruments are far above the ground. Others are tools you may be familiar with from everyday use.

**WEATHER BALLOONS**

*Weather balloons* carry electronic equipment. The equipment on a weather balloon can measure weather conditions as high as 30 km above Earth's surface. This equipment measures temperature, air pressure, and relative humidity. It transmits the information to meteorologists using radio signals. Meteorologists can track the path of the balloons to measure wind speed and direction.



Weather balloons carry equipment into the atmosphere. They use radio signals to transmit information on weather conditions to meteorologists on the ground.

**STUDY TIP**

**Compare** As you read this section, make a chart comparing the different tools that meteorologists use to collect weather data.

**READING CHECK**

- Explain** What do meteorologists use to forecast the weather?
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**TAKE A LOOK**

- Describe** How do meteorologists obtain the information from weather balloons?
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**SECTION 4** Forecasting Weather *continued***THERMOMETERS AND BAROMETERS**

Remember that air temperature and pressure can affect the weather. Therefore, meteorologists must be able to measure temperature and pressure accurately. They use **thermometers** to measure temperature, just like you do. They use tools called **barometers** to measure air pressure.

**WINDSOCKS, WIND VANES, AND ANEMOMETERS**

Meteorologists can use windsocks and wind vanes to measure wind direction. A *windsock* is a cone-shaped cloth bag that is open at both ends. The wind enters through the wide end and leaves through the narrow end. The wide end always points into the wind.

A *wind vane* is shaped like an arrow. It is attached to a pole. The wind pushes the tail of the arrow. The vane spins until the arrow points into the wind.

An **anemometer** measures wind speed. It has three or four cups connected to a pole with spokes. The wind pushes on the open sides of the cups. This makes them spin on the pole. The spinning of the pole produces an electric current, which is displayed on a dial. The faster the wind speed, the stronger the electric current, and the further the dial moves.



Meteorologists use anemometers to measure wind speed.

**TAKE A LOOK**

- 4. Identify** What is an anemometer?
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**READING CHECK**

- 5. Describe** Give two things that meteorologists can use radar to do.
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**RADAR AND SATELLITES**

Scientists use *radar* to locate fronts and air masses. Radar can locate a weather system and show the direction it is moving. It can show how much precipitation is falling, and what kind of precipitation it is. Most television stations use radar to give information about weather systems.

*Weather satellites* orbiting Earth produce images of weather systems. Satellites can also measure wind speeds, humidity, and temperatures from different altitudes. Meteorologists use weather satellites to track storms.

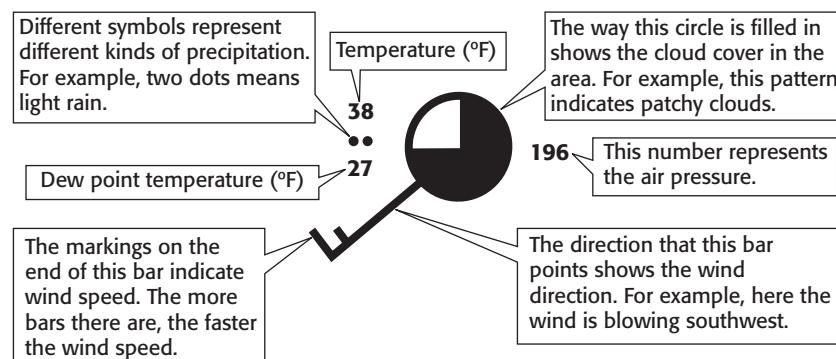
**SECTION 4** Forecasting Weather *continued*

## What Are Weather Maps?

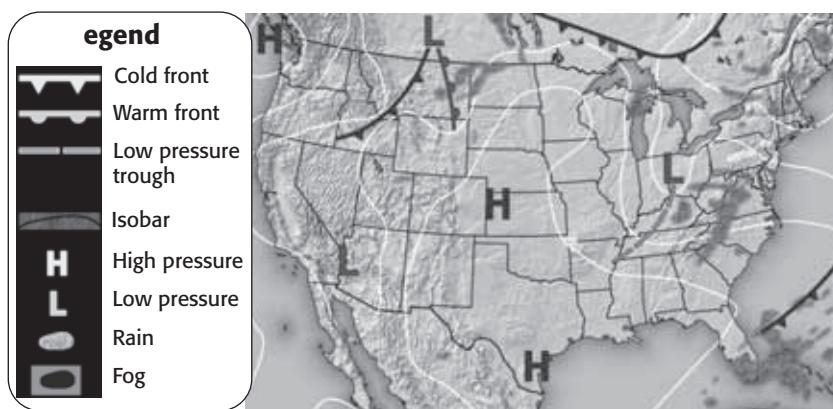
In the United States, two main groups of scientists collect weather data. One group is the National Weather Service (NWS). The other group is the National Oceanic and Atmospheric Administration (NOAA). These groups gather information from about 1,000 weather stations across the United States to produce weather maps. 

### READING A WEATHER MAP

Some weather maps contain station models. A *station model* is a symbol that shows the weather at a certain location. Station models look like circles with numbers and symbols around them. The numbers and symbols stand for different measurements, as shown below.



Some weather maps, such as those you see on television, show lines called isobars. *Isobars* are lines that connect points of equal air pressure. They are similar to contour lines on a topographic map. Isobars that form closed circles represent areas of high (H) or low (L) pressure. Weather maps also show fronts.

**READING CHECK**

- 6. Identify** What are two groups that collect weather data in the United States?
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**TAKE A LOOK**

- 7. Use a Model** What is the dew point temperature for the station shown in the figure?
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- 8. Infer** Will condensation happen in the air at the station in the figure? Explain your answer.
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**TAKE A LOOK**

- 9. Read a Map** On the map, circle the areas of high pressure.

# Section 4 Review

NSES ES 1i, 1j

## SECTION VOCABULARY

**anemometer** an instrument used to measure wind speed

**barometer** an instrument that measures atmospheric pressure

**thermometer** an instrument that measures and indicates temperature

- 1. Compare** How is an anemometer different from a windsock or a wind vane?

- 2. Identify** What three atmospheric conditions do weather balloons measure?

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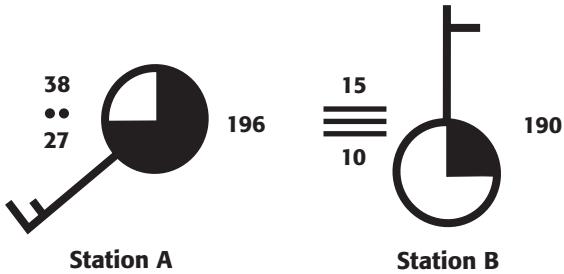
- 3. Describe** Give three things that meteorologists use weather satellites for.

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- 4. Apply Concepts** Which of the two weather stations below is experiencing higher air temperatures? Which is experiencing higher wind speeds?



- 5. Apply Concepts** In which direction is the wind blowing at station A? In which direction is it blowing at station B?

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