



## Indicator 8 Class Notes by Mrs. Joshi

### Measurement Units

3. Use ratio and rate reasoning to solve mathematical and real-world problems (including but not limited to percent, measurement conversion, and equivalent ratios) using a variety of models, including tables of equivalent ratios, tape diagrams, double number lines, and equations.


12 inches	1 foot
3 feet	1 yard
1760 yards	1 mile
5,280 feet	1 mile
60 minutes	1 hour
60 seconds	1 minute
24 hours	1 day
4 quarts	1 gallon
2 pints	1 quart
16 ounces	1 pound
2,000 pounds	1 ton
1000 milliliters	1 liter



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### Learn Unit Ratios and Measurement Conversions

The table shows the Customary measurement conversions of length, weight, and capacity.

Customary Conversions			
Type of Measure	Larger Unit	→	Smaller Unit
	1 foot (ft)	=	12 inches (in.)
	1 yard (yd)	=	3 feet
	1 mile (mi)	=	5,280 feet
	1 pound (lb)	=	16 ounces (oz)
	1 ton (T)	=	2,000 pounds
	1 cup (c)	=	8 fluid ounces (fl oz)
	1 pint (pt)	=	2 cups
	1 quart (qt)	=	2 pints
	1 gallon (gal)	=	4 quarts

Each relationship listed in the table is a ratio relationship. Because there are 12 inches for every 1 foot, the relationship between number of inches and number of feet is a ratio relationship. The ratio of inches to feet is 12 : 1 or 12 to 1.

A **unit ratio** is a ratio in which the first quantity is compared to 1 unit of the second quantity. Each of the conversions can be written as unit ratios. Some examples of unit ratios are shown.

inches to feet            12 : 1  
feet to yards            3 : 1  
feet to miles            5,280 : 1

What unit ratio can you use to represent the relationship between ounces and pounds? 16 : 1

What unit ratio can you use to represent the relationship between pints and quarts? 2 : 1

What unit ratio can you use to represent the relationship between feet and miles? 5,280 : 1



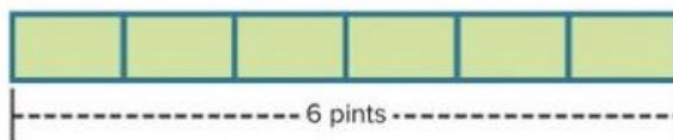
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### Learn Convert Larger Units to Smaller Units

You can use reasoning about ratios to convert a measurement from a larger unit to a smaller unit. The numerical value of the measurement is greater when a smaller unit is used. To see why, consider the following problem. Suppose you want to know how many fluid ounces are in 6 pints.

**Method 1** Use a bar diagram.

**Step 1** Draw a bar to represent 6 pints.



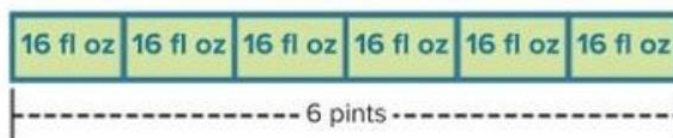
Divide the bar into six equal sections. Each section represents 1 pint.

**Step 2** Find the number of cups.



Label each section as 2 cups, because there are 2 cups for every 1 pint.

**Step 3** Find the number of fluid ounces.



For every 1 cup, there are 8 fluid ounces. This means that for every 2 cups, there are 16 fluid ounces.

Multiply 6 by 16 to find the number of fluid ounces that are in 6 pints. Because  $6 \times 16 = 96$ , there are 96 fluid ounces in 6 pints.



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**Method 2** Use unit ratios and equivalent ratios.

**Step 1** Convert 6 pints to cups.

There are 2 cups in every 1 pint. The unit ratio of cups to pints is 2 : 1. Let  $c$  represent the unknown number of cups that are in 6 pints.

$$\begin{array}{l} \text{cups} \rightarrow \frac{2}{1} = \frac{c}{6} \leftarrow \text{cups} \\ \text{pints} \rightarrow \end{array}$$

$$\begin{array}{c} \times 6 \\ \curvearrowright \\ \frac{2}{1} = \frac{12}{6} \\ \curvearrowleft \\ \times 6 \end{array}$$

Because  $1 \times 6 = 6$ , multiply 2 by 6 to find the value of  $c$ . There are 12 cups.

