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 $(2, 3)$.

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

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

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

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

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

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

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

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

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. $\boxed{y = 4x - 5}$
2. $\boxed{y = -\frac{1}{2}x + 3}$
3. $\boxed{\text{Yes}}$
4. $\boxed{\text{Yes}}$
5. $\boxed{-\frac{4}{3}}$
6. $\boxed{\frac{5}{2}}$
7. $\boxed{y = -6}$
8. $\boxed{x = -2}$
9. $\boxed{\text{Yes}}$
10. $\boxed{\text{Yes}}$
11. $\boxed{y = \frac{1}{2}x - 3}$
12. $\boxed{y = \frac{4}{3}x + 2}$

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 $90°$.
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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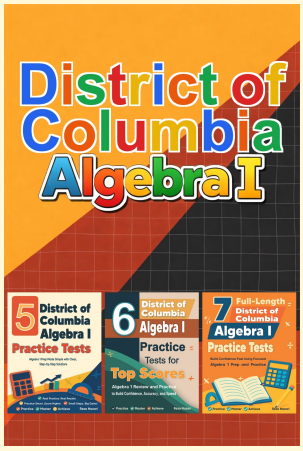

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