Solving simultaneous equations graphically

Worked solutions

GCSE Maths topic practice

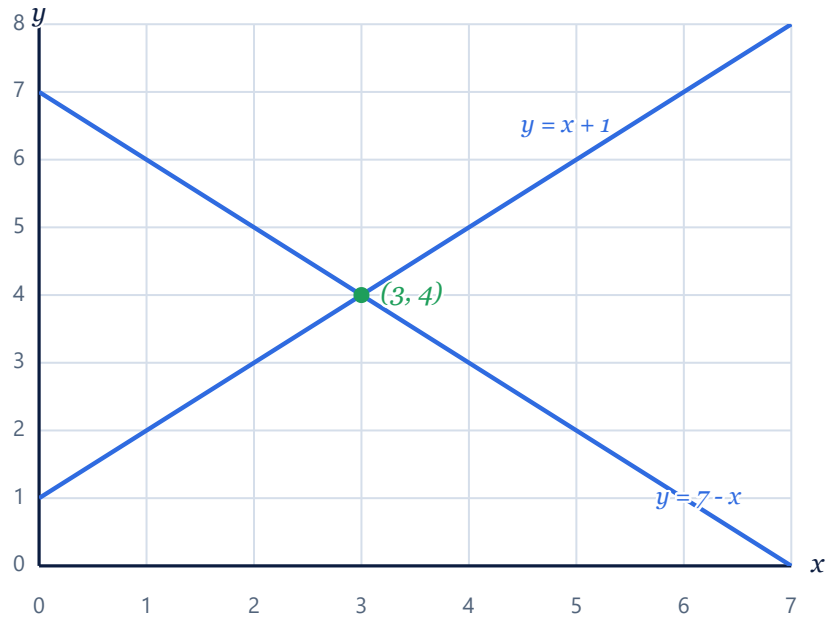
This topic online

1 The graphs of $y = x + 1$ and $y = 7 - x$ are drawn on the grid.

Use the graphs to solve the simultaneous equations

$y = x + 1$

$y = 7 - x$



(1 mark)

The lines cross at (3, 4)

Check

$3 + 1 = 4$

$7 - 3 = 4$

$x = 3, y = 4$

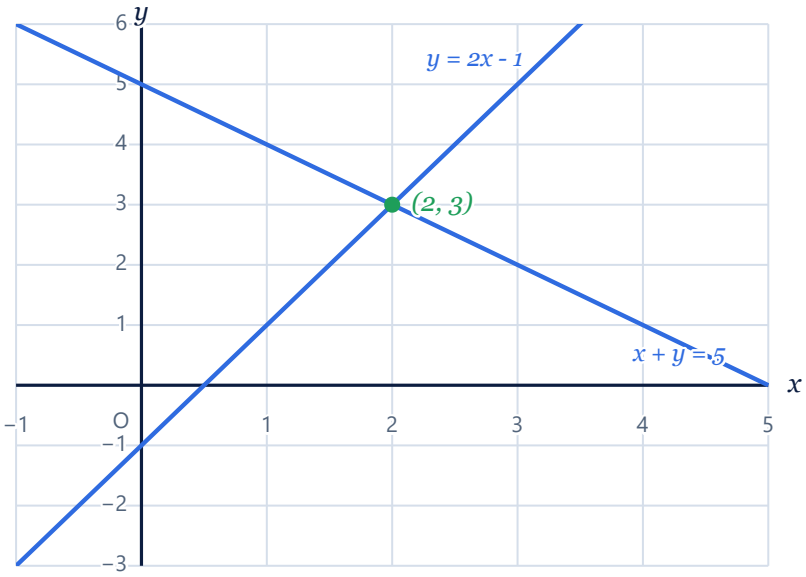
Free for classroom and home use: print, photocopy and share. Not for resale or re-hosting.

