

Parallel and Perpendicular Lines

Algebra 1 • Section 5.6

Name: _____

Date: _____

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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

- | | |
|---|--|
| <p>1. $y = 4x - 5$</p> <p>2. $y = -\frac{1}{2}x + 3$</p> <p>3. Yes</p> <p>4. Yes</p> <p>5. $-\frac{4}{3}$</p> <p>6. $\frac{5}{2}$</p> | <p>7. $y = -6$</p> <p>8. $x = -2$</p> <p>9. Yes</p> <p>10. Yes</p> <p>11. $y = \frac{1}{2}x - 3$</p> <p>12. $y = \frac{4}{3}x + 2$</p> |
|---|--|

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° .
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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