

Slope Lineup

Use slope rules to build parallel and perpendicular lines.

HIGH SCHOOL • HSG-GPE.B.5

CCSS.Math.Content.HSG-GPE.B.5 "Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point)."

NAME _____

DATE _____

SLOPE RULES

For nonvertical lines, equal slopes mean the lines have the same rise and run, so they are parallel. Perpendicular nonvertical lines have slopes that multiply to -1 , so each slope is the negative reciprocal of the other. Vertical lines are parallel to vertical lines and perpendicular to horizontal lines.

WORKED EXAMPLE

Write the equation of the line perpendicular to $y = 13x - 17$ that passes through $(19, 23)$.

1. The given slope is 13, so the perpendicular slope is $-1/13$.
2. Use point-slope form: $y - 23 = -1/13(x - 19)$.
3. Simplify: $y = -1/13x + 318/13$.

Answer: $y = -1/13x + 318/13$

PRACTICE 6 problems

- 1** Are the lines $y = 4x + 6$ and $y = -1/4x + 8$ parallel, perpendicular, or neither?

ANSWER _____

- 2** Line A passes through $(-8, 2)$ and $(4, 5)$. Line B passes through $(1, -6)$ and $(9, 0)$. Are the lines parallel, perpendicular, or neither?

ANSWER _____

- 3** Write the equation of the line parallel to $6x - 2y = 10$ that passes through $(-4, 8)$.

ANSWER _____

- 4** Write the equation of the line perpendicular to $y = -7/3x + 4$ that passes through $(8, -2)$.

ANSWER _____

- 5** Are the lines $x = -6$ and $y = 12$ parallel, perpendicular, or neither?

ANSWER _____

- 6** Write the equation of the line perpendicular to $x = 14$ that passes through $(2, -9)$.

ANSWER _____

APPLY IT Show your work

- 1** The student council is planning a poster-wall grid. On a coordinate map, one border follows $y = -3/4x + 12$. A second border must be perpendicular to it and pass through $(8, -1)$. Write the equation of the second border.

WORK SPACE

ANSWER _____

- 2** On a robotics practice floor, a taped guide line runs from $(-8, -3)$ to $(4, 3)$. A safety line must be parallel to this route and pass through $(2, 8)$. Write the equation of the safety line.

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

On a stage-lighting map, cable endpoints are $A(-10, 4)$ and $B(2, 10)$. A support line must pass through the midpoint of AB and be perpendicular to AB . Write the equation of the support line. Explain using the slope and midpoint.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	Are the lines $y = 4x + 6$ and $y = -1/4x + 8$ parallel, perpendicular, or neither?	Perpendicular
2	Line A passes through $(-8, 2)$ and $(4, 5)$. Line B passes through $(1, -6)$ and $(9, 0)$. Are the lines parallel, perpendicular, or neither?	Neither, the slopes are $1/4$ and $3/4$.
3	Write the equation of the line parallel to $6x - 2y = 10$ that passes through $(-4, 8)$.	$y = 3x + 20$
4	Write the equation of the line perpendicular to $y = -7/3x + 4$ that passes through $(8, -2)$.	$y = 3/7x - 38/7$
5	Are the lines $x = -6$ and $y = 12$ parallel, perpendicular, or neither?	Perpendicular
6	Write the equation of the line perpendicular to $x = 14$ that passes through $(2, -9)$.	$y = -9$

PART 2 • APPLY IT

- $y = 4/3x - 35/3$** The perpendicular slope is $4/3$. Substitute $(8, -1)$ into $y = 4/3x + b$ to get $b = -35/3$.
- $y = 1/2x + 7$** The guide line has slope $(3 - (-3))/(4 - (-8)) = 1/2$. Use slope $1/2$ and point $(2, 8)$ to find the y-intercept of 7.

CHALLENGE

Midpoint: $(-4, 7)$. Slope of AB: $1/2$, so the perpendicular slope is -2 . The equation is $y = -2x - 1$.

Accept equivalent equations in slope-intercept, point-slope, or standard form. For perpendicular lines, accept correct use of negative reciprocal slopes and the vertical-horizontal special case.