

Slope Sleuths

Use slopes to test line relationships on a coordinate plane.

HIGH SCHOOL • MA.912.GR.3

MA.912.GR.3 "Use coordinate geometry to solve problems or prove relationships."

NAME _____

DATE _____

SLOPES SHOW RELATIONSHIPS

To compare two lines, find each slope using rise/run, or $(y_2 - y_1)/(x_2 - x_1)$. Equal slopes mean the lines are parallel. Slopes that are negative reciprocals mean the lines are perpendicular.

WORKED EXAMPLE

Determine whether line PQ through P(101, 103) and Q(114, 110) is parallel, perpendicular, or neither to line RS through R(120, 121) and S(146, 135).

- $m_{PQ} = (110 - 103)/(114 - 101) = 7/13$.
- $m_{RS} = (135 - 121)/(146 - 120) = 14/26 = 7/13$.
- The slopes are equal.

Answer: The lines are parallel.

PRACTICE 6 problems

- 1** Find the slope of the line through A(-8, 5) and B(4, 9).

ANSWER _____

- 2** Are the lines through A(-9, -4) and B(1, 8), and through C(3, 10) and D(8, 20), parallel, perpendicular, or neither?

ANSWER _____

- 3** Are the lines through E(-9, 1) and F(-5, 4), and through G(20, 21) and H(23, 17), parallel, perpendicular, or neither?

ANSWER _____

- 4** Write the equation of the line through (3, 15) and (10, 8).

ANSWER _____

- 5** Classify the relationship between $y = 3x - 5$ and $y = -1/3x + 9$.

ANSWER _____

- 6** Point M(-11, 9) and point N(k, 18) form a line parallel to a line with slope $3/5$. Find k.

ANSWER _____

APPLY IT Show your work

- 1** A student designs two trails for a game map. Trail AB goes through A(-8, 3) and B(4, 9). Trail CD goes through C(5, -11) and D(17, -5). Will the trails be parallel? Use slopes to decide.

WORK SPACE

ANSWER _____

- 2** At a music festival, a walkway from the entrance at (-10, -8) to the stage at (2, 0) is planned. A second walkway runs from (20, 22) to (24, 16). Are the walkways perpendicular?

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

Quadrilateral ABCD has vertices A(-8, -5), B(4, 1), C(9, 11), and D(-3, 5). Use slopes to prove that ABCD is a parallelogram.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	Find the slope of the line through A(-8, 5) and B(4, 9).	1/3
2	Are the lines through A(-9, -4) and B(1, 8), and through C(3, 10) and D(8, 20), parallel, perpendicular, or neither?	Neither parallel nor perpendicular.
3	Are the lines through E(-9, 1) and F(-5, 4), and through G(20, 21) and H(23, 17), parallel, perpendicular, or neither?	Perpendicular.
4	Write the equation of the line through (3, 15) and (10, 8).	$y = -x + 18$
5	Classify the relationship between $y = 3x - 5$ and $y = -1/3x + 9$.	Perpendicular.
6	Point M(-11, 9) and point N(k, 18) form a line parallel to a line with slope $3/5$. Find k.	k = 4

PART 2 • APPLY IT

- Yes, the trails are parallel.** Slope AB is $6/12$, or $1/2$. Slope CD is also $6/12$, or $1/2$, so the trails are parallel.
- Yes, the walkways are perpendicular.** The first walkway has slope $2/3$, and the second has slope $-3/2$. These slopes are negative reciprocals.

CHALLENGE

Slope AB = $1/2$ and slope CD = $1/2$, so AB is parallel to CD. Slope BC = 2 and slope AD = 2, so BC is parallel to AD. Both pairs of opposite sides are parallel, so ABCD is a parallelogram.

Accept equivalent slope forms and correctly simplified fractions. For the equation in problem 4, accept any equivalent equation, including $x + y = 18$.