

Using Ratios to Convert Measurement Units

Objects can be measured using either the **customary system** or the **metric system**. We can measure length, **mass**, and **capacity**. We can also convert the measurements within a system.

EXAMPLE A Which is longer, 5 feet or 58 inches?

1

Write the ratio for feet to inches.

You can use ratios to convert measurement units. In a ratio, as one unit changes, the other unit changes in the same way.

Use the measurement equivalence:
1 foot = 12 inches.

$$\frac{\text{feet}}{\text{inches}} = \frac{1}{12}$$

2

Write an equivalent ratio to show the number of inches in 2 feet.

Multiply both terms of the ratio by 2.

$$\frac{1}{12} = \frac{1 \times 2}{12 \times 2} = \frac{2}{24}$$

So 2 ft = 24 in.

3

Continue writing equivalent ratios until the number of inches is 58 or greater.

3 ft = ? in.

Multiply both terms of the ratio by 3.

$$\frac{1}{12} = \frac{1 \times 3}{12 \times 3} = \frac{3}{36}$$

So 3 ft = 36 in.

4 ft = ? in.

Multiply both terms of the ratio by 4.

$$\frac{1}{12} = \frac{1 \times 4}{12 \times 4} = \frac{4}{48}$$

So 4 ft = 48 in.

5 ft = ? in.

Multiply both terms of the ratio by 5.

$$\frac{1}{12} = \frac{1 \times 5}{12 \times 5} = \frac{5}{60}$$

So 5 ft = 60 in.

4

Compare.

5 ft = 60 in.

60 in. > 58 in.

So 5 ft > 58 in.

► 5 feet is longer than 58 inches.

DISCUSS

Explain how to use equivalent ratios to find the number of feet in 26 yards.

Use *Math Tool: Tables of Measurement Units*.

EXAMPLE B How many quarts are in 3 gallons?

1

Write the ratio of quarts to gallons.

Use the measurement equivalence:

4 quarts = 1 gallon.

$$\frac{\text{quarts}}{\text{gallons}} = \frac{4}{1}$$

2

Use a tape diagram to model the ratio.

The tape diagram shows that
4 quarts = 1 gallon.

Quarts	1	2	3	4
Gallons	1			

3

Extend the tape diagram to find the equivalence.

Use the tape diagram to show 3 gallons.

Draw 4 quarts for every gallon.

Quarts	1	2	3	4	5	6	7	8	9	10	11	12
Gallons	1				2				3			

4

Use the tape diagram to record the number of quarts in 3 gallons.

► There are 12 quarts in 3 gallons.

TRY

Use a tape diagram to find how many pints are in 3 quarts.

EXAMPLE C Which is longer, 72 centimeters or 7 meters?

1

Write the ratio of centimeters to meters.

Use the measurement equivalence:
100 centimeters = 1 meter.

$$\frac{\text{centimeters}}{\text{meters}} = \frac{100}{1}$$

2

Write an equivalent ratio to find the number of centimeters in 7 meters.

Multiply both terms of the ratio by 7.

$$\frac{100}{1} = \frac{100 \times 7}{1 \times 7} = \frac{700}{7}$$

So 700 cm = 7 m

3

Compare 72 cm and 7 m.

$$7 \text{ m} = 700 \text{ cm}$$

$$72 \text{ cm} < 700 \text{ cm}$$

$$\text{So } 72 \text{ cm} < 7 \text{ m}$$

► 7 meters is longer than
72 centimeters.

TRY

How many centimeters are in
150 millimeters?

Use *Math Tool: Tables of Measurement
Units*.

Relevant

Ratios

Use Math Tool: Tables of Measurement Units for this activity.

Work with a partner to complete the tables.

1. Choose six different objects in your classroom. For example, choose the door in your classroom. For the time table, choose an event such as the length of a song. Record the names of the objects and the event in the first empty column in the tables.
2. Estimate the measures of the objects and the event you chose. Record the values in the Estimate column. Do not use the same unit of measure for all the objects.
3. Select units to which you will convert your estimated measures. Record these units in the Conversion Units column. For example, if your estimate was in feet and you are going to convert feet to inches, record "inches" in this column.
4. Determine the ratios you will use to convert your estimated measures. Record these ratios in the Conversion Ratio column.
5. Write the estimates in the converted units in the Conversion column.

Customary Units

	Object	Estimate	Conversion Units	Conversion Ratio	Conversion
Length					
Capacity					
Weight					

Metric Units

	Object	Estimate	Conversion Units	Conversion Ratio	Conversion
Length					
Capacity					
Mass					

Time

	Event	Estimate	Conversion Units	Conversion Ratio	Conversion

Practice

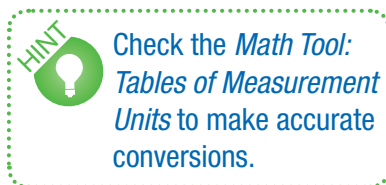
Use **Math Tool: Tables of Measurement Units**.

Use ratios to convert each measurement.

1. 24 ft = _____ yd

2. 96 oz = _____ lb

3. 4 h = _____ min



4. 20 mm = _____ cm

5. 16 L = _____ mL

6. 9,000 g = _____ kg

7. 36 gal = _____ qt

8. 2 ft = _____ in.

9. 5 km = _____ cm

10. 1.4 kg = _____ g

11. 6 pt = _____ c

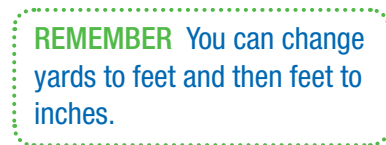
12. 120 h = _____ d

Compare. Write $>$, $<$, or $=$.

13. 320 s _____ 4 min

14. 5 yd _____ 175 in.

15. 800 mm _____ 80 cm



16. 2 lb _____ 42 oz

17. 6 km _____ 6,100 cm

18. 3 g _____ 450 mg

19. 3 qt _____ 6 pt

20. 35 L _____ 2 kL

21. 20 ft _____ 6 yd

22. 70 cm _____ 7 m

23. 2 gal _____ 15 pt

24. 1 d _____ 38 h

Solve.

25. Which is a longer piece of ribbon, one that is 635 millimeters long or one that is 535 centimeters long? How do you know?

26. Which pitcher has a greater capacity, one that holds 2 gallons or one that holds 12 quarts? How do you know?

27. Which melon has a greater mass, one that is 4 kilograms or one that is 4,100 grams?
How do you know?

28. Which class lasts longer, one that is 3 hours long or one that is 175 minutes long?
How do you know?

Choose the best answer.

29. Which is the longest?

- A. 2 km
- B. 25 m
- C. 2,500 cm
- D. 3,000 mm

30. Which has the least capacity?

- A. 1 gal
- B. 4 qt
- C. 6 pt
- D. 15 c

Solve.

31. Rylie drinks 2 cups of water from a 1-quart bottle of water. How much water is left in the bottle?

33. **REASON** How can you use the metric prefixes *milli-*, *centi-*, and *kilo-* to help you decide if a metric conversion is reasonable?

32. A track is 200 meters long. How many times must Julius run around the track to run 3 kilometers?

34. **CONSTRUCT** How many cups equal 2 gallons? Explain how you did the conversion.
