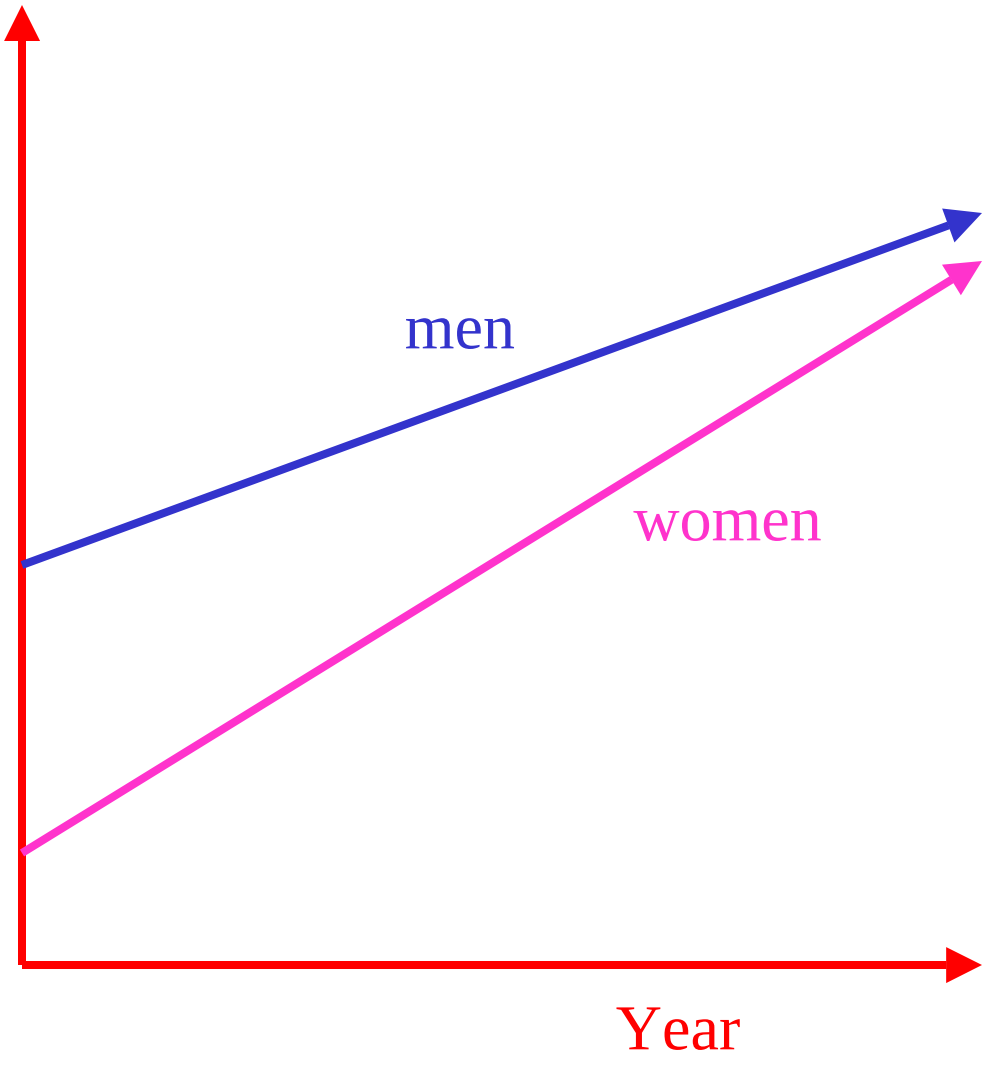
Slope of a Line



This graph approximates the growth patterns of attendance of men's and women's basketball games at a large university.

The slope of a line is a description of how steep the line is and whether the line goes up (positive slope) or down (negative slope).

Slope of a Line

The change in the y-coordinates as we move from P to Q is called the ***rise***. The change in the x-coordinates as we move from P to Q is called the ***run***.

