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Air Temperature

Topic

Using a thermometer

Key Question

How does air temperature affect a thermometer?

Learning Goal

Students will use a thermometer to measure air temperature.

Guiding Documents

Project 2061 Benchmarks

- Tools such as thermometers, magnifiers, rulers, or balances often give more information about things than can be obtained by just observing things without their help.
- Some events in nature have a repeating pattern. The weather changes some from day to day, but things such as temperature and rain (or snow) tend to be high, low, or medium in the same months every year.

NRC Standards

- Weather changes from day to day and over the seasons. Weather can be described by measurable quantities, such as temperature, wind direction and speed, and precipitation.
- Simple instruments, such as magnifiers, thermometers, and rulers, provide more information than scientists obtain using only their senses.

*NCTM Standards 2000**

- Select and apply appropriate standard units and tools to measure length, area, volume, weight, time, temperature, and the size of angles
- Recognize and apply mathematics in contexts outside of mathematics

Math

Measuring
temperature

Science

Earth science
air temperature

Integrated Processes

Observing
Predicting
Comparing and contrasting
Collecting and recording data
Communicating



Materials

Immersion thermometers
Small containers for water
Masking tape, optional
Permanent colored pens, optional
Warm water
Cool water

Background Information

Temperature tells us how hot or cold something is. Most people are familiar with the idea of temperature. The temperature of our bodies is important to our health; the temperature of the air is given in the weather report. Our experience tells us that the warmer something feels, the higher the temperature is likely to be.

A thermometer is an instrument whose size, shape, or some other feature changes when its temperature changes so that it can be used to measure temperature. The most common thermometers are those that have an expanding column of mercury or colored alcohol. (Only alcohol thermometers should be used in elementary school.)

Management

1. Large Styrofoam cups or liter boxes work well for the water containers.
2. Make sure the warm water will not be uncomfortable to the touch.
3. If students have not had prior experience with thermometers, you will need to spend time during the lesson talking about the scale of the thermometers.
4. It is best to use thermometers with only one scale. The student page illustrates both Fahrenheit and Celsius scales. You may want to cover one of the scales before copying the page to prevent confusion.

Procedure

Observing the thermometer

1. Give each group a thermometer. Have the students examine the thermometer and discuss their observations.
2. Explain to the students that the thermometer has colored alcohol in the bulb that expands (takes up more room) when it gets warm or hot and the liquid goes up the tube. Encourage them to offer ways they can get the alcohol to go up the tube.
3. Ask them what they think will happen if they put their thumb on the bulb of the thermometer. Allow time for them to test their predictions. Ask them what they know about the temperature of their

finger. [If the alcohol rose in the thermometer, their thumb was warmer than the surrounding air.] Have them remove their thumbs from the thermometers' bulbs and after a short time ask them what has happened to the column of liquid and why it happened.

4. Provide the students with two containers of water, one warm and one cool. Tell them to stick one hand in each container and note the difference. Have them predict what will happen when they place their thermometers in the two different containers of water.
5. Direct them to place the bulb ends of their thermometers in the containers of water. Urge them to observe what happens to the red liquid.
6. When the red liquid stops rising, ask the students which number the red liquid is next to.
7. Encourage them to compare their results with those of other groups and to record their observations.

Using the thermometer for air temperature

1. Distribute the student page.
2. Have the students take their thermometers outside and record the temperature of the air in the sun and in the shade.
3. Ask the students to explain the differences in the temperatures.
4. Encourage them to find other areas that would have big differences in temperatures, for example, the blacktop and a grassy area. Have the students explain why they think one area will be hotter than the other.

Connecting Learning

1. What do you like to eat or drink that is hot? What is your favorite cold food or drink? How does each of these foods become hot or cold?
2. Do you have thermometers at home? What are they used for? [air conditioning, heater or furnace, body temperature]
3. When something is warm, what happens to the thermometer? When something is cold, what happens to it?
4. When you were using your thermometer, what did you notice about the red liquid in the tube? [It goes up when it is hot, and it goes down when it is cold.]
5. When you put your thumb on the bulb of the thermometer, what happened to the red liquid? What temperature were you measuring? [my thumb's]
6. When you put the thermometer in the containers of water, what temperature were you measuring? [the water's]
7. When you measured the temperature of the air outside, where did you find the coolest temperature? ...the warmest?

8. How can you tell if something is hot or cold without actually touching it yourself?

9. What are you wondering now?

Extension

Challenge the students to find the hottest and the coldest spot on the school ground. Let them explain why they chose certain areas to investigate.

Curriculum Correlation

Maestro, Betsy and Giulio. *Temperature and You*. Lodestar Books. New York. 1990.

