

Simultaneous Equations

Solutions

For Pearson Edexcel GCSE Mathematics (1MA1) • 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

$$3x + y = 11$$

$$x + y = 5$$

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

$$(3x + y) - (x + y) = 11 - 5$$

$$2x = 6$$

Divide both sides by 2: $x = 3$

Substitute $x = 3$ into $x + y = 5$: $3 + y = 5$

So $y = 2$

Check: $3 \times 3 + 2 = 11$ ✓

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 eliminating y . 1 mark for $x = 3$. 1 mark for $y = 2$.

2 (3 marks)

Solve the simultaneous equations

$$2x + 5y = 19$$

$$2x - y = 1$$

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

$$(2x + 5y) - (2x - y) = 19 - 1$$

$$5y - (-y) = 6y, \text{ so } 6y = 18$$

Divide both sides by 6: $y = 3$

Substitute $y = 3$ into $2x - y = 1$: $2x - 3 = 1$

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

Check: $2 \times 2 + 5 \times 3 = 19$ ✓

Answer: $x = 2, y = 3$

Tip: Subtracting a negative is the same as adding: $5y - (-y) = 6y$, not $4y$.

Marks: 1 mark for eliminating x . 1 mark for $y = 3$. 1 mark for $x = 2$.

3 (3 marks)

Solve the simultaneous equations

Show clear algebraic working.

$$3x + 2y = 18$$

$$2x - y = 5$$

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

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

$$7x = 28$$

Divide both sides by 7: $x = 4$

Substitute $x = 4$ into $2x - y = 5$: $8 - y = 5$

So $y = 3$

Check: $3 \times 4 + 2 \times 3 = 18$ ✓

Answer: $x = 4, y = 3$

Tip: Multiply **every** term in the equation, including the number on the right: $2 \times 5 = 10$.

Marks: 1 mark for a correct method to eliminate one letter. 1 mark for substituting to find the other. 1 mark for both answers.

4 (3 marks)

Solve algebraically the simultaneous equations

$$5x + 3y = 21$$

$$2x + 5y = 16$$

No terms match, so multiply both equations.

Multiply the first by 5: $25x + 15y = 105$

Multiply the second by 3: $6x + 15y = 48$

Both have $+15y$, so subtract: $19x = 57$

Divide both sides by 19: $x = 3$

Substitute $x = 3$ into $5x + 3y = 21$: $15 + 3y = 21$

So $3y = 6$ and $y = 2$

Check: $2 \times 3 + 5 \times 2 = 16$ ✓

Answer: $x = 3, y = 2$

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

5 (3 marks)

