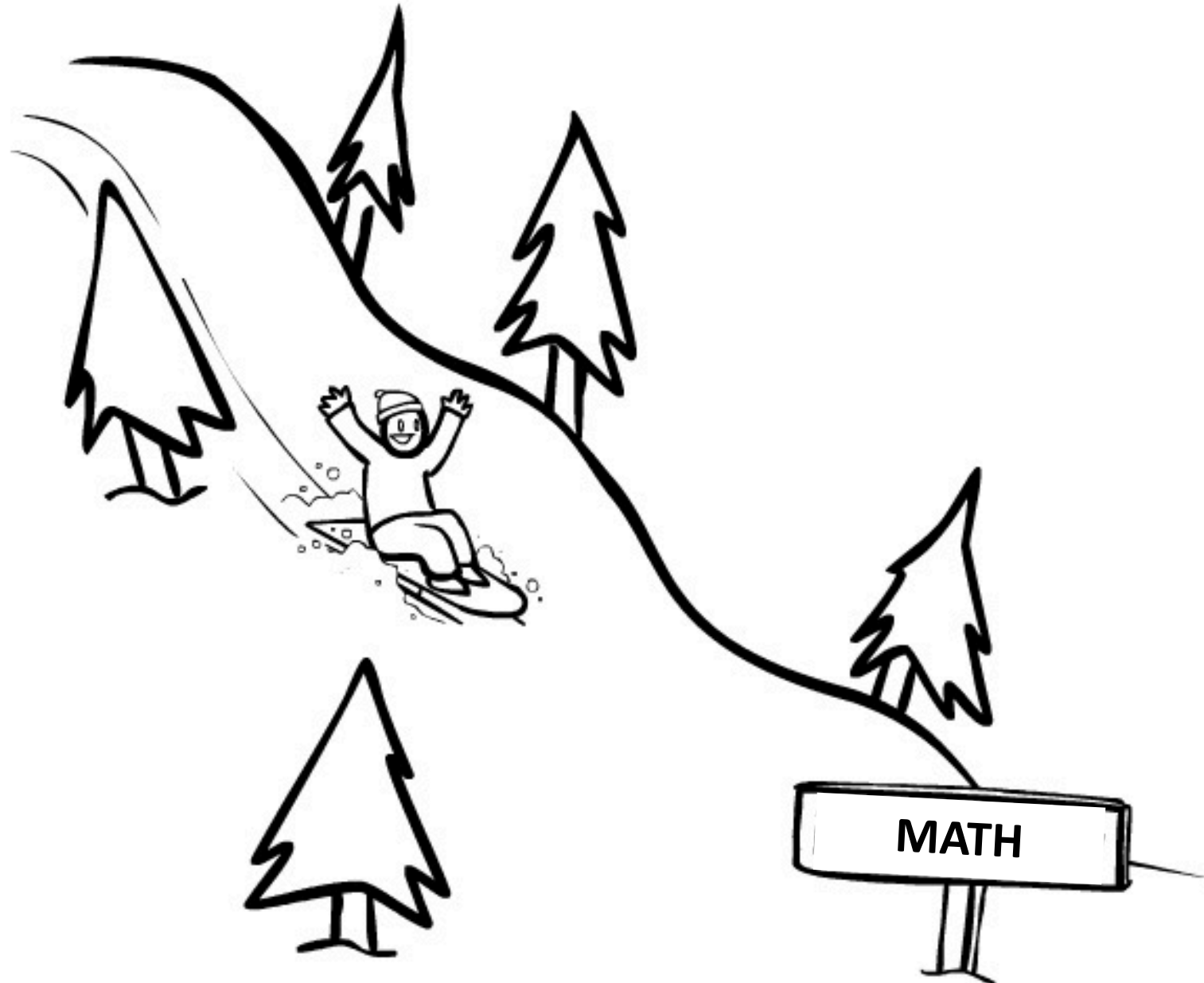


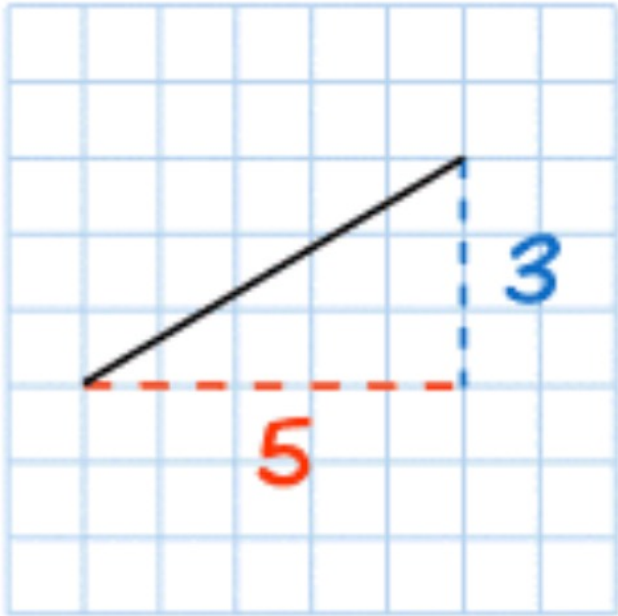
Day 9:
Slope,
Perpendicular
vs. Parallel



IT'S A SLIPPERY SLOPE...



What is slope?

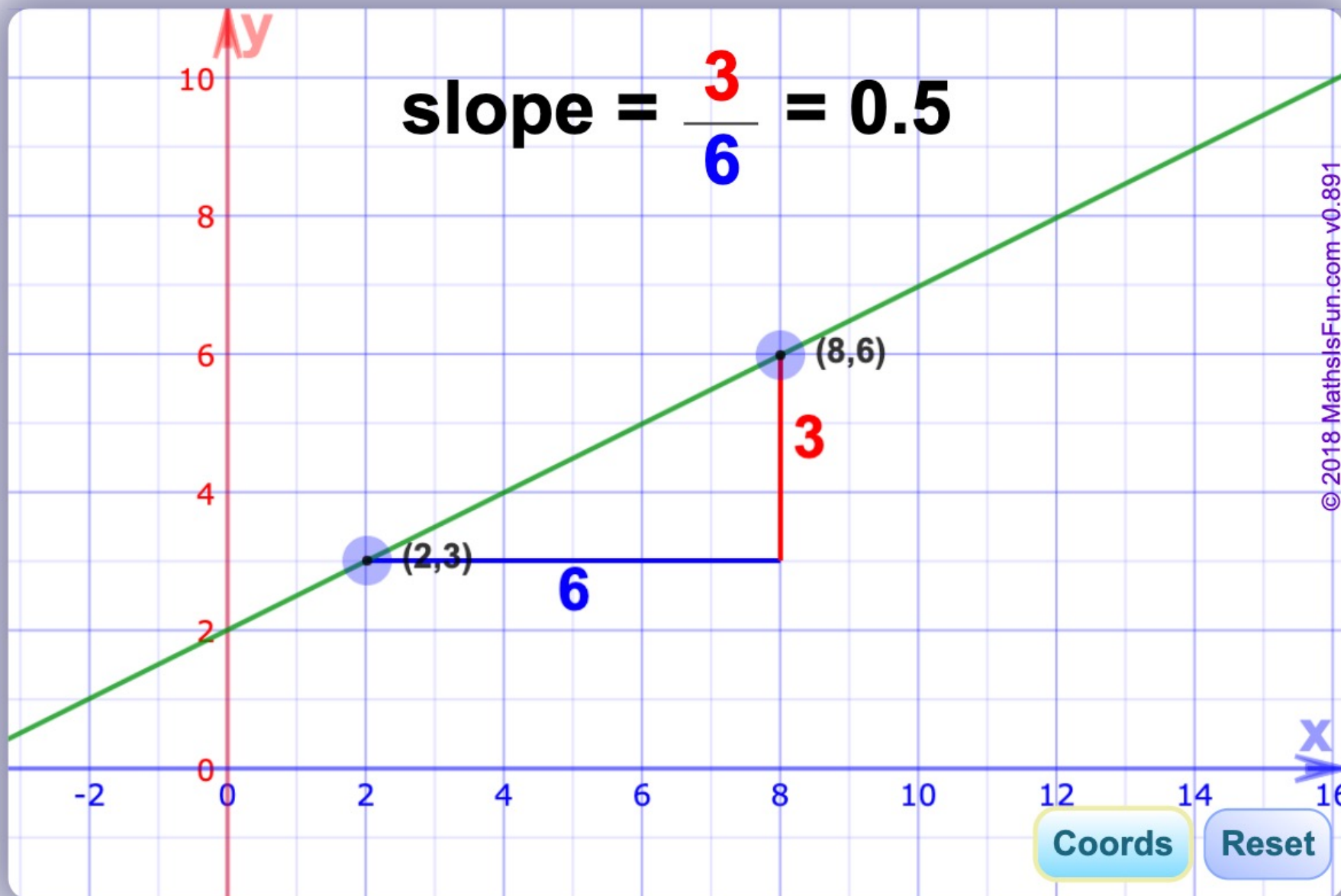


How steep a line is.

