

# Solving simultaneous equations by drawing graphs

Year 8 About 70 minutes No calculator 45 marks



Hints online, answers free with an account:  
mathswariz.uk/worksheets/ks3-year-8-solving-simultaneous-equations-by-drawing-graphs/

Date \_\_\_\_\_

## A Do Now

Quick questions to start.

**A1** Last lesson [1 mark]

Where does the line  $2y + 3x = 12$  cross the  $x$ -axis?

Answer \_\_\_\_\_

**A2** Needed today [1 mark]

Work out the value of  $3x - 2y$  when  $x = 4$  and  $y = -2$ .

Answer \_\_\_\_\_

**A3** From chapter 10 [1 mark]

A cylinder has radius 5 cm and height 4 cm. Work out its curved surface area. Leave your answer in terms of  $\pi$ .

Answer \_\_\_\_\_

**A4** Year 7 [1 mark]

Solve  $5x - 7 = 2x + 8$ .

Answer \_\_\_\_\_

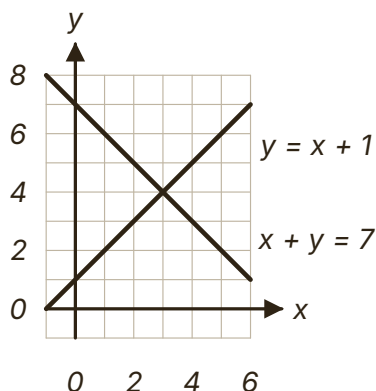
## B Example, then your turn

Year 8

Your teacher works through each example with you. Then try the one beside it.

### EXAMPLE 1

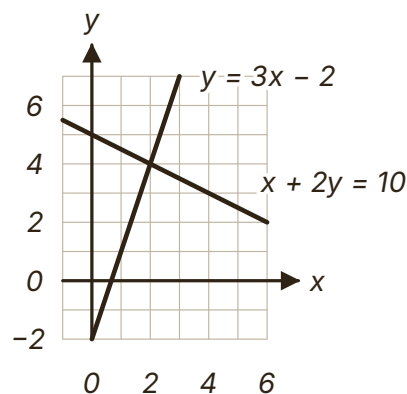
The graphs of  $y = x + 1$  and  $x + y = 7$  are drawn. Use them to solve the simultaneous equations.



**Hint** The solution is the one point that is on both lines.

**B1** The graphs of  $y = 3x - 2$  and  $x + 2y = 10$  are drawn. Use [2 marks]

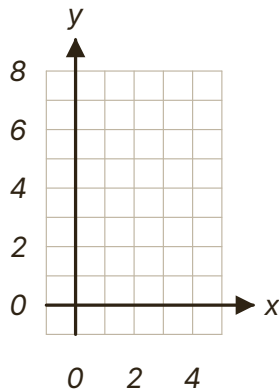
them to solve the simultaneous equations.



Answer  $x = \dots\dots$   $y = \dots\dots$

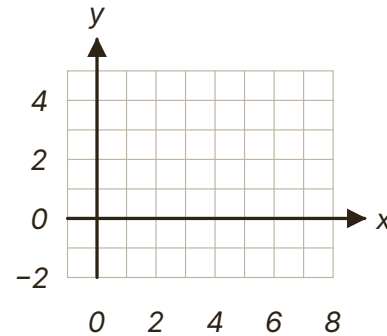
**EXAMPLE 2**

Draw the graphs of  $2x + y = 8$  and  $y = x + 2$  on the grid. Use them to solve the simultaneous equations.



**Hint**  $2x + y = 8$  crosses the axes at  $(0, 8)$  and  $(4, 0)$ .  
For  $y = x + 2$ , find two points such as  $(0, 2)$  and  $(3, 5)$ .

**B2** Draw the graphs of  $x + 2y = 8$  [3 marks]  
and  $y = 2x - 1$  on the grid.  
Use them to solve the simultaneous equations.