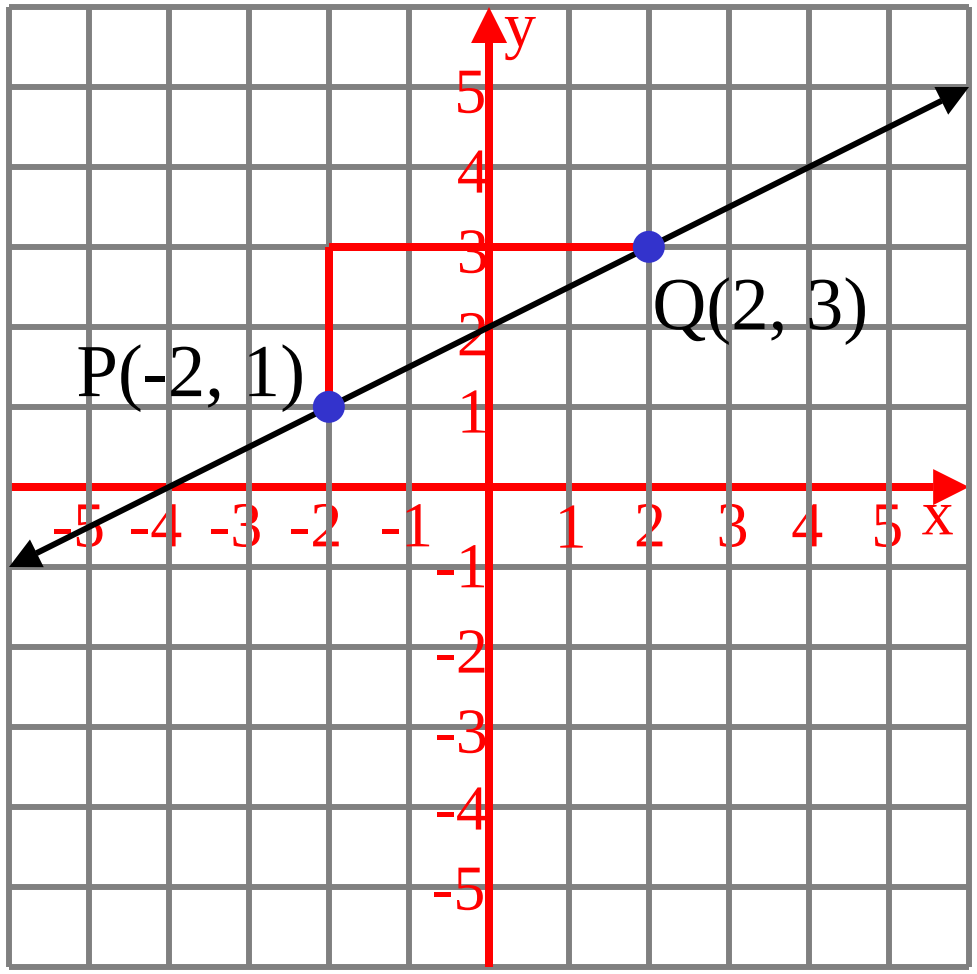
The slope is the ratio of the rise to the run.

$$\text{slope} = \frac{\text{rise}}{\text{run}} = \frac{\text{change in y}}{\text{change in x}}$$

For the graph shown:

$$\text{slope} = \frac{2}{4} = \frac{1}{2}$$

The letter *m* is commonly used for slope.



