

2.8.2: The US Measurement System



Robin the cat has the spirit of '76.

You may use a calculator throughout this module.

This system used to be called the English system, but now the U.S. has the dubious honor of being associated with the system that uses inches, feet, miles, ounces, pounds, cups, gallons, etc. To convert from one unit to another, we often have to perform messy calculations like dividing by 16 or multiplying by 5,280.

We could solve these unit conversions using proportions, but there is another method that is more versatile, especially when a conversion requires more than one step. This method goes by various names, such as *dimensional analysis* or the *factor label method*. The basic idea is to begin with the measurement you know, then multiply it by a conversion ratio that will cancel the units you don't want and replace it with the units you do want.

It's okay if you don't have the conversion ratios memorized; just be sure to have them available. If you discover other conversion ratios that aren't provided here, go ahead and write them down!

U.S. System: Measurements of Length

1 foot = 12 inches

1 yard = 3 feet

1 mile = 5,280 feet

? Exercises 2.8.2.1

1. How many inches are in 4.5 feet?
2. How many feet make up 18 yards?
3. 1 yard is equal to how many inches?
4. 1 mile is equivalent to how many yards?
5. How many feet is 176 inches?
6. 45 feet is what length in yards?
7. Convert 10,560 feet into miles.
8. How many yards are the same as 1,080 inches?

Answer

1. 54 in
2. 54 ft
3. 36 in
4. 1,760 yd

5. $14\frac{2}{3}$ ft or 14 ft 8 in
6. 15 yd
7. 2 mi
8. 30 yd

Notice that Exercises 3 & 4 give us two more conversion ratios that we could add to our list.

U.S. System: Measurements of Weight or Mass

- 1 pound = 16 ounces
- 1 ton = 2,000 pounds

? Exercises 2.8.2.1

9. How many ounces are in 2.5 pounds?
10. How many pounds are equivalent to 1.2 tons?
11. Convert 300 ounces to pounds.
12. 1 ton is equivalent to what number of ounces?

Answer

9. 40 oz
10. 2,400 lb
11. 18.75 lb
12. 32,000 oz

U.S. System: Measurements of Volume or Capacity

- 1 cup = 8 fluid ounces
- 1 pint = 2 cups
- 1 quart = 2 pints
- 1 gallon = 4 quarts

There are plenty of other conversions that could be provided, such as the number of fluid ounces in a gallon, but let's keep the list relatively short.

? Exercises 2.8.2.1

13. How many fluid ounces are in 6 cups?
14. How many pints are in 3.5 quarts?
15. 1 gallon is equal to how many pints?
16. How many cups equal 1.25 quarts?
17. Convert 20 cups into gallons.
18. How many fluid ounces are in one half gallon?

Answer

13. 48 fl oz
14. 7 pt

- 15. 8 pt
- 16. 5 c
- 17. 1.25 gal
- 18. 64 fl oz

U.S. System: Using Mixed Units of Measurement

Measurements are frequently given with mixed units, such as a person's height being given as 5 ft 7 in instead of 67 in, or a newborn baby's weight being given as 8 lb 3 oz instead of 131 oz. This can sometimes make the calculations more complicated, but if you can convert between improper fractions and mixed numbers, you can handle this.

? Exercises 2.8.2.1

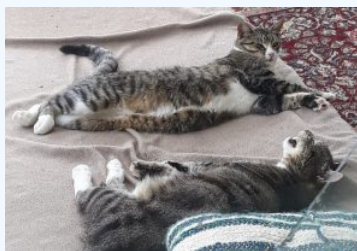
- 19. A bag of apples weighs 55 ounces. What is its weight in pounds and ounces?
- 20. A carton of orange juice contains 59 fluid ounces. Determine its volume in cups and fluid ounces.
- 21. A hallway is 182 inches long. Give its length in feet and inches.
- 22. The maximum loaded weight of a Ford F-150 pickup truck is 8,500 lb. Convert this weight into tons and pounds.

Answer

- 19. 3 lb 7 oz
- 20. 7 c 3 fl oz
- 21. 15 ft 2 in
- 22. 4 t 500 lb

We'll finish up this module by adding and subtracting with mixed units. Again, it may help to think of them as mixed numbers, with a whole number part and a fractional part.

? Exercises 2.8.2.1



Comet weighs 8 lb 7 oz and Fred weighs 11 lb 9 oz.

- 23. Comet and Fred are being put into a cat carrier together. What is their combined weight?
 - 24. How much heavier is Fred than Comet?
- Two tables are 5 ft 3 in long and 3 ft 10 in long.
- 25. If the two tables are placed end to end, what is their combined length?
 - 26. What is the difference in length between the two tables?

Answer

- 23. 20 lb or 20 lb 0 oz combined
- 24. 3 lb 2 oz heavier

25. 9 ft 1 in combined

26. 1 ft 5 in longer

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