

## 4.4 - Volume



Students can discuss the fact that an imperial cup is 284.13 mL; a metric cup is 250 mL in Canada, Australia, and New Zealand; a US legal cup is 240 mL; and a Japanese cup is 200 mL. Students can then create an international table of conversions to see what the recipe would look like in a different country.

Must Know

**FIGURE 4.2****Imperial Units of Volume and Capacity**

<i>Unit</i>	<i>Abbreviation</i>
ounce	oz
fluid ounce	fl oz
pint	pt
quart	qt
gallon	gal

## Conversions in Capacity: SI vs Metric

**CONVERTING COMMON COOKING UNITS**

<i>Imperial</i>	<i>SI</i>
¼ teaspoon	1.25 mL
½ teaspoon	2.5 mL
1 teaspoon	5 mL
1 tablespoon (3 teaspoons)	15 mL
1 cup	250 mL
1 pint	568.2614 mL
1 quart (2 pt)	1.1365 L
1 gallon (4 qt)	4.5461 L

**CONVERTING US IMPERIAL TO SI UNITS**

<i>US Imperial</i>	<i>SI</i>
1 fl oz	29.5735 mL
1 pt = 16 fl oz	473.176 mL or 0.473 L
1 qt = 2 pt	946.352 mL or 0.946 L
1 gal = 4 qt	3785.4 mL or 3.785 L

1 cup = 250 mL British

**SI Capacity:** 1L = 1000 mL

1 kL = 1000 L

**SI Volume:** 1 cm<sup>3</sup> = 1 mL

FORMULA/TABLE Sheet???

**GMF 10 – Conversions & Formulas for Chapter 4**

**IMPORTANT CONVERSIONS...**

SI Length	$\longleftrightarrow$	Imperial Length	
1 cm = 10 mm 1 m. = 100 cm 1 km = 1000 m	1 m = 1.0936 yd 1 mi. = 1.6093 km 1 in. = 2.54 cm	1 ft. = 12 in. 1 yd = 3 ft. 1 mi. = 1760 yd	<b>SI Capacity:</b> 1 L = 1000 mL 1 kL = 1000 L <b>SI Volume:</b> 1 cm <sup>3</sup> = 1 mL

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B

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US

**IMPORTANT SURFACE AREA FORMULAS...**

$SA_{prism} = \text{Add area of all the faces}$

$SA_{cylinder} = 2\pi r^2 + 2\pi rh$

$SA_{cone} = \pi r^2 + \pi rs$

$SA_{pyramid} = A_{base} + (\text{area of the triangular faces})$

**IMPORTANT VOLUME FORMULAS...**

$V_{prism} = lwh$

$V_{cylinder} = \pi r^2 h$

**FIGURE 4.2**  
**Imperial Units of Volume and Capacity**

<i>Unit</i>	<i>Abbreviation</i>
ounce	oz
fluid ounce	fl oz
pint	pt
quart	qt
gallon	gal

**SI Units of Volume and Capacity**

<i>Unit</i>	<i>Abbreviation</i>
liter	L
cubic meter	m <sup>3</sup>

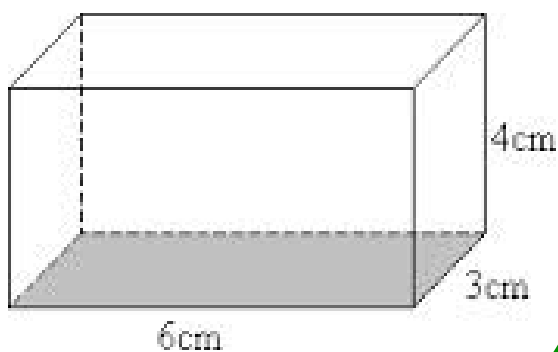
**TABLE 1.5 Selected Prefixes Used in the Metric System**

<b>Prefix</b>	<b>Abbreviation</b>	<b>Meaning</b>	<b>Example</b>
Giga	G	10 <sup>9</sup>	1 gigameter (Gm) = 1 × 10 <sup>9</sup> m
Mega	M	10 <sup>6</sup>	1 megameter (Mm) = 1 × 10 <sup>6</sup> m
Kilo	k	10 <sup>3</sup>	1 kilometer (km) = 1 × 10 <sup>3</sup> m
Deci	d	10 <sup>-1</sup>	1 decimeter (dm) = 0.1 m
Centi	c	10 <sup>-2</sup>	1 centimeter (cm) = 0.01 m
Milli	m	10 <sup>-3</sup>	1 millimeter (mm) = 0.001 m
Micro	μ <sup>a</sup>	10 <sup>-6</sup>	1 micrometer (μm) = 1 × 10 <sup>-6</sup> m
Nano	n	10 <sup>-9</sup>	1 nanometer (nm) = 1 × 10 <sup>-9</sup> m
Pico	p	10 <sup>-12</sup>	1 picometer (pm) = 1 × 10 <sup>-12</sup> m
Femto	f	10 <sup>-15</sup>	1 femtometer (fm) = 1 × 10 <sup>-15</sup> m

<sup>a</sup>This is the Greek letter mu (pronounced "mew").

