

Activity: The Third Degree

Objective: Use degrees Celsius to determine temperatures.

Materials: The Third Degree Activity Sheet and Transparency
One thermometer per pair of participants
One Styrofoam cup having a capacity of at least 6 fluid ounces (180 mL) per pair of participants
One large container of water
One bag of ice cubes containing at least one ice cube per pair of participants

Procedures:

1. Begin this activity by telling participants that there are two commonly used thermometric scales: The Celsius and Fahrenheit Scales. Tell them that in this activity they will measure temperatures in degrees Celsius, but will use both scales to measure temperatures as they complete the small-group activities on temperature.
2. Provide the following background information on the Celsius and Fahrenheit thermometric scales:
 - a. The Celsius Scale was devised by Anders Celsius (1701-1744). For many years it was known as the centigrade scale because there are 100 degrees between freezing and boiling water. In honor of its inventor, the scale's name was changed to Celsius in 1948. On the Celsius scale, water freezes at 0°C and boils at 100°C ; a comfortable room temperature on this scale is around 20°C .
 - b. The Fahrenheit Scale was devised by Gabriel Fahrenheit (1686-1736). Fahrenheit invented the first mercury-in-glass thermometer and this scale to measure temperatures in 1714. On the Fahrenheit scale, water freezes at 32°F and boils at 212°F ; a comfortable room temperature on this scale is around 70°F .
3. Suggest to participants that they use the temperatures discussed in Procedure 2 as a guide when estimating and predicting temperatures. As with other units of measure, emphasize the importance of making accurate estimates.
4. Distribute "The Third Degree" activity sheet. Use the Celsius thermometer on the transparency for this activity to locate the temperatures at which

water freezes and boils. Have participants do this on their activity sheets and then summarize the remaining activities on this page.

5. Distribute a Styrofoam cup containing 5 fluid ounces (150 mL) of water, an ice cube, and a thermometer to each pair of participants and have them do Activities 2-5 on "The Third Degree" activity sheet.
6. Allow participants time to complete this activity sheet. Circulate among participants as they work on these activities providing assistance and asking questions as necessary.
7. Discuss the data participants collected and predictions they made. Conclude the activity by reviewing the Celsius scale.

Notes:

1. The thermometers used for this module are dual-scale thermometers. Make sure participants use the Celsius scale for this activity, correctly read the increment marks on the thermometer, and place the ice cube on the spherical stem at the base of the thermometer.
2. Ice cubes can be kept until needed for this activity by placing them in a plastic bag and then wrapping the bag in several layers of newspaper.
3. The answers to "The Third Degree" activities will vary and depend on such things as room temperature, size of ice cubes, measurement errors. . . Representative answers for each activity are listed below:
 2. Answers will vary. Hopefully, the room in which you are conducting this training session will have a temperature between 17°C and 23°C ; an ideal temperature would be 20°C .
 3. a. 18°C to 20°C
b. -2°C to -5°C
 4. a. Approximately 15°C ; the water's temperature should be 4°C to 6°C colder after the ice cube is in it for one minute.
b. Approximately 10°C ; the water's temperature should be 8°C to 12°C after the ice cube is in it for two minutes.

5. Approximately 5°C ; the water's temperature would be 12°C to 18°C colder after the ice cube was in it for 10 minutes. Because the size of the ice cube and the water's temperature decrease with time, the rate of change in the temperature of the water also decreases as the amount of time increases.

Extension:

This is a good place to write these temperatures as ordered pairs: (0, 32) for freezing, (100, 212) for boiling. Participants could graph these points and determine equivalent temperatures from the graphs.

THE THIRD DEGREE

1. Water freezes at 0°C and boils at 100°C . Locate and label these temperatures on the Celsius thermometer shown to the right.
2. This thermometer shows an ideal temperature for indoor meetings. Temperatures 3°C above or below this are also considered satisfactory. What is the current temperature in this room? _____ Label this temperature on the thermometer, is it within the satisfactory range? _____
3. Find and label on the thermometer the temperature of:
 - A. A cup of water at room temperature
 - B. An ice cube
4. Place the ice cube in a cup containing 5 fluid ounces (150 mL) of water. What is the water's temperature after the ice cube has been in it for:
 - A. 1 minute? _____
 - B. 3 minutes? _____
5. Based on your previous observations, predict the temperature the water will be after the ice cube has been in it for 10 minutes. _____

Explain your prediction.

