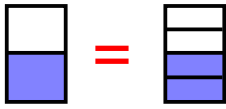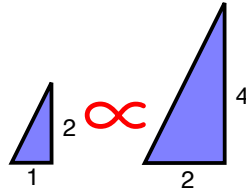# Fractions

one half is equal to two fourths

$$\frac{1}{2} = \frac{2}{4}$$

fraction   fraction

Fractions are usually parts of things.

When adding, subtracting, multiplying, or dividing fractions it is usually a necessary step to change one fraction to another, equal fraction.

Proportion

1 to 2 is proportional to 2 to 4
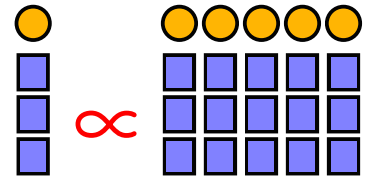
$$\frac{1}{2} \propto \frac{2}{4}$$

ratio   ratio

Proportions are similar to fractions, but instead of parts of things, two whole things are compared.

In this example the triangles are the same shape but one is bigger. In both triangles the height is twice as big as the base.

A small toy car is proportional to a bigger real car. A small map is proportional to a bigger real place.

Proportion

1 to 3 is proportional to 5 to 15

$$\frac{1}{3} \propto \frac{5}{15}$$

ratio   ratio

The first group of whole things is proportional to the larger group. Both groups have a **ratio** of one circle to three squares.

A proportion has two equal ratios.

It's kind of like two equal fractions.

How to do a simple proportion

$$\frac{1}{3} = \frac{X}{15}$$

After fractions, proportions are easy.

This problem is like the example above. How many yellow dots are needed in a group with 15 blue blocks to be proportional to the ratio of 1 to 3?

$$\frac{1}{3} \diagdown \frac{X}{15}$$

Cross multiply

$$3X = 15$$

$$\frac{3X}{3} = \frac{15}{3}$$

Divide

$$X = 5$$

How to do any percent problem

$$\frac{X}{\text{OF } 12} = \frac{25\%}{100}$$

What is 25% of 12?

$$\frac{3}{\text{OF } 12} = \frac{X\%}{100}$$

3 out of 12 is what percent?

$$\frac{3}{\text{OF } X} = \frac{25\%}{100}$$

3 is 25% of what number?

How tall is the flag pole?

This is a classic proportion problem. The flag pole is on a large level area. The teacher takes a class of 12-year-olds out by the school's flag on a sunny day. The students have two one-meter rulers. The teacher asks the students to use them to measure the flag pole.

The trick is to stand one ruler at 90º to the ground and use the second ruler to measure the first ruler's shadow.

They now know the ratio of the ruler to its shadow.

They measure the flag pole's shadow and do a proportion with the two ratios and solve for X, how tall is the flag pole.

How to do a complex proportion

$$\frac{3.5}{X} = \frac{1.3}{4.12}$$

A proportion can work with decimals, fractions, mixed numerals, etc.

The X can be in any of the four spots. The only mistake is to get one of the ratios upside-down.

$$1.3X = 14.42$$

$$X \approx 11.09$$

$$\frac{\text{ruler}}{\text{shadow}} = \frac{\text{pole}}{\text{shadow}} \qquad \frac{1}{0.5} = \frac{X}{3.5}$$