Name _____ Date _____ Period _____

Rise Over Run

Exploring the slope of a line

Explore

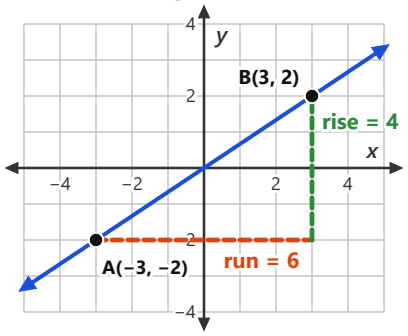
The **slope** of a line measures how steep it is and which way it tilts. Pick any two points on the line and move from the left point to the right point:

Rise = the vertical change (up is +, down is −)
Run = the horizontal change (right is +, left is −)

$$\text{slope} = m = \frac{\text{rise}}{\text{run}} = \frac{\text{change in } y}{\text{change in } x} = \frac{y_2 - y_1}{x_2 - x_1}$$

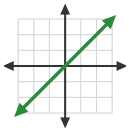
Slope is a **rate of change**: it tells how much y changes each time x goes up by 1. Any two points on the same line give the **same** slope, so choose points that are easy to read.

Worked example

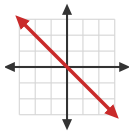


From A to B the line goes **right 6** and **up 4**, so $m = \frac{4}{6} = \frac{\mathbf{2}}{\mathbf{3}}$.

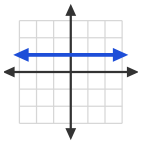
Formula check: $\frac{2-(-2)}{3-(-3)} = \frac{4}{6} = \frac{2}{3}$ ✓



Positive
rises from left to right



Negative
falls from left to right



Zero
horizontal: rise = 0

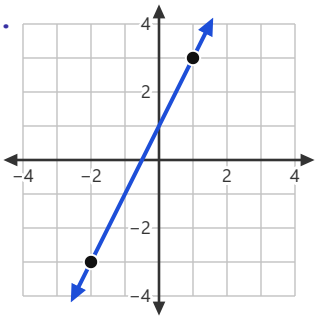


Undefined
vertical: run = 0, and you can't divide by 0

Part A · Count It

Draw a slope triangle between the two dots, then count the rise and run.

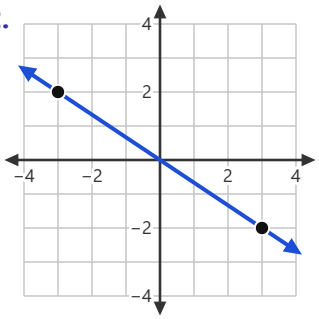
1.



rise = _____ run = _____

slope = _____

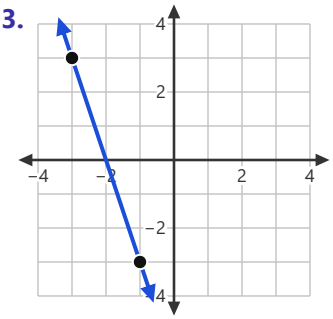
2.



rise = _____ run = _____

slope = _____

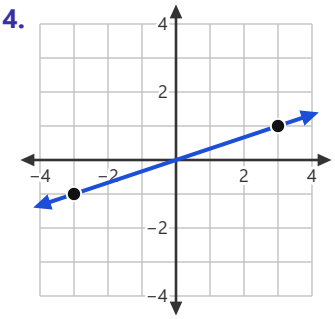
3.



rise = _____ run = _____

slope = _____

4.



rise = _____ run = _____

slope = _____

Part B · Use the Formula

Find the slope of the line through each pair of points. Show your work.

5. (2, 3) and (6, 11)

m = _____

6. (−1, 4) and (3, −4)

m = _____

7. (0, 5) and (4, 7)

m = _____

8. (−5, 2) and (3, 2)

m = _____

9. (4, −1) and (4, 6)

m = _____

10. (−6, −3) and (−2, −9)

m = _____

Part C · Slope From a Table

Slope = change in y ÷ change in x, between any two rows.

11. Find the slope.

x	0	1	2	3	4
y	3	7	11	15	19

m = _____

12. Find the slope.

x	−2	0	2	4
y	10	7	4	1

m = _____

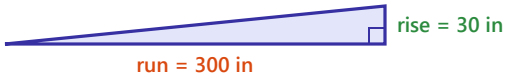
13. Find m and the missing value.

x	1	3	5	7
y	2	8	14	?

m = _____ ? = _____

Part D · Slope in the Real World

14. Wheelchair ramps can be no steeper than a slope of $1/12$ (1 inch of rise for every 12 inches of run). This ramp rises 30 inches over a run of 300 inches.



(a) Its slope, in lowest terms: _____

(b) Is it too steep? Explain.

(c) What run makes the slope exactly $1/12$? _____

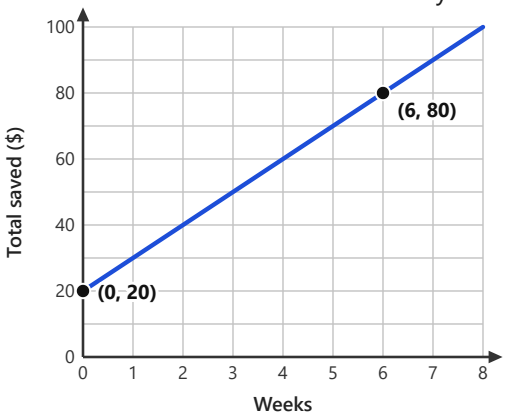
15. A road sign warns of a **6% grade**: the road rises 6 feet for every 100 feet of horizontal distance.

(a) The slope as a fraction in lowest terms: _____

(b) How many feet does the road rise over 1,500 feet of horizontal distance?

(c) A roof rises 6 inches for every 12 inches of run. Which is steeper, the road or the roof? How do you know?

16. Jada saves the same amount every week.



(a) Use the two marked points to find the slope. _____

(b) What are the units of the slope? _____

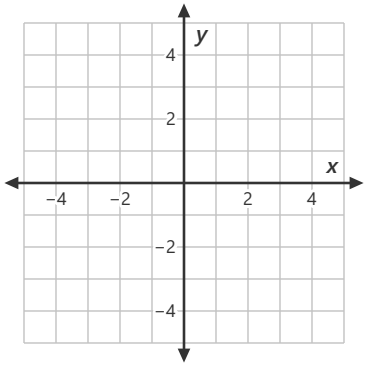
(c) What does the slope mean for Jada?

(d) Where does the line cross the y-axis? What does that number mean?

(e) Write an equation $y = mx + b$ for Jada's savings. Then predict her total after 12 weeks.

Part E · Slope-Intercept Form

In $\boldsymbol{y = mx + b}$, m is the slope and b is the **y-intercept** (where the line crosses the y-axis).



17. Graph $y = \frac{2}{3}x - 1$. Plot b, then use rise 2, run 3 to plot two more points.

18. Write the equation of the line with slope −3 and y-intercept 4. Does it rise or fall?

Part F · Think Deeper

19. Why is the slope of a horizontal line 0, but the slope of a vertical line *undefined*?

20. Line 1 passes through (0, 1) and (2, 5). Line 2 is parallel to Line 1. What is the slope of Line 2? How do you know?

21. Does it matter which point you call (x_1, y_1)? Test it with the points in #5.