



Liquid Capacity

Based on power point presentations by Pearson Education, Inc.
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Learning Objectives

1. Memorize units of liquid capacity in the U.S. Measuring System and use dimensional analysis to change units.
2. Memorize units of liquid capacity in the Metric Measuring System and use dimensional analysis to change units.
3. Memorize the relationship between volume and liquid capacity in the Metric Measuring System.
4. Convert to and from the Metric Measuring System.

1. Liquid Capacity in the U.S. Measuring System

Liquid capacity is the amount of fluid that a three-dimensional object can hold. **You must memorize the following measures.**

Symbol	Unit	Meaning
1 fl oz	fluid ounce	
1 c	cup	8 fl oz
1 pt	pint	2 c = 16 fl oz
1 qt	quart	2 pt
1 gal	gallon	4 qt

Example 1: Change Units in the U.S. Measuring System

Change 5.6 quarts to pints using dimensional analysis.

First, we'll write the original measure as the fraction $\frac{5.6 \text{ qt}}{1}$.

We memorized that 1 quart contains 2 pints. We express this as a unit ratio in which the new unit of measure (pt) is in the numerator and the original unit of measure (qt) is in the denominator.

$$\frac{2 \text{ pt}}{1 \text{ qt}}$$

Now, we'll multiply the original measure in fraction form with the unit ratio:

$$\frac{5.6 \text{ qt}}{1} \left(\frac{2 \text{ pt}}{1 \text{ qt}} \right) = \frac{5.6(2) \text{ pt}}{1} \\ = 11.2 \text{ pt}$$

We find that 5.6 quarts equal 11.2 pints.

2. Liquid Capacity in the Metric Measuring System

The milliliter and the liter are the most commonly used metric liquid capacity measures. **You must memorize them.**

Symbol	Unit	Meaning
1 mL	milliliter	
1 L	liter	1000 mL

Less commonly used metric units of liquid capacity:

1 centiliter (cL) = 10 milliliters (mL)

1 deciliter (dL) = 100 mL

1 dekaliter (dkL) = 10 liters (L)

1 hectoliter (hL) = 10 dekaliters (dkL)

1 kiloliter (kL) = 10 hectoliters (hL)

Example 2: Change Units in the Metric Measuring System

Change 0.714 liters to milliliter using dimensional analysis.

First, we'll write the original measure as the fraction $\frac{0.714 \text{ L}}{1}$.

We memorized that 1 liter contains 1000 milliliter. We express this as a unit ratio in which the new unit of measure (mL) is in the numerator and the original unit of measure (L) is in the denominator.

$$\frac{1 \text{ L}}{1000 \text{ mL}}$$

Now, we'll multiply the original measure in fraction form with the unit ratio:

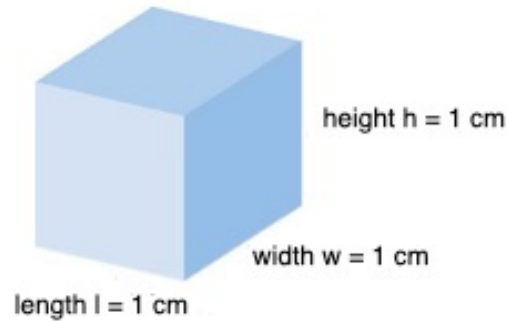
$$\begin{aligned} \frac{0.714 \cancel{\text{L}}}{1} \left(\frac{1000 \text{ mL}}{1 \cancel{\text{L}}} \right) &= \frac{0.714(1000) \text{ mL}}{1(1)} \\ &= 714 \text{ mL} \end{aligned}$$

We find that 0.714 liters equal 714 milliliters.

3. The Relationship Between Liquid Capacity and Volume (1 of 2)

Volume refers to the amount of space occupied by a three-dimensional figure. In the Metric Measuring System, there is a relationship between liquid capacity and volume.

To illustrate this, let's use a unit cube which is a three-dimensional figure having a height of 1 cm, a width of 1 cm, and a length of 1 cm.



We calculate the volume of a cube by multiplying its measures of height, width, and length.

In our case, this will be $1 \text{ cm} \times 1 \text{ cm} \times 1 \text{ cm}$ which equals 1 cubic centimeter usually symbolized by 1 cm^3 or 1 cc.

The Relationship Between Liquid Capacity and Volume (2 of 2)

We will now state the following relationships between liquid capacity and volume:

$$1 \text{ mL (milliliter)} = 1 \text{ cm}^3 = 1 \text{ cc}$$

$$1 \text{ L (liter)} = 1000 \text{ cm}^3 = 1000 \text{ cc}$$

You must memorize this because cc is especially important in medicine.

Example 3: Volume and Capacity (1 of 2)

An aquarium has a volume of 34,000 cubic centimeters (cm^3). How many liters of water does the aquarium hold? Use dimensional analysis.

First, we'll write the original measure as the fraction $\frac{34000\text{cm}^3}{1}$.

We memorized that 1 liter contains 1000 cubic centimeters. We express this as a unit ratio in which the new unit of measure (L) is in the numerator and the original unit of measure (cm^3) is in the denominator.

$$\frac{1\text{L}}{1000\text{cm}^3}$$

Now, we'll multiply the original measure in fraction form with the unit ratio

$$\frac{34000\text{cm}^3}{1} \left(\frac{1\text{L}}{1000\text{cm}^3} \right) = \frac{34000(1)\text{L}}{1000} = 34\text{L}$$

We find that 34000 cubic centimeters equals 34 liters.

4. Convert to and from the Metric Measuring System

You must memorize the following conversions.

1 fluid ounce (oz) \approx 29.57 milliliter (mL)
This is an approximation!
1 quart (qt) \approx 0.95 liter (L)
This is an approximation!
1 gallon (gal) \approx 3.79 liter (L)
This is an approximation!

Example 4: Convert to and from the Metric Measuring System

Change 10000 cubic centimeters to fluid ounces using dimensional analysis.

Since we know that **1 cc = 1 mL**, we'll write the original measure as the fraction

$$\frac{10000 \text{ mL}}{1} .$$

We memorized that 1 fluid ounce is approximately equal to 29.57 milliliter. We express this as a unit ratio in which the new unit of measure (oz) is in the numerator and the original unit of measure (mL) is in the denominator.

$$\frac{1 \text{ fl oz}}{29.57 \text{ mL}}$$

Now, we'll multiply the original measure in fraction form with the unit ratio:

$$\frac{10000 \text{ mL}}{1} \left(\frac{1 \text{ fl oz}}{29.57 \text{ mL}} \right) \approx 338.18 \text{ fl oz}$$

We find that 10000 cubic centimeters equals approximately 337.84 fluid ounces.