2 The graphs of $y = 2x - 1$ and $x + y = 5$ are drawn on the grid.

Use the graphs to solve the simultaneous equations

$y = 2x - 1$

$x + y = 5$



(1 mark)

The lines cross at (2, 3)

Check

$2 \times 2 - 1 = 3$

$2 + 3 = 5$

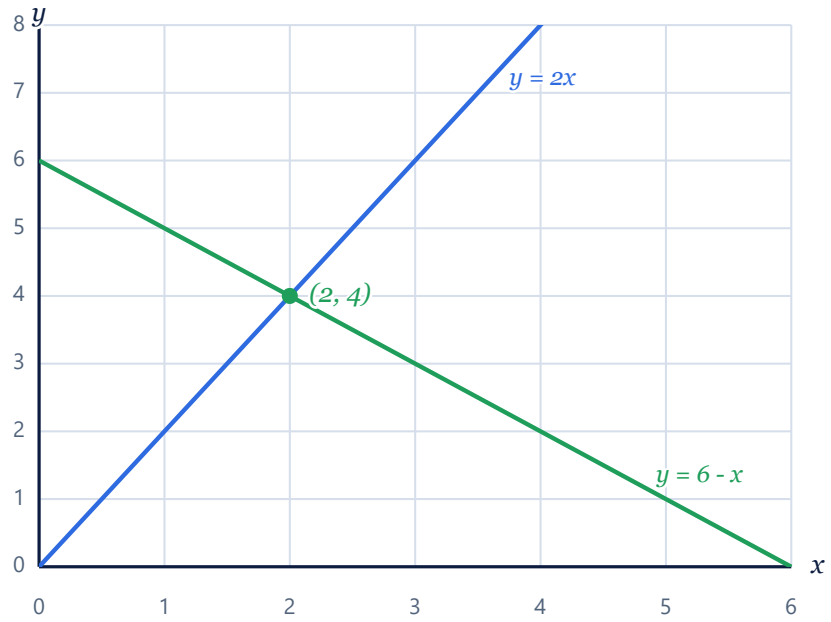
$x = 2, y = 3$

Free for classroom and home use: print, photocopy and share. Not for resale or re-hosting.

3 The graph of $y = 2x$ is drawn on the grid.

a. On the same grid, draw the graph of $y = 6 - x$ for values of x from 0 to 6

b. Use your graphs to solve the simultaneous equations $y = 2x$ and $y = 6 - x$



(3 marks)

a) Points on $y = 6 - x$

(0, 6), (3, 3), (6, 0)

Straight line through these points

b) The lines cross at (2, 4)

Check

$2 \times 2 = 4$

$6 - 2 = 4$

$x = 2, y = 4$

Free for classroom and home use: print, photocopy and share. Not for resale or re-hosting.

4 The graph of $x + y = 10$ is drawn on the grid.

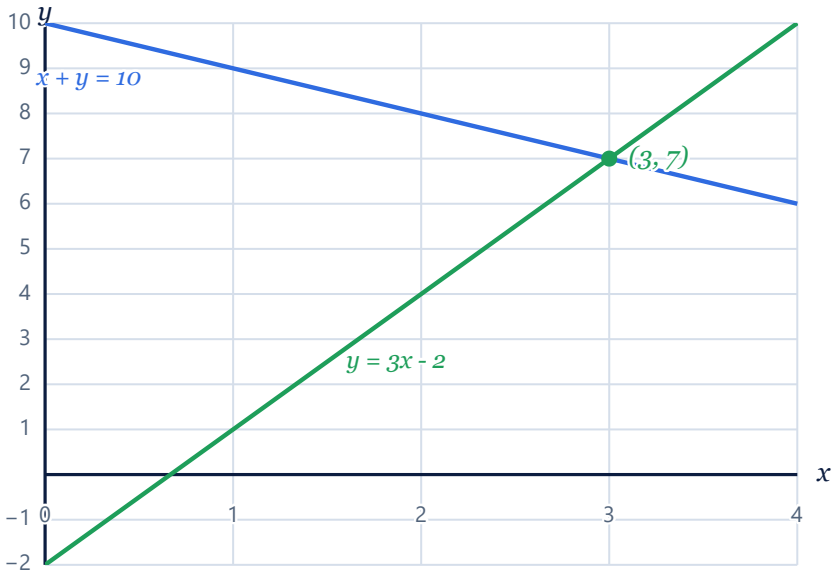
a. Complete the table of values for $y = 3x - 2$

x	0	1	2	3	4
y		1		7	

Write the missing values for $x = 0$, 2 and 4, in that order.

