



Simultaneous Equations (Elimination)

Elimination Method

Simultaneous equations involve more than one linear equation. When these two or more functions intersect, we can solve for the points of intersection. One method to achieve this is through elimination.

EXAMPLE: Solve $2x + 3y = 8$ and $3x + 2y = 7$

STEP ONE: Label the equations (1) $2x + 3y = 8$ (2) $3x + 2y = 7$

STEP TWO: Isolate the first variable.

Choose the variable x or y to eliminate first, whichever is easiest.

To eliminate a variable, use multiplication (to lowest common multiple) so that the two equations have the same coefficient for that variable.

To eliminate x :

$$(1) \quad 2x + 3y = 8 \quad \rightarrow \text{Multiply equation by 3 to get } 6x$$

$$(2) \quad 3x + 2y = 7 \quad \rightarrow \text{Multiply equation by 2 to get } 6x$$

Write new equations:

$$(1) \quad 6x + 9y = 24 \quad \rightarrow \text{The coefficient for } x \text{ is now the same}$$

$$(2) \quad 6x + 4y = 14 \quad \rightarrow \text{The coefficient for } x \text{ is now the same}$$

Subtract the equations to eliminate x :

$$(1) \quad 6x + 9y = 24$$

$$- (2) \quad 6x + 4y = 14$$

$$5y = 10 \quad \rightarrow \quad \mathbf{y = 2 \text{ INTERSECTION Y-VALUE}}$$

STEP THREE: Isolate the second variable.

Substitute the variable you found into either (1) or (2) to find the other.

Substitute $y = 2$ into (1):

$$(1) \quad 2x + 3(2) = 8 \quad \rightarrow \quad \mathbf{x = 1 \text{ INTERSECTION X-VALUE}}$$

The solution is (1, 2). Verify by graphing.



Instructions: Solve the simultaneous equations below using elimination.

1

$$2x - y = 1$$

$$3x + y = 9$$

2

$$2x + 3y = 15$$

$$x - 3y = 3$$

3

$$5x + 2y = 47$$

$$2x - y = 8$$



4

$$\begin{aligned}4y - 2x &= 8 \\ 2x - y &= 7\end{aligned}$$

5

$$\begin{aligned}3x + 4y &= 0 \\ x - 2y &= -10\end{aligned}$$

6

$$\begin{aligned}3y &= 11 + 5x \\ 15 - 5x &= 10y\end{aligned}$$



7

$$\begin{aligned}8x + 2y &= 34 \\7x + 3y &= 26\end{aligned}$$

8

$$\begin{aligned}\frac{1}{2}x + 4y &= 42 \\2x - 5y &= 21\end{aligned}$$

9

$$\begin{aligned}3x + 2y &= 11 \\7x - 5y &= 19\end{aligned}$$



Simultaneous Equations (Elimination)

Elimination Method

Simultaneous equations involve more than one linear equation. When these two or more functions intersect, we can solve for the points of intersection. One method to achieve this is through elimination.

EXAMPLE: Solve $2x + 3y = 8$ and $3x + 2y = 7$

STEP ONE: Label the equations (1) $2x + 3y = 8$ (2) $3x + 2y = 7$

STEP TWO: Isolate the first variable.

Choose the variable x or y to eliminate first, whichever is easiest.

To eliminate a variable, use multiplication (to lowest common multiple) so that the two equations have the same coefficient for that variable.

To eliminate x :

$$(1) \quad 2x + 3y = 8 \quad \rightarrow \text{Multiply equation by 3 to get } 6x$$

$$(2) \quad 3x + 2y = 7 \quad \rightarrow \text{Multiply equation by 2 to get } 6x$$

Write new equations:

$$(1) \quad 6x + 9y = 24 \quad \rightarrow \text{The coefficient for } x \text{ is now the same}$$

$$(2) \quad 6x + 4y = 14 \quad \rightarrow \text{The coefficient for } x \text{ is now the same}$$

Subtract the equations to eliminate x :

$$(1) \quad 6x + 9y = 24$$

$$- (2) \quad 6x + 4y = 14$$

$$5y = 10 \quad \rightarrow \quad \mathbf{y = 2 \text{ INTERSECTION Y-VALUE}}$$

STEP THREE: Isolate the second variable.

Substitute the variable you found into either (1) or (2) to find the other.

Substitute $y = 2$ into (1):

$$(1) \quad 2x + 3(2) = 8 \quad \rightarrow \quad \mathbf{x = 1 \text{ INTERSECTION X-VALUE}}$$

The solution is (1, 2). Verify by graphing.



Instructions: Solve the simultaneous equations below using elimination.

1

$$3x - 4y = 17$$

$$x - 4y = 3$$

2

$$2y + 3x = 2$$

$$y - 4 = -6x$$

3

$$4x - 3y = 10$$

$$6x + 4y = 49$$



4

$$\begin{aligned}5x + 3y &= 51 \\ 2x - 12 &= 3y\end{aligned}$$

5

$$\begin{aligned}-4x &= -2 + 3y \\ 5x + 6y &= 7\end{aligned}$$

6

$$\begin{aligned}6x + 5y &= 39 \\ 3y &= 17 - 2x\end{aligned}$$



7

$$\begin{aligned}3x + 5y &= 7 \\ 7x + 9 &= y\end{aligned}$$

8

$$\begin{aligned}11y &= 9 - 3x \\ 5x &= 4y + 82\end{aligned}$$

9

$$\begin{aligned}x + \frac{1}{2}y &= \frac{9}{2} \\ \frac{1}{4}x - \frac{5}{6} &= \frac{1}{6}y\end{aligned}$$