

9




Stretch lesson: Finding equations of straight lines

Stretch objectives

Before you start this chapter, mark how confident you feel about each of the statements below:

I can find the equation of a line through one point with a given gradient.

I can find the equation of a line through two given points.

Check-in questions

- Complete these questions to assess how much you remember about each topic. Then mark your work using the answers at the end of the lesson.
- If you score well on all sections, you can go straight to the Revision Checklist and Exam-style Questions at the end of the lesson. If you don't score well, go to the lesson section indicated and work through the examples and practice questions there.

- 1 A line has gradient 3 and goes through the point (4, -1). Find the equation of this line.

Go to 9.1 

9.1 Finding the equations of straight lines

You need to be able to find the equations of lines from key information. Remember the equation of a straight line is in the form $y = mx + c$.

Example 1 **Q** Find the equation of a line with gradient -3 that passes through the point $(-2, 10)$.

A Substitute the gradient ($m = -3$) and the given point ($x = -2, y = 10$) into the equation $y = mx + c$.

$$10 = (-3 \times -2) + c$$

$$10 = 6 + c$$

$$c = 4$$

So the equation of the line is $y = -3x + 4$.

Example 2 Q Find the equation of a line with gradient 4 that passes through the point $(\frac{1}{2}, 5)$.

A Substitute the gradient ($m = 4$) and the coordinates ($x = \frac{1}{2}, y = 5$) into the equation $y = mx + c$.

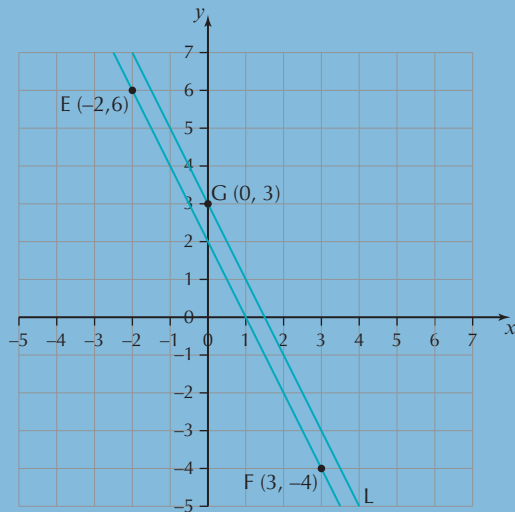
$$5 = (4 \times \frac{1}{2}) + c$$

$$5 = 2 + c$$

$$c = 3$$

So the equation of the line is $y = 4x + 3$.

Example 3 Q



The diagram shows three points: E $(-2, 6)$ F $(3, -4)$ G $(0, 3)$

Line L is parallel to EF and passes through G.

- Find the equation of line L.
- Write down the equation of a line that passes through the point G and is not parallel to L.

A a Gradient of L = gradient of EF

$$= \frac{\text{change in } y}{\text{change in } x}$$

$$= \frac{6 - (-4)}{-2 - 3}$$

$$= \frac{10}{-5}$$

$$= -2$$

Passes through G so y-intercept is $(0, 3)$.

Equation of L is $y = -2x + 3$.

- Equation of line is $y = kx + 3$, where k is any value except -2 .

Exam tips Take care to substitute coordinates carefully into the equation.

Practice questions

- 1 Find the equation of the line with gradient 4 which passes through (0, 7).
- 2 Find the equation of the line with gradient -1 which passes through (1, 4).
- 3 Find the equation of the line which passes through (0, 6) and (10, 8).
- 4 The line L_1 passes through (2, 4) and (9, 1). The line L_2 is parallel to L_1 but passes through (0, 2). Find the equation of L_2 .
- 5 The line L_1 passes through (0, 7) and (10, 6). The line L_2 is parallel to L_1 but passes through (0, 4). Find the equation of L_2 .

Exam-style questions

- 1 Work out the equation of the line which passes through (2, 4) and has a y -intercept of 2.
- 2 Kai has drawn a line which passes through (0, 10) and (10, 5).
Alexandra has drawn a line which passes through (4, 8) and (8, 6).
Kai says they have drawn segments of the same line. Is he correct?
Show your working.
- 3 The line L_1 passes through (1, 5) and (5, 7). The line L_2 has the same gradient but passes through (8, 2). Find the equation of L_2 .

Chapter 9 Stretch lesson: Answers

Check-in questions

1 $y = 3x - 13$

9.1 Finding the equations of straight lines

1 $y = 4x + 7$

2 $y = -x + 5$

3 $y = 0.2x + 6$

4 $y = -\frac{3}{7}x + 2$

5 $y = -0.1x + 4$

Exam-style questions

1 $y = x + 2$

2 The equation of Kai's line is $y = -0.5x + 10$.

Substituting the coordinates (4, 8) on Alexandra's line segment into the equation of Kai's line gives $8 = -0.5 \times 4 + 10$, $8 = -2 + 10$, $8 = 8$.

Substituting the coordinates (8, 6) on Alexandra's line segment into the equation of Kai's line gives $6 = -0.5 \times 8 + 10$, $6 = -4 + 10$, $6 = 6$. So the two lines are the same.

3 $y = 0.5x - 2$