

## Volume Conversions (Dry Measure)

Many people are familiar with the U.S. Customary units of measure, either because they are using them now or have used them in the past. However, the metric system, while commonly used in many parts of the world, is not always as familiar to people in the United States.

The metric system began as a result of the French National Assembly asking the French Academy of Sciences to try to standardize the system of weights and measures that had become so confused in France. In 1791, work on the new system was begun, and by 1795, all metric units had been set and identified in France. By 1799, the new units were declared the legal standards for every measurement used in France. In 1875, an international conference met in Paris to set up an International Bureau of Weights and Measures. Meetings are held to reconsider the way the units have been determined, and the system has been refined over the years. Today, the metric system, based on units of 10, has been officially adopted by most of the countries in the world.

Below are two tables. The first shows the equivalency of 1 dry pint, 1 dry quart, 1 dry gallon, and 1 bushel to common metric measures. The second shows the equivalency of 1 milliliter, 1 centiliter, 1 liter, and 1 kiloliter to common U.S. Customary measurements. For ease in use, we have rounded the measurements to two decimal places where possible.

	Milliliter	Centiliter	Liter	Kiloliter
1 Dry Pint	550.61	55.06	.55	.00055
1 Dry Quart	1101.2	110.12	1.10	.0011
1 Dry Gallon	4404.88	440.49	4.40	.0044
1 Bushel	35,240	3524	35.24	.04

	Pint	Quart	Gallon	Bushel
1 Milliliter	.0018	.00091	.000227	.0000284
1 Centiliter	.018	.0091	.00227	.00284
1 Liter	1.82	0.9081	.227	.0284
1 Kiloliter	1816.17	908.08	227.02	28.38

How do you convert between the two systems when the need arises? Use the standard methods of conversion shown in the tables above to solve the following practice problems.

### Activity One:

If we know that 1 dry pint (pt.) = 550.61 milliliters (ml) or 55.061 centiliters (cl), find the answers to the following problems. (We are using three decimal places for centiliters in this activity to achieve a more accurate answer. Please also use up to three decimal places in your answers.)

$6 \text{ pt.} = \underline{\hspace{2cm}} \text{ ml}$

$12 \text{ pt.} = \underline{\hspace{2cm}} \text{ cl}$

$10 \text{ pt.} = \underline{\hspace{2cm}} \text{ ml}$

$17 \text{ pt.} = \underline{\hspace{2cm}} \text{ cl}$

$16 \text{ pt.} = \underline{\hspace{2cm}} \text{ ml}$

$4 \text{ pt.} = \underline{\hspace{2cm}} \text{ cl}$

$30 \text{ pt.} = \underline{\hspace{2cm}} \text{ ml}$

$35 \text{ pt.} = \underline{\hspace{2cm}} \text{ cl}$

$24 \text{ pt.} = \underline{\hspace{2cm}} \text{ ml}$

$40 \text{ pt.} = \underline{\hspace{2cm}} \text{ cl}$

### Activity Two:

Now that you have your answers for the above problems, convert them into different metric measurements. For example, we see that 6 pt. equals 3303.66 ml. There are 10 milliliters in a centiliter. To convert from milliliters to centiliters, you divide the number of milliliters by 10, so 18 fl. oz. also equals 330.366 cl. To convert from centiliters to milliliters, you multiply the number of centiliters by 10. Using your answers in the exercise above, convert the milliliter answers to centiliters, and the centiliter answers to milliliters. The first one is done for you. (Please use up to three decimal places in your answers.)

$6 \text{ pt.} = 3303.66 \text{ ml or } 330.366 \text{ cl}$

$12 \text{ pt.} = \underline{\hspace{2cm}} \text{ cl or } \underline{\hspace{2cm}} \text{ ml}$

$10 \text{ pt.} = \underline{\hspace{2cm}} \text{ ml or } \underline{\hspace{2cm}} \text{ cl}$

$17 \text{ pt.} = \underline{\hspace{2cm}} \text{ cl or } \underline{\hspace{2cm}} \text{ ml}$

$16 \text{ pt.} = \underline{\hspace{2cm}} \text{ ml or } \underline{\hspace{2cm}} \text{ cl}$

$4 \text{ pt.} = \underline{\hspace{2cm}} \text{ cl or } \underline{\hspace{2cm}} \text{ ml}$