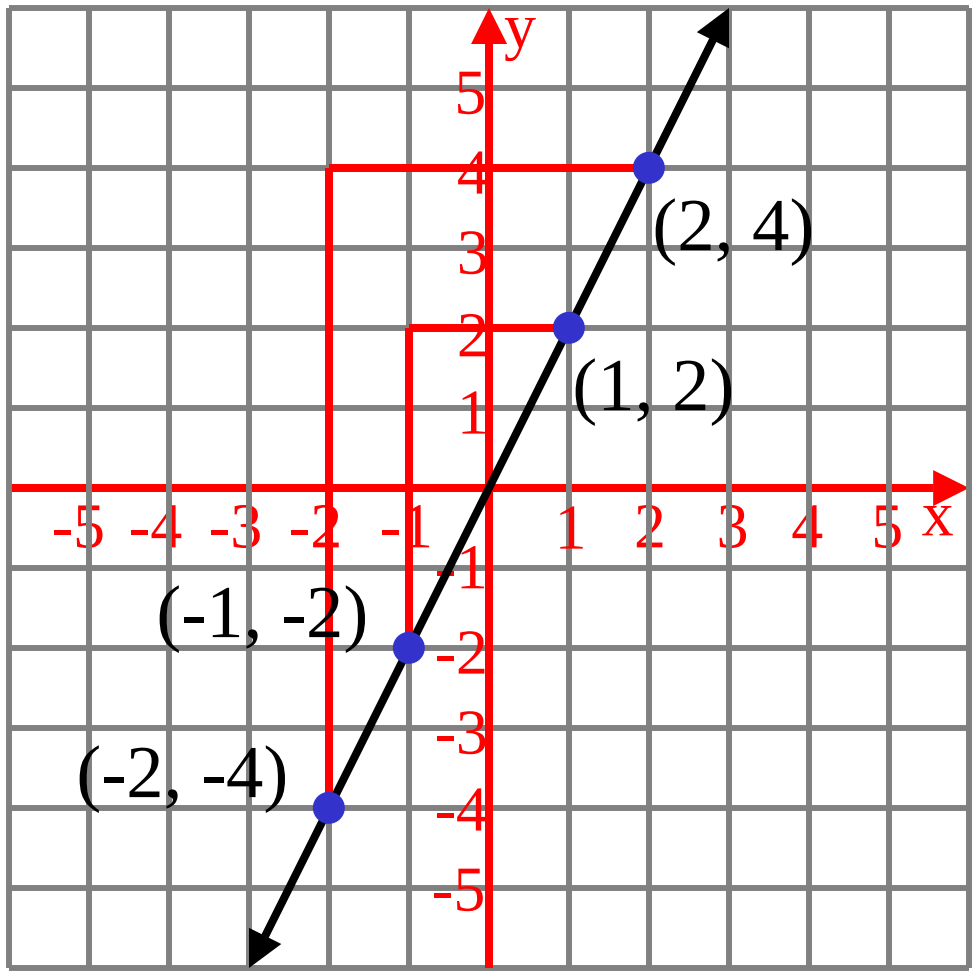
Slope of a Line

$$\text{slope} = \frac{\text{rise}}{\text{run}} = \frac{\text{change in y}}{\text{change in x}}$$

It doesn't matter which two points you pick, or their order!

$$\text{slope} = m = \frac{8}{4} = 2$$

$$\text{slope} = m = \frac{4}{2} = 2$$



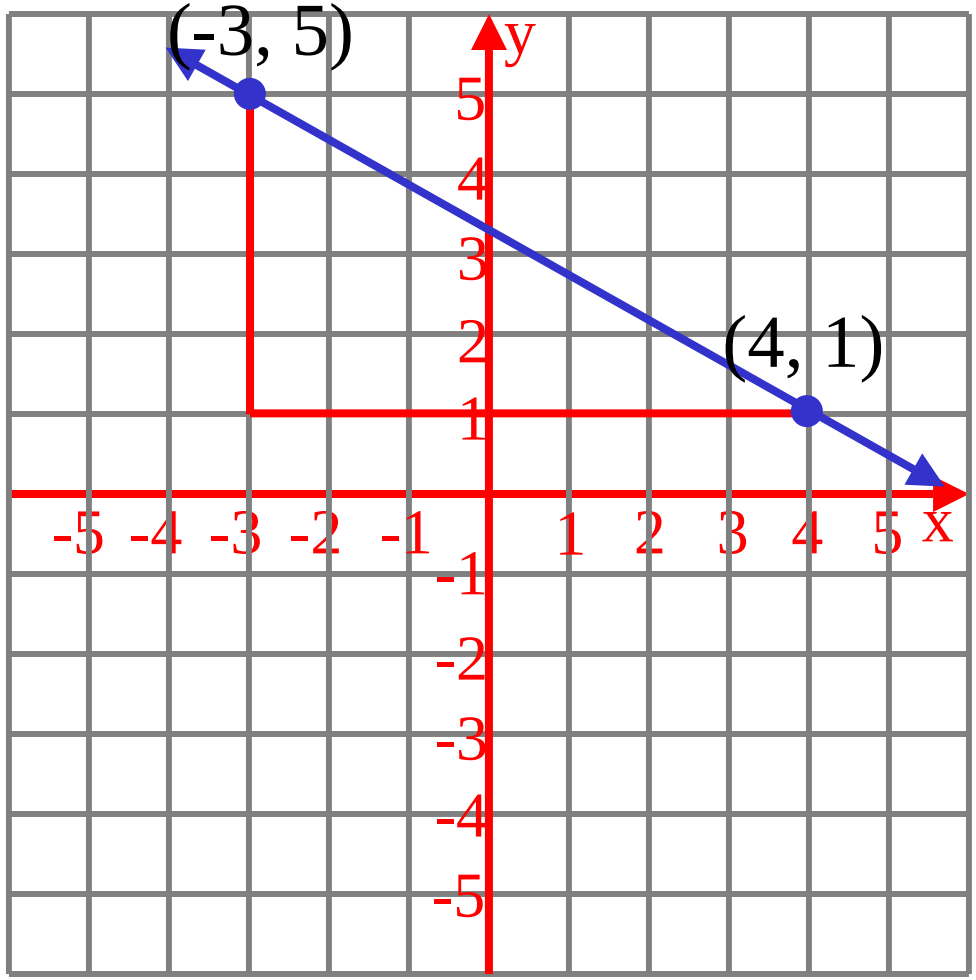
Slope of a Line

Find the slope of the line containing the points (-3, 5) and (4, 1)

