LESSON MAKER PRO

Slope Line Detectives

Use rise, run, and intercepts to write linear equations.

GRADE 8 · NY-8.EE.6

NY-8.EE.6 "Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane..."

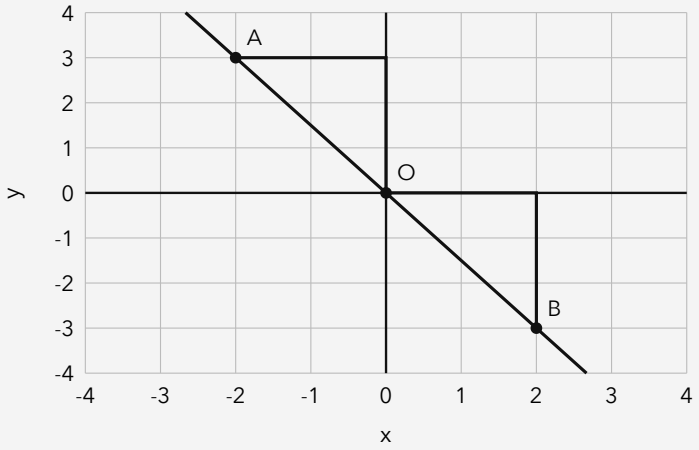
NAME _____ DATE _____

WHY SLOPE STAYS CONSTANT

On a non-vertical line, right triangles made between different pairs of points are similar. Their rise/run ratios are equal, so the slope m stays the same. A line has equation y = mx + b, where b is the y-intercept. If it goes through the origin, b = 0 and y = mx.

WORKED EXAMPLE

Use the graph to find the slope and write the equation of the line. The horizontal axis is x and the vertical axis is y; each grid interval is one unit.



1. Use A(-2, 3) and B(2, -3).
2. The drawn slope triangles have right angles and equal acute angles with parallel horizontal lines, so AA proves similarity. Signed rise/run is therefore constant.
3. m = (-3 - 3)/(2 - (-2)) = -6/4 = -3/2.
4. The line crosses the y-axis at 0, so b = 0.
5. Write y = -3/2x.

Answer: y = -3/2x

PRACTICE 6 problems

1 A line passes through (4, 1) and (7, 5). Find its slope and write its equation.

ANSWER _____

2 Find the slope of the line through (-5, 6) and (1, -6).

ANSWER _____

3 Write the equation of a line with slope 5/4 and y-intercept -6.

ANSWER _____

4 A line goes through the origin and the point (9, -3). Write its equation.

ANSWER _____

5 A line passes through (-4, -2), (2, 1), and (6, 3). Find the slope using the first two points and then using the last two points. What do the matching slopes show?

ANSWER _____

_____

6 A line passes through (7, -4) and (7, 6). State its slope. Can this line be written as y = mx + b?

ANSWER _____

_____

APPLY IT Show your work

1 A student gaming club sells digital art packs. The table shows the total money y, in dollars, available after a$7 donation and selling x packs. Write an equation for y in terms of x. Then find the total earned after 10 packs.

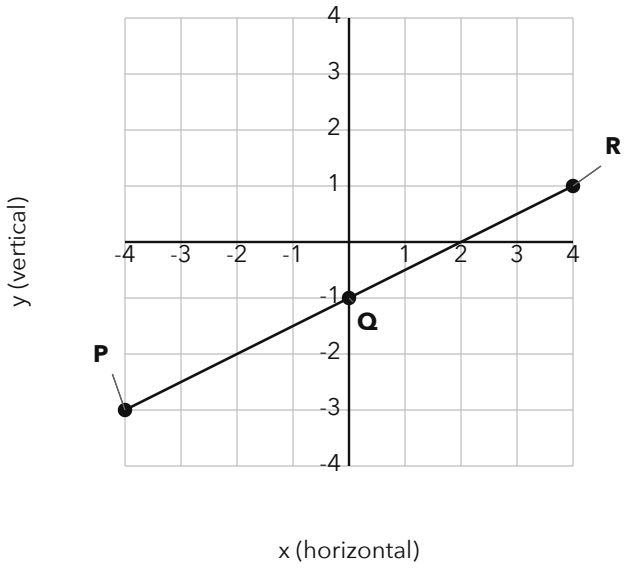
DIGITAL ART PACK SALES

x, packs sold	y, total dollars
0	7
4	19
8	31

2 A music fan has 12 songs in a new playlist. After 4 weeks, the playlist has 32 songs. The number of songs grows at a constant rate. Let x be the number of weeks and y be the number of songs. Write an equation, then find the number of songs after 7 weeks.

CHALLENGE One step up

The plotted points lie on one line. Use two different pairs of points from the graph to find the slope. Explain why the slopes match, then write the equation of the line. The horizontal axis is x and the vertical axis is y; each grid interval is one unit. Draw the slope triangles and justify similarity by AA rather than assuming equal ratios. Then derive y=mx+b using a general point(x,y)and(0,b); explain the origin case and the case x=0.



ANSWER KEY

Slope Line Detectives

GRADE 8 · NY-8.EE.6

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	A line passes through (4, 1) and (7, 5). Find its slope and write its equation.	**m = 4/3; y = 4/3x - 13/3**
2	Find the slope of the line through (-5, 6) and (1, -6).	**-2**
3	Write the equation of a line with slope 5/4 and y-intercept -6.	**y = 5/4x - 6**
4	A line goes through the origin and the point (9, -3). Write its equation.	**y = -1/3x**
5	A line passes through (-4, -2), (2, 1), and (6, 3). Find the slope using the first two points and then using the last two points. What do the matching slopes show?	**1/2 and 1/2; the slope is the same between different pairs of points on the line.**
6	A line passes through (7, -4) and (7, 6). State its slope. Can this line be written as y = mx + b?	**The slope is undefined. No, it is a vertical line.**

PART 2 · APPLY IT

1. **y = 3x + 7; $37** The total increases $12 for 4 packs, so the slope is 3 dollars per pack. The table shows a starting amount of $7, then y = 3x + 7 and y = 37 when x = 10.
2. **y = 5x + 12; 47 songs** The playlist gained 20 songs in 4 weeks, so the slope is 5 songs per week. It started with 12 songs, so y = 5x + 12 and y = 47 when x = 7.

CHALLENGE

From P to Q, m = 2/4 = 1/2. From Q to R, m = 2/4 = 1/2. The right triangles have the same rise/run ratio, so they are similar and the slope stays the same. The y-intercept is -1, so y = 1/2x - 1. Both right triangles share the line's angle with horizontal parallels, so AA proves similarity; signed ratios match. For x≠0,m=(y−b)/x, hence y=mx+b. At x=0,the point is(0,b),which also satisfies the equation. With b=0,this becomes y=mx. Horizontal lines have m=0 directly; no nondegenerate slope triangles are needed.

Accept equivalent algebraic forms of each equation. For the challenge, accept a correct explanation that the right triangles are similar or that each pair has the same rise/run ratio.