$30 \text{ pt.} = \underline{\hspace{2cm}} \text{ ml or } \underline{\hspace{2cm}} \text{ cl}$

$35 \text{ pt.} = \underline{\hspace{2cm}} \text{ cl or } \underline{\hspace{2cm}} \text{ ml}$

$24 \text{ pt.} = \underline{\hspace{2cm}} \text{ ml or } \underline{\hspace{2cm}} \text{ cl}$

$40 \text{ pt.} = \underline{\hspace{2cm}} \text{ cl or } \underline{\hspace{2cm}} \text{ ml}$

### Activity Three:

If we know that 1 cl equals .018 dry pint (pt.), convert the following: (**Please note** that because of the large numbers used for the amount of centiliters, we have used three decimal places for the pint measurements for greater accuracy. Please round your answers to two decimal places.)

$875 \text{ cl} = \underline{\hspace{2cm}} \text{ pt.}$

$593 \text{ cl} = \underline{\hspace{2cm}} \text{ pt.}$

$419 \text{ cl} = \underline{\hspace{2cm}} \text{ pt.}$

$647 \text{ cl} = \underline{\hspace{2cm}} \text{ pt.}$

$269 \text{ cl} = \underline{\hspace{2cm}} \text{ pt.}$

$195 \text{ cl} = \underline{\hspace{2cm}} \text{ pt.}$

$382 \text{ cl} = \underline{\hspace{2cm}} \text{ pt.}$

$67 \text{ cl} = \underline{\hspace{2cm}} \text{ pt.}$

$741 \text{ cl} = \underline{\hspace{2cm}} \text{ pt.}$

$934 \text{ cl} = \underline{\hspace{2cm}} \text{ pt.}$

### Activity Four:

Using the fact that 1 dry quart (qt.) equals 1.10 liters (l) or 110.12 centiliters (cl), find the answers to the following problems, rounding your answers to two decimal places:

1. Your mom just bought 5 quarts of strawberries at the grocery store to make strawberry jam. How many liters of strawberries does that equal? How many centiliters of strawberries?
2. Blueberries are a fruit with lots of vitamins and minerals. If you bought 3 quarts of blueberries at the store to use for your family to snack on over the next week, how many liters of blueberries would that equal? How many centiliters of blueberries?
3. Last week, our family bought 10 quarts of raspberries to make jam. How many liters of raspberries does that equal?
4. If you wanted to make gooseberry jam to can, how many liters of gooseberries would you have if you bought 17 quarts of gooseberries?
5. Mom needed 15 quarts of blueberries to bake pies for the annual pie sale. How many liters of blueberries did she need?

### Activity Five:

Now, using the fact that 1 kiloliter (kl) = 227.02 dry gallons (gal.), compute the following:

$39 \text{ kl} = \underline{\hspace{2cm}} \text{ gal.}$

$19 \text{ kl} = \underline{\hspace{2cm}} \text{ gal.}$

$57 \text{ kl} = \underline{\hspace{2cm}} \text{ gal.}$

$43 \text{ kl} = \underline{\hspace{2cm}} \text{ gal.}$

$24 \text{ kl} = \underline{\hspace{2cm}} \text{ gal.}$

$85 \text{ kl} = \underline{\hspace{2cm}} \text{ gal.}$

$62 \text{ kl} = \underline{\hspace{2cm}} \text{ gal.}$

$91 \text{ kl} = \underline{\hspace{2cm}} \text{ gal.}$

$74 \text{ kl} = \underline{\hspace{2cm}} \text{ gal.}$

$6 \text{ kl} = \underline{\hspace{2cm}} \text{ gal.}$

### Activity Six:

Using the fact that 1 bushel (bu.) equals .04 kiloliters (kl), do the following problems:

1. You worked all morning picking apples in your uncle's orchard. If you picked 8 bushels of apples, how many kiloliters of apples did you pick?
2. Your mom bought 6 bushels of apples to make apple butter for canning. If she paid \$864.00 per kiloliter, how much did she pay for the 6 bushels of apples?
3. You bought 3 bushels of pears, 4 bushels of peaches, and 2 bushels of apples for canning. How many total kiloliters of fruit did you buy?
4. Your church is having a fall festival where they will be giving away a bushel of apples to the winner of each contest at the festival. If there are 15 contests at the festival, how many kiloliters of apples will they need?
5. Your garden produced an enormous amount of tomatoes this year. You decided to take them to the farmer's market and sell them by the bushel. If you sold 23 bushels of tomatoes, how many kiloliters of tomatoes did you sell?

