

Solving Simultaneous Equations - Elimination Method - PDF Copy

The presentation contains the slides below with the objective of: **a. Understanding what is meant by a pair of simultaneous equations** **b. Solving a pairs of simultaneous equations using the elimination method.** There are animated explanations and problems with answers.

Solving Simultaneous Equations with the Elimination Method

Objectives:
 Understand what is meant by a pair of simultaneous equations
 Solve a pairs of simultaneous equations using the elimination method

Grade C - B Topic



1

$x + y = 5$

An equation with two unknown values like this has lots of (infinite) solutions

For example...

$x = 1$ and $y = 4$

$x = -2$ and $y = 7$

$x = 3.1$ and $y = 1.1$



2

If, however, we add a second equation like this...

$x + y = 5$
 $x - y = 1$

$3 + 2 = 5$
 $3 - 2 = 1$

...there is only one value of x and one value of y that will fit into two equations

$x = 3$ and $y = 1$

We call pairs of equations that are solved in this way simultaneous equations



3

For these pairs of equations, the values of x and y are whole numbers between and including 2 and 8. By trying numbers in this range, find the solutions

1. $x + y = 7$
 $x - y = 3$
 $x = 5$ and $y = 2$

2. $y - x = 1$
 $y + x = 9$
 $x = 4$ and $y = 5$

3. $y + 2x = 7$
 $y - x = 1$
 $x = 2$ and $y = 3$

4. $y - x = 4$
 $y + 3x = 12$
 $x = 2$ and $y = 6$



4

We need a better way of solving pairs of simultaneous equations and we have this...

The Elimination Method



5

Ignoring the signs, these terms must have the same numbers

$3x + 2y = 16$ (A) Label the equations

$2x - 2y = 4$ (B)

Look at the terms' signs

We will show you what to do later when the terms' numbers are not the same

If the signs are the same \rightarrow Subtract (B) from (A)

If the signs are different \rightarrow Add (B) to (A)



6

The signs are different so Add

$3x + 2y = 16$ (A)

$2x - 2y = 4$ (B)

$5x = 20$

$3x + 2x = 5x$

$16 + 4 = 20$

$(2y) + (-2y) = 0$
 The terms eliminate each other



7

$3x + 2y = 16$ (A) $x = 4$

$2x - 2y = 4$ (B)

$5x = 20$

We can solve this equation

$x = 20 \div 5$

$x = 4$

We know that $x = 4$ so put this value into (A) or (B) to find y



8

We've chosen (A) so...

$3x + 2y = 16$ $x = 4$

$2x - 2y = 4$ (B) $y = 2$

$3x + 2y = 16$

$3 \times 4 + 2y = 16$

$12 + 2y = 16$

$2y = 16 - 12$

$2y = 4$

$y = 2$



9

$6x - 3y = 12$

$4x - 3y = 2$

Here is another example where the terms have the same sign



10

Ignoring signs, the terms' numbers are the same so we can use elimination

$6x - 3y = 12$ (A) Label the equations

$4x - 3y = 2$ (B)

Look at the terms' signs

If the signs are the same \rightarrow Subtract (B) from (A)

If the signs are different \rightarrow Add (B) to (A)



11

The signs are the same so Subtract

$6x - 3y = 12$ (A)

$4x - 3y = 2$ (B)

$2x = 10$

$6x - 4x = 2x$

$12 - 2 = 10$

$(-3y) - (-3y) = 0$
 The terms eliminate each other



12

Continued....

$3x + 2y = 16$ (A) $x = 4$
 $2x - 2y = 4$ (B) $y = 2$
 $3 \times 4 + 2y = 16$
 $3 \times 4 + 2y = 16$
 $12 + 2y = 16$
 $2y = 16 - 12$
 $2y = 4$
 $y = 2$



9

$6x - 3y = 12$
 $4x - 3y = 2$

Here is another example where the terms have the same sign



10

Ignoring signs, the terms' numbers are the same so we can use elimination
 $6x - 3y = 12$ (A)
 $4x - 3y = 2$ (B)
 Look at the terms' signs
 If the signs are the same \rightarrow subtract (B) from (A)
 If the signs are different \rightarrow Add (B) to (A)



11

The signs are the same so subtract
 $6x - 3y = 12$ (A)
 $4x - 3y = 2$ (B)
 $2x = 10$
 $6x - 4x = 2x$
 $12 - 2 = 10$
 $(-3y) - (-3y) = 0$
 The terms eliminate each other



12

$6x - 3y = 12$ (A) $x = 5$
 $4x - 3y = 2$ (B)
 $2x = 10$
 $x = 10 \div 2$
 $x = 5$
 We know that $x = 5$ so put this value into (A) or (B) to find y



13

We've chosen (B) so...
 $6x - 3y = 12$ (A) $x = 5$
 $4x - 3y = 2$ (B) $y = 6$
 $4 \times 5 - 3y = 2$
 $4 \times 5 - 3y = 2$
 $20 - 3y = 2$
 $-3y = 2 - 20$
 $-3y = -18$
 $-3 \div -3 = 6$
 $y = 6$



14

Solve these simultaneous equations

1. $4x + 3y = 32$	3. $4x + y = 41$
$x + 3y = 17$	$5x - y = 49$

Subtract $3x = 15$ $x = 5$
 Add $9x = 90$ $x = 10$
 Substitute to get $y = 4$ $y = 1$
 2. $3x - 2y = 17$ $4. 5x - 3y = 18$
 $2x + 2y = 28$ $3x - 3y = 6$
 Add $5x = 45$ $x = 9$
 Subtract $2x = 12$ $x = 6$
 Substitute to get $y = 5$ $y = 4$



15

$4x + 3y = 15$
 $5x - 2y = 13$
 Simultaneous equations with terms that have different numbers like this example...
 To solve the equations, the y terms - ignoring the signs - must have the same numbers.
 Here is how to do it...



16

$4x + 3y = 15$ (A)
 $5x - 2y = 13$ (B)
 Multiply (A) by 2 $2 \times 4x + 2 \times 3y = 2 \times 15$ (A)
 Multiply (B) by 3 $3 \times 5x - 3 \times 2y = 3 \times 13$ (B)
 This gives the same equations in a form where the y terms can be eliminated
 $8x + 6y = 30$ (A)
 $15x - 6y = 39$ (B)



17

Signs are different so Add
 $8x + 6y = 30$ (A) $x = 3$
 $15x - 6y = 39$ (B)
 $23x = 69$
 $x = 69 \div 23$
 $x = 3$
 Finally, substitute $x = 3$ into (A) or (B) to find y . We've chosen (A)...



18

$8x + 6y = 30$ (A) $x = 3$
 $15x - 6y = 39$ (B)
 $8 \times 3 + 6y = 30$
 $(8 \times 3) + 6y = 30$
 $24 + 6y = 30$
 $6y = 30 - 24$
 $6y = 6$
 $y = 1$



19

Solve these simultaneous equations

1. $4x + 2y = 20$	3. $2x + 3y = 16$
$2x + 3y = 18$	$3x - 2y = 11$

$12x + 6y = 60$ $4x + 6y = 32$
 $4x + 6y = 36$ $9x - 6y = 33$
 $x = 3 \ \& \ y = 4$ $x = 5 \ \& \ y = 2$
 2. $5x - 2y = 2$ $4. 3x - 2y = 7$
 $3x + 4y = 22$ $5x - 5y = 5$
 $20x - 8y = 8$ $15x - 10y = 35$
 $6x + 8y = 44$ $10x - 10y = 10$
 $x = 2 \ \& \ y = 4$ $x = 5 \ \& \ y = 4$



20