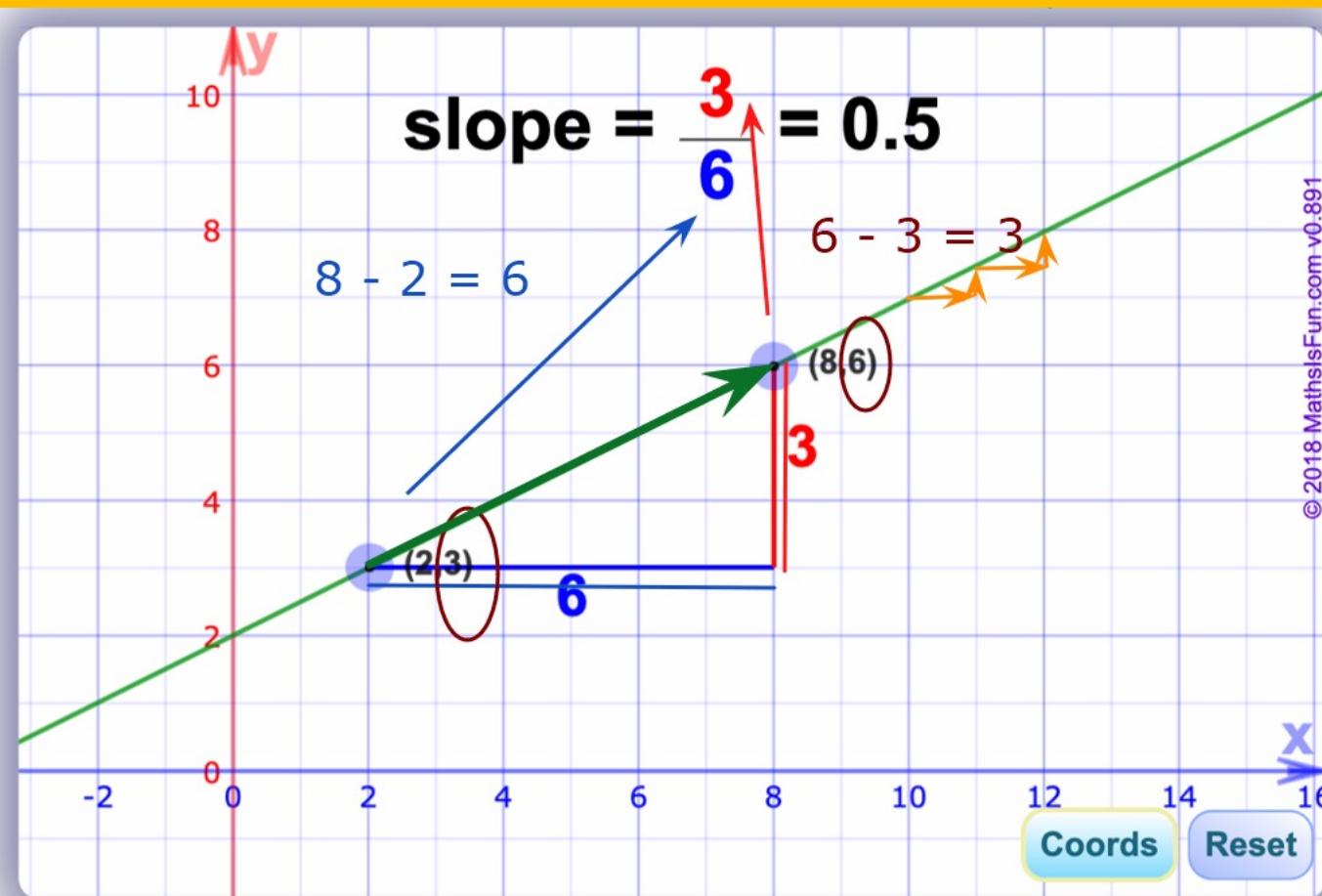
In this example the slope is $3/5 = 0.6$

Also called "gradient".

$$\text{slope} = \frac{3}{6} = 0.5$$



Daniel Johnson



the
y-value
always
represents
vertical
change

the x
value
represents
horizontal
change

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Coords

Reset

How do I calculate the slope of a line?

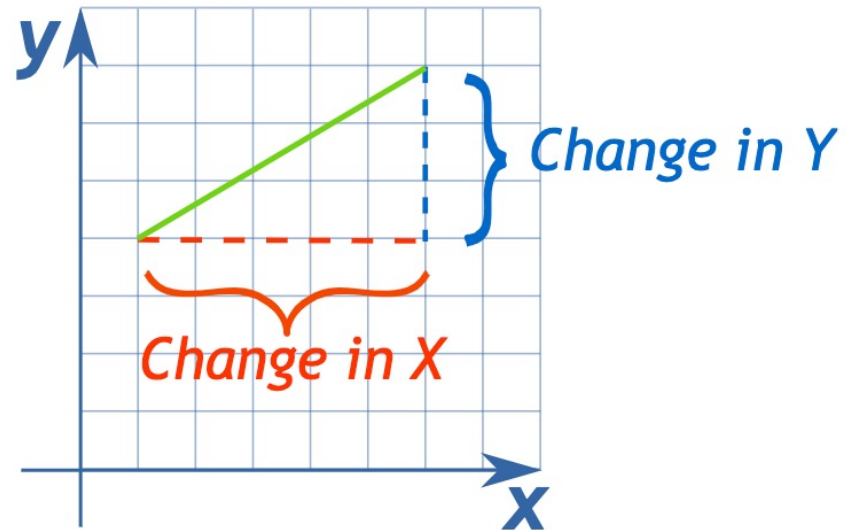
To calculate the Slope:

Divide the **change in height** by the **change in horizontal distance**

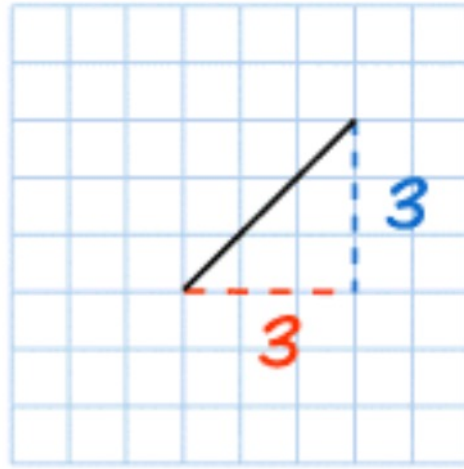
$$\text{Slope} = \frac{\text{Change in Y}}{\text{Change in X}}$$

“RISE”

“RUN”

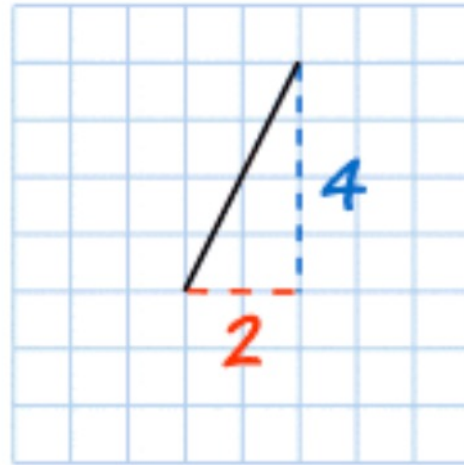


More examples:



The Slope of this line = $\frac{3}{3} = 1$

So the Slope is equal to 1



The Slope of this line = $\frac{4}{2} = 2$

The line is steeper, and so the Slope is larger.

Positive or Negative?

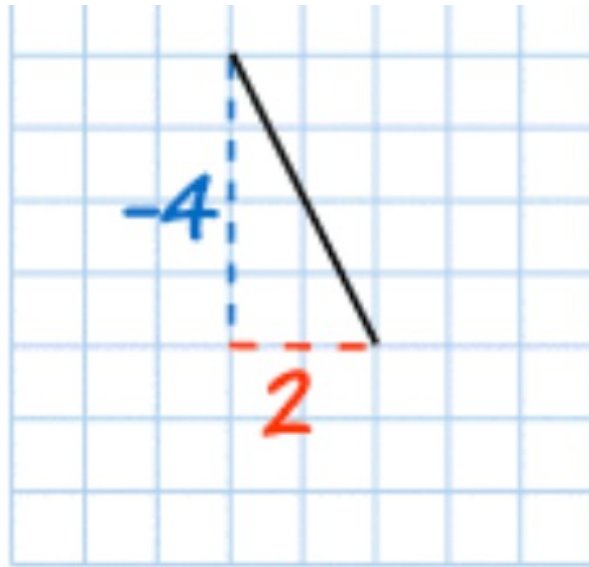
Going from left-to-right, the cyclist has to **P**ush on a **P**ositive Slope:



When measuring the line:

- Starting from the left and going across **to the right is positive** (but going across to the left is negative).
- **Up is positive**, and down is negative

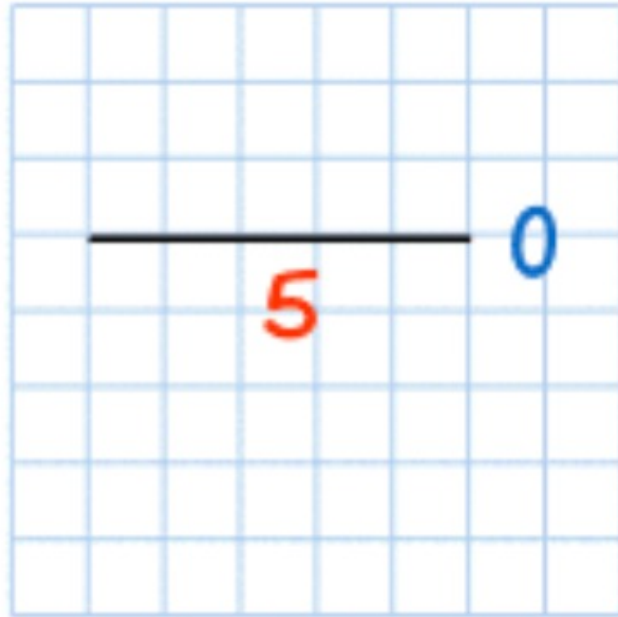
Negative Slope



$$\text{Slope} = \frac{-4}{2} = -2$$

That line goes **down** as you move along, so it has a negative Slope.

