

2.8.8: Converting Between Systems



You may use a calculator throughout this module.

Converting between the U.S. system and metric system is important in today's global economy; like it or not, the metric system is infiltrating our lives.

The numbers in these conversion ratios are usually difficult to work with, so we will use a calculator whenever necessary and pay attention to rounding. If you discover other conversion ratios that aren't provided here, write them down!

Converting Measurements of Length

You can use the conversion ratios in this table...

- 1 in = 2.54 cm
- 1 ft \approx 0.305 m
- 1 yd \approx 0.914 m
- 1 mi \approx 1.61 km

...or the equivalent conversion ratios in this table.

- 1 cm \approx 0.394 in
- 1 m \approx 3.28 ft
- 1 m \approx 1.09 yd
- 1 km \approx 0.621 mi

Okay, full disclosure: these conversion ratios aren't exactly equivalent. For example, if we reverse the conversion ratio 1 in = 2.54 cm^[1], we discover that 1 cm is actually $\frac{1}{2.54} \approx 0.3937$ inches. All of these conversion have been rounded to three significant figures, which means that we may get a slightly different result depending on which version of the conversion ratio we use. As long as we round our answer to three or fewer significant figures, though, we should be all right.

? Exercises 2.8.8.1

1. How many centimeters is 6 inches?
2. Convert 200 yards into meters.
3. 12 feet is equal to how many centimeters?
4. How many feet is 50 meters?
5. 15 meters is what length in yards?
6. Convert 75 centimeters into inches.
7. Is 21 kilometers equivalent to 13 miles? If not, what is the percent error?



8. Is 66 kilometers equivalent to 41 miles? If not, what is the percent error?



Answer

1. 15.2cm
2. 183m
3. 366cm
4. 164ft
5. 16.4yd
6. 29.5in
7. not exactly; the error is around 0.3%
8. they are essentially the same; the error is around 0.015%

Converting Measurements of Weight or Mass

You can use the conversion ratios in this table...

- $1 \text{ oz} \approx 28.35 \text{ g}$
- $1 \text{ lb} \approx 0.454 \text{ kg}$

...or the (almost) equivalent conversion ratios in this table.

- $1 \text{ g} \approx 0.0353 \text{ oz}$
- $1 \text{ kg} \approx 2.20 \text{ lb}$

You probably have noticed that some conversion problems involve multiplication but others involve division. This is based on which version of the conversion ratio you choose; any of these. If you prefer multiplying to dividing, see whether you can figure out a strategy for choosing your conversion ratio.

? Exercises 2.8.8.1

9. Convert 4 ounces into grams.
10. How many kilograms are equivalent to 120 pounds?
11. Convert 50 grams to ounces.
12. Convert 5 kilograms to pounds.
13. How many grams is a half pound of ground beef?
14. In around 2010, the National Collector's Mint (not affiliated with the U.S. Mint) ran a TV commercial selling an imitation \$ 50 gold coin modeled after the U.S. "buffalo" nickel. The commercial made the following claims. *This replica coin is coated in 31 milligrams of pure gold! And the price of gold keeps going up; gold is worth about \$ 1,000 per ounce! But you can order these fake coins for only \$ 19.95 apiece!* What is the approximate dollar value of the gold in one of these coins?
15. In 2020, the National Collector's Mint is still selling the imitation \$ 50 gold "buffalo" nickel for \$ 19.95. This version of the coin is coated in 14 milligrams of pure gold.^[2] As of September 2, 2020, the price of gold is \$ 1,940 per ounce.^[3] What is the approximate dollar value of the gold in one of these coins?

Answer

9. 113g
10. 54.5kg
11. 1.76oz
12. 11.0lb
13. 227g
14. about \$ 1.09
15. about \$ 0.96

Converting Measurements of Volume or Capacity

You can use the conversion ratios in this table...

- 1 fl oz \approx 29.6 mL
- 1 qt \approx 0.946 L
- 1 gal \approx 3.79 L

...or the (almost) equivalent conversion ratios in this table. This table includes one extra entry.

- 1 mL \approx 0.0338 fl oz
- 1 L \approx 1.06 qt
- 1 L \approx 0.264 gal
- 1 L \approx 33.8 fl oz

? Exercises 2.8.8.1

16. A toilet uses 3.5 gallons of water per flush. How many liters is this?
17. How many milliliters of drink are in a 12-ounce can?
18. How many fluid ounces are in a 50 milliliter mini-sized bottle of alcohol?
19. What part of a gallon is in a 2-liter bottle of soda pop?

Answer

16. 13.3L

- 17. 355 mL
- 18. 1.69 fl oz
- 19. 0.53 gal

Converting Measurements: Extensions

Let's finish up with some rates that require conversions.

? Exercises 2.8.8.1

Maxine is driving across Canada. Her car has a 14.2-gallon gas tank and gets an average of 26 miles per gallon.

- 20. Approximately how many kilometers—actually, the Canadian spelling is kilometres. Approximately how many kilometres can she travel on a full tank of gas?
- 21. Of course, Canada measures gas in liters. Actually, litres. Convert Maxine's mileage rate, 26 miles per gallon, to kilometres per litre.

Answer

- 20. a bit less than 600 km
- 21. 11 km/L

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- 1. An inch is defined to be exactly 2.54 cm, if you were curious. ↩
 - 2. <https://ncmint.com/2020-buffalo-tribute-proof/> ↩
 - 3. <https://markets.businessinsider.com/commodities/gold-price> ↩

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