b. On the grid, draw the graph of $y = 3x - 2$

c. Use your graphs to solve the simultaneous equations $x + y = 10$ and $y = 3x - 2$



(4 marks)

a)

$3 \times 0 - 2 = -2$

$3 \times 2 - 2 = 4$

$3 \times 4 - 2 = 10$

-2, 4, 10

b) Plot every point in the table and join

Straight line from (0, -2) to (4, 10)

c) The lines cross at (3, 7)

Check

$3 + 7 = 10$

$3 \times 3 - 2 = 7$

$x = 3$, $y = 7$

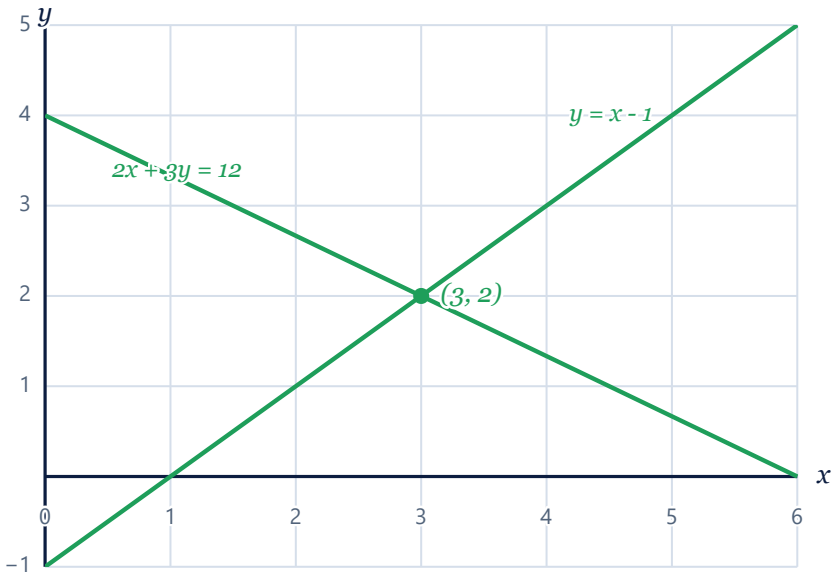
Free for classroom and home use: print, photocopy and share. Not for resale or re-hosting.

5 a. On the grid, draw the graphs of $2x + 3y = 12$ and $y = x - 1$ for values of x from 0 to 6

b. Use your graphs to solve the simultaneous equations

$2x + 3y = 12$

$y = x - 1$



(4 marks)

a) $2x + 3y = 12$

When $x = 0$

$3y = 12$

$y = 4$

When $x = 6$

$12 + 3y = 12$

$y = 0$

(0, 4), (6, 0)

$y = x - 1$

(0, −1), (3, 2), (6, 5)

Both lines drawn with a ruler

b) The lines cross at (3, 2)