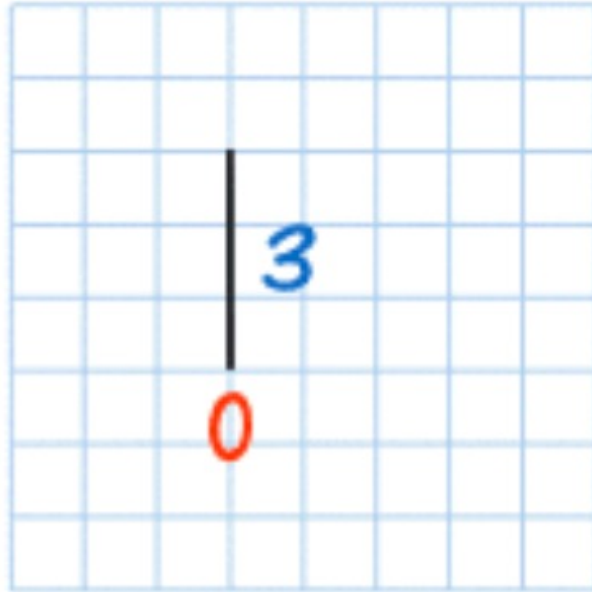
Slope of Zero



$$\text{Slope} = \frac{0}{5} = 0$$

A line that goes straight across (Horizontal) has a Slope of zero.

Undefined Slope

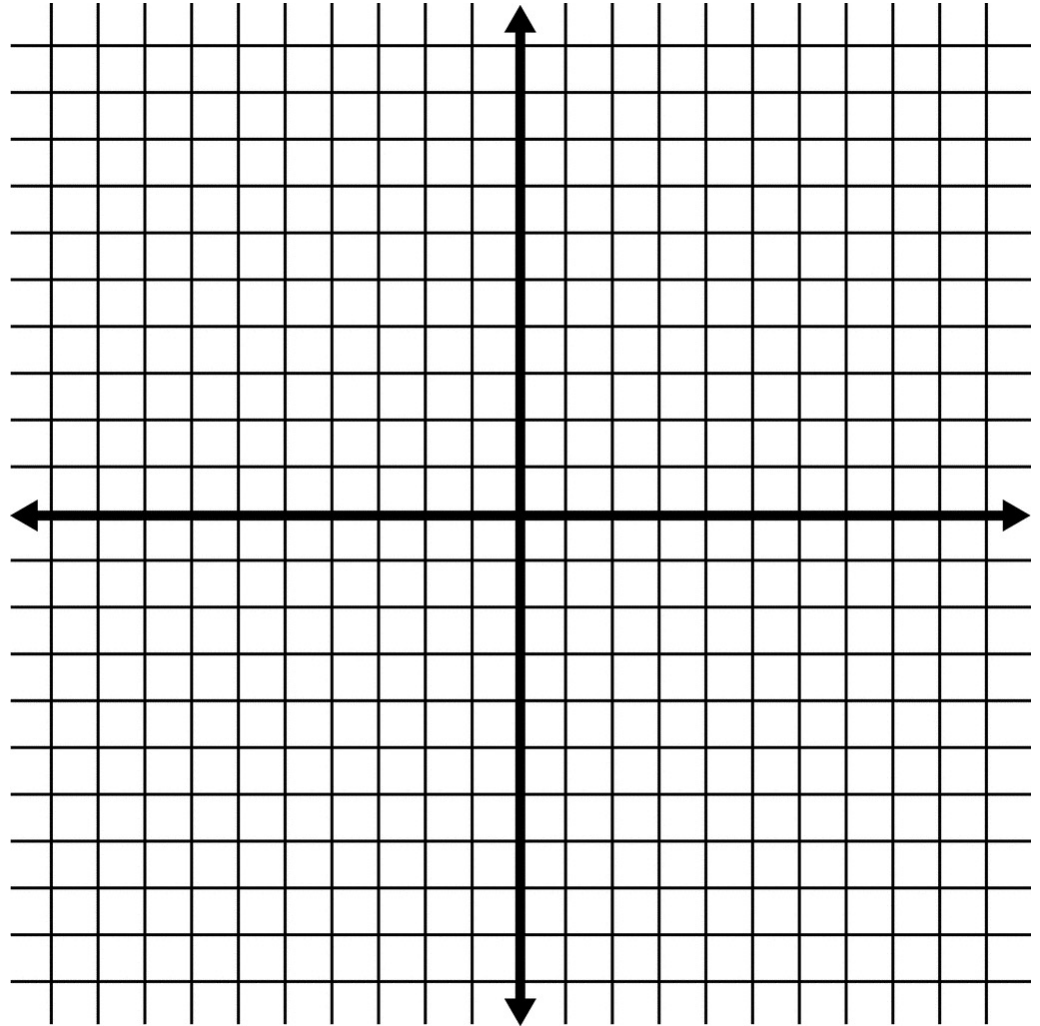


$$\text{Slope} = \frac{3}{0} = \text{undefined}$$

That last one is a bit tricky ... you can't divide by zero, so a "straight up and down" (vertical) line's Slope is "undefined".

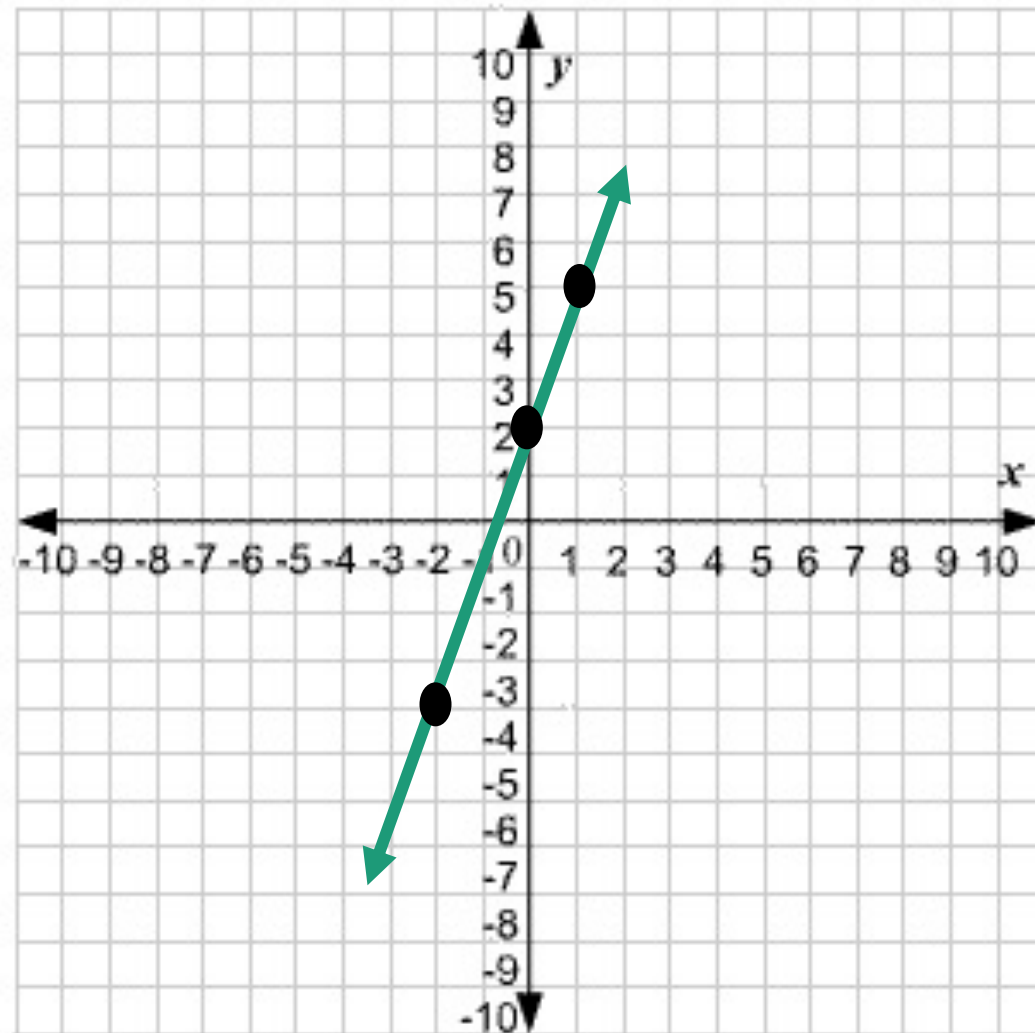
What is the slope of a line that passes through $(-1, 3)$ and $(1, 4)$?

- A. 0
- B. $-1/2$
- C. $1/2$
- D. $2/3$



The following points lie on A: $(-2, -4)$, $(0, 2)$, and $(1, 5)$. What is the slope of line A?

- A. 3
- B. 9
- C. 10
- D. 12



The following points lie on A: $(-2, -4)$, $(0, 2)$, and $(1, 5)$. What is the slope of line A?

