

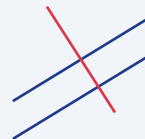
# Parallel and Perpendicular Lines

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Score: \_\_\_\_\_ / 18

## Quick Review and Helpful Hints

Two lines are *parallel* when they have the *same slope*. They are *perpendicular* when their slopes are *negative reciprocals* (the product of the slopes is  $-1$ ). To get a perpendicular slope, flip the fraction and change its sign.

▶ **Example:** A line has slope 2. Find the slope of a line (a) parallel and (b) perpendicular to it. **Work:** Parallel keeps the same slope: 2. Perpendicular flips and negates:  $-\frac{1}{2}$ . ★ **Answer:** 2 and  $-\frac{1}{2}$



Parallel: same slope. Perpendicular: flip & negate.

### ◆ Practice Problems

Find the slope or answer Yes/No as directed.

- |  |   |
|--|---|
| <p>1. Parallel slope to <math>m = 3</math> _____</p> <p>2. Perpendicular slope to <math>m = 3</math> _____</p> <p>3. Parallel slope to <math>m = -2</math> _____</p> <p>4. Perpendicular slope to <math>m = -2</math> _____</p> <p>5. Parallel slope to <math>m = \frac{1}{4}</math> _____</p> <p>6. Perpendicular slope to <math>m = \frac{1}{4}</math> _____</p> <p>7. Perpendicular slope to <math>m = 1</math> _____</p> | <p>8. Perpendicular slope to <math>m = -\frac{2}{3}</math> _____</p> <p>9. Are <math>y = 2x + 1</math> and <math>y = 2x - 5</math> parallel? _____</p> <p>10. Are <math>y = 3x</math> and <math>y = -\frac{1}{3}x</math> perpendicular? _____</p> <p>11. Are <math>y = x + 2</math> and <math>y = x - 7</math> perpendicular? _____</p> <p>12. Parallel slope to <math>y = -4x + 3</math> _____</p> <p>13. Perpendicular slope to <math>y = 5x - 1</math> _____</p> <p>14. Are <math>y = 2x + 1</math> and <math>y = -2x + 1</math> parallel? _____</p> |
|--|---|

### ◆ Word Problems

15. A road has slope  $\frac{3}{4}$ . A road parallel to it has what slope? \_\_\_\_\_
16. A wall is perpendicular to a ramp of slope  $\frac{2}{5}$ . What is the wall's slope? \_\_\_\_\_
17. Line  $a$  is  $y = \frac{1}{2}x + 4$ . Give the slope of any line perpendicular to it. \_\_\_\_\_
18. Are the lines  $y = -x + 6$  and  $y = x - 2$  perpendicular? \_\_\_\_\_



## Answer Keys

- |                                      |                                      |                                       |
|--------------------------------------|--------------------------------------|---------------------------------------|
| 1. <input type="text" value="3"/>    | 7. <input type="text" value="-1"/>   | 13. <input type="text" value="-1/5"/> |
| 2. <input type="text" value="-1/3"/> | 8. <input type="text" value="3/2"/>  | 14. <input type="text" value="No"/>   |
| 3. <input type="text" value="-2"/>   | 9. <input type="text" value="Yes"/>  | 15. <input type="text" value="3/4"/>  |
| 4. <input type="text" value="1/2"/>  | 10. <input type="text" value="Yes"/> | 16. <input type="text" value="-5/2"/> |
| 5. <input type="text" value="1/4"/>  | 11. <input type="text" value="No"/>  | 17. <input type="text" value="-2"/>   |
| 6. <input type="text" value="-4"/>   | 12. <input type="text" value="-4"/>  | 18. <input type="text" value="Yes"/>  |