rise = -4

run = 7

m = -4/7



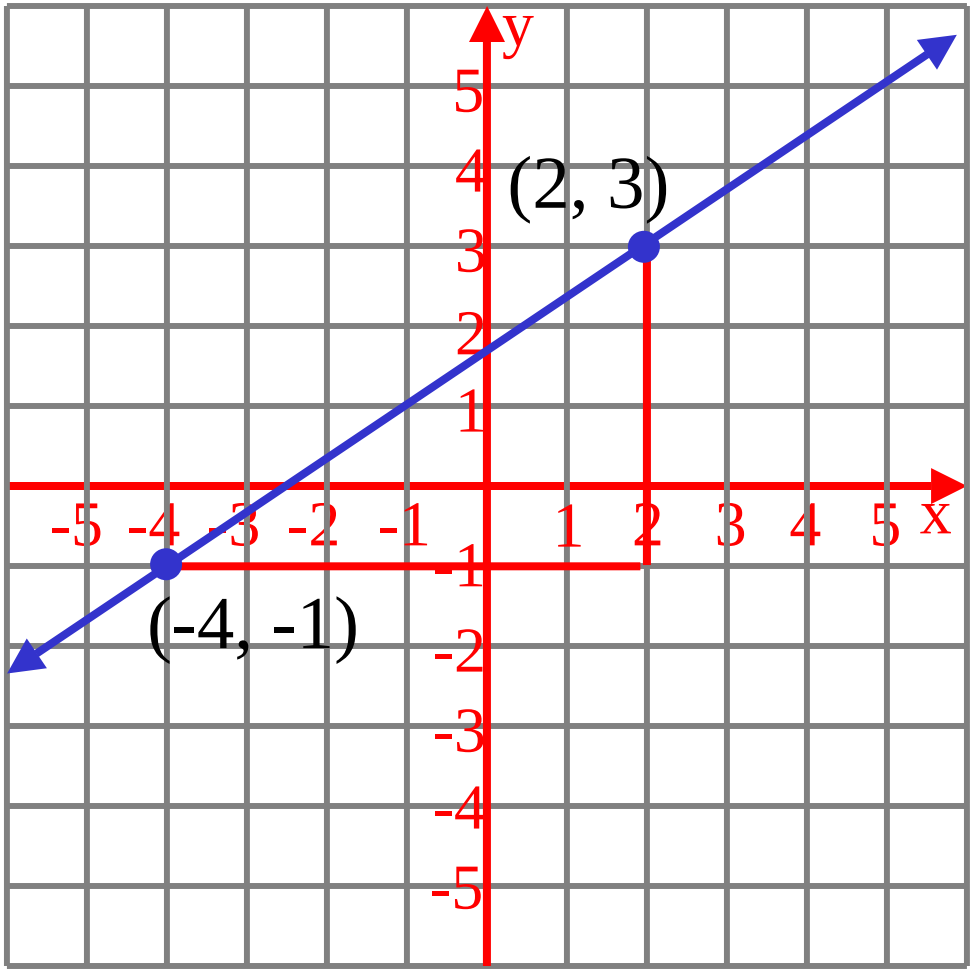
Slope of a Line

Find the slope of the line containing the points (2, 3) and (-4, -1)

rise = 4

run = 6

m = 4/6 = 2/3



Slope of a Line

You don't need to draw a slope triangle to find the slope. You can use this formula:

For any two points (x_1, y_1) and (x_2, y_2) slope = $m = \dfrac{y_2 - y_1}{x_2 - x_1}$

Let's try this with the two points from the last example (x_1, y_1) are (2, 3) and (x_2, y_2) are (-4, -1).

$$\frac{y_2 - y_1}{x_2 - x_1} = \frac{-1-3}{-4-2} = \frac{-4}{-6} = \frac{2}{3}$$

Suppose we swap the two points. This time (x_1, y_1) are (-4, -1) and (x_2, y_2) are (2, 3).

$$\frac{y_2 - y_1}{x_2 - x_1} = \frac{3-(-1)}{2-(-4)} = \frac{4}{6} = \frac{2}{3}$$

Slope of a Line

It doesn't matter which point you choose to go first.
It DOES matter that you don't mix up your x and y!