Solve the simultaneous equations

$$4x + y = 7$$

$$3x - 2y = 19$$

Multiply the first equation by 2: $8x + 2y = 14$

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

$$11x = 33$$

Divide both sides by 11: $x = 3$

Substitute $x = 3$ into $4x + y = 7$: $12 + y = 7$

$$\text{So } y = 7 - 12 = -5$$

$$\text{Check: } 3 \times 3 - 2 \times (-5) = 9 + 10 = 19 \quad \checkmark$$

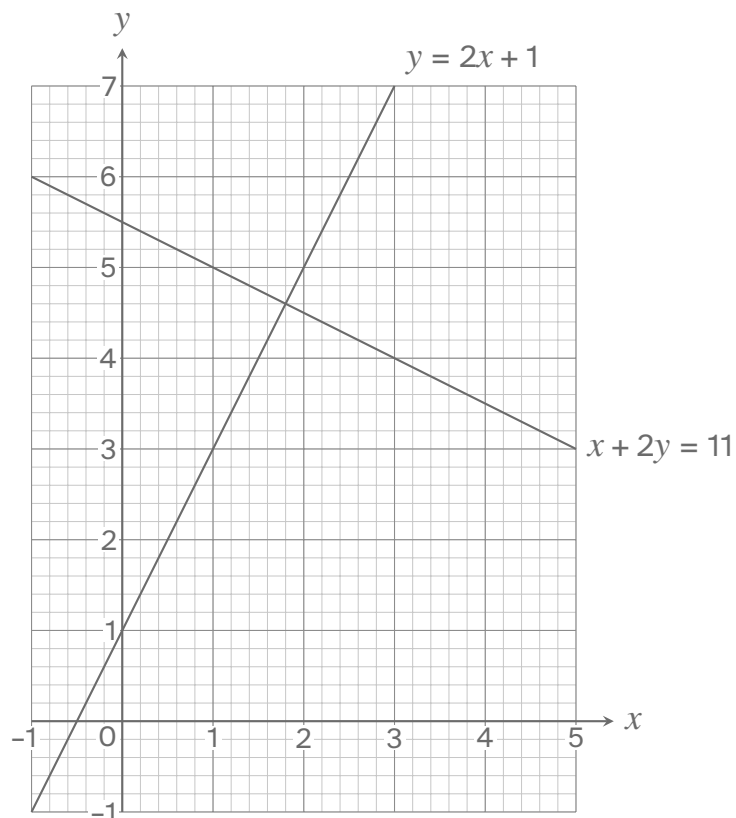
Answer: $x = 3, y = -5$

Tip: $12 + y = 7$ gives $y = -5$. Do not lose the minus sign.

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

6 (1 mark)

The graphs of $y = 2x + 1$ and $x + 2y = 11$ are drawn on the grid.



Use the graphs to solve the simultaneous equations

$$y = 2x + 1$$

$$x + 2y = 11$$

The solution is where the two lines cross.

Reading from the grid, they cross at (1.8, 4.6).

Check: $2 \times 1.8 + 1 = 4.6$ ✓

and $1.8 + 2 \times 4.6 = 11$ ✓

Answer: $x = 1.8$, $y = 4.6$ (accept readings close to these)

Tip: Use the crossing point of the two lines, not where they meet the axes. Give x first, then y .

7 (3 marks)

The sum of two numbers is 45

The difference between the two numbers is 11

Work out the two numbers.

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

Sum: $a + b = 45$

Difference: $a - b = 11$

Add the equations: $2a = 56$

Divide both sides by 2: $a = 28$

Then $b = 45 - 28 = 17$

Check: $28 - 17 = 11$ ✓

Answer: 28 and 17

Marks: 1 mark for two correct equations. 1 mark for $2a = 56$. 1 mark for 28 and 17.

8 (4 marks)

2 adult tickets and 3 child tickets for a cinema cost £41

1 adult ticket and 2 child tickets cost £24

Work out the cost of one adult ticket and the cost of one child ticket.

Let an adult ticket cost £ a and a child ticket cost £ c .

$$2a + 3c = 41$$

$$a + 2c = 24$$

Multiply the second equation by 2: $2a + 4c = 48$

Both have $+2a$, so subtract: $(2a + 4c) - (2a + 3c) = 48 - 41$

$$c = 7$$

Substitute $c = 7$ into $a + 2c = 24$: $a + 14 = 24$

So $a = 10$

Check: $2 \times 10 + 3 \times 7 = 41$ ✓

Answer: Adult £10, child £7

Tip: Do not assume the two tickets cost the same. Any guess must work in **both** statements.

Marks: 1 mark for two correct equations. 1 mark for a correct method to eliminate a letter. 1 mark for £10. 1 mark for £7.

9 (4 marks)

Kay buys 4 apples and 3 pears for £1.80

Joe buys 2 apples and 5 pears for £2.02

Work out the cost of one apple and the cost of one pear.

Work in pence: £1.80 = 180p and £2.02 = 202p.

Let an apple cost a pence and a pear cost p pence.

$$4a + 3p = 180$$

$$2a + 5p = 202$$

Multiply the second equation by 2: $4a + 10p = 404$

Both have $+4a$, so subtract: $7p = 224$

Divide both sides by 7: $p = 32$

Substitute $p = 32$ into $4a + 3p = 180$: $4a + 96 = 180$

So $4a = 84$ and $a = 21$

Check: $2 \times 21 + 5 \times 32 = 42 + 160 = 202$ ✓

Answer: Apple 21p, pear 32p

Tip: Change the prices to pence first. This avoids decimals in your equations.

Marks: 1 mark for two correct equations. 1 mark for a correct method to eliminate a letter. 1 mark for 21. 1 mark for 32.
