Solve an algebraic proportion :

Algebraic proportion

An algebraic proportion is an equation that sets two ratios, including variables, equal to each other. For example, $\frac{3}{4}$ and $\frac{9}{12}$ are equal ratios. Therefore $\frac{3}{4} = \frac{9}{12}$ is a proportion. A proportion has two cross products that are equal to each other. In the proportion $\frac{3}{4} = \frac{9}{12}$, the cross products are $3 \bullet 12$ and $4 \bullet 9$. To find the cross products of a proportion, multiply the numbers that are diagonally across from each other.

$$\frac{3}{4} \times \frac{9}{12} \longrightarrow 3 \bullet 12 = 4 \bullet 9 \longrightarrow 36 = 36 \longrightarrow \text{true}$$

If one of the values in a proportion is represented by a variable, the cross products will produce a linear equation that can be solved to find the value of the variable.

Solving systems of linear equations in two variables :

System of linear equations

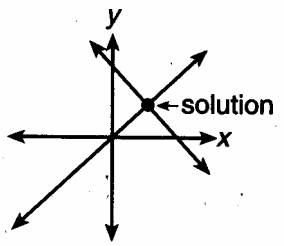
A system of linear equations consists of two or more linear equations. A solution to a system of linear equations is an ordered pair that makes all the equations in the system true. There are three types of systems of linear equations, each with a different number of solutions.

Consistent system

A consistent system has exactly one solution. The lines intersect at one point, and they might be perpendicular. Remember that lines are perpendicular if the product of their slopes is -1.

A consistent system has

- exactly one solution
- lines intersect and may or may not be perpendicular
- different slopes

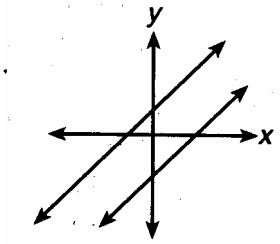


Inconsistent system

An inconsistent system has no solution. The graphs of the equations are parallel to each other and will not touch.

An inconsistent system has

- no solution
- lines are parallel
- same slope, different y-intercepts



Dependent system

A dependent system has an infinite number of solutions. The graphs of the lines coincide, meaning that they will be exactly the same.

A dependent system

- infinite number of solutions
- lines are coincident
- same slopes, same y-intercepts