Check

$2 \times 3 + 3 \times 2 = 12$

$3 - 1 = 2$

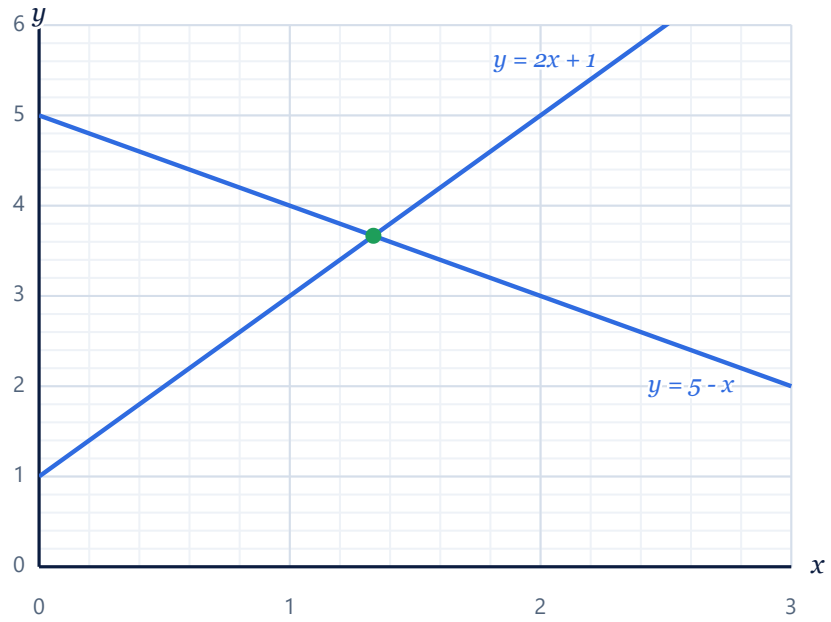
$x = 3, y = 2$

Free for classroom and home use: print, photocopy and share. Not for resale or re-hosting.

6 The graphs of $y = 2x + 1$ and $y = 5 - x$ are drawn on the grid.

a. Use the graphs to estimate the solution of the simultaneous equations $y = 2x + 1$ and $y = 5 - x$.
Give each value to 1 decimal place.

b. Explain why your answer to part (a) is only an estimate.



(3 marks)

a) Read the crossing point carefully

one small square = 0.2

$x \approx 1.3, y \approx 3.7$

b)

The lines cross between grid lines

Values can only be read approximately

7 Maya wants to solve these simultaneous equations by drawing their graphs.

$y = 2x + 3$

$4x - 2y = 2$

Explain why she will not find a solution.

(2 marks)

Make y the subject

$$\begin{array}{lrcll} & 4x - 2y & = & 2 & \\ +2y & 4x & = & 2 + 2y & +2y \\ -2 & 4x - 2 & = & 2y & -2 \\ \div 2 & 2x - 1 & = & y & \div 2 \end{array}$$

Both lines have gradient 2

Parallel lines never cross, so no solution

Free for classroom and home use: print, photocopy and share. Not for resale or re-hosting.

8 Two taxi firms work out their prices like this.

Firm A: £3 plus £2 per mile, so $y = 2x + 3$

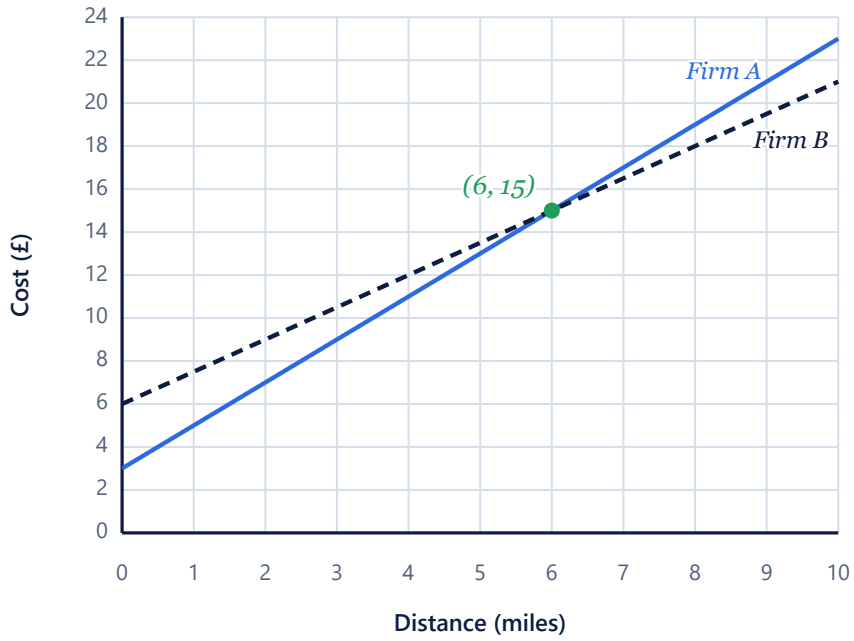
Firm B: £6 plus £1.50 per mile, so $y = 1.5x + 6$

x is the number of miles and y is the cost in pounds. The graph shows both lines.

a. For what distance do both firms charge the same?

b. What is the cost for this distance?

c. Which firm is cheaper for a 10 mile journey?



