

## Simultaneous Equations — Manipulation of One Equation

### Starter

1. (Review of last lesson)

Solve the equations  $5x + y = 10$  and  $x - y = -4$  algebraically.

### Notes

How is the following pair of simultaneous equations different to the one in the starter?

$$\begin{aligned} 3x + y &= -5 \\ 5x - 3y &= -13 \end{aligned}$$

You should be able to recognise that the coefficients of the unknowns are not numerically equal so we cannot immediately add or subtract the equations in order to eliminate an unknown.

Instead, we multiply one of the equations by a number as preparation before we add or subtract.

**N.B.** Always *multiply an equation by a positive number* to reduce the possibility of errors.

The 1st equation is multiplied by 3 so that the coefficients of y become 3 and -3 i.e. they are numerically equal  $\rightarrow \times 3$

$$\begin{array}{r} 3x + y = -5 \\ 5x - 3y = -13 \\ \hline 9x + 3y = -15 \\ 5x - 3y = -13 \\ \hline 14x = -28 \\ \hline x = -2 \\ \hline -6 + y = -5 \\ \hline y = 1 \\ \hline x = -2, y = 1 \end{array}$$

Write out the 2nd equation again so that it is easier to do the next step  $\leftarrow$

The rest of the working is exactly as before  $\leftarrow$

**E.g. 1** Solve the simultaneous equations  $2x + y = 5$  and  $3x - 2y = 11$  algebraically.

**E.g. 2** Solve the simultaneous equations  $4x + 3y = 20$  and  $2x + 5y = 24$  algebraically.

**Video A:**

**Video B:**

[Solving simultaneous equations algebraically](#)

[Solving simultaneous equations algebraically](#)

[Solutions to Starter and E.g.s](#)

### Exercise

9-1 class textbook:	p381 M12.4 Qu 1-9
A*-G class textbook:	p346 M12.4 Qu 1-9
9-1 homework book:	See the 6 questions below
A*-G homework book:	See the 6 questions below

### Questions

Solve these pairs of simultaneous equations.

- $x + 2y = 8$  and  $2x + y = 7$
- $x + 2y = 17$  and  $8x + 3y = 45$
- $2x + 5y = 24$  and  $4x + 3y = 20$
- $x - 2y = -4$  and  $3x + y = 9$
- $2a + 3b = 9$  and  $4a + b = 13$
- $2x + y = 5$  and  $3x - 2y = 4$

**Answers**

1.  $x = 2, y = 3$

2.  $x = 3, y = 7$

3.  $x = 2, y = 4$

4.  $x = 2, y = 3$

5.  $a = 3, b = 1$

6.  $x = 2, y = 1$

**Summary**

Always multiply simultaneous equations by a positive number before adding or subtracting.

[Homework book answers \(only available during a lockdown\)](#)