A. 3

B. 9

C. 10

D. 12

We need to pick two points

$(1, 5)$
 $(-2, -4)$

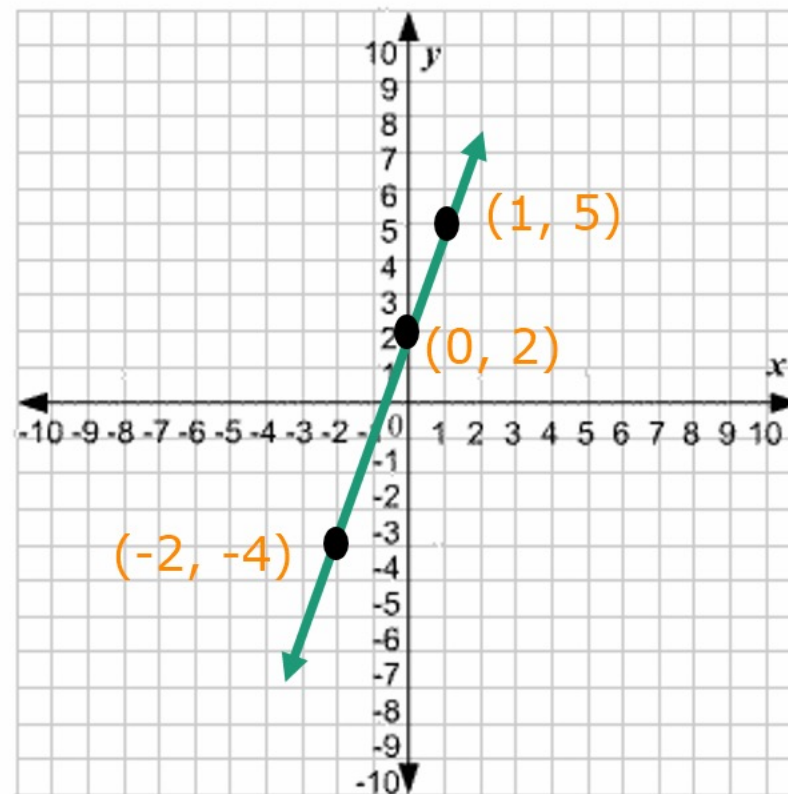
Change in y:

$$5 - (-4) = 9$$

Change in x:

$$1 - (-2) = 3$$

$$\frac{9}{3}$$



The following points lie on A: $(-2, -4)$, $(0, 2)$, and $(1, 5)$. What is the slope of line A?

A. 3

B. 9

C. 10

D. 12

We need to pick two points

$(1, 5)$
 $(0, 2)$

Change in y:

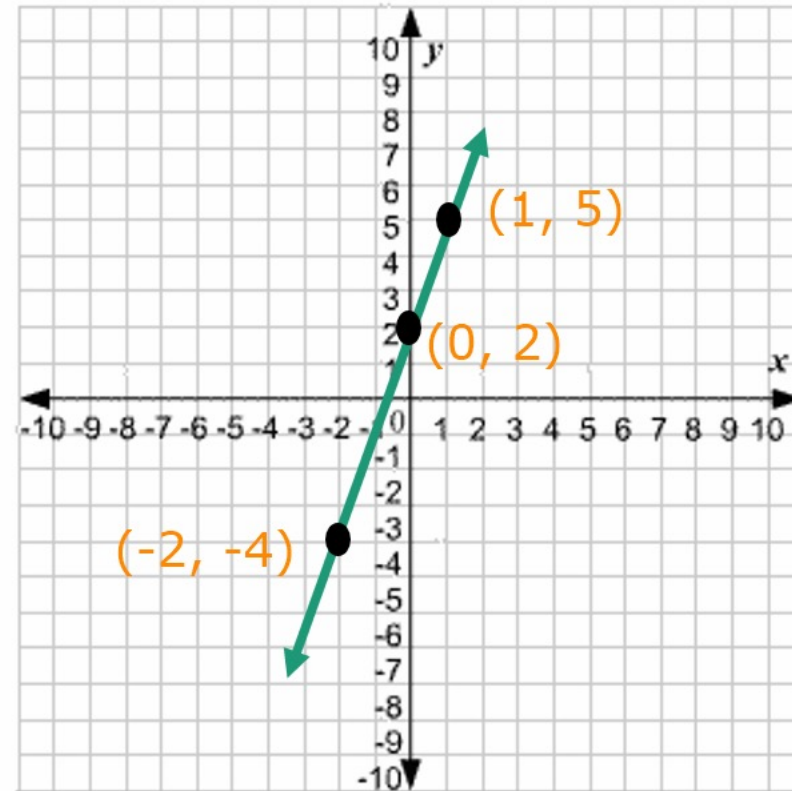
$$5 - 2 = 3$$

Change in x:

$$1 - 0 = 1$$

3

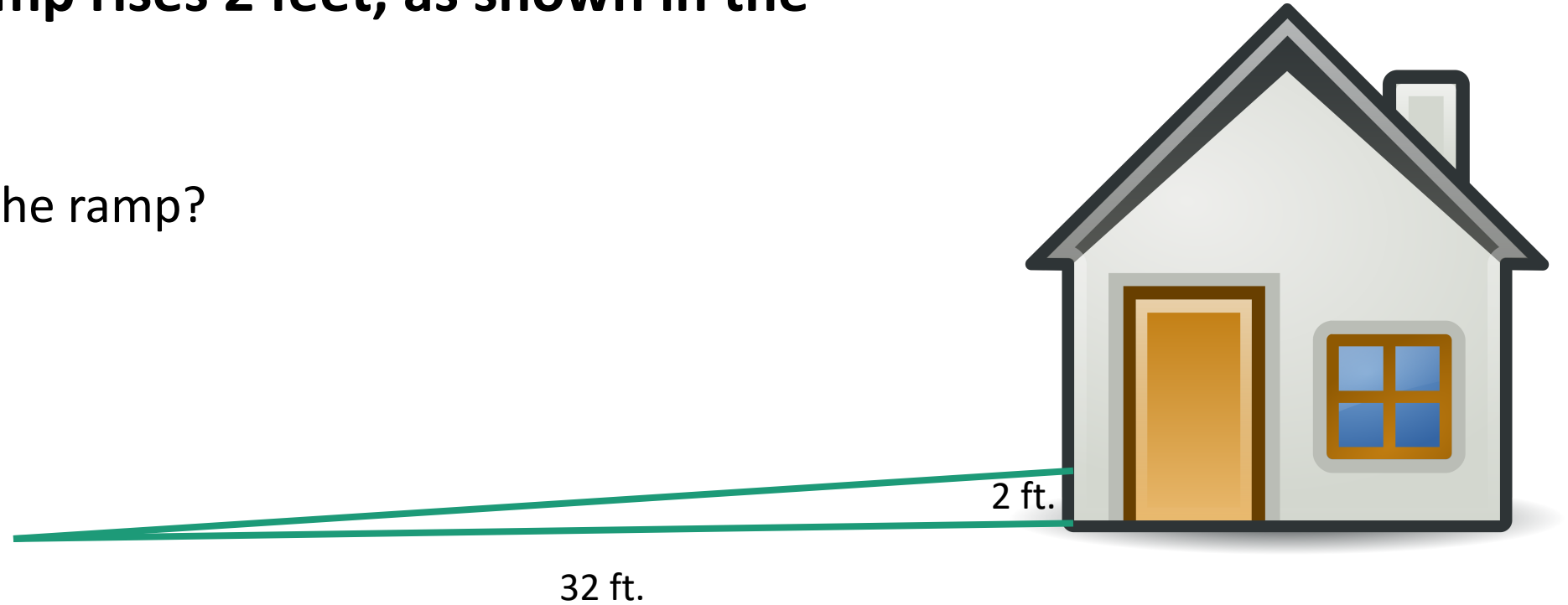
1



A ramp was built to allow wheelchair access to a front door. The ramp rises 2 feet, as shown in the diagram below.

What is the slope of the ramp?