(4 marks)

a) The lines cross at (6, 15)

6 miles

b) Check

$2 \times 6 + 3 = 15$

$1.5 \times 6 + 6 = 15$

£15

c) 10 miles

A: $2 \times 10 + 3 = 23$

B: $1.5 \times 10 + 6 = 21$

Firm B

Free for classroom and home use: print, photocopy and share. Not for resale or re-hosting.

9 Aisha says the graphs of $3x + y = 11$ and $y = 2x - 4$ cross at the point (2, 5).

a. Is Aisha correct? You must show your working.

b. Find the point where the two graphs cross.

(3 marks)

a) Test (2, 5) in both

$3 \times 2 + 5 = 11$

$2 \times 2 - 4 = 0$

0 is not 5, so (2, 5) is not on $y = 2x - 4$

No, Aisha is wrong

b) Put $y = 2x - 4$ into $3x + y = 11$

$$\begin{aligned} 3x + 2x - 4 &= 11 \\ 5x - 4 &= 11 \\ +4 \quad 5x &= 15 \quad +4 \\ \div 5 \quad x &= 3 \quad \div 5 \\ y &= 2 \times 3 - 4 \\ &= 2 \end{aligned}$$

(3, 2)

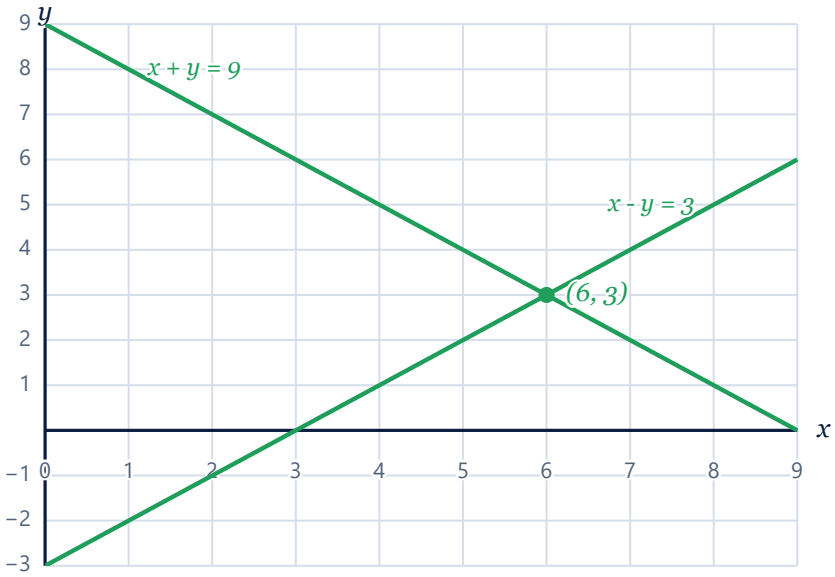
Free for classroom and home use: print, photocopy and share. Not for resale or re-hosting.

10 Two numbers, x and y, add up to 9. Their difference, $x - y$, is 3.

a. Write down two equations in x and y.

b. On the grid, draw the graphs of your two equations for values of x from 0 to 9

c. Use your graphs to find the two numbers.



(4 marks)

a)

$x + y = 9$

$x - y = 3$

b) $x + y = 9$

(0, 9), (4, 5), (9, 0)

$x - y = 3$ is $y = x - 3$

(3, 0), (6, 3), (9, 6)

c) The lines cross at (6, 3)

Check

$6 + 3 = 9$

$6 - 3 = 3$

$\boxed{x = 6, y = 3}$

Free for classroom and home use: print, photocopy and share. Not for resale or re-hosting.