

Practice Problems 3.7

Circle the correct measure in degrees Celsius.

- Ice 0° 32° 10°
- Summer day 80° 32° 10°
- Hot soup 20° 45° 70°
- Body temperature 37° 60° 90°
- Freezer temperature 2° 12° -22°
- Cold drink 4° 50° 70°
- Oven temperature 350° 700° 175°
- Fall day 54° 15° 31°

3.8 Converting Temperatures

Since there are 100 degrees between the freezing point and boiling point of water on the Celsius temperature scale and there are 180 degrees ($212 - 32$) between the freezing point and boiling point of water on the Fahrenheit temperature scale, the ratio between a Fahrenheit degree and a Celsius degree is $\frac{180}{100}$ or $\frac{9}{5}$. Therefore, the formula for converting temperature from the Celsius to the Fahrenheit scale is $F = \frac{9}{5}C + 32$.

Algebra Connection

Thirty-two must be added because the ratio was found by comparing the number of degrees between freezing points and boiling points. On the Fahrenheit scale the freezing point is 32° , not 0° as it is on the Celsius scale.

To convert temperature from the Fahrenheit scale to the Celsius scale, the formula $C = \frac{5}{9}(F - 32)$ can be used. This formula was derived from $F = \frac{9}{5}C + 32$.

Since -40°F . and -40°C are measures of the same temperature, the temperature conversions can also be made using the formulas $C = \frac{5}{9}(F + 40) - 40$ and $F = \frac{9}{5}(C + 40) - 40$.

Example 3.8a

Convert 45°C to Fahrenheit.

$$\begin{aligned} F &= \frac{9}{5}C + 32 & F &= \frac{9}{5}(C + 40) - 40 \\ F &= \frac{9}{5}(45) + 32 & F &= \frac{9}{5}(45 + 40) - 40 \\ F &= 81 + 32 & F &= \frac{9}{5}(85) - 40 \\ F &= 113^\circ & F &= 153 - 40 \\ & & F &= 113^\circ \end{aligned}$$

Example 3.8b

Convert -13°F . to Celsius.

$$\begin{aligned} C &= \frac{5}{9}(F - 32) & C &= \frac{5}{9}(F + 40) - 40 \\ C &= \frac{5}{9}(-13 - 32) & C &= \frac{5}{9}(-13 + 40) - 40 \\ C &= \frac{5}{9}(-45) & C &= \frac{5}{9}(27) - 40 \\ C &= -25^\circ & C &= 15 - 40 \\ & & C &= -25^\circ \end{aligned}$$

Practice Problems 3.8

Convert these temperatures. Use both formulas for exercises 1–3.

1. $50^\circ\text{C} = \underline{122}^\circ\text{F}$.

2. $392^\circ\text{F} = \underline{200}^\circ\text{C}$

3. $41^\circ\text{F} = \underline{5}^\circ\text{C}$

$$\begin{array}{llllll} F = \frac{9}{5}C + 32 & F = \frac{9}{5}(C + 40) - 40 & C = \frac{5}{9}(F - 32) & C = \frac{5}{9}(F + 40) - 40 & C = \frac{5}{9}(F - 32) & C = \frac{5}{9}(F + 40) - 40 \\ F = \frac{9}{5} \cdot 50 + 32 & F = \frac{9}{5}(50 + 40) - 40 & C = \frac{5}{9}(392 - 32) & C = \frac{5}{9}(392 + 40) - 40 & C = \frac{5}{9}(41 - 32) & C = \frac{5}{9}(41 + 40) - 40 \\ F = 90 + 32 & F = \frac{9}{5}(90) - 40 & C = \frac{5}{9}(360) & C = \frac{5}{9}(432) - 40 & C = \frac{5}{9}(9) & C = \frac{5}{9}(81) - 40 \\ F = 122^\circ & F = 162 - 40 & C = 200^\circ & C = 240 - 40 & C = 5^\circ & C = 45 - 40 \\ & F = 122^\circ & & C = 200^\circ & & C = 5^\circ \end{array}$$

4. $-10^{\circ}\text{C} = \underline{14}^{\circ}\text{F}$.

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

$$F = \frac{9}{5}(-10) + 32$$

$$F = -18 + 32$$

$$F = 14^{\circ}$$

5. $135^{\circ}\text{C} = \underline{275}^{\circ}\text{F}$.

