

Slope Triangle Detectives

Use rise and run to track one line's constant slope.

GRADE 7 • 7.PAR.4.7

7.PAR.4.7 "Use similar triangles to explain why the slope, m , is the same between any two distinct points on a nonvertical line in the coordinate plane."

NAME _____

DATE _____

SAME LINE, SAME SLOPE

Choose any two points on a line and make a right triangle by moving horizontally and then vertically. On a nonvertical straight line, slope triangles from different point pairs are similar, so the ratio of rise to run stays the same. Slope = change in y / change in x .

WORKED EXAMPLE

Find the slope of the line through (10, 11) and (14, 19).

1. Find the run: $14 - 10 = 4$.
2. Find the rise: $19 - 11 = 8$.
3. Divide rise by run: $8/4 = 2$.

Answer: $m = 2$

PRACTICE 6 problems

- 1** Find the slope of the line through (-7, -9) and (-1, 9).

ANSWER _____

- 2** Points A(-12, -5), B(-6, 1), and C(0, 7) are on one nonvertical line. Find the slope from A to B and from B to C.

ANSWER _____

- 3** Find the slope of the line through (3, -13) and (9, -7).

ANSWER _____

- 4** Points (-13, -13), (-7, -6), and (-1, 1) are on one line. Find the slope between the first two points and between the last two points.

ANSWER _____

- 5** A small slope triangle on a line rises 7 units and runs 9 units. A larger slope triangle on the same line runs 27 units. What is its rise, and what is the line's slope?

ANSWER _____

- 6** Between one pair of points on a line, the rise is -9 and the run is 3. Between another pair, the run is 12. What is the new rise, and what is the slope?

ANSWER _____

APPLY IT Show your work

- 1** On a game map, a character follows a straight climbing path through $(0, 6)$, $(9, 13)$, and $(18, 20)$. Find the slope from the first point to the second point and from the second point to the third point. Explain why the slopes match.

WORK SPACE

ANSWER _____

- 2** A skatepark designer draws a straight rail. A small slope triangle beside the rail has a rise of 5 centimeters and a run of 12 centimeters. A larger similar triangle along the rail has a run of 36 centimeters. Find its rise and the rail's slope.

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

Points $A(-12, -13)$, $B(-3, -6)$, and $C(x, 1)$ lie on the same nonvertical line. Find x . Explain how similar slope triangles help you decide.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	Find the slope of the line through $(-7, -9)$ and $(-1, 9)$.	$m = 3$
2	Points $A(-12, -5)$, $B(-6, 1)$, and $C(0, 7)$ are on one nonvertical line. Find the slope from A to B and from B to C.	A to B: 1; B to C: 1
3	Find the slope of the line through $(3, -13)$ and $(9, -7)$.	$m = 1$
4	Points $(-13, -13)$, $(-7, -6)$, and $(-1, 1)$ are on one line. Find the slope between the first two points and between the last two points.	First pair: $7/6$; second pair: $7/6$
5	A small slope triangle on a line rises 7 units and runs 9 units. A larger slope triangle on the same line runs 27 units. What is its rise, and what is the line's slope?	Rise = 21 units; $m = 7/9$
6	Between one pair of points on a line, the rise is -9 and the run is 3. Between another pair, the run is 12. What is the new rise, and what is the slope?	Rise = -36; $m = -3$

PART 2 • APPLY IT

- Both slopes are $7/9$. Each section rises 7 and runs 9, so the slope triangles have the same rise-to-run ratio.**
For each pair, subtract the y-coordinates to get a rise of 7 and subtract the x-coordinates to get a run of 9. The matching ratios show the line has the same slope.
- The larger rise is 15 centimeters, and the slope is $5/12$.** The larger run is 3 times the smaller run, so the rise is also 3 times as large: 15. Both similar triangles have rise/run equal to $5/12$.

CHALLENGE

$x = 6$. From A to B, the rise is 7 and the run is 9. From B to C, the rise is also 7, so the run must also be 9. Starting at -3 and moving 9 units right gives $x = 6$.

Accept equivalent fraction forms when they represent the same slope, such as $21/27$ for $7/9$. For negative slopes, accept a negative sign in the numerator, denominator, or in front of the fraction.