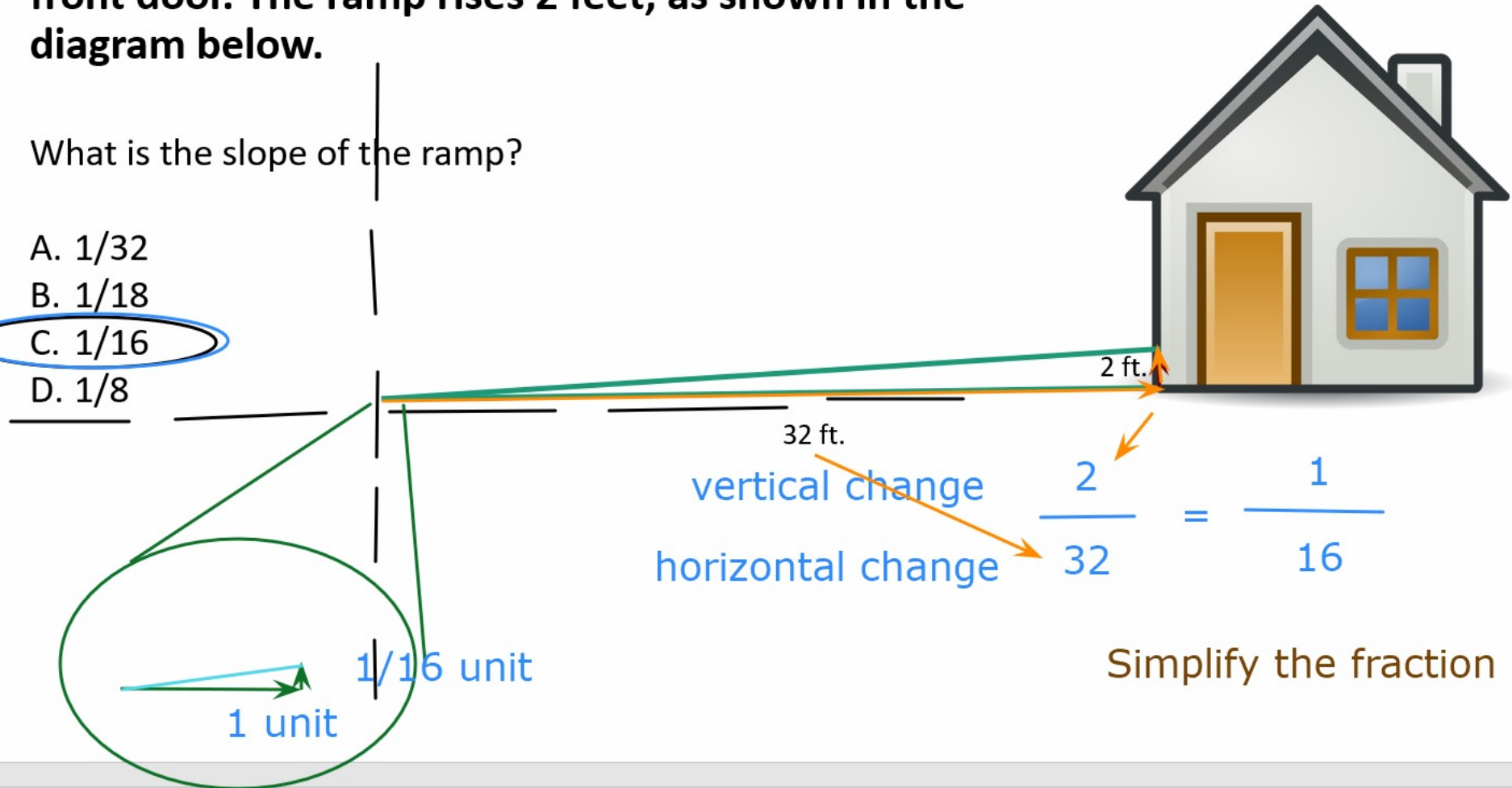
- A. $\frac{1}{32}$
- B. $\frac{1}{18}$
- C. $\frac{1}{16}$
- D. $\frac{1}{8}$



A ramp was built to allow wheelchair access to a front door. The ramp rises 2 feet, as shown in the diagram below.

What is the slope of the ramp?

- A. $\frac{1}{32}$
- B. $\frac{1}{18}$
- C. $\frac{1}{16}$
- D. $\frac{1}{8}$



Slope-intercept form

- The slope of a line can be used in combination with other information to find the formula of the line. The slope-intercept form can be used if the y-intercept is known:

$$y = mx + b$$

***m* is the slope and *b* is the y-intercept**

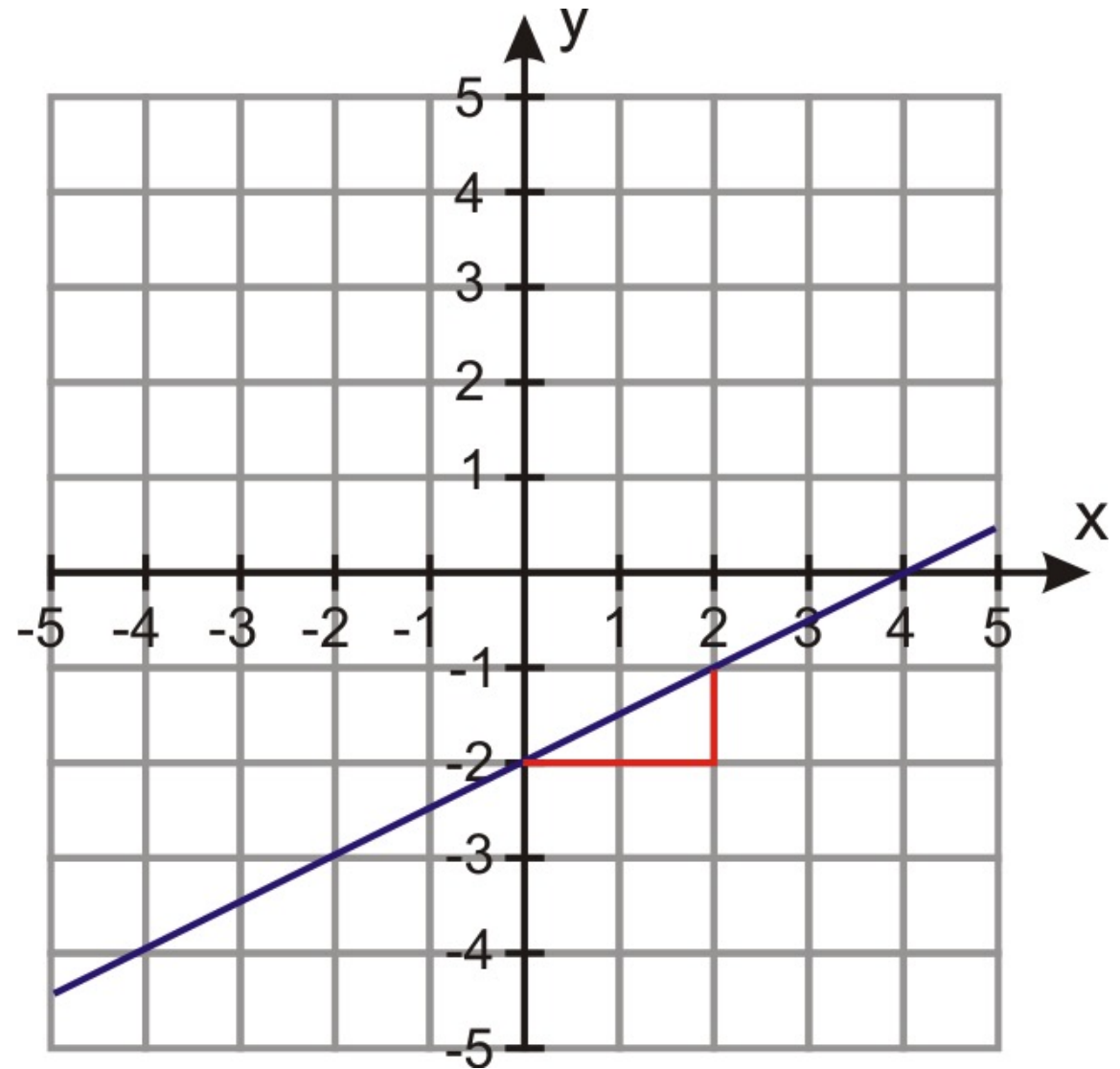
- If one point is known:

$$y - y1 = m(x - x1)$$

***m* is the slope and (x1, y1) is the point**

Equation of a Line

- To find the equation of a line, find the y-intercept (where the line crosses the y-axis). The line crosses the y-axis at -2.
- Next find the slope. The slope of this line is $\frac{1}{2}$
- Substitute the values of m and b into the equation.
 - $Y = mx + b$
 - $Y = \frac{1}{2}x + (-2)$
 - $Y = \frac{1}{2}x - 2$



$(2, -1)$
 $(0, -2)$

Change in y : $(-1) - (-2) = +1$
 Change in x : $2 - 0 = 2$

$$(-1) + 2 = 1$$

Equation of a Line

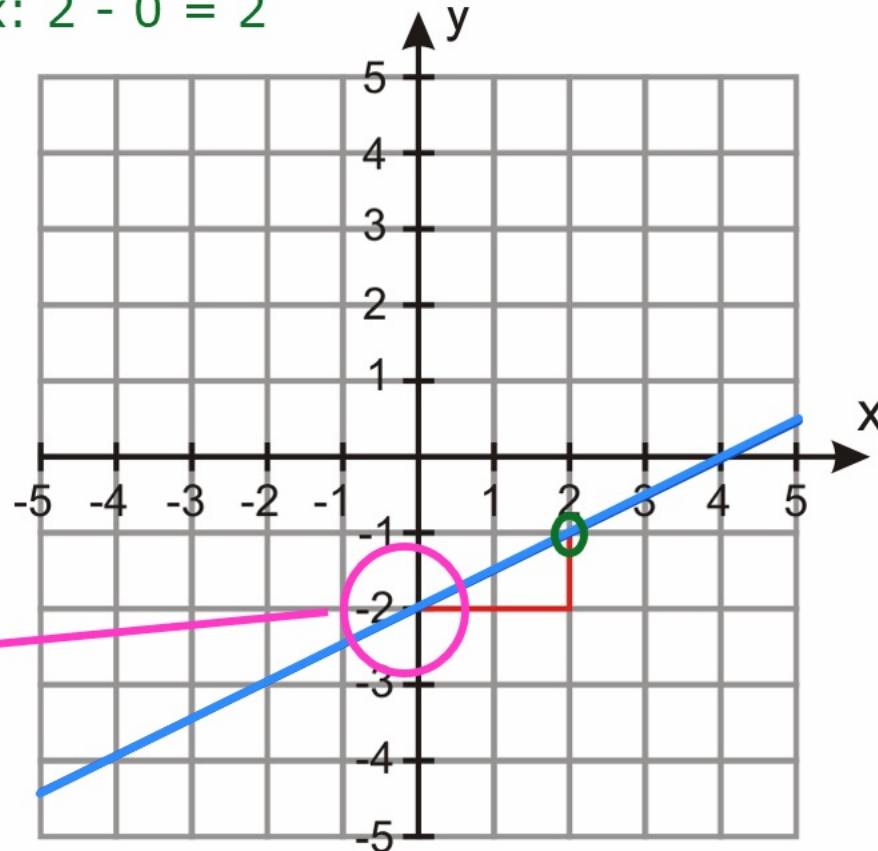
- To find the equation of a line, find the y-intercept (where the line crosses the y-axis). The line crosses the y-axis at -2.
- Next find the slope. The slope of this line is $1/2$.
- Substitute the values of m and b into the equation.

$$Y = mx + b$$

$$Y = 1/2x + (-2)$$

$$Y = 1/2x - 2$$

$$y = \frac{1}{2}x - 2$$



Test-Taking Tip

- Note that the slopes of $-1/2$ and $1/-2$ have the same value. Both show a negative slope.
- However, $-1/-2$ actually shows a positive slope because a negative divided by a negative equals a positive.