With Capacity you must

- 1) Volume first
- 2) and then use your conversion chart to calculate capacity



1) Volume:

$$\begin{aligned} & \pi \text{ base} \times h \\ & 6 \times 3 \times 4 \\ & = 72 \text{ cm}^3 \end{aligned}$$

$$72 \text{ cm}^3 \times \frac{1 \text{ mL}}{1 \text{ cm}^3} = 72 \text{ mL}$$

2) How many milliliters will the figure hold?

**EXAMPLES:** Fill in the blanks...

a) \_\_\_\_\_ cups = 4 liters

b) 8 tablespoons = \_\_\_\_\_ milliliters

c) 6 US quarts = \_\_\_\_\_ liters

d) 16 tsp = \_\_\_\_\_ tbsp

e) \_\_\_\_\_ cups = 12 US pints

f) 10 fl oz = \_\_\_\_\_ cup

a) 16 cups = 4 liters

$$4 \cancel{\text{L}} \times \frac{1000 \cancel{\text{mL}}}{1 \cancel{\text{L}}} \times \frac{1 \text{ cup}}{250 \cancel{\text{mL}}} = 16 \text{ cups}$$

b) 8 tablespoons = 120 milliliters

$$8 \cancel{\text{Tbsp}} \times \frac{15 \text{ mL}}{1 \cancel{\text{Tbsp}}} = 120 \text{ mL}$$



c) 6 US quarts = 5.7 liters

$$\begin{array}{r}
 \cancel{6 \text{ US qt}} \times \frac{0.946 \text{ L}}{\cancel{1 \text{ US qt}}} \\
 \hline
 5.679 \text{ L}
 \end{array}$$

d) 16 tsp = 5.3 tbsp

$$\begin{array}{r}
 \cancel{16 \text{ tsp}} \times \frac{1 \text{ Tbsp}}{\cancel{3 \text{ tsp}}} \\
 \hline
 5 \frac{1}{3}
 \end{array}$$

e) 22.7 cups = 12 US pints

$$12 \cancel{\text{ US Pts}} \times \frac{473.176 \cancel{\text{ mL}}}{1 \cancel{\text{ US Pt}}} \times \frac{1 \text{ cup}}{250 \cancel{\text{ mL}}} = 22.7 \text{ cups}$$

f) 10 fl oz = 1.25 cup

or

$$10 \cancel{\text{ fl oz}} \times \frac{1 \text{ cup}}{8 \cancel{\text{ fl oz}}} = 1.25 \text{ cups}$$

$$10 \text{ fl oz} \times \frac{29.5735 \text{ mL}}{1 \text{ fl oz}} \times \frac{1 \text{ cup}}{250 \text{ mL}}$$

= 1.18 cups

**MORE EXAMPLES:** Fill in the blanks...

a) \_\_\_\_\_  $\text{in}^3 = 250 \text{ mL}$

b)  $4 \text{ L} =$  \_\_\_\_\_ US gal

c)  $2.5 \text{ m}^3 =$  \_\_\_\_\_ L

d)  $20 \text{ US pints} =$  \_\_\_\_\_ US quarts

e) \_\_\_\_\_ L = 12 Brit gal

f)  $20 \text{ fl oz} =$  \_\_\_\_\_ mL

a) 15.3 in<sup>3</sup> = 250 mL

$$250 \text{ mL} \times \frac{1 \text{ cm}^3}{1 \text{ mL}} \times \left( \frac{.3937 \text{ in}}{1 \text{ cm}} \right)^3$$

15.3 in<sup>3</sup>

b) 4 L = 1.1 US gal

$$4 \text{ L} \times \frac{1 \text{ gal}}{3.785 \text{ L}}$$

1.1 US Gal

## Attachments

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GMF\_10\_-\_Chp.\_4\_Tables\_and\_Formulas.docx

Worksheet - Converting Capacity in Imp.docx

Worksheet - Converting Volumes Imp\_Metric.docx