Proportions: A statement saying that two ratios are equal.

We can solve proportions three ways:

1) By looking for a multiplication or division relationship <u>between</u> the ratios. You try the last one.

Examples:

a) $5:7 = 10:x$

$$\boxed{x = 14}$$

b) $\dfrac{6}{24} = \dfrac{a}{4}$ $\quad \div 6$

$$\boxed{a = 1}$$

c) $\dfrac{3}{10} = \dfrac{x}{50}$ $\quad \times 5$

$$\boxed{x = 15}$$

The second way to solve proportions is...

2) By looking for a multiplication relationship <u>within</u> the ratios. You try the last one.

Examples:

a) $4:12 = 10:x$ $\quad \times 3 \quad \times 3$

$$\boxed{x = 30}$$

b) $\left(\dfrac{5}{35} = \dfrac{4}{y}\right)$ $\quad \times 7 \quad \times 7$

$$\boxed{y = 28}$$

c) $\left(\dfrac{10}{60} = \dfrac{3}{x}\right)$ $\quad \times 6 \quad \times 6$

$$\boxed{x = 18}$$

3) By using "cross-multiplication"

The previous two methods require you to find a relationship on your own. A method that works the same way every time, and is repeatable is "cross-multiplication".

Example: Solve the following proportion

$$\dfrac{5}{8} = \dfrac{4}{x}$$

$$x = 8 \times 4 \div 5$$

$$\boxed{x = 6.4}$$

You try the following using cross-multiplication:

a) $\dfrac{6}{a} = \dfrac{10}{27}$

$$a = 6 \times 27 \div 10$$

$$\boxed{a = 16.2}$$

b) $\dfrac{7}{2} = \dfrac{b}{18}$

$$b = 7 \times 18 \div 2$$

$$\boxed{b = 63}$$

Canada's official measurement system is the metric system. However, most Canadians use another system called the **imperial system** as well. While science and medicine use the metric system, construction and cooking use the imperial system (generally).

Metric System: A common sense system based on powers of 10.

Category	Unit of measure and abbreviation
Length	Meter (m) km, cm, mm, etc.
Volume	Litre (L) mL
Mass	Gram (g) kg, mg
Temperature	Celcius (°C)

Imperial System: A system that is based on seemingly random conversion values.

Let's brainstorm some commonly used units of the imperial measurement system:

Category	Unit of measure and abbreviation
Length	inches, feet, yards, miles
Volume	Gallons, fluid ounces, pints, quarts
Mass	pounds, ounces, tonnes
Temperature	Fahrenheit (°F)

The table below contains the essential conversion factors that you will use to convert within the imperial system.

pound

Length	Mass	Volume
1 ft = 12 in	1 lb = 16 oz	1 gal = 4 qt
1 yd = 3 ft	1 tn = 2000 lb	1 qt = 2 pt
1 mile = 1760 yd		1 pt = 16 fl oz

Now let's do some basic conversions.

#1. Convert the following to the units indicated. We will start by using ratios and proportions.

a) 4 feet to inches

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

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

$$\boxed{x = 48 \text{ inches}}$$

b) 24 ounces to pounds

$$\frac{ounces}{pounds} = \frac{16}{1} = \frac{24}{x}$$

$$x = 1 \times 24 \div 16$$

$$\boxed{x = 1.5 \text{ lbs}}$$

c) 3 gallons to quarts

$$\frac{gallons}{quarts} = \frac{1}{4} = \frac{3}{x}$$

$$x = 4 \times 3 \div 1$$

$$\boxed{x = 12 \text{ qt}}$$

d) 175 pounds to tonnes

$$\frac{tonnes}{pounds} = \frac{1}{2000} = \frac{x}{175}$$

$$x = 1 \times 175 \div 2000$$

$$\boxed{x = 0.0875 \text{ tonnes}}$$

e) 2.25 pints to fluid ounces

$$\frac{pints}{fl. ounces} = \frac{1}{16} = \frac{2.25}{x}$$

$$x = 16 \times 2.25 \div 1$$

$$x = 44 \text{ fl. ounces}$$
$$36$$

f) 26.2 miles into yards

$$\frac{miles}{yards} = \frac{1}{1760} = \frac{26.2}{x}$$

$$x = 1760 \times 26.2 \div 1$$

$$\boxed{x = 46,112 \text{ yards}}$$