A linear function is represented by $y = x - 2$. What is the slope of the line?

A. -2

B. -1

C. 0

D. 1

$$y = mx + b$$

where (m) is the slope

A linear function is represented by
 $y = x - 2$. What is the slope of the line?

$1 * x$

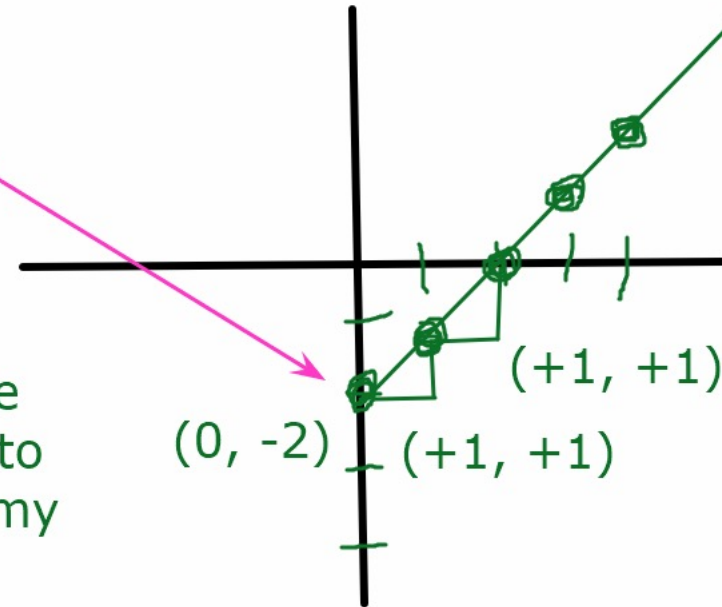
A. -2

B. -1

C. 0

D. 1

A positive slope means a line pointing upward (as it goes to the right) - in other words, my change in y is positive



Identify which of the following equations are written in point-slope form.

A. $3x + 3y = 18$

B. $Y = 2x + 3$

C. $Y + 3 = 6$

D. $Y + 3 = 3(x - 4)$

Note: Letter (B) is in point-slope form.

We can find the slope of equation (A) by graphing it, then calculating based on the two known points.

gn Transitions Animations Slide Show

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$y = mx + b$

Identify which of the following equations are written in point-slope form.

A. $3x + 3y = 18$ \longrightarrow $\frac{3x}{3} + \frac{3y}{3} = \frac{18}{3}$
 $x + y = 6$

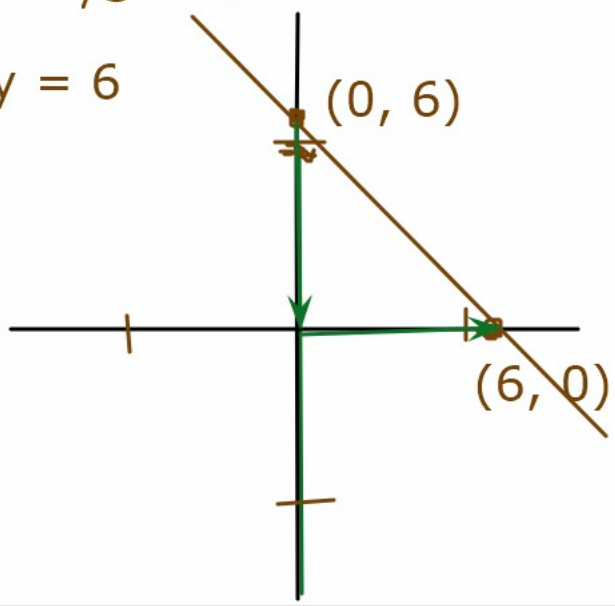
B. $Y = 2x + 3$

C. $Y + 3 = 6$

D. $Y + 3 = 3(x - 4)$

negative slope

change in y : $\frac{-6}{6}$ = -1
change in x : 6



The graph shows a coordinate plane with a line passing through the points (0, 6) and (6, 0). The line has a negative slope. The y-intercept is at (0, 6) and the x-intercept is at (6, 0). Green arrows indicate the change in y from 6 to 0 (a change of -6) and the change in x from 0 to 6 (a change of 6).

s) Notes 77%

Perpendicular & Parallel

What do these words mean?

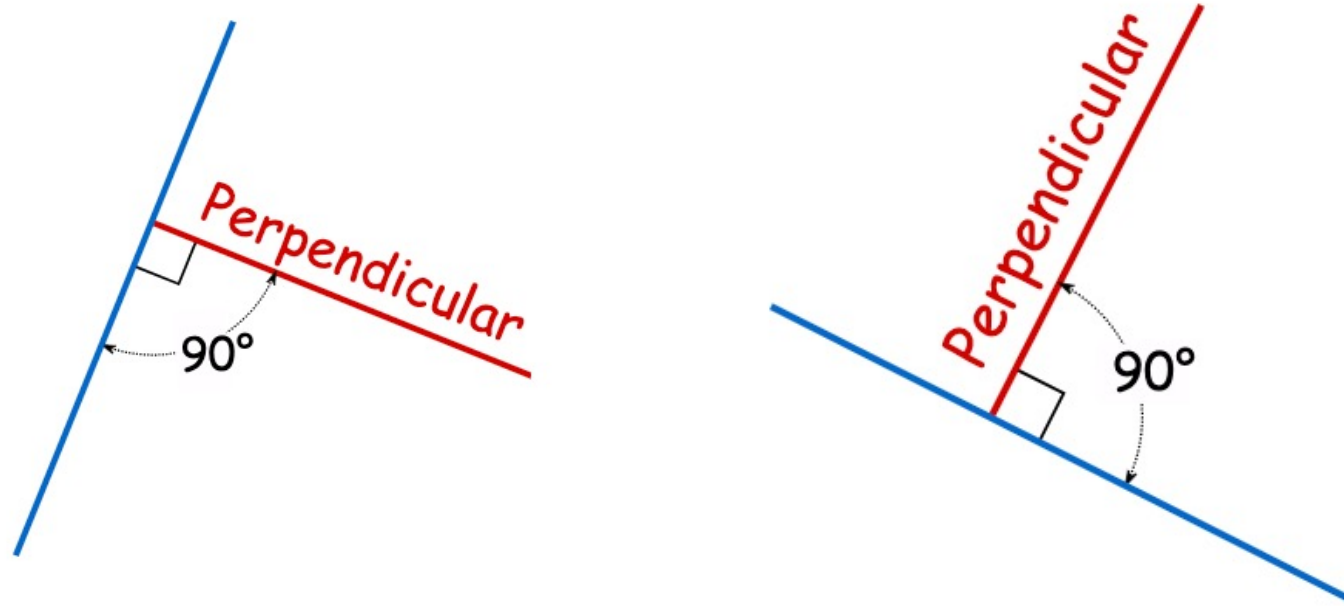


*“Don’t be frightened. I’m you, but I come
from a perpendicular universe.”*

Perpendicular

It just means **at right angles (90°)** to.

The red line is perpendicular to the blue line:



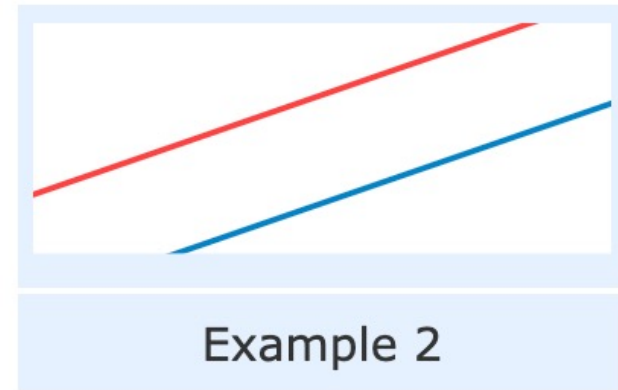
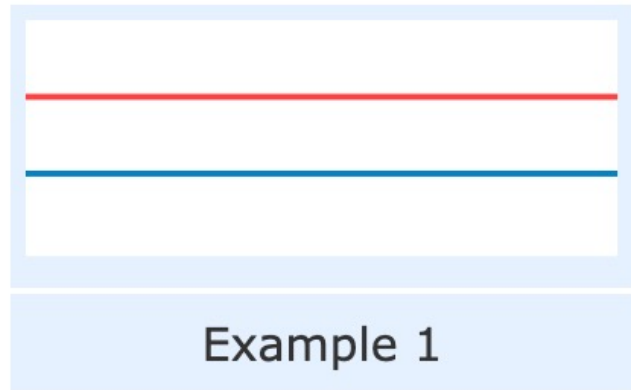
If two lines are perpendicular to each other, their slopes are negative reciprocals of each other. For example, if the slope of one line is 2, the slope of a perpendicular line is $-1/2$.

Parallel

Lines are parallel if they are always the same distance apart (called "equidistant"), and will never meet. (They also point in the same direction). Just remember:

Always the same distance apart and never touching.