Answer  $x = \dots\dots$   $y = \dots\dots$

**EXAMPLE 3**

Is  $x = 4, y = -1$  the solution of  $2x + 3y = 5$   
and  $x - y = 5$ ?

**Hint** Put the values into both equations. Both must be true.

**B3** Is  $x = 3, y = 2$  the solution of [2 marks]  
 $3x - y = 7$  and  $x + 2y = 8$ ?  
Show how you decide.

**EXAMPLE 4**

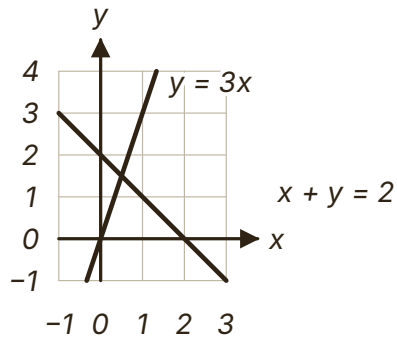
Explain why  $y = 2x + 1$  and  $2y - 4x = 6$  have  
no solution.

**Hint** Rearrange the second equation into the form  
 $y = mx + c$ .

**B4** How many solutions do [2 marks]  
 $x + 2y = 6$  and  $2x + 4y = 12$   
have? Give a reason.

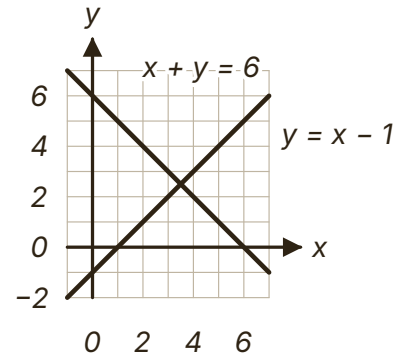
**EXAMPLE 5**

The graphs of  $y = 3x$  and  $x + y = 2$  are drawn. Use them to solve the simultaneous equations.



**Hint** The lines cross between two gridlines: read the halfway value.

- B5** The graphs of  $y = x - 1$  and  $x + y = 6$  are drawn. Use them to solve the simultaneous equations. [2 marks]

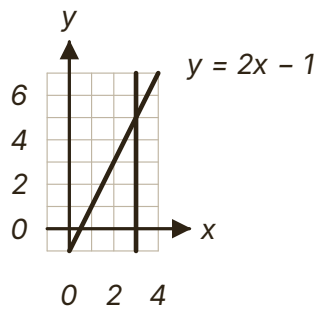


Answer  $x = \dots\dots$   $y = \dots\dots$

**c Practice**

Year 8

- C1** The graphs of  $x = 3$  and  $y = 2x - 1$  are drawn. Write down the solution of the simultaneous equations. [2 marks]



Answer  $x = \dots\dots$   $y = \dots\dots$

- C2** Two numbers  $x$  and  $y$  add up to 11. Their difference,  $x - y$ , is 5. Write down two equations, and solve them. [3 marks]

Answer .....

- C3** The lines  $x + y = 3$  and  $y = mx + 6$  cross at the point  $(-1, 4)$ . Work out the value of  $m$ . [2 marks]

Answer .....

- C4** Which pair of equations has the solution  $x = 2, y = -1$ ? [2 marks]  
 A:  $x + y = 1$  and  $y = x - 3$   
 B:  $x + y = 1$  and  $y = 2x + 1$   
 C:  $x - y = 3$  and  $x + y = 3$

Answer .....

**D1**

Ana says, "The solution of  $x + y = 6$  and  $y = x + 2$  is  $x = 4$ ,  $y = 2$ , because  $4 + 2 = 6$ ."

[4 marks]

Explain why Ana is wrong. Find the correct solution.

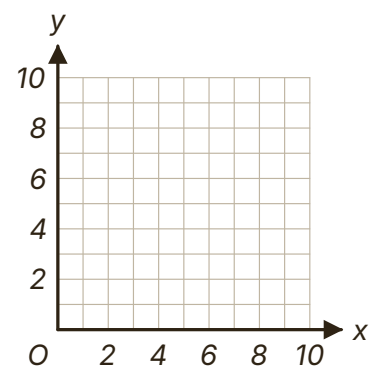
Answer  $x = \dots\dots$   $y = \dots\dots$

**D2** At a museum, 2 adult tickets and 1 child ticket cost £20 altogether. An adult ticket costs £4 more than a child ticket. Let a child ticket cost £ $x$  and an adult ticket cost £ $y$ .