You can line the points up in columns to keep from getting mixed up. Compute the differences, then put the y-difference (the rise) over the x-difference (the run) to compute the slope.

Compute the slope of the line that contains the points (0, 4) and (4, 2).

0	4
4	2
-4	2
run	rise

$$m = \frac{2}{-4} = -\frac{1}{2}$$

Slope of a Line

You try it! Compute the slope of the line that contains the points:

1) (5, 0) and (0, -2)

$$\begin{array}{cc} 5 & 0 \\ 0 & -2 \\ \hline 5 & 2 \\ \text{run} & \text{rise} \end{array} \qquad m = \frac{2}{5}$$

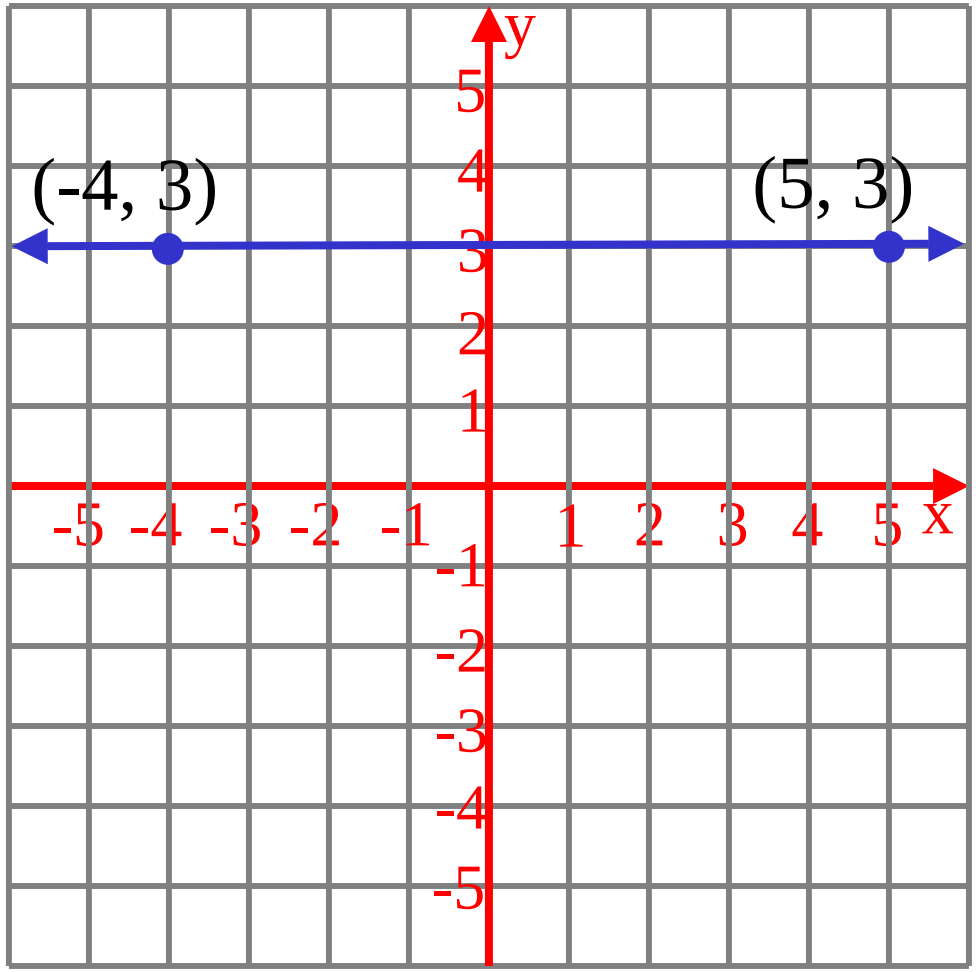
2) (2, 4) and (6, 5)

$$\begin{array}{cc} 2 & 4 \\ 6 & 5 \\ \hline -4 & -1 \\ \text{run} & \text{rise} \end{array} \qquad m = \frac{-1}{-4} = \frac{1}{4}$$

Slope of Horizontal Lines

Find the slope of the line y = 3

The points (-4, 3) and (5, 3) are both on the line y = 3.



rise = 3 – 3 = 0

run = 5 – (-4) = 9

m = 0/9 = 0

All horizontal lines have slope $m = 0$.

Slope of Vertical Lines

Find the slope of the line x = -4

The points (-4, 3) and (-4, -5) are both on the line x = -4.

rise = 3 – (-5) = 8

run = (-4) – (-4) = 0

m = 8/0

But division by 0 is undefined so …

All vertical lines have no slope.