

GCSE Maths: Parallel and perpendicular lines (Higher): answers

GCSE Maths - Straight-Line Graphs and Coordinates - Higher - Lesson 12.7

Answers. Final answers to the worksheet questions. Full step-by-step solutions for every question are free at websink.site/gcse/maths/ch12-straight-line-graphs-coordinates/higher/parallel-and-perpendicular-lines/

Exercise 12I Parallel lines Non-calculator

1 Write down the gradient of any line that is parallel to each of these lines.

(a) $y = 3x + 2$

Answer: 3

(b) $y = -x + 7$

Answer: -1

(c) $y = \frac{1}{2}x - 1$

Answer: $\frac{1}{2}$

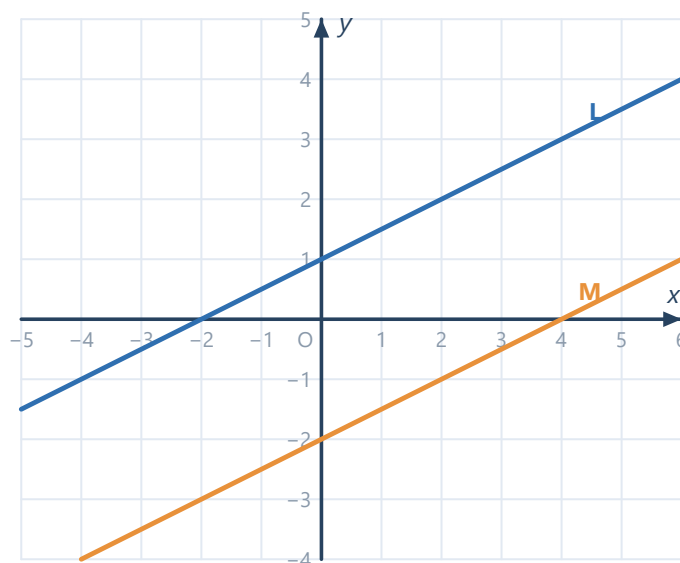
(d) $y = -2x + 5$

Answer: -2

2 Which of these lines are parallel to $y = 2x + 1$? A: $y = 2x - 3$ B: $y = x + 2$ C: $y = 2x$ D: $y = -2x + 1$

Answer: A and C

3 The grid shows two parallel lines L and M. Find the equation of each line.



(a) line L

Answer: $y = \frac{1}{2}x + 1$

(b) line M

Answer: $y = \frac{1}{2}x - 2$

4 Find the equation of the line parallel to the given line that passes through the given point.

(a) parallel to $y = 2x + 1$, through (3, 4)

Answer: $y = 2x - 2$

(b) parallel to $y = -x + 4$, through (2, 5)

Answer: $y = -x + 7$

(c) parallel to $y = \frac{1}{2}x + 3$, through (4, 0)

Answer: $y = \frac{1}{2}x - 2$

(d) parallel to $y = -3x$, through (-1, 2)

Answer: $y = -3x - 1$

5 Show that the two lines in each pair are parallel.

(a) $y = 2x + 3$ and $2y = 4x - 5$

Answer: Both have gradient 2

(b) $4x + 2y = 7$ and $y = -2x + 1$

Answer: Both have gradient -2

6 The vertices of quadrilateral ABCD are A(-2, -1), B(2, 1), C(3, 4) and D(-1, 2). Show that ABCD is a parallelogram.

Answer: Opposite sides have equal gradients

7 Find the value of k in each case so that the lines are parallel.

(a) $y = 3x + 1$ and $y = kx - 5$

Answer: $k = 3$

(b) $y = 10x$ and $y = 2kx + 1$

Answer: $k = 5$

8 On a map a straight road has equation $y = \frac{1}{2}x + 1$. A new straight railway runs parallel to the road and passes through the point (4, 6). Find the equation of the railway.

Answer: $y = \frac{1}{2}x + 4$

9 Explain why the lines $y = 2x + 1$ and $y = 2x + 4$ never meet.

Answer: Same gradient, different intercept: parallel

10 Here are six lines: A $y = 2x + 3$ B $y = -x + 2$ C $y = 2x - 4$ D $y = -x + 5$ E $y = \frac{1}{2}x$ F $y = 3$. Write down the pairs of parallel lines.

Answer: A and C; B and D

Exercise 12J Perpendicular lines

Non-calculator

1 Write down the gradient of a line perpendicular to a line with each gradient.

(a) 2

Answer: $-\frac{1}{2}$

(b) -3

Answer: $\frac{1}{3}$

(c) $\frac{3}{4}$

Answer: $-\frac{4}{3}$

(d) $-\frac{2}{5}$

Answer: $\frac{5}{2}$

2 Are the two lines perpendicular? Show your working.

(a) $y = 2x + 1$ and $y = -\frac{1}{2}x + 4$

Answer: Yes

(b) $y = 3x - 2$ and $y = 3x + 5$

Answer: No

(c) $y = \frac{3}{4}x$ and $y = -\frac{4}{3}x + 1$

Answer: Yes

(d) $y = -2x + 3$ and $y = 2x + 3$

Answer: No

3 Find the equation of the line perpendicular to the given line that passes through the given point.

(a) perpendicular to $y = 2x + 3$, through (4, 1)

Answer: $y = -\frac{1}{2}x + 3$

(b) perpendicular to $y = \frac{1}{2}x + 1$, through (2, 5)

Answer: $y = -2x + 9$

(c) perpendicular to $y = -3x + 2$, through (6, 0)

Answer: $y = \frac{1}{3}x - 2$

(d) perpendicular to $y = 4x - 1$, through (8, 3)

Answer: $y = -\frac{1}{4}x + 5$

4 Find the equation of the perpendicular bisector of the line segment AB.

(a) A(0, 1), B(4, 3)

Answer: $y = -2x + 6$

(b) A(-2, 3), B(2, -3)

Answer: $y = \frac{2}{3}x$

(c) A(1, 0), B(5, 2)

Answer: $y = -2x + 7$

5 Show that the lines $2x + 3y = 6$ and $3x - 2y = 4$ are perpendicular.

Answer: Gradients $-2/3$ and $3/2$ multiply to -1

6 A is (1, 1), B is (5, 3) and C is (3, 7). Use gradients to show that angle ABC is a right angle.

Answer: Gradients $\frac{1}{2}$ and -2 multiply to -1

7 A is (0, 0), B is (4, 2), C is (2, 6) and D is (-2, 4). Use gradients to show that ABCD is a rectangle.

Answer: Opposite sides parallel; adjacent sides perpendicular

8 The line $y = kx + 1$ is perpendicular to the line $3y + 2x = 5$. Find the value of k .

Answer: $k = \frac{3}{2}$

9 The line L passes through P(2, 5) and is perpendicular to the line through A(0, 1) and B(4, 3). Find the equation of L.

Answer: $y = -2x + 9$

10 A line has gradient 0 and another line is vertical. Explain why they are perpendicular. Why can you not use "gradients multiply to -1 " here?

Answer: Horizontal meets vertical at 90° ; the vertical line has no gradient

11 A circle has centre C(2, 1) and the point P(6, 4) is on the circle. Find the equation of the tangent to the circle at P.

Answer: $y = -\frac{4}{3}x + 12$