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

$$F = \frac{9}{5}(135) + 32$$

$$F = 243 + 32$$

$$F = 275^{\circ}$$

6. $167^{\circ}\text{F} = \underline{75}^{\circ}\text{C}$

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

$$C = \frac{5}{9}(167 - 32)$$

$$C = \frac{5}{9}(135)$$

$$C = 75^{\circ}$$

Sharpening Skills *Work problems on notebook paper.*

Write the correct answer for each row.

1. length of a pencil	<u>10 cm</u>	5 mm	10 km	5 dm
2. width of a room	5 cm	10 km	<u>5 m</u>	10 mm
3. area of a postage stamp	2 m ²	10 dm ²	4 mm ²	<u>6 cm²</u>
4. capacity of a glass of milk	20 mL	2.5 liters	<u>.3 liters</u>	30 liters
5. weight of a box of cereal	<u>480 g</u>	50 mg	2 kg	100 cg
6. weight of a sewing needle	<u>100 mg</u>	20 g	1,000 cg	1 kg
7. capacity of a test tube	25 liters	3 kL	<u>70 mL</u>	4 dL
8. long-distance run	10,000 mm	10,000 cm	<u>10,000 m</u>	10,000 km
9. weight of a nickel	20 mg	<u>5 g</u>	475 dg	11 cg
10. temperature of ice cream	35°F.	5°C	10°C	<u>0°F.</u>

Convert these temperatures. Use both formulas for exercise 11.

11. $5^{\circ}\text{C} = \underline{41}^{\circ}\text{F}$.

12. $50^{\circ}\text{F} = \underline{10}^{\circ}\text{C}$

13. $200^{\circ}\text{C} = \underline{392}^{\circ}\text{F}$.

Convert to the nearest whole unit.

14. 700 mi. = 1,127 km

15. 11.6 kg = 26 lb.

16. 512 oz. = 15 kg

17. 95 qt. = 90 liters

18. 34 km = 21 mi.

19. 12 liters = 13 qt.

Lesson 48

3.9 Review of the Metric System

Practice Problems 3.9

Fill in each blank with the correct number.

1. $\frac{1,000}{(\times 1,000)}$ mL = 1 liter

2. $\frac{100}{(\times 100)}$ g = 1 hg

3. $\frac{1,000}{(\times 1,000)}$ cm = 1 dam

4. $\frac{1}{(+ 10)}$ kg = 10 hg

5. $\frac{80}{(\times 10)}$ m = 8 dam

6. $\frac{.2}{(+ 10)}$ daL = 2 liters

7. $\frac{1,000}{(\times 1,000)}$ m = 1 km

8. $\frac{300}{(\times 100)}$ cL = 3 liters

9. $\frac{100}{(\times 100)}$ mm = 1 dm

Convert to the nearest tenth.

10. 5 lb. = 2.3 kg

$$\begin{array}{r} .45 \\ \times 5 \\ \hline 2.25 = 2.3 \end{array}$$

11. 5 km = 3.1 mi.

$$\begin{array}{r} .62 \\ \times 5 \\ \hline 3.10 \end{array}$$

12. 16 liters = 17.0 qt. 1.06

$$\begin{array}{r} \times 16 \\ \hline 636 \\ + 106 \\ \hline 16.96 = 17.0 \end{array}$$

13. 20 in. = 50.8 cm

$$\begin{array}{r} 2.54 \\ \times 20 \\ \hline 50.80 \end{array}$$

14. 50 mi. = 80.5 km

$$\begin{array}{r} 1.61 \\ \times 50 \\ \hline 80.50 \end{array}$$

15. 42 kg = 92.4 lb. 42

$$\begin{array}{r} \times 2.2 \\ \hline 84 \\ + 84 \\ \hline 92.4 \end{array}$$

16. 5,000 oz. = 141,750.0 g

$$\begin{array}{r} 28.35 \\ \times 5,000 \\ \hline 141,750.00 \end{array}$$

17. 36 qt. = 34.2 liters $.95$

$$\begin{array}{r} .95 \\ \times 36 \\ \hline 570 \\ + 285 \\ \hline 34.20 \end{array}$$

18. 10,000 m = 6.2 mi.

$$\begin{array}{r} 10 \text{ km} \\ \times .62 \\ \hline 6.2 \end{array}$$

19. 671 g = 26.8 oz.

$$\begin{array}{r} 671 \\ \times .04 \\ \hline 26.84 = 26.8 \end{array}$$

20. 5,000 m = 5,450.0 yd.

$$\begin{array}{r} 5,000 \\ \times 1.09 \\ \hline 45000 \\ + 50000 \\ \hline 5,450.00 \end{array}$$

21. 623 yd. = 566.9 m

$$\begin{array}{r} 623 \\ \times .91 \\ \hline 623 \\ + 5607 \\ \hline 566.93 = 566.9 \end{array}$$

Convert these temperatures. Use both formulas for exercise 22.

