

Temperature Scales

READ



The Fahrenheit and Celsius temperature scales are commonly used scales for reporting temperature values. Scientists use the Celsius scale almost exclusively, as do many countries of the world. The United States relies on the Fahrenheit scale for reporting temperature information. You can convert information reported in degrees Celsius to degrees Fahrenheit or vice versa using conversion formulas.

Fahrenheit ($^{\circ}\text{F}$) to Celsius ($^{\circ}\text{C}$) conversion formula: $^{\circ}\text{C} = \frac{5}{9} (^{\circ}\text{F} - 32)$

Celsius ($^{\circ}\text{C}$) to Fahrenheit ($^{\circ}\text{F}$) conversion formula: $^{\circ}\text{F} = \left(\frac{9}{5} \times ^{\circ}\text{C}\right) + 32$

EXAMPLES



What is the Celsius value for 65° Fahrenheit?

Step 1: Subtract $^{\circ}\text{C} = \left(\frac{5}{9}\right) (65^{\circ}\text{F} - 32)$

Step 2: Multiply $^{\circ}\text{C} = \left(\frac{5}{9}\right) (33) = (5 \times 33) \div 9$

Step 3: Divide $^{\circ}\text{C} = (165) \div 9$
 $^{\circ}\text{C} = 18.3$

200°C is the same temperature as what value on the Fahrenheit scale?

$$^{\circ}\text{F} = \left(\frac{9}{5}\right) (200^{\circ}\text{C}) + 32$$

Step 1: Multiply $^{\circ}\text{F} = [(9 \times 200^{\circ}\text{C}) \div 5] + 32$

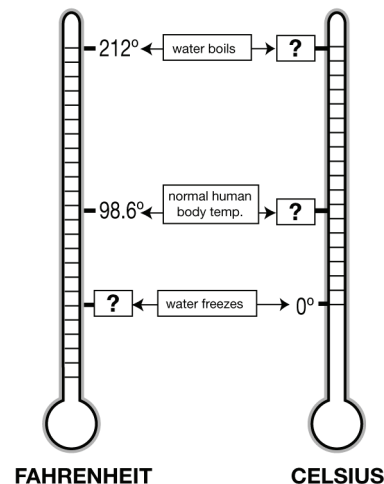
Step 2: Divide $^{\circ}\text{F} = [1800 \div 5] + 32$

Step 3: Add $^{\circ}\text{F} = 360 + 32$
 $^{\circ}\text{F} = 392$

PRACTICE



1. For each of the problems below, show your calculations. Follow the steps from the examples above.
 - a. What is the Celsius value for 212°F ?
 - b. What is the Celsius value for 98.6°F ?
 - c. What is the Celsius value for 40°F ?
 - d. What is the Celsius value for 10°F ?
 - e. What is the Fahrenheit value for 0°C ?
 - f. What is the Fahrenheit value for 25°C ?
 - g. What is the Fahrenheit value for 75°C ?



2. The weatherman reports that today will reach a high of 45°F . Your friend from Sweden asks what the temperature will be in degrees Celsius. What value would you report to your friend?
3. Your parents order an oven from England. The temperature dial on the new oven is calibrated in degrees Celsius. If you need to bake a cake at 350°F in the new oven, at what temperature should you set the dial?
4. A German automobile's engine temperature gauge reads in Celsius, not Fahrenheit. The engine temperature should not rise above about 225°F . What is the corresponding Celsius temperature on this car's gauge?
5. Your grandmother in Ireland sends you her favorite cookie recipe. Her instructions say to bake the cookies at 190.5°C . To what Fahrenheit temperature would you set the oven to bake the cookies?
6. A scientist wishes to generate a chemical reaction in his laboratory. The temperature values in his laboratory manual are given in degrees Celsius. However, his lab thermometers are calibrated in degrees Fahrenheit. If he needs to heat his reactants to 232°C , what temperature will he need to monitor on his lab thermometers?
7. You call a friend in Denmark during the winter holidays and say that the temperature in Boston is 15 degrees. He replies that you must enjoy the warm weather. Explain his comment using your knowledge of the Fahrenheit and Celsius scales. To help you get started, fill in this table. What is 15°F on the Celsius scale? What is 15°C on the Fahrenheit scale?

| $^{\circ}\text{F}$ | | $^{\circ}\text{C}$ |
|----------------------|---|----------------------|
| 15°F | = | |
| | = | 15°C |

8. Challenge questions:
 - a. A gas has a boiling point of -175°C . At what Fahrenheit temperature would this gas boil?
 - b. A chemist notices some silvery liquid on the floor in her lab. She wonders if someone accidentally broke a mercury thermometer, but did not thoroughly clean up the mess. She decides to find out if the silver stuff is really mercury. From her tests with the substance, she finds out that the melting point for the liquid is 35°F . A reference book says that the melting point for mercury is -38.87°C . Is this substance mercury? Explain your answer and show all relevant calculations.
 - c. It is August 1st and you are at a Science Camp in Florida. During an outdoor science quiz, you are asked to identify the temperature scale for a thermometer that reports the current temperature as 90. Is this thermometer calibrated for the Fahrenheit, or Celsius temperature scale? Fill in the table below to answer this question.

| $^{\circ}\text{F}$ | | $^{\circ}\text{C}$ |
|----------------------|---|----------------------|
| 90°F | = | |
| | = | 90°C |