

# Parallel and Perpendicular Lines

Algebra 1 • Section 5.6

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Score: \_\_\_\_\_ / 12

## Quick Review and Helpful Hints

Linear relationships have a constant rate of change. Use slope, intercepts, points, and context to move between equations, tables, graphs, and real-world meanings.

▷ **Example:** Write the line with slope 2 through (3, 11).

**Work:** Use  $y = 2x + b$ . Substitute the point:  $11 = 2(3) + b$ , so  $b = 5$ .

★ **Answer:**  $y = 2x + 5$

## ◆ Practice Problems

Solve each problem. Show enough work that another student could follow your thinking.

1. Write a line parallel to  $y = 4x + 1$  through (2, 3). \_\_\_\_\_

6. Find the slope of a line parallel to  $5x - 2y = 8$ . \_\_\_\_\_

2. Write a line perpendicular to  $y = 2x - 7$  through (4, 1). \_\_\_\_\_

7. Write a horizontal line through (5, -6). \_\_\_\_\_

3. Are  $y = 3x - 1$  and  $y = 3x + 8$  parallel? \_\_\_\_\_

8. Write a vertical line through (-2, 9). \_\_\_\_\_

4. Are  $y = -2x + 5$  and  $y = \frac{1}{2}x - 3$  perpendicular? \_\_\_\_\_

9. Are  $x = 4$  and  $x = -1$  parallel? \_\_\_\_\_

5. Find the slope of a line perpendicular to slope  $\frac{3}{4}$ . \_\_\_\_\_

10. Are  $y = 6$  and  $x = 6$  perpendicular? \_\_\_\_\_

## ◆ Word Problems

11. Road A is  $y = \frac{1}{2}x + 3$ . Road B is parallel through (8, 1). Find Road B. \_\_\_\_\_

12. A ladder line has slope  $-\frac{3}{4}$ . A support beam is perpendicular through (0, 2). Write its equation. \_\_\_\_\_



## Answer Keys

1.  $y = 4x - 5$

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

3. Yes

4. Yes

5.  $-\frac{4}{3}$

6.  $\frac{5}{2}$

7.  $y = -6$

8.  $x = -2$

9. Yes

10. Yes

11.  $y = \frac{1}{2}x - 3$

12.  $y = \frac{4}{3}x + 2$

### Step-by-Step Explanations

1. Parallel means matching slopes, so keep the 4, then solve  $3 = 4(2) + b$  to land  $b = -5$ .
2. Flip and negate 2 to get the perpendicular slope  $-\frac{1}{2}$ , then use  $(4, 1)$  to find  $b = 3$ .
3. Same slope of 3 but different starting points means they run side by side forever — parallel.
4. Multiply their slopes:  $-2 \cdot \frac{1}{2} = -1$ , and that  $-1$  is the signature of perpendicular lines.
5. For perpendicular, flip the fraction and switch its sign —  $\frac{3}{4}$  becomes  $-\frac{4}{3}$ .
6. Rearrange into  $y = \frac{5}{2}x - 4$  first; a parallel line copies that slope of  $\frac{5}{2}$ .

7. Horizontal lines hold one height steady, so this one locks onto  $y = -6$ .
8. Vertical lines keep  $x$  fixed no matter the height, so it's simply  $x = -2$ .
9. Two vertical lines always point the same way and never cross, so yes — they're parallel.
10. One is flat, the other straight up, and a horizontal and vertical line always cross at  $90^\circ$ .
11. Hold onto the slope  $\frac{1}{2}$ , then plug in  $(8, 1)$ :  $1 = \frac{1}{2}(8) + b$  gives  $b = -3$ .
12. Flip and negate  $-\frac{3}{4}$  for the perpendicular slope  $\frac{4}{3}$ , and the point hands you intercept 2.



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