3-8 Slopes of Parallel and Perpendicular Lines

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G.GPE.5 Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems.

Objective To relate slope to parallel and perpendicular lines

take note

Key Concept Slopes of Parallel Lines

- If two nonvertical lines are parallel, then their slopes are equal.
- If the slopes of two distinct nonvertical lines are equal, then the lines are parallel.
- Any two vertical lines or horizontal lines are parallel.

1. Line ℓ_3 contains $A(-13, 6)$ and $B(-1, 2)$. Line ℓ_4 contains $C(3, 6)$ and $D(6, 7)$. Are ℓ_3 and ℓ_4 parallel? Explain.

$$\ell_3 = \frac{6-2}{-13-(-1)} = \frac{4}{-12} = -\frac{1}{3}$$

$$\ell_4 = \frac{6-7}{3-6} = \frac{-1}{-3} = \frac{1}{3}$$

2. What is an equation of the line parallel to $y = -x - 7$ that
contains $(-5, 3)$?

$$m = -1 \quad \| \quad m = -1$$

$$(-5, 3)$$

$$y - 3 = -(x + 5)$$

take note

Key Concept   Slopes of Perpendicular Lines

- If two nonvertical lines are perpendicular, then the product of their slopes is -1.
- If the slopes of two lines have a product of -1, then the lines are perpendicular.
- Any horizontal line and vertical line are perpendicular.

opposite reciprocal

$$m = \frac{2}{5} \perp m = -\frac{5}{2}$$

3. Line ℓ_3 contains $A(2, 7)$ and $B(3, -1)$. Line ℓ_4 contains $C(-2, 6)$ and $D(8, 7)$.
Are ℓ_3 and ℓ_4 perpendicular? Explain.

$$\ell_3 = \frac{7 - (-1)}{2 - 3} = \frac{8}{-1}$$

$$\ell_4 = \frac{6 - 7}{-2 - 8} = \frac{-1}{-10} = \frac{1}{10}$$

$\perp$

4. What is an equation of the line perpendicular to $y = -3x - 5$ that contains $(-3, 7)$?

$$m = -\frac{3}{1} \quad \perp \quad m = \frac{1}{3}$$

$$(-3, 7)$$

$$y - 7 = \frac{1}{3}(x + 3)$$

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