

# Solving Simultaneous Equations Graphically - PDF Copy

The presentation contains the slides below with the objective of: a. Understand what is meant by simultaneous equations, b. Use a graphical methods to solve simultaneous equation. There are animated explanations and problems with answers,

**Solve Simultaneous Equations with Graphs**

Objectives

Understand what is meant by simultaneous equations

Use a graphical methods to solve simultaneous equations

Grade C Topic

☆ 1

**What are simultaneous equations?**

Simultaneous equations are pairs of equations that contain two unknown numbers like these:

$x + y = 7$

$x - y = 5$

The only numbers that **solve both equations** are...

$x = 5$  and  $y = 1$

simultaneous because we solve both at the same time

Check

$6 + 1 = 7$

$6 - 1 = 5$

☆ 2

For very simple, it is often possible to find solutions by trying numbers. Here is an example:

$x + y = 9$

$x - y = 5$

Try  $x = 1$  &  $y = 1$

$\rightarrow 8 + 1 = 9$  ✓

$\rightarrow 8 - 1 = 7$  ✗

Need to try equal 1

Try  $x = 7$  &  $y = 2$

$\rightarrow 7 + 2 = 9$  ✓

$\rightarrow 7 - 2 = 5$  ✓

Works in both

$x = 7$  and  $y = 2$

☆ 3

Here is a slightly more difficult example:

$x + y = 5$

$2x + y = 8$

Try  $x = 4$  &  $y = 1$

$\rightarrow 4 + 1 = 5$  ✓

$\rightarrow 2 \times 4 + 1 = 9$  ✗

Need to try equal 1

Try  $x = 2$  &  $y = 2$

$\rightarrow 3 + 2 = 5$  ✓

$\rightarrow 2 \times 3 + 2 = 8$  ✓

Works in both

$x = 3$  and  $y = 2$

☆ 4

By trying numbers in both equations, try to find solutions for these

1. $x + y = 5$	5. $x + y = 3$
$x - y = 3$	$2x + y = 5$
2. $x + y = 6$	6. $x + y = 5$
$x - y = 4$	$x + 2y = 7$
3. $x + y = 8$	7. $x + y = 4$
$x - y = 2$	$2x + y = 7$
4. $x + y = 10$	8. $x + y = 4$
$x - y = 4$	$x + 2y = 7$

☆ 5

By trying numbers in both equations, try to find solutions for these

1. $x + y = 5$	$x = 4$	5. $x + y = 3$	$x = 2$
$x - y = 3$	$y = 1$	$2x + y = 5$	$y = 1$
2. $x + y = 6$	$x = 5$	6. $x + y = 5$	$x = 3$
$x - y = 4$	$y = 1$	$x + 2y = 7$	$y = 2$
3. $x + y = 8$	$x = 5$	7. $x + y = 5$	$x = 4$
$x - y = 2$	$y = 3$	$2x + y = 9$	$y = 1$
4. $x + y = 10$	$x = 7$	8. $x + y = 4$	$x = 1$
$x - y = 4$	$y = 3$	$x + 2y = 7$	$y = 3$

☆ 6

**Using a graph to solve simultaneous equations**

As the equations contain more difficult numbers, it becomes more difficult to solve by simply trying numbers. But we can find answers from graphs

☆ 7

To solve:

$x + y = 6$

$5x + y = 10$

We start by showing how a graph can be used to solve this pair of simultaneous equations

☆ 8

To solve:

$x + y = 6$

$5x + y = 10$

Draw the graph of:  $x + y = 6$

Let  $x = 0$

$\rightarrow y = 6$

Let  $y = 0$

$\rightarrow x = 6$

Draw a straight line through these two points

☆ 9

To solve:

$x + y = 6$

$5x + y = 10$

Draw the graph of:  $5x + y = 10$

Let  $x = 0$

$\rightarrow y = 10$

Let  $y = 0$

$\rightarrow 5x = 10$

$\rightarrow x = 2$

Draw a straight line through these two points

☆ 10

To solve:

$x + y = 6$

$5x + y = 10$

$x = 1$  and  $y = 5$

The solution will be the coordinates of the point where the lines intersect

☆ 11

To solve:

$x + y = 6$

$5x + y = 10$

Check

$x + y = 6$

$1 + 5 = 6$  ✓

$5x + y = 10$

$5 \times 1 + 5 = 10$  ✓

☆ 12

To solve:

$x + y = 8$

$2x - 3y = 6$

For our second example, we show how a graph can be used to solve this pair of simultaneous equations

☆ 13

To solve:

$x + y = 8$

$2x - 3y = 6$

Draw the graph of:  $x + y = 8$

Let  $x = 0$

$\rightarrow y = 8$

Let  $y = 0$

$\rightarrow x = 8$

Draw a straight line through these two points

☆ 14

To solve:

$x + y = 8$

$2x - 3y = 6$

Draw the graph of:  $2x - 3y = 6$

Let  $x = 0$

$\rightarrow -3y = 6$

$\rightarrow y = -2$

Let  $y = 0$

$\rightarrow 2x = 6$

$\rightarrow x = 3$

Draw a straight line through these two points

☆ 15

Continued...

To solve:  
 $x + y = 8$   
 $2x - 3y = 6$   
 $x = 6$  and  $y = 2$

The solution will be the coordinates of the point where the lines intersect

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To solve:  
 $x + y = 8$   
 $2x - 3y = 6$   
 $x = 6$  and  $y = 2$

Check  
 $x + y = 8$   
 $6 + 2 = 8$  ✓  
 $2x - 3y = 6$   
 $2 \times 6 - 3 \times 2 = 6$  ✓

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graphs to solve some simultaneous equations.

