

Simultaneous equations using substitution

Year 9 Maths
Mainstream

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Learning Objectives

By the end of the lesson I hope that you understand and can apply the following to a range of questions from the Year 9 Mathematics course.

- Understand that two linear equations can cross once, none or an infinite number of times
- Understand that, when we use the term solution, we mean a coordinate of a point of intersection
- Understand that we can use a method of elimination using two equations to find a point of intersection



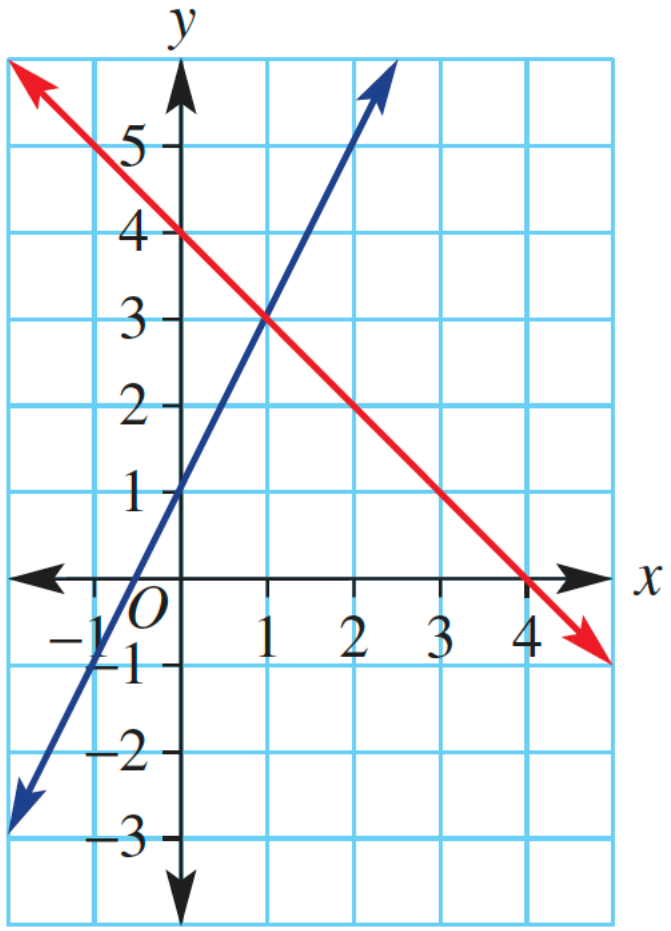
RECAP

In previous work we have been doing, we know that two lines can cross once, never or an infinite number of times. We are really interested in where lines intersect. There are lots of ways of finding this point of intersection:

- Graphical ✓
- Substitution ✓
- Elimination
- Matrices

We must remember that a point of intersection is also called a solution.

We are going to spend the lesson looking at “solutions” to simultaneous equations using a method of substitution.





Algebra is so important

Every part of the work we will do involves the correct use of algebra.

Making sure we understand how to add, subtract, multiply and divide expressions is going to be key. In fact, the rest of the course at a Year 9, 10, 11 and 12 level will require great use of algebra.

The more you do, the better you will become.

For example:

We can multiply all terms in an equation by the same number. It will change the appearance of the equation, but the values of 'x' and 'y' will not change.

$\times 2$

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

These are the same equation!
They look different but each term is twice the previous one.



Let's look at examples

Solve each of the following pairs of simultaneous equations by using elimination:

$$x - 2y = 1$$
$$-x + 5y = 2$$

$+ \quad x - 2y = 1$

$+ \quad -x + 5y = 2$

$3y = 3$

$y = 1$

$y = 1$

$x - 2y = 1$

$x - 2(1) = 1$

$x - 2 = 1$

$x = 3$

$(3, 1)$

$+ + \} +$

$- - \}$

$- + \}$

$+ - \} -$

Check.

$-x + 5y$

$-3 + 5$

2



Let's look at examples

Solve each of the following pairs of simultaneous equations by using elimination:

$$3x - \cancel{2y} = 5$$
$$- \quad 5x - \cancel{2y} = 11$$

$$-2x = -6$$
$$x = \frac{-6}{-2} = +3$$

Check.

$$5x - 2y$$
$$15 - 4 = 11$$

$$x = 3$$

$$3x - 2y = 5$$
$$3(3) - 2y = 5$$
$$9 - 2y = 5$$
$$-9 + 2y = -5$$
$$2y = 4$$
$$y = 2$$

$$- \; - \} \; +$$

$$(3, 2)$$



Let's look at examples

Solve each of the following pairs of simultaneous equations by using elimination:

1. $5x + 2y = -7$
2. $x + 7y = 25$ x 5

1. $5x + 2y = -7$
− $5x + 35y = 125$

$-33y = -132$

$y = \frac{-132}{-33}$

$y = 4$

$y = 4$

$5x + 2y = -7$

$5x + 2(4) = -7$

$5x + 8 = -7$

$5x = -15$

$x = -3$

$(-3, 4)$

Check:

$x + 7y$

$-3 + 7(4) = 25$ ✓



Look out for the tricks!

Solve each of the following pairs of simultaneous equations by using elimination:

1. $4x + 3y = 18$ ×3
2. $3x - 2y = 5$ ×4

$12x + 9y = 54$

$-\ 12x - 8y = 20$

$17y = 34$

$y = \underline{2}$

$y = 2$

$4x + 3y = 18$

$4x + 3(2) = 18$

$4x + 6 = 18$

$4x = 12$

$x = \underline{3}$

$(3, 2)$

check.

$3x - 2y = 5$

$9 - 4 = 5$ ✓



Questions to complete:

The questions I would like you to complete for this lesson are:

Exercise 2J: Simultaneous equations using elimination
Questions: 1b, 2b, 3be, 4aei, 5cfil, 6, 7, 8, 12

