MATHEMATICS · GRADES 7-9

Parallel and Perpendicular Lines Introduction

Difficulty level: Intermediate

Mathematics: Grades 7-9

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Overview of the concept

This is how you tell whether two roads will ever meet, like railway tracks that stay apart forever and a crossing road that meets them at a corner. A city planner lays out streets on a grid, with parallel streets running side by side and cross streets meeting them at right angles. A builder uses the same idea to check that the two sides of a hallway stay the same distance apart. Once you can see which lines meet and which never do, you can read a map, a floor plan, or a road layout at a glance.



Rule

Parallel lines have the same slope.

Perpendicular lines have slopes that are negative reciprocals of each other: flip the fraction and change the sign, so $m_1 \times m_2 = -1$.

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Worked examples

EXAMPLE 1

Q Two lines have slopes 3 and 3. Are they parallel or perpendicular?

SOLUTION

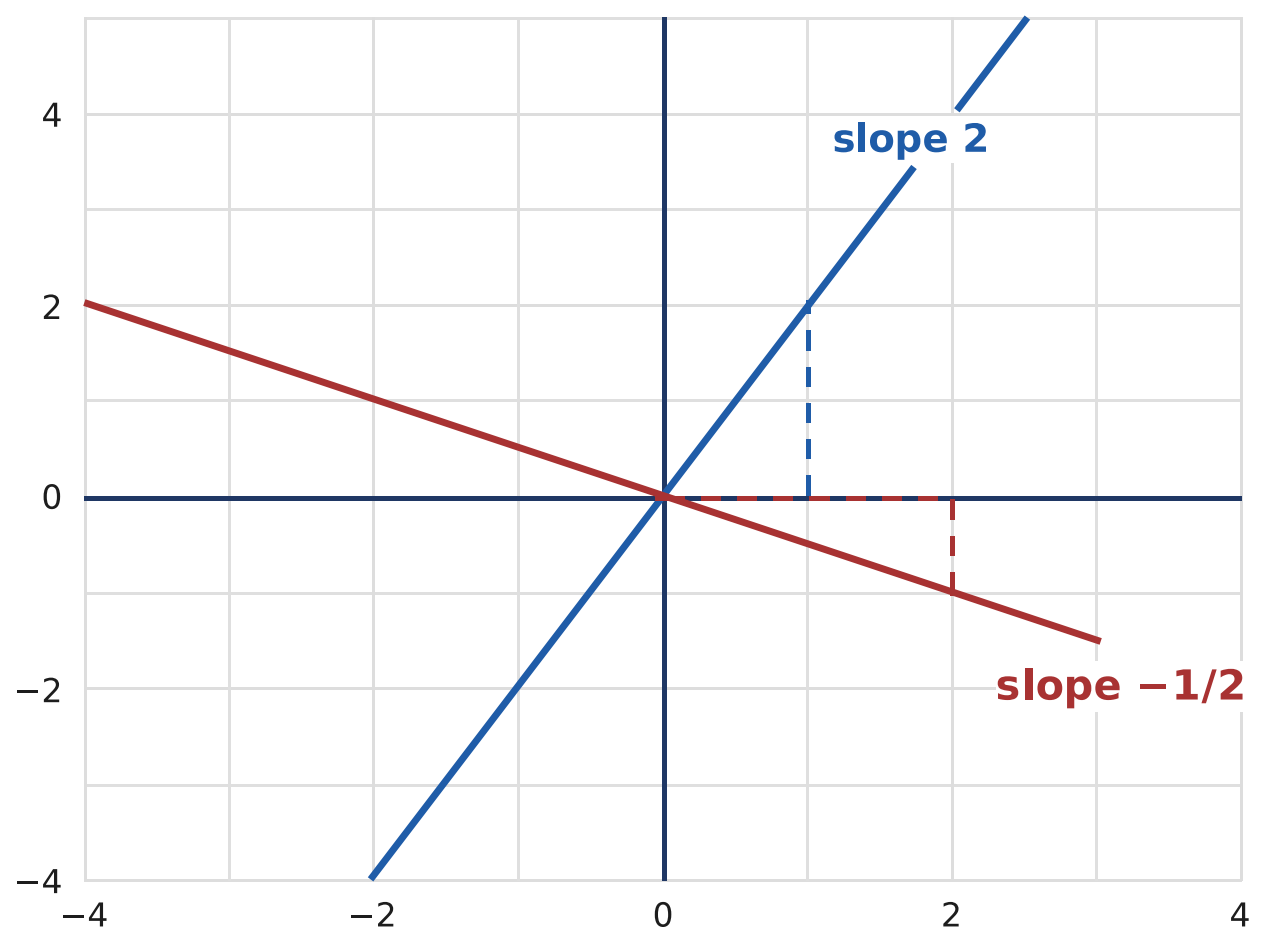
Lines running parallel to each other have matching slopes. Both slopes are 3, so the lines run side by side and never meet.

They are parallel.

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EXAMPLE 2

Q Two lines have slopes 2 and $\frac{-1}{2}$. Are they parallel or perpendicular?



SOLUTION

Multiply the slopes. $2 \times (\frac{-1}{2}) = -1$, and slopes that multiply to –1 are negative reciprocals, so the lines meet at a right angle.

They are perpendicular.

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Practice questions

1 Two lines have slopes 4 and 4. Are they parallel or perpendicular?

- A Parallel
- B Perpendicular

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2 Two lines have slopes 5 and $\frac{-1}{5}$. Are they parallel or perpendicular?

- A Parallel
- B Perpendicular

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3 A line has slope 7. What is the slope of a line parallel to it?

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4 **A road has slope 5. What is the slope of a line perpendicular to it?**

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5 **A fence line has slope −3. What is the slope of a line perpendicular to it?**

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6 **Railway tracks run side by side and never meet. Are they parallel or perpendicular?**

A Perpendicular

B Parallel

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7 A shelf and a wall meet at a right angle. Are they parallel or perpendicular?

- A Perpendicular
- B Parallel

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8 Two lines are perpendicular. One has slope 4. What is the other slope?

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9 Two lines have slopes 2 and 3. Are they parallel, perpendicular, or neither?

- A Parallel
- B Perpendicular
- C Neither

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10 A horizontal line has slope 0. What is the slope of a line parallel to it?

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ANSWER KEY

1. Parallel

2. Perpendicular

3. 7

4. $\frac{-1}{5}$

5. $\frac{1}{3}$

6. Parallel

7. Perpendicular

8. $\frac{-1}{4}$

9. Neither

10. 0

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