- (a) Explain why  $x + 2y = 20$ . Write down a second [1 mark]  
equation.

Answer .....

- (b) Draw the graphs of  $x + 2y = 20$  and  $y = x + 4$  [2 marks]  
on the grid.



- (c) Use your graphs to find the cost of each ticket. [2 marks]

Answer child £ ..... adult £ .....

Total for D2: 5 marks

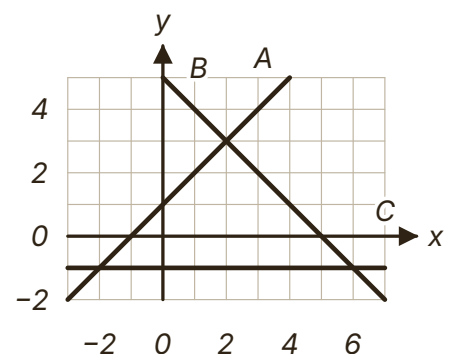
**D3** The lines  $A: y = x + 1$ ,  $B: x + y = 5$  and  $C: y = -1$  are drawn on the grid.

- (a) Solve the simultaneous equations [1 mark]  
 $y = x + 1$  and  $x + y = 5$ .

Answer  $x = \dots\dots$   $y = \dots\dots$

- (b) Solve the simultaneous equations [1 mark]  
 $y = x + 1$  and  $y = -1$ .

Answer  $x = \dots\dots$   $y = \dots\dots$



(c) The three lines make a triangle. Work out its area.

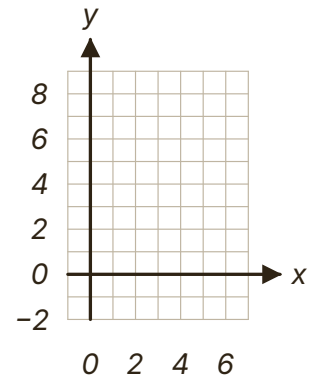
[2 marks]

Answer .....

Total for D3: 4 marks

- D4** Draw the graphs of  $3x + 2y = 18$  and  $y = x - 1$  on the grid. Use them to solve the simultaneous equations. [4 marks]

Answer  $x = \dots\dots$   $y = \dots\dots$



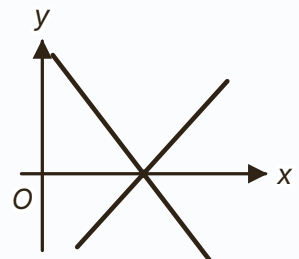
## E Extension

Stretch

No route is given. The hints are at the end of the sheet. Use one at a time.

- E1** The lines  $kx + 2y = 12$  and  $y = 2x - 6$  meet at a point on the  $x$ -axis. Work out the value of  $k$ . Then find where the line  $kx + 2y = 12$  crosses the  $y$ -axis. [4 marks]

Answer  $k = \dots\dots$   $(\dots\dots, \dots\dots)$



Not drawn accurately

### Extension hints

Cover these with paper. Uncover one at a time.

- E1** **Hint 1** On the  $x$ -axis  $y = 0$ . Find where  $y = 2x - 6$  crosses it.  
**Hint 2**  $y = 2x - 6$  crosses the  $x$ -axis at  $(3, 0)$ , so  $(3, 0)$  is on  $kx + 2y = 12$  too.  
**Hint 3**  $3k = 12$ . On the  $y$ -axis  $x = 0$ , so  $2y = 12$ .

### How did it go?

Colour one circle on each line: not yet, nearly, yes.

I can draw two lines on one grid and read where they cross.



I can check a solution by putting it into both equations.



I can explain why parallel lines give no solution.