You can draw your own graphs or download the sheet on the right by clicking on <Graphs> on the homepage

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Using graphs, solve these simultaneous equations

1. $x - y = 4$	4. $x + y = 10$
2. $x + y = 7$	5. $2x + y = 10$
3. $x - y = 5$	6. $3x + 2y = 18$

$2x + y = 14$      $2x + y = 14$   
 $x + 4y = 2$        $x + 4y = 6$   
 $2x + y = 12$      $2x - y = 6$   
 $x + 2y = 14$      $x - 2y = 14$   
 $x + 8y = 3$        $x + 6y = -3$

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1.  $x - y = 4$   
 $2x + y = 14$

To draw the line:  
 $x - y = 4$   
 Let  $x = 0$   
 $\rightarrow -y = 4$   
 $\rightarrow y = -4$   
 Let  $y = 0$   
 $\rightarrow x = 4$

Draw a straight line through the two points

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1.  $x - y = 4$   
 $2x + y = 14$

To draw the line:  
 $2x + y = 14$   
 Let  $x = 0$   
 $\rightarrow y = 14$   
 Let  $y = 0$   
 $\rightarrow 2x = 14$   
 $\rightarrow x = 7$

Draw a straight line through the two points

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1.  $x - y = 4$   
 $2x + y = 14$   
 $x = 6$  and  $y = 2$

Check  
 $x - y = 4$   
 $6 - 2 = 4$  ✓  
 $2x + y = 14$   
 $2 \times 6 + 2 = 14$  ✓

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1.  $x - y = 4$   
 $2x + y = 14$   
 $x = 6$  and  $y = 2$

Check  
 $x - y = 4$   
 $6 - 2 = 4$  ✓  
 $2x + y = 14$   
 $2 \times 6 + 2 = 14$  ✓

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2.  $x + y = 7$   
 $2x + y = 12$

Let  $x = 0$   
 $\rightarrow y = 7$   
 Let  $y = 0$   
 $\rightarrow x = 7$

Let  $x = 0$   
 $\rightarrow y = 12$   
 Let  $y = 0$   
 $\rightarrow 2x = 12$   
 $\rightarrow x = 6$

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2.  $x + y = 7$   
 $2x + y = 12$   
 $x = 2$  and  $y = 5$

Check  
 $x + y = 7$   
 $2 + 5 = 7$  ✓  
 $2x + y = 12$   
 $2 \times 2 + 5 = 12$  ✓

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3.  $x - y = 5$   
 $x + 2y = 14$

Let  $x = 0$   
 $\rightarrow -y = 5$   
 $\rightarrow y = -5$   
 Let  $y = 0$   
 $\rightarrow x = 5$

Let  $x = 0$   
 $\rightarrow 2y = 14$   
 $\rightarrow y = 7$   
 Let  $y = 0$   
 $\rightarrow x = 14$

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3.  $x - y = 5$   
 $x + 2y = 14$   
 $x = 8$  and  $y = 3$

Check  
 $x - y = 5$   
 $8 - 3 = 5$  ✓  
 $x + 2y = 14$   
 $8 + 2 \times 3 = 14$  ✓

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4.  $x + y = 10$   
 $2x + y = 14$

Let  $x = 0$   
 $\rightarrow y = 10$   
 Let  $y = 0$   
 $\rightarrow x = 10$

Let  $x = 0$   
 $\rightarrow y = 14$   
 Let  $y = 0$   
 $\rightarrow 2x = 14$   
 $\rightarrow x = 7$

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4.  $x + y = 10$   
 $2x + y = 14$   
 $x = 4$  and  $y = 6$

Check  
 $x + y = 10$   
 $4 + 6 = 10$  ✓  
 $2x + y = 14$   
 $2 \times 4 + 6 = 14$  ✓

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5.  $2x + y = 10$   
 $2x - y = 6$

Let  $x = 0$   
 $\rightarrow y = 10$   
 Let  $y = 0$   
 $\rightarrow 2x = 10$   
 $\rightarrow x = 5$

Let  $x = 0$   
 $\rightarrow -y = 6$   
 $\rightarrow y = -6$   
 Let  $y = 0$   
 $\rightarrow 2x = 6$   
 $\rightarrow x = 3$

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6.  $2x + y = 10$   
 $2x - y = 6$   
 $x = 4$  and  $y = 2$

Check  
 $2x + y = 10$   
 $2 \times 4 + 2 = 10$  ✓  
 $2x - y = 6$   
 $2 \times 4 - 2 = 6$  ✓

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6.  $3x + 2y = 18$   
 $x - 2y = 14$

Let  $x = 0$   
 $\rightarrow 2y = 18$   
 $\rightarrow y = 9$   
 Let  $y = 0$   
 $\rightarrow 3x = 18$   
 $\rightarrow x = 6$

Let  $x = 0$   
 $\rightarrow -2y = 14$   
 $\rightarrow -2y = 14$   
 $\rightarrow y = -7$   
 Let  $y = 0$   
 $\rightarrow x = 14$

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6.  $3x + 2y = 18$   
 $x - 2y = 14$   
 $x = 8$  and  $y = -3$

Check  
 $3x + 2y = 18$   
 $3 \times 8 + 2 \times -3 = 18$  ✓  
 $x - 2y = 14$   
 $8 - 2 \times -3 = 14$  ✓

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