**Step 2** Convert 12 cups to fluid ounces.

There are 8 fluid ounces in every 1 cup. The unit ratio of fluid ounces to cups is 8 : 1. Let  $f$  represent the unknown number of fluid ounces.

$$\begin{array}{l} \text{fluid ounces} \rightarrow \frac{8}{1} = \frac{f}{12} \leftarrow \text{fluid ounces} \\ \text{cups} \rightarrow \end{array}$$

$$\begin{array}{c} \times 12 \\ \curvearrowright \\ \frac{8}{1} = \frac{96}{12} \\ \curvearrowleft \\ \times 12 \end{array}$$

Because  $1 \times 12 = 12$ , multiply 8 by 12 to find the value of  $f$ . There are 96 fluid ounces.

Using either method, there are 96 fluid ounces in 6 pints.



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Proportion Method

$$\frac{60 \text{ sec.}}{1 \text{ min.}} = \frac{x \text{ sec.}}{8 \text{ min.}}$$

$$x \times 1 = 60 \times 8$$

$$x = 480 \text{ sec.}$$

$$8 \text{ min.} = 480 \text{ sec.}$$

8 min. has 480 sec.



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Proportions Method

$$\frac{4}{1} = \frac{12}{x}$$

$$4 \times x = 12 \times 1$$

$$x = \frac{12}{4}$$

$$x = 3$$



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Indicator 10

Measurement Units

$$\frac{1000 \text{ mL}}{1 \text{ L}} = \frac{2500 \text{ mL}}{x \text{ L}}$$

2.5L

~~$$\frac{1000}{1} = \frac{2500}{x}$$~~

$$\frac{2500 \text{ mL}}{2.5 \text{ L}}$$

$$1000x = 2500$$

$$x = \frac{2500}{1000}$$

x = 2.5L



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Conversion Factor Method

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Conversion Factor  
Method

1)  $\frac{60 \text{ sec.}}{1 \text{ min.}} \times 8 \text{ min.}$   
480 seconds

2)  $\frac{1 \text{ liter}}{1000 \text{ mL}} \times 2500 \text{ mL}$   
2.5 L

3)  $\frac{1 \text{ ft.}}{12 \text{ in.}} \times 3 \text{ in.}$   
 $\frac{1}{4} = 0.25 \text{ ft.}$



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**Conversion Factor Method**

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4)  $\frac{1 \text{ lb.}}{16 \text{ oz.}} \times 13 \text{ oz}$

		0.8125
13	16	13.000
16		128
Round to hundredths.		20
0.8125		-16
0.81 pounds		40
		-32

5)  $\frac{1 \text{ ton}}{2000 \text{ lbs}} \times 6000 \text{ lbs}$

	3	80
2000 lbs	6000 lbs	-80
		0
1		
3 tons		





## Indicator 8 Class Notes by Mrs. Joshi

Solve each problem.

1) 15 feet = \_\_\_\_ yards

2) 21 feet = \_\_\_\_ yards

3) 6 feet = \_\_\_\_ yards

4) \_\_\_\_ pints = 10 quarts

5) \_\_\_\_ ounces = 6 cups

6) \_\_\_\_ liters = 22,000 milliliters

7) \_\_\_\_ liters = 27,000 milliliters

8) \_\_\_\_ milliliters = 5 liters

9) \_\_\_\_ cups = 32 ounces

10) \_\_\_\_ gallons = 28 quarts

### Answers

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

### Answer Key

Solve each problem.

1) 15 feet = 5 yards

2) 21 feet = 7 yards

3) 6 feet = 2 yards

4) 20 pints = 10 quarts

5) 48 ounces = 6 cups

6) 22 liters = 22,000 milliliters

7) 27 liters = 27,000 milliliters

8) 5,000 milliliters = 5 liters

9) 4 cups = 32 ounces

10) 7 gallons = 28 quarts

### Answers

- 5
- 7
- 2
- 20
- 48
- 22
- 27
- 5,000
- 4
- 7