### Step-by-Step Explanations

1. Start by naming the process: Parallel lines keep the same slope; perpendicular lines use the opposite reciprocal slope. The setup/work is Parallel lines share the slope: 3. So the final answer is 3.
2. A good way to think about this is: Parallel lines keep the same slope; perpendicular lines use the opposite reciprocal slope. The setup/work is Flip and negate  $3 = \frac{3}{1} : -\frac{1}{3}$ . So the final answer is  $-\frac{1}{3}$ .
3. Step by step: Parallel lines keep the same slope; perpendicular lines use the opposite reciprocal slope. The setup/work is Parallel keeps the slope:  $-2$ . So the final answer is  $-2$ .
4. Take it one move at a time: Parallel lines keep the same slope; perpendicular lines use the opposite reciprocal slope. The setup/work is Flip and negate  $-2 : \frac{1}{2}$ . So the final answer is  $\frac{1}{2}$ .
5. Start by naming the process: Parallel lines keep the same slope; perpendicular lines use the opposite reciprocal slope. The setup/work is Parallel keeps the slope:  $\frac{1}{4}$ . So the final answer is  $\frac{1}{4}$ .
6. A good way to think about this is: Parallel lines keep the same slope; perpendicular lines use the opposite reciprocal slope. The setup/work is Flip and negate  $\frac{1}{4} : -4$ . So the final answer is  $-4$ .
7. Step by step: Parallel lines keep the same slope; perpendicular lines use the opposite reciprocal slope. The setup/work is Flip and negate  $1 : -1$ . So the final answer is  $-1$ .
8. Take it one move at a time: Parallel lines keep the same slope; perpendicular lines use the opposite reciprocal slope. The setup/work is Flip and negate  $-\frac{2}{3} : \frac{3}{2}$ . So the final answer is  $\frac{3}{2}$ .
9. Start by naming the process: Parallel lines keep the same slope; perpendicular lines use the opposite reciprocal slope. The setup/work is Same slope 2, so yes, parallel. So the final answer is Yes.
10. A good way to think about this is: Parallel lines keep the same slope; perpendicular lines use the opposite reciprocal slope. The setup/work is Slopes 3 and  $-\frac{1}{3}$  multiply to  $-1$ , so yes. So the final answer is Yes.
11. Step by step: Parallel lines keep the same slope; perpendicular lines use the opposite reciprocal slope. The setup/work is Both have slope 1 (parallel, not perpendicular): no. So the final answer is No.
12. Take it one move at a time: Parallel lines keep the same slope; perpendicular lines use the opposite reciprocal slope. The setup/work is Parallel keeps the slope:  $-4$ . So the final answer is  $-4$ .
13. Start by naming the process: Parallel lines keep the same slope; perpendicular lines use the opposite reciprocal slope. The setup/work is Flip and negate  $5 : -\frac{1}{5}$ . So the final answer is  $-\frac{1}{5}$ .
14. A good way to think about this is: Parallel lines keep the same slope; perpendicular lines use the opposite reciprocal slope. The setup/work is Slopes 2 and  $-2$  differ, so not parallel: no. So the final answer is No.
15. Step by step: Parallel lines keep the same slope; perpendicular lines use the opposite reciprocal slope. The setup/work is A parallel road keeps the slope:  $\frac{3}{4}$ . So the final answer is  $\frac{3}{4}$ .
16. Take it one move at a time: Parallel lines keep the same slope; perpendicular lines use the opposite reciprocal slope. The setup/work is Flip and negate  $\frac{2}{5} : -\frac{5}{2}$ . So the final answer is  $-\frac{5}{2}$ .
17. Start by naming the process: Parallel lines keep the same slope; perpendicular lines use the opposite reciprocal slope. The setup/work is Flip and negate  $\frac{1}{2} : -2$ . So the final answer is  $-2$ .
18. A good way to think about this is: Parallel lines keep the same slope; perpendicular lines use the opposite reciprocal slope. The setup/work is Slopes  $-1$  and  $1$  multiply to  $-1$ , so yes, perpendicular. So the final answer is Yes.



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