

Simultaneous Equations — Manipulation of Both Equations

Starter

1. Solve the simultaneous equations $5x - 7y = 27$
 $3x - 4y = 16$

Notes

Our final step is to solve equations like:

$$\begin{aligned} 5x - 7y &= 27 \\ 3x - 4y &= 16 \end{aligned}$$

In these cases, you can choose to eliminate x or y but try to choose the one that multiplies the equations by the smallest numbers.

With the example above, I suggest multiplying the first equation by 3 and the second equation by 5. In this way the coefficients of x both become 15.

If you wanted to prepare the coefficients of y ready for the elimination of y , multiply the first equation by 4 and the second equation by 7.

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

To eliminate x

The 1st equation is multiplied by 3 so that the coefficient of x is 15

The 2nd equation is multiplied by 5 so that the coefficient of x is 15

$$\begin{array}{r} 5x - 7y = 27 \\ 3x - 4y = 16 \\ \times 3 \quad \underline{15x - 21y = 81} \\ \times 5 \quad \underline{15x - 20y = 80} \\ \text{Sub.} \quad \quad \quad -y = 1 \\ \quad \quad \quad \quad \quad \underline{y = -1} \\ 5x + 7 = 27 \\ \quad \quad \quad \quad \quad \underline{5x = 20} \\ \quad \quad \quad \quad \quad \underline{x = 4} \\ x = 4, y = -1 \end{array}$$

Remember: $-21 - -20 = -1$

The rest of the working is exactly as before

E.g. 1 Solve the simultaneous equations $2x + 3y = 5$ and $5x - 2y = -16$.

Working: To eliminate y

The 1st equation is multiplied by 2 so that the coefficient of y is 6

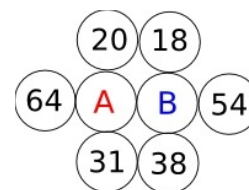
The 2nd equation is multiplied by 3 so that the coefficient of y is -6

$$\begin{array}{r} 2x + 3y = 5 \\ 5x - 2y = -16 \\ \times 2 \quad \underline{4x + 6y = 10} \\ \times 3 \quad \underline{15x - 6y = -48} \\ \text{Add} \quad \quad \quad 19x = -38 \\ \quad \quad \quad \quad \quad \underline{x = -2} \\ -4 + 3y = 5 \\ \quad \quad \quad \quad \quad \underline{3y = 9} \\ \quad \quad \quad \quad \quad \underline{y = 3} \\ x = -2, y = 3 \end{array}$$

The rest of the working is exactly as before

E.g. 2 Solve the simultaneous equations $2x + 7y = 17$ and $5x + 3y = -1$.

E.g. 3* Ali (A) and Baba (B) are shown surrounded by six thieves. The thieves' ages are given. Ali's age is the average of his four nearest neighbours', and so is Baba's. How old is Ali?



Video A:

[Solving simultaneous equations algebraically](#)

Video B:

[Solving simultaneous equations algebraically](#)

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

Exercise

9-1 class textbook:	p381 M12.4 Qu 10-24
A*-G class textbook:	p346 M12.4 Qu 10-24
9-1 homework book:	p128 M12.4 Qu 1-12
A*-G homework book:	p96 M12.4 Qu 1-12

Summary

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

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