

Simultaneous Equations

Solutions

For AQA GCSE Mathematics (8300) • Foundation tier

Each question is shown in grey, followed by the working, one step per line. The final answer is in a box. *Marks* shows how the marks are usually given in the exam, and **Tip** points out a common mistake.

1 (3 marks)

Solve the simultaneous equations

$$x + y = 10$$

$$x - y = 4$$

The y-terms are +y and -y. They have different signs, so add the equations.

$$(x + y) + (x - y) = 10 + 4$$

$$2x = 14$$

Divide both sides by 2: $x = 7$

Substitute $x = 7$ into $x + y = 10$: $7 + y = 10$

So $y = 3$

Check in the other equation: $7 - 3 = 4$ ✓

Answer: $x = 7, y = 3$

Marks: 1 mark for adding the equations. 1 mark for $x = 7$. 1 mark for $y = 3$.

2 (3 marks)

Solve the simultaneous equations

$$3x + y = 13$$

$$x - y = 3$$

The y-terms are +y and -y, so add the equations.

$$4x = 16$$

Divide both sides by 4: $x = 4$

Substitute $x = 4$ into $x - y = 3$: $4 - y = 3$

So $y = 1$

Check: $3 \times 4 + 1 = 13$ ✓

Answer: $x = 4, y = 1$

Marks: 1 mark for eliminating y . 1 mark for $x = 4$. 1 mark for $y = 1$.

3 (3 marks)

Solve the simultaneous equations

$$2x + 3y = 12$$

$$2x + y = 8$$

Both equations have $+2x$. Same sign, so subtract the equations.

$$(2x + 3y) - (2x + y) = 12 - 8$$

$$2y = 4$$

Divide both sides by 2: $y = 2$

Substitute $y = 2$ into $2x + y = 8$: $2x + 2 = 8$

So $2x = 6$ and $x = 3$

Check: $2 \times 3 + 3 \times 2 = 12$ ✓

Answer: $x = 3, y = 2$

Tip: If the terms you want to remove have the **same** sign, subtract. If they have **different** signs, add.

Marks: 1 mark for subtracting to eliminate x . 1 mark for $y = 2$. 1 mark for $x = 3$.

4 (3 marks)

Solve the simultaneous equations

$$3x + 2y = 14$$

$$x + 4y = 8$$

No terms match yet, so multiply one equation first.

Multiply the first equation by 2: $6x + 4y = 28$

Now both have $+4y$, so subtract $x + 4y = 8$:

$$5x = 20$$

Divide both sides by 5: $x = 4$

Substitute $x = 4$ into $x + 4y = 8$: $4 + 4y = 8$

So $4y = 4$ and $y = 1$

Check: $3 \times 4 + 2 \times 1 = 14$ ✓

Answer: $x = 4$, $y = 1$

Tip: When you multiply an equation, multiply **every** term, including the number on the right:
 $2 \times 14 = 28$.

Marks: 1 mark for multiplying to get equal coefficients. 1 mark for eliminating a letter. 1 mark for both answers.

5 (3 marks)

Solve the simultaneous equations

$$4x - 3y = 11$$

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

Multiply the second equation by 2: $4x + 10y = -2$

Now both have $+4x$, so subtract this from the first equation:

