LESSON MAKER PRO

Same Line, Same Slope

Compare rise and run using similar triangles.

GRADE 7 · 7A.PR.B.6.a

7A.PR.B.6.a "Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in a coordinate plane."

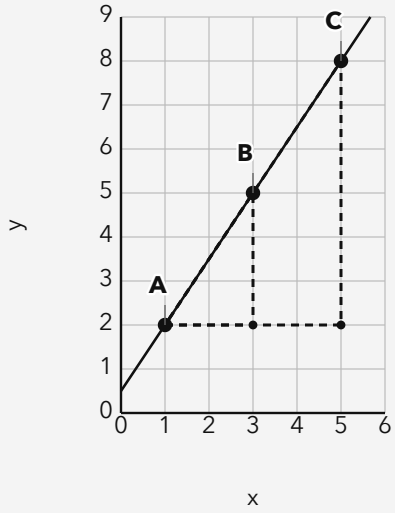
NAME _____ DATE _____

THE BIG IDEA

On a non-vertical line, each pair of points can form a right triangle whose legs show the rise and run. These triangles have the same angles, so they are similar. Their matching rise-to-run ratios are equal, which means the slope stays the same.

WORKED EXAMPLE

Use the graph to compare the slopes from A to B and from A to C. Why are they equal?

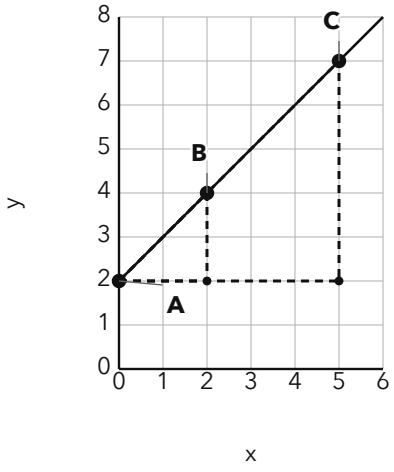


1. From A to B, the run is 2 and the rise is 3, so the slope is 3/2.
2. From A to C, the run is 4 and the rise is 6, so the slope is 6/4 = 3/2.
3. The right triangles share an angle along the line, so they are similar. Their rise-to-run ratios must match.

Answer: Both slopes are 3/2.

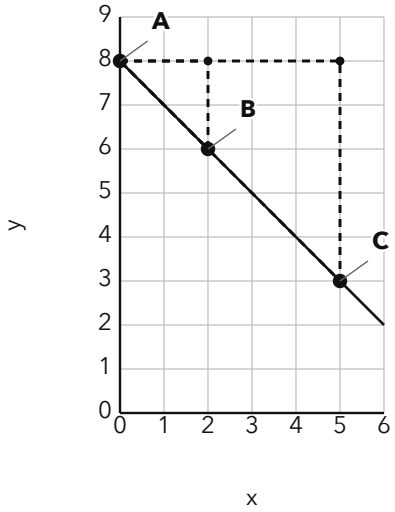
PRACTICE 6 problems

1 Use the graph to find the slopes from A to B and from A to C. Why do they match?



ANSWER _____

2 Use the graph to find the slopes from A to B and from A to C. Explain the negative sign.



ANSWER _____

3 A(1, 1), B(4, 7), and C(7, 13) lie on one line. Find the slopes from A to B and from A to C.

ANSWER _____

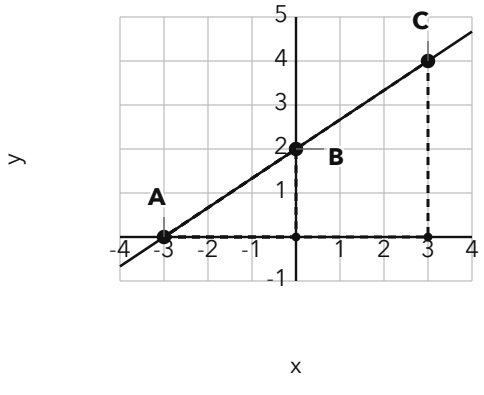
4 A(-4, -1), B(0, 2), and C(4, 5) lie on one line. Compare the rise-to-run ratios from A to B and from A to C.

ANSWER _____

5 A(1, 9), B(5, 7), and C(9, 5) lie on one line. Find the slope using A and B, then check it using A and C.

ANSWER _____

6 Use the graph to compare the rise-to-run ratios from A to B and from A to C. How do the triangles help?



ANSWER _____

APPLY IT Show your work

1 A video upload has transferred 7 MB after 2 seconds, 17 MB after 6 seconds, and 27 MB after 10 seconds. Let x be time and y be MB transferred. Find the slope using the first two readings, then the first and third readings. Explain why the results match.

WORK SPACE

ANSWER _____

2 A straight skateboard ramp is 12 ft high at its start. Its height is 9 ft at a horizontal distance of 4 ft and 6 ft at a horizontal distance of 8 ft. Find the slope using each distance from the start. How do similar triangles explain your results?

WORK SPACE

ANSWER _____

CHALLENGE One step up

A(-4, 7), B(2, 3), and C(8, x) lie on one non-vertical line. Find x. Use the rise and run of two similar triangles to explain your answer.

WORK SPACE AND ANSWER

ANSWER KEY

Same Line, Same Slope

GRADE 7 · 7A.PR.B.6.a

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Use the graph to find the slopes from A to B and from A to C. Why do they match?	**A to B: 2/2 = 1. A to C: 5/5 = 1. The right triangles are similar, so their rise-to-run ratios match.**
2	Use the graph to find the slopes from A to B and from A to C. Explain the negative sign.	**A to B: -2/2 = -1. A to C: -5/5 = -1. The slopes are negative because y decreases as x increases.**
3	A(1, 1), B(4, 7), and C(7, 13) lie on one line. Find the slopes from A to B and from A to C.	**A to B: (7 - 1)/(4 - 1) = 6/3 = 2. A to C: (13 - 1)/(7 - 1) = 12/6 = 2.**
4	A(-4, -1), B(0, 2), and C(4, 5) lie on one line. Compare the rise-to-run ratios from A to B and from A to C.	**A to B: 3/4. A to C: 6/8 = 3/4. The ratios are equal.**
5	A(1, 9), B(5, 7), and C(9, 5) lie on one line. Find the slope using A and B, then check it using A and C.	**Using A and B: -2/4 = -1/2. Using A and C: -4/8 = -1/2.**
6	Use the graph to compare the rise-to-run ratios from A to B and from A to C. How do the triangles help?	**A to B: 2/3. A to C: 4/6 = 2/3. The triangles are similar, so their rise-to-run ratios are equal.**

PART 2 · APPLY IT

1. **Both slopes are 5/2 MB per second. The right triangles formed by the readings are similar, so their rise-to-run ratios match.** The slopes are (17 - 7)/(6 - 2) = 10/4 = 5/2 and (27 - 7)/(10 - 2) = 20/8 = 5/2.
2. **Both slopes are -3/4. The right triangles along the straight ramp are similar, so both have the same height-change-to-horizontal-distance ratio.** From the start, the slopes are (9 - 12)/4 = -3/4 and (6 - 12)/8 = -6/8 = -3/4.

CHALLENGE

x = -1. From A to B, the run is 6 and the rise is -4. From A to C, the run is 12, twice as long, so the rise is -8. Thus x = 7 - 8 = -1.

Accept equivalent fractions and explanations that identify equal rise-to-run ratios in similar right triangles. For negative slopes, accept a description of falling y-values as x increases.