The red line and blue line are parallel in both these examples:



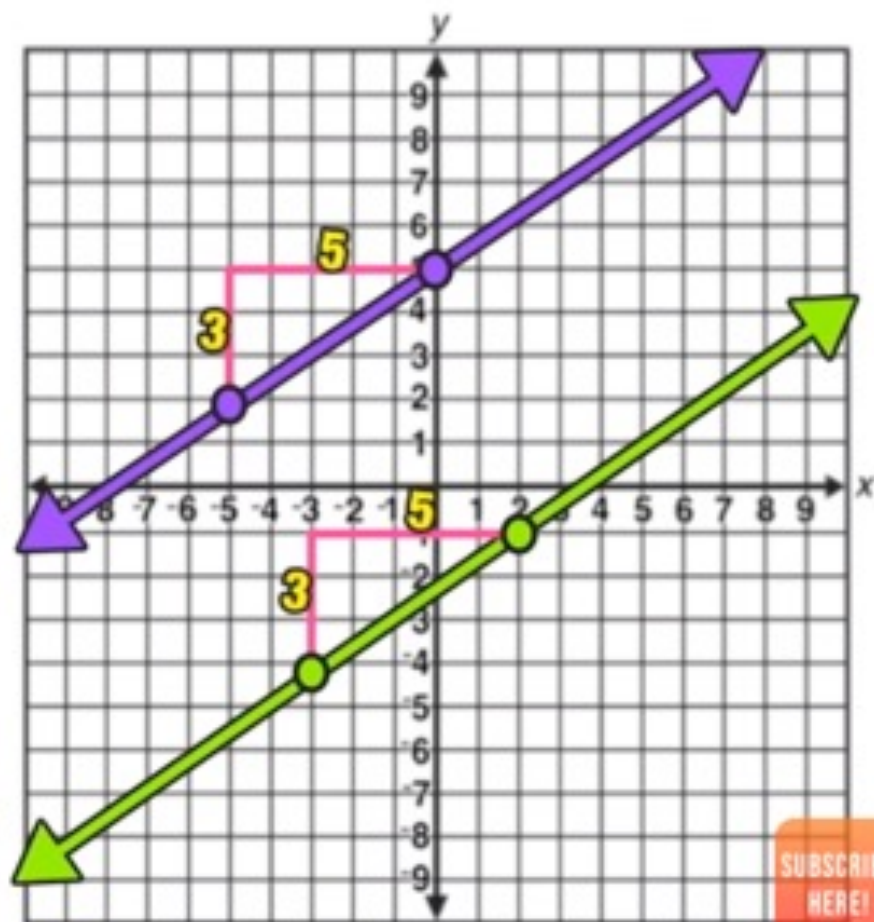
If two lines are parallel to each other, they have the same slope.

If lines are **parallel**,
then their slopes are
the

SAME

$$m = \frac{3}{5}$$


$$m = \frac{3}{5}$$




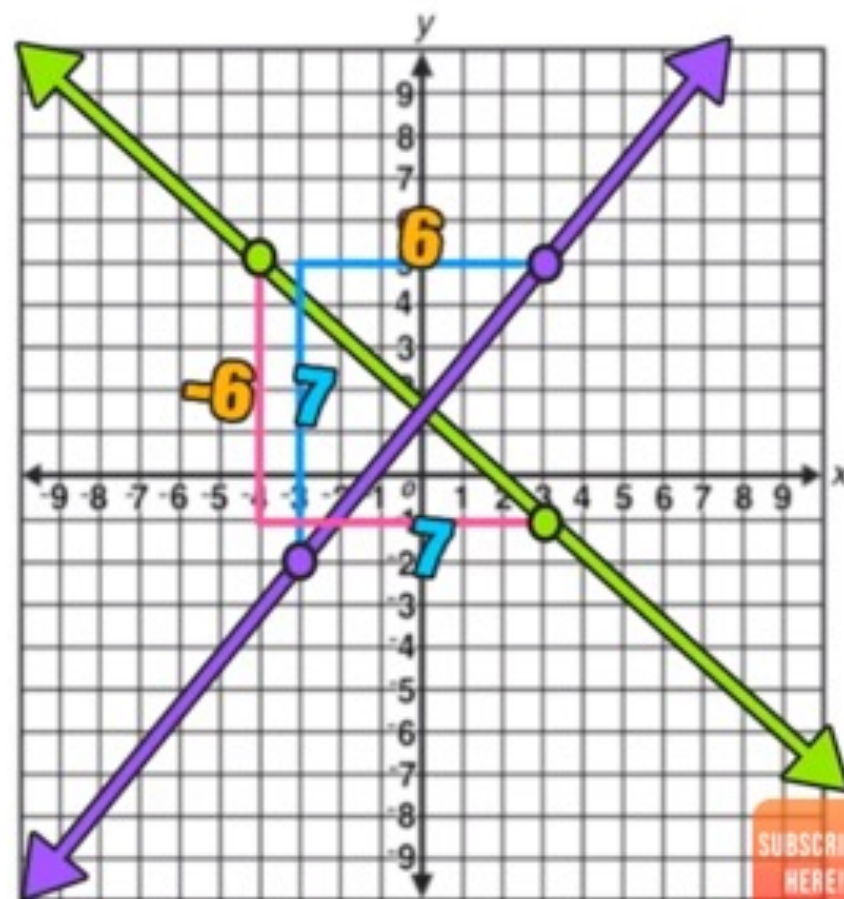
SUBSCRIBE
HERE!

If lines are **perpendicular**,
then their slopes are

**NEGATIVE
RECIPROCAL**

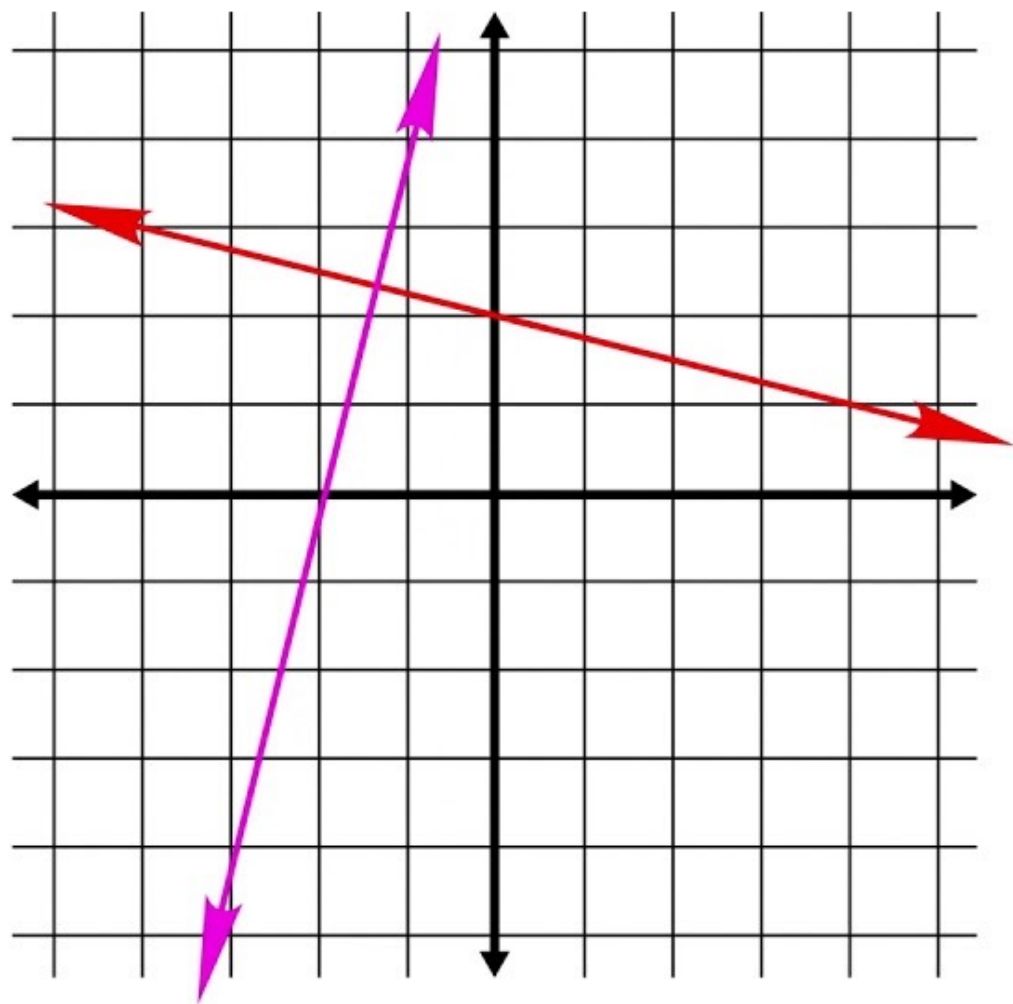

$$m = -\frac{6}{7}$$


$$m = +\frac{7}{6}$$



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Parallel and Perpendicular Lines