$$(4x - 3y) - (4x + 10y) = 11 - (-2)$$

$$-13y = 13$$

Divide both sides by -13 : $y = -1$

Substitute $y = -1$ into $4x - 3y = 11$: $4x + 3 = 11$

So $4x = 8$ and $x = 2$

Check: $2 \times 2 + 5 \times (-1) = -1$ ✓

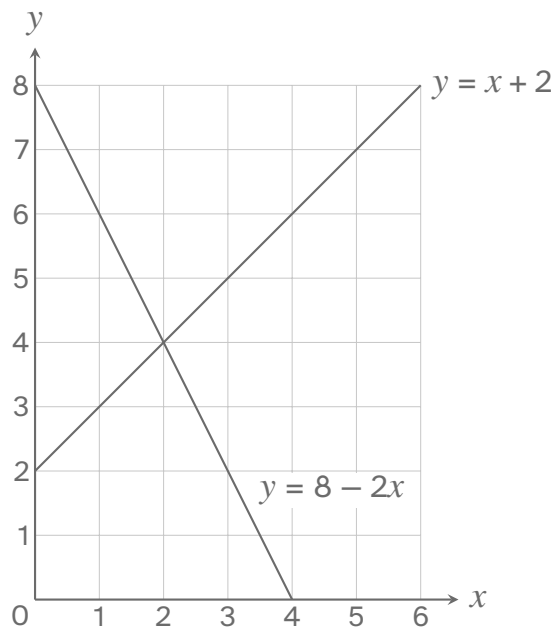
Answer: $x = 2, y = -1$

Tip: Take care with negatives when you subtract: $-3y - 10y = -13y$ and $11 - (-2) = 13$.

Marks: 1 mark for getting equal coefficients. 1 mark for eliminating a letter. 1 mark for both answers.

6 (1 mark)

The graphs of $y = x + 2$ and $y = 8 - 2x$ are drawn on the grid.



Use the graphs to solve the simultaneous equations

$$y = x + 2$$

$$y = 8 - 2x$$

The solution is where the two lines cross.

They cross at the point (2, 4).

Check: $2 + 2 = 4$ and $8 - 2 \times 2 = 4$ ✓

Answer: $x = 2, y = 4$

Tip: Read off the point where the lines cross, not where they meet the axes.

7 (4 marks)

3 burgers and 2 drinks cost £13

1 burger and 2 drinks cost £7

Work out the cost of one burger and the cost of one drink.

Let a burger cost £ b and a drink cost £ d .

$$3b + 2d = 13$$

$$b + 2d = 7$$

Both have $+2d$, so subtract the equations: $2b = 6$

Divide both sides by 2: $b = 3$

Substitute $b = 3$ into $b + 2d = 7$: $3 + 2d = 7$

So $2d = 4$ and $d = 2$

Check: $3 \times 3 + 2 \times 2 = 13$ ✓

Answer: Burger £3, drink £2

Tip: If you use trial and improvement, your answer must work in **both** statements. Setting up two equations is more reliable.

Marks: 1 mark for two correct equations. 1 mark for eliminating a letter. 1 mark for £3. 1 mark for £2.

8 (2 marks)

Here are two equations.

$$2x + y = 11$$

$$x - 3y = 4$$

Anna says the solution is $x = 5$, $y = 1$

Is she correct? Tick a box.

Show working to support your answer.

Substitute $x = 5$ and $y = 1$ into both equations.

First: $2 \times 5 + 1 = 11$ ✓

Second: $5 - 3 \times 1 = 2$, but it should be 4 ✗

The values only work in one equation.

So Anna is not correct.

Answer: No, because $x = 5$, $y = 1$ does not satisfy $x - 3y = 4$.

Tip: A solution must work in **both** equations. Checking only the first one is not enough.

Marks: 1 mark for substituting into both equations. 1 mark for No with the correct values.

9 (3 marks)

Two numbers have a sum of 31 and a difference of 7

Work out the two numbers.

Call the two numbers a and b , with a the larger.

Sum: $a + b = 31$

Difference: $a - b = 7$

Add the equations: $2a = 38$

Divide both sides by 2: $a = 19$

Then $b = 31 - 19 = 12$

Check: $19 - 12 = 7$ ✓

Answer: 19 and 12

Marks: 1 mark for two correct equations. 1 mark for $2a = 38$. 1 mark for 19 and 12.

10 (3 marks)

Solve the simultaneous equations

$$5x + 2y = 20$$

$$3x - 2y = 4$$

The y-terms are $+2y$ and $-2y$, so add the equations.

$$8x = 24$$

Divide both sides by 8: $x = 3$

Substitute $x = 3$ into $5x + 2y = 20$: $15 + 2y = 20$

$$\text{So } 2y = 5$$

Divide both sides by 2: $y = 2.5$

Answer: $x = 3$, $y = 2.5$

Tip: $2y = 5$ means $y = 5 \div 2 = 2.5$. Answers do not have to be whole numbers.

Marks: 1 mark for adding the equations. 1 mark for $x = 3$. 1 mark for $y = 2.5$.