22. $55^\circ\text{C} = \underline{131}^\circ\text{F}$

23. $59^\circ\text{F} = \underline{15}^\circ\text{C}$

24. $347^\circ\text{F} = \underline{175}^\circ\text{C}$

$F = \frac{9}{5}C + 32$ $F = \frac{9}{5}(C + 40) - 40$

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

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

$F = \frac{9}{5}(55) + 32$ $F = \frac{9}{5}(55 + 40) - 40$

$C = \frac{5}{9}(59 - 32)$

$C = \frac{5}{9}(347 - 32)$

$F = 99 + 32$ $F = \frac{9}{5}(95) - 40$

$C = \frac{5}{9}(27)$

$C = \frac{5}{9}(315)$

$F = 131^\circ$ $F = 171 - 40$

$C = 15^\circ$

$C = 175^\circ$

$F = 131^\circ$

25. $88^\circ\text{F} = \underline{31.1}^\circ\text{C}$

26. $88^\circ\text{C} = \underline{190.4}^\circ\text{F}$

27. $-15^\circ\text{C} = \underline{5}^\circ\text{F}$

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

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

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

$C = \frac{5}{9}(88 - 32)$

$F = \frac{9}{5}(88) + 32$

$F = \frac{9}{5}(-15) + 32$

$C = \frac{5}{9}(56)$

$F = \frac{792}{5} + 32$

$F = -27 + 32$

$C = \frac{280}{9}$

$F = 158.4 + 32$

$F = 5^\circ$

$C = 31.1^\circ$

$F = 190.4^\circ$

Circle the longer measure in each pair.

28. inch ; foot

29. decameter ; centimeter

30. millimeter ; inch

31. yard ; meter

32. mile ; kilometer

33. hectometer ; kilometer

Problem Solving

1. In the United States a bale of cotton weighs 500 pounds. How many kilograms does a bale weigh? **225 kg**
3. One cup of cooked spinach has 1.67 decigrams of calcium. How many milligrams does it have? **167 mg**
5. Kendra Foster ran 6.5 kilometers during physical education class. How many miles did she run? Find the answer to the nearest tenth of a mile. **4.0 mi.**
7. The Mississippi River is 2,375 miles long. How long is it to the nearest whole kilometer? **3,824 km**
2. One cup of orange juice contains 2 grams of protein. How many centigrams of protein are in 32 fluid ounces of orange juice? **800 cg**
4. It takes about 1,600 gallons of water to refine one barrel of crude oil. How many liters does it take? **6,080 L**
6. A hydroelectric power dam on the Euphrates River made it possible to irrigate and farm 606,000 hectares of land. How many square meters are in 606,000 hectares? **($\times 10,000$) 6,060,000,000 m²**
8. The top of the Kiban Dam in Turkey measures 1,155 meters across. How many feet across is the dam to the nearest whole foot? Find the answer by changing the meters to yards first. **3,777 ft.**

Sharpening Skills *Work problems on notebook paper.*

Write the correct abbreviation for each.

- | | | | |
|-------------------------|-------------------------|------------------------|------------------------|
| 1. milliliter mL | 2. gram g | 3. centigram cg | 4. decimeter dm |
| 5. hectogram hg | 6. decaliter daL | 7. meter m | 8. liter L |

Convert to the nearest tenth.

- | | | |
|---------------------------------|---------------------------------|--------------------------------|
| 9. 500 mi. = <u>805.0</u> km | 10. 38 liters = <u>40.3</u> qt. | 11. 229 m = <u>249.6</u> yd. |
| 12. 738 kg = <u>1,623.6</u> lb. | 13. 92 mi. = <u>148.1</u> km | 14. 120.5 yd. = <u>109.7</u> m |