

Equivalent Ratios and Proportions

A ratio can be simplified by dividing (or multiplying) its terms by the same number. That is,
 $6:12 = 1:2 = 5:10 = 8:16$

Equivalent Ratios:

Two ratios $a:b$ & $c:d$ are said to be equivalent if $a:b = c:d$. That is $6:12 = 1:2$

In general: Multiplying both terms of the ratio $a:b$ by the same number, c , results in the equivalent ratio $ac:bc$.

Simplification of Ratios:

A ratio $a:b$ or $\frac{a}{b}$ is said to be in its simplest form if $a:b$ or $\frac{a}{b}$ has been reduced to its lowest terms. That is, a and b have no common factor

Express the ratio 6:9 in its simplest form.

$$6:9 = \frac{6}{3}:\frac{9}{3} = 2:3$$

Find the ratio of 40 centimeters to 2 meters in its simplest form.

$$2m = 2 \times 100cm = 200cm$$

Ratio of 40 cm to 2 m = 40:200

$$\begin{aligned} &= \frac{40}{40}:\frac{200}{40} \\ &= 1:5 \end{aligned}$$

A **proportion** is a comparison of two equal ratios. **Proportions** are written as a statement of equality of two ratios. In other words; it is an equation in the form $\frac{a}{b} = \frac{c}{d}$

$2:3 = 8:12$ is a proportion.

The proportion $2:3 = 8:12$ is read as '2 is to 3' as '8 is to 12'.

In problems involving proportions, we can use cross products to test whether two ratios are equal and form a proportion

$$\frac{40}{35} = \frac{8}{7} \quad \text{Cross product: } 40 \times 7 = 8 \times 35$$

$$280 = 280$$

We can also use cross products to find a missing term in a proportion.