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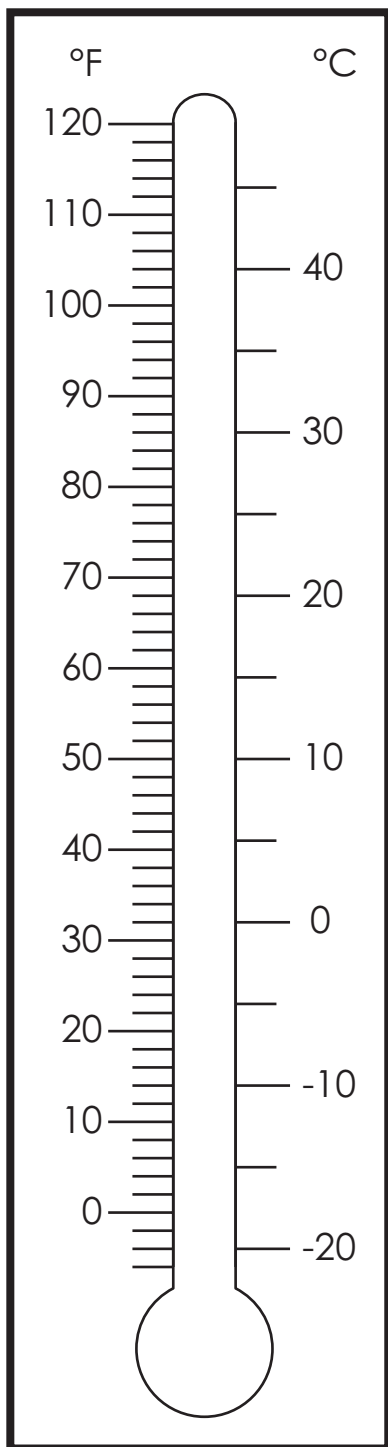


Air Temperature

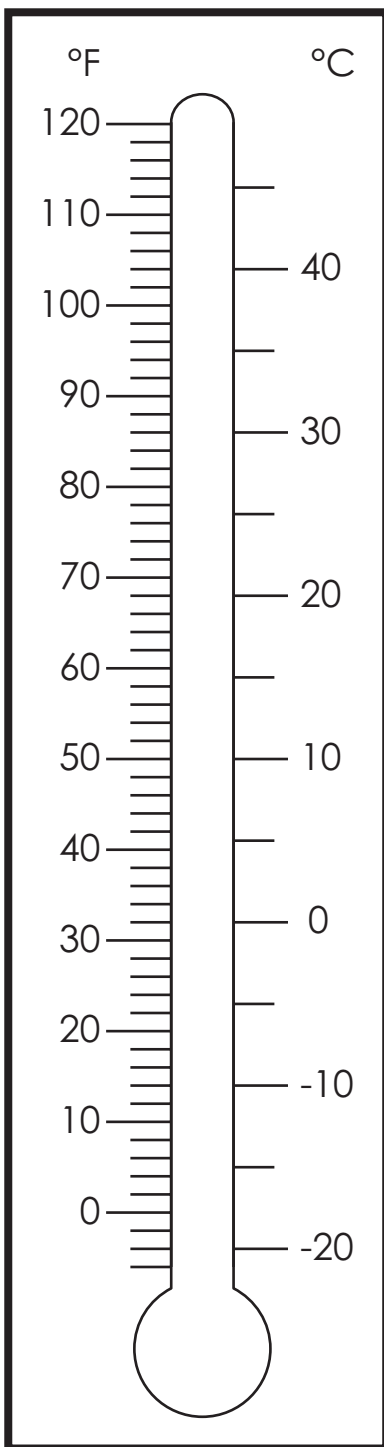
Measure Air Temperature

Color in the red to match your thermometer.

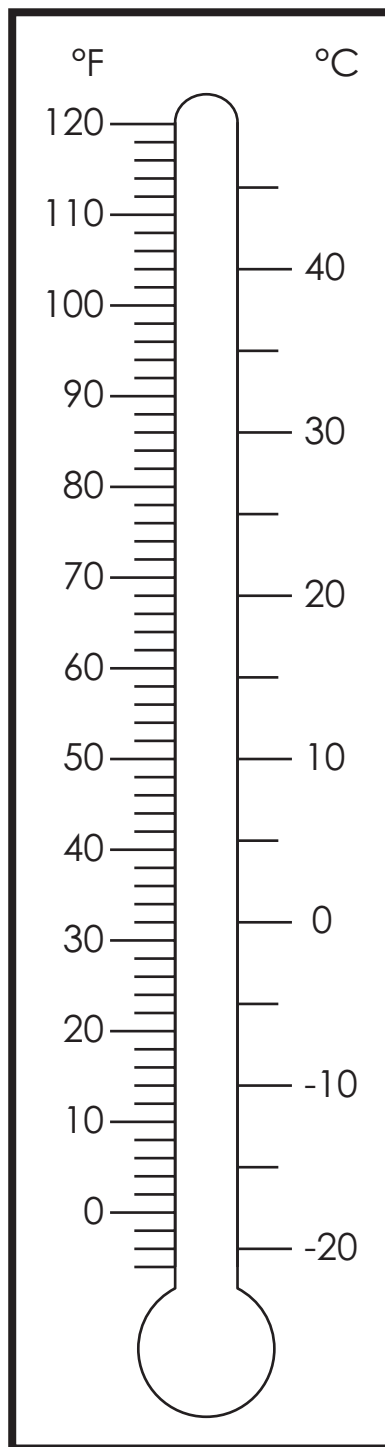
Where: _____



Where: _____



Where: _____



What did you find out?