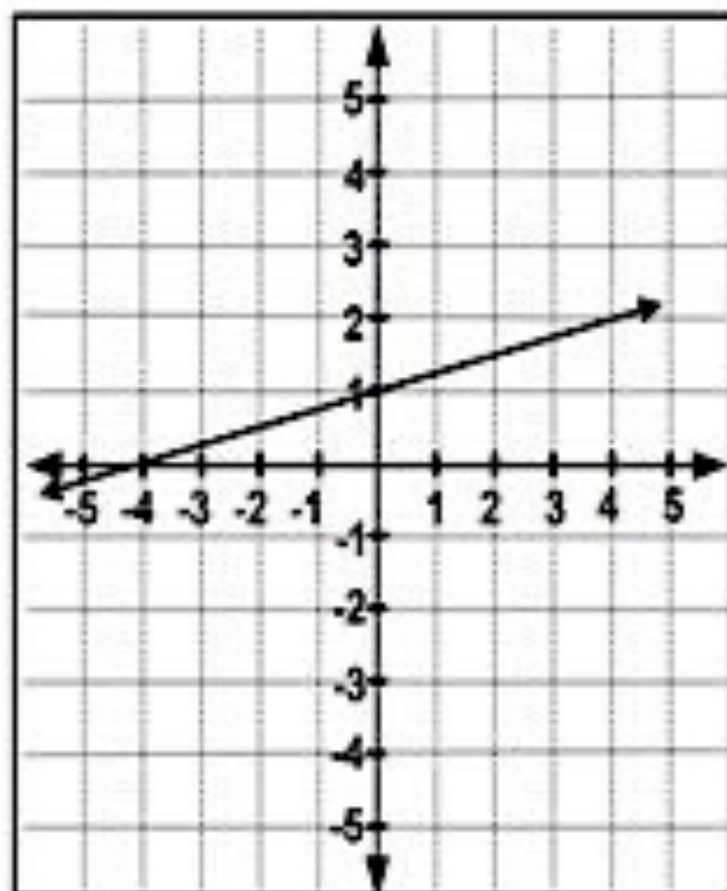
write the equation
of any line that is
perpendicular to

$$y = -\frac{1}{4}x + 2$$

$$y = 4x + 6$$

$$y = 4x - 1000$$

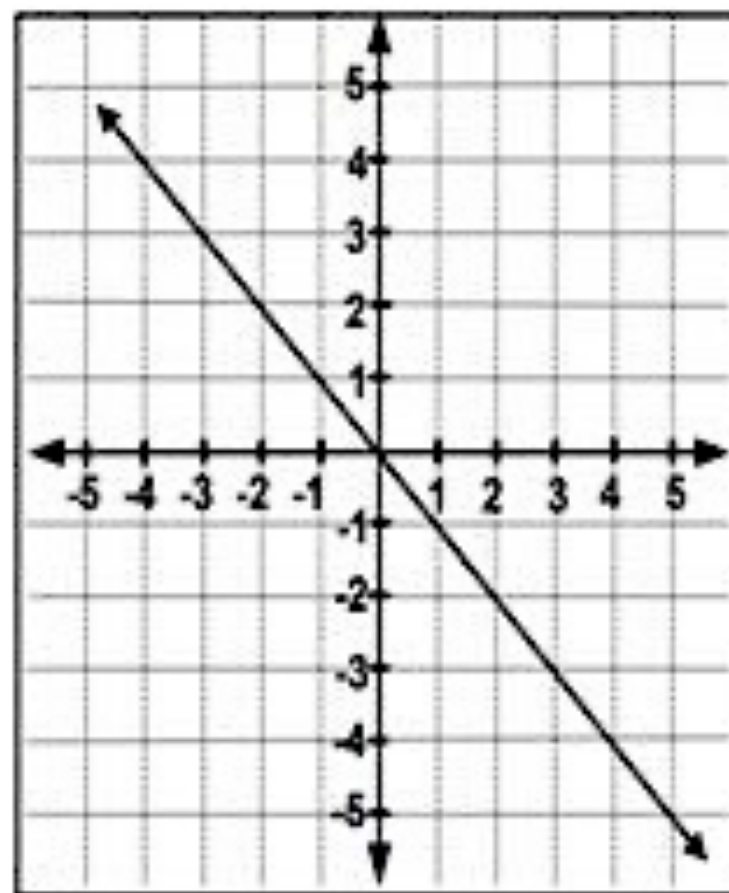
1. Is the line in the graph below parallel to the line with the equation $y = \frac{1}{3}x + 2$?



Yes ☐

No ☐

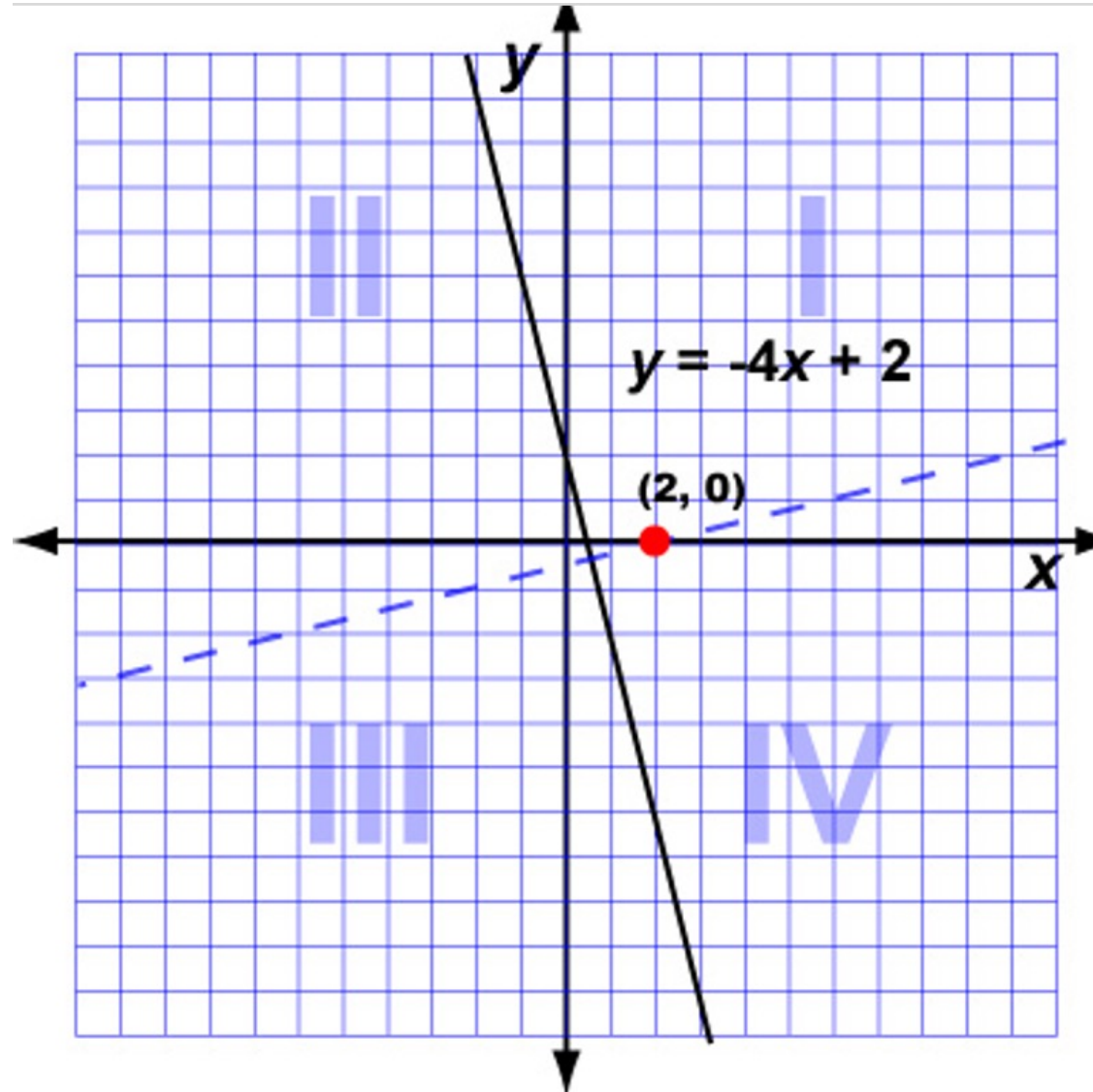
2. Is the line in the graph perpendicular to the line with the equation $y = x + 2$?



Yes ☐

No ☐

Find the equation of the line passing through the point shown and perpendicular to the given line.



**What is the slope of a line parallel to
 $y = 4x + 3$?**

A. $-3/4$

B. $-1/4$

C. 3

D. 4

**What is the slope of a line perpendicular to
 $y = -3x + 2$?**

A. -3

B. $-1/3$

C. $1/3$

D. 3

What is the slope of a line perpendicular to $y = -3x + 2$?

A. -3

B. $-1/3$

C. $1/3$

D. 3

turn it over

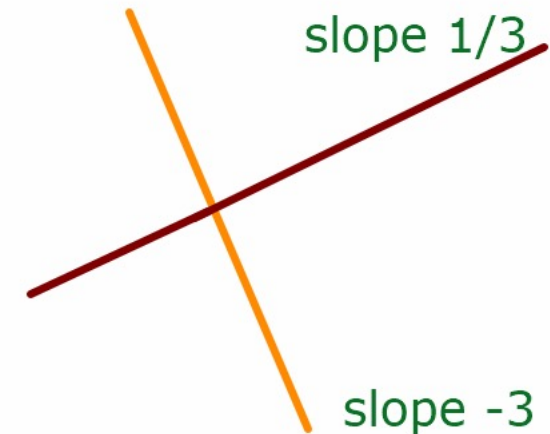
change the sign

$$\frac{-3}{1}$$

$$\frac{1}{-3}$$

$$\frac{1}{3}$$

perpendicular lines:
turn the fraction over
and change the sign



Homework!

Active Assignments



Week 9

To begin, select an activity from All Activities

[Select New Activity](#) 



All Activities

Completion: 0/5 (0%)



No Due Date