



Ratio & Proportion

A **proportion** is an equality of two or more ratios:

$$\frac{a}{b} = \frac{c}{d} \quad [1]$$

In any proportion, the **cross-products** are equal:

$$ad = bc$$

Equation [1] could also be expressed using colon notation, as a ratio:

$$a : b :: c : d \text{ or } a : b = c : d$$

In this example, a and d are called the **extremes** and b and c are called the **means**.
Using this terminology:

$$\begin{array}{l} \text{the product of the extremes} = \text{the product of the means} \\ ad = bc \end{array}$$

Example 1: Solve: $\frac{5}{25} = \frac{2}{x}$

Solution: Set up the cross products:

$$5 \cdot x = 25 \cdot 2$$

Simplify:

$$5x = 50$$

Solve for x by dividing both sides by the coefficient of x :

$$\begin{array}{l} 5x + 5 = 50 + 5 \\ x = 10 \end{array}$$

Example 2: Solve: $\frac{2}{3} = \frac{1}{x}$

Solution: Set up the cross products:

$$2 \cdot x = 3 \cdot 1$$

Simplify:

$$2x = \frac{3}{2}$$

Solve for x . We could do this by dividing both sides by the coefficient of x , but since we have a fraction it might be easier to multiply both sides by the reciprocal of the coefficient (which amounts to the same thing). The reciprocal of 2 is $\frac{1}{2}$, so:

$$\begin{array}{l} 2x \cdot \frac{1}{2} = \frac{3}{2} \cdot \frac{1}{2} \\ x = \frac{3}{4} \end{array}$$