

Chapter 4

Mass, Temperature, and Volume



To make good bread, the ingredients must be measured accurately and the dough stored and baked at the correct temperature. Cam McCaw, a Red Seal pastry chef, turns out hundreds of loaves of bread daily.

Temperature Conversions

4.1

NEW SKILLS: WORKING WITH TEMPERATURE

If you travel to the United States, you will notice that a different temperature scale is used there. The US uses the Fahrenheit scale ($^{\circ}\text{F}$) of the imperial system, while Canada uses the Celsius scale ($^{\circ}\text{C}$) of the SI.

In the SI, water freezes at 0°C and boils at 100°C . In the imperial system, water freezes at 32°F and boils at 212°F . Since water freezes at 0°C and 32°F , the relationship between the two temperature systems can be calculated with the following formulas, where C represents degrees Celsius and F represents degrees Fahrenheit.

$$C = \frac{5}{9}(F - 32) \text{ or } F = \frac{9}{5}C + 32$$

The Celsius scale used to be called the centigrade scale, and it is sometimes referred to this way.

For more details, see page 138 of *MathWorks 10*.

When working with temperatures, convert them to the nearest tenth of a degree.

Example 1

While visiting Florida, Kathy heard a local person say that it had been very cold overnight, as it was only 42° . At first, she thought this was not cold, but then Kathy realized the person meant degrees Fahrenheit. What was the temperature in degrees Celsius?

SOLUTION

Use the following formula, and substitute 42 for F .

$$C = \frac{5}{9}(F - 32) \quad \text{or} \quad C = \frac{5(F-32)}{9}$$

The temperature is _____ C, which would be very cold in Florida.

Example 2

Sverre was paving a road with heated tar during a hot summer day. He noted that the external temperature of the tar was 48°C . What was this in degrees Fahrenheit?

SOLUTION

Use the formula for converting degrees Fahrenheit to degrees Celsius, and substitute 48 for C .

$$F = \frac{9}{5}C + 32 \quad \text{or} \quad F = \frac{9C}{5} + 32$$

The temperature was approximately _____ $^\circ\text{F}$.

BUILD YOUR SKILLS

1. A cake recipe says to bake at 350°F . Your oven only shows temperatures in degrees Celsius. At what temperature should you set your oven?
2. Sophie is making fudge in France, using an American cookbook. She needs to cook the chocolate until the temperature is 238°F , but her thermometer only shows temperatures in degrees Celsius. What temperature does her fudge mixture need to reach?
3. Firefighters can estimate the temperature of a burning fire by the colour of its flame. A clear orange flame has a temperature of about 2190°F . How hot is this in degrees Celsius?
4. The normal temperature for a dog is from 99°F to 102°F . Ashley's dog has a temperature of 40°C . Convert the temperature to Fahrenheit to calculate if it falls within the normal range.

5. Roger is painting the exterior of a house. He should not apply the paint if the temperature is below 45°F . The temperature is 9°C . Is it safe to apply the paint?

6. Chinook winds are known to cause great changes in temperature over a short period of time. The most extreme temperature change in a 24-hour period occurred in Loma, Montana, on January 15, 1972. The temperature rose from -54°F to 49°F .

a) What was the change in temperature in degrees Fahrenheit?

b) What were the minimum and maximum temperatures in degrees Celsius?

c) What was the change in temperature in degrees Celsius?

A chinook wind is a warm, dry wind that blows east of the Rocky Mountains, often causing significant temperature increases in a short time in winter.

PRACTISE YOUR NEW SKILLS

1. Convert the following temperatures to degrees Fahrenheit.

a) 35°C

b) -8°C

c) 165°C

d) 21°C

e) -40°C

f) 202°C

2. Convert the following temperatures to degrees Celsius.

a) -20°F

b) 80°F

c) 375°F

d) 2°F

e) 0°F

f) -2°F

3. Which is hotter: a blowtorch flame at 1300°C or a candle flame at 1830°F ?
By how much is one flame hotter than the other in each scale?

4. When Harry mixes different materials to pave a road, he knows that they must be kept at the following temperatures in degrees Fahrenheit. Calculate the temperatures in degrees Celsius.

a) Bituminous material must be between 200°F and 260°F .

b) Water solution must be between 65°F and 100°F .

c) The mixing gel must be between 160°F and 210°F .