### Activity Seven:

Knowing that 1 kiloliter (kl) = 28.38 bushels (bu.), do the following problems:

$25 \text{ kl} = \underline{\hspace{2cm}} \text{ bu.}$

$45 \text{ kl} = \underline{\hspace{2cm}} \text{ bu.}$

$17 \text{ kl} = \underline{\hspace{2cm}} \text{ bu.}$

$14 \text{ kl} = \underline{\hspace{2cm}} \text{ bu.}$

$36 \text{ kl} = \underline{\hspace{2cm}} \text{ bu.}$

$23 \text{ kl} = \underline{\hspace{2cm}} \text{ bu.}$

$62 \text{ kl} = \underline{\hspace{2cm}} \text{ bu.}$

$51 \text{ kl} = \underline{\hspace{2cm}} \text{ bu.}$

$122 \text{ kl} = \underline{\hspace{2cm}} \text{ bu.}$

$33 \text{ kl} = \underline{\hspace{2cm}} \text{ bu.}$

## Answer Key:

### Activity One:

6 pt. = 3303.66 ml

10 pt. = 5506.1 ml

16 pt. = 8809.76 ml

30 pt. = 16518.3 ml

24 pt. = 13214.64 ml

12 pt. = 660.732 cl

17 pt. = 936.037 cl

4 pt. = 220.244 cl

35 pt. = 1927.135 cl

40 pt. = 2202.44 cl

### Activity Two:

6 pt. = 3303.66 ml or 330.366 cl

10 pt. = 5506.1 ml or 550.61 cl

16 pt. = 8809.76 ml or 880.976 cl

30 pt. = 16518.3 ml or 1651.83 cl

24 pt. = 13214.64 ml or 1321.464 cl

12 pt. = 660.732 cl or 6607.32 ml

17 pt. = 936.037 cl or 9360.37 ml

4 pt. = 220.244 cl or 2202.44 ml

35 pt. = 1927.135 cl or 19271.35 ml

40 pt. = 2202.44 cl or 22024.4 ml

### Activity Three:

875 cl = 15.75 pt.

419 cl = 7.54 pt.

269 cl = 4.84 pt.

382 cl = 6.88 pt.

741 cl = 13.34 pt.

593 cl = 10.67 pt.

647 cl = 11.65 pt.

195 cl = 3.51 pt.

67 cl = 1.21 pt.

934 cl = 16.81 pt.

### Activity Four:

1. 5.5 l or 550.6 cl

2. 3.3 l or 330.36 cl

3. 11 l

4. 18.7 l

5. 16.5 l

**Activity Five:**

$39 \text{ kl} = 8853.78 \text{ gal.}$

$57 \text{ kl} = 12940.14 \text{ gal.}$

$24 \text{ kl} = 5448.48 \text{ gal.}$

$62 \text{ kl} = 14075.24 \text{ gal.}$

$74 \text{ kl} = 16799.48 \text{ gal.}$

$19 \text{ kl} = 4313.38 \text{ gal.}$

$43 \text{ kl} = 9761.86 \text{ gal.}$

$85 \text{ kl} = 19296.7 \text{ gal.}$

$91 \text{ kl} = 20658.82 \text{ gal.}$

$6 \text{ kl} = 1362.12 \text{ gal.}$

**Activity Six:**

Using the fact that 1 bushel (bu.) equals .04 kiloliters (kl), do the following problems:

1. .32 kl
2. She bought .24 kl of apples which cost \$207.36
3. .36 kl
4. .6 kl
5. .92 kl

**Activity Seven:**

$25 \text{ kl} = 709.5 \text{ bu.}$

$17 \text{ kl} = 482.46 \text{ bu.}$

$36 \text{ kl} = 1021.68 \text{ bu.}$

$62 \text{ kl} = 1759.56 \text{ bu.}$

$122 \text{ kl} = 3462.36 \text{ bu.}$

$45 \text{ kl} = 1277.1 \text{ bu.}$

$14 \text{ kl} = 397.32 \text{ bu.}$

$23 \text{ kl} = 652.74 \text{ bu.}$

$51 \text{ kl} = 1447.38 \text{ bu.}$

$33 \text{ kl} = 936.54 \text{ bu.}$