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 $y = mx + c$.
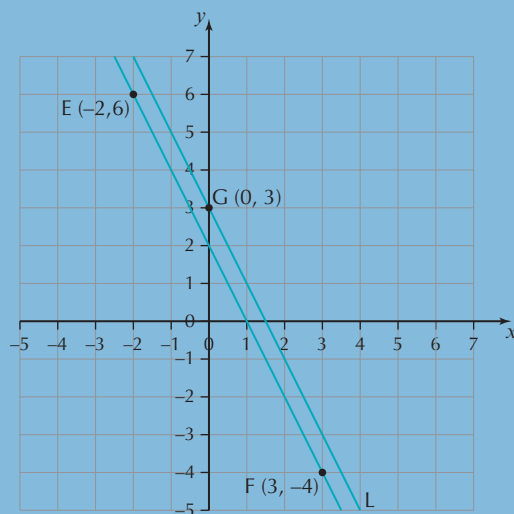
$5 = \left(4 \times \frac{1}{2}\right) + c$

$5 = 2 + c$

$c = 3$

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.

a Find the equation of line L.

b 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 $y = -2x + 3$.

b 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 $y = -\dfrac{3}{7}x + 2$

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 $y = 0.5x - 2$