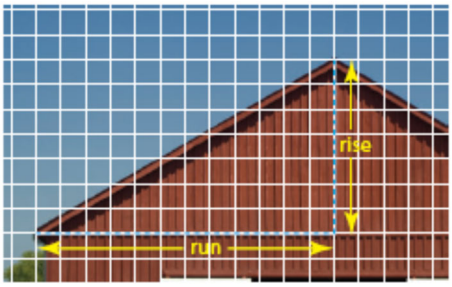
NOTES

Lesson 1: Slope of a Line



The steepness of a roof is measured by calculating its SLOPE.

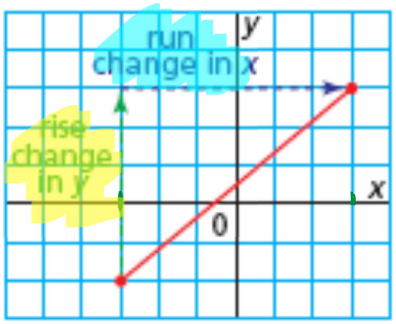
LAST CHAPTER IT WAS CALLED "RATE OF CHANGE" B/C THE UNITS FOR RISE & RUN WERE DIFFERENT.

Rise: VERTICAL DISTANCE (Δ IN Y)
↑ CHANGE

Run: HORIZONTAL DISTANCE (Δ IN X)

The change in y is the RISE

The change in x is the RUN

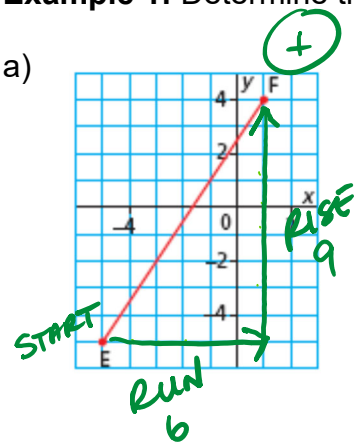


slope (m) = $\frac{\text{RISE}}{\text{RUN}}$

The symbol for slope is m

Example 1: Determine the slope of each line segment.

a)



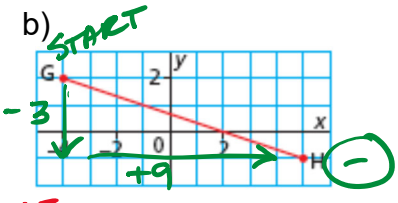
$m = \frac{\text{RISE}}{\text{RUN}}$

$= \frac{9}{6}$

REDUCE

$= \frac{3}{2}$

b)



$m = \frac{\text{RISE}}{\text{RUN}}$

$= \frac{-3}{9}$

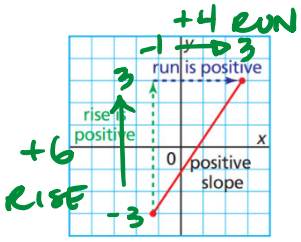
DROPPING 3 UNITS

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

There are 4 types of slope:

MOVING TOWARDS (+) SIDE OF X & Y AXES

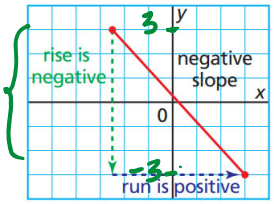
1. When a line segment goes up to the right, both y and x INCREASE; both the rise and the run are POSITIVE, so the slope of the segment is POSITIVE.



$m = \frac{+6}{+4} = \frac{3}{2}$

DROPPING DOWN TOWARDS (−)

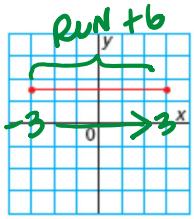
2. When a line segment goes down to the right, y DECREASES and x INCREASE; the rise is NEGATIVE and the run is POSITIVE, so the slope of the segment is NEGATIVE.



$m = \frac{-6}{+5.5} \doteq 1.09$

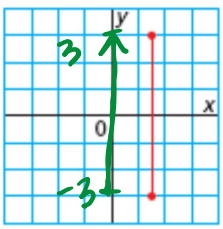
OR (EQUIV. $\frac{a}{b}$) $\frac{-6 \cdot 10}{5.5 \cdot 10} = \frac{-60}{55}$ REDUCE $\frac{-60 \div 5}{55 \div 5} = \frac{-12}{11}$ BETTER

3. For a horizontal line segment, the change in y is 0 and x INCREASES. The rise is 0 and the run is POSITIVE. The slope of a horizontal line is ZERO.



$m = \frac{0}{+6} = 0$

4. For a vertical line segment, y INCREASES and the change in x is 0. The rise is POSITIVE and the run is 0. The slope of a vertical line is UNDEFINED.



$m = \frac{+6}{0}$ = UNDEFINED

Example 2: Draw a line segment with each slope.

a) $\frac{5}{2}$ starting at A(-3, -3)

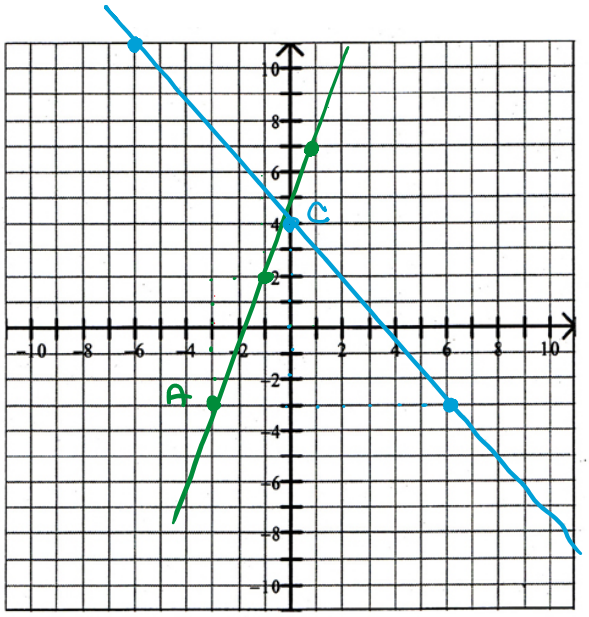
+5 ← UP 5 (+)

+2 ← RIGHT 2 (+)

b) $-\frac{7}{6}$ starting at C(0, 4)

-7 ← DOWN 7 (-)

+6 ← RIGHT 6 (+)



Example 3: Determine the slope of the line that passes through G(–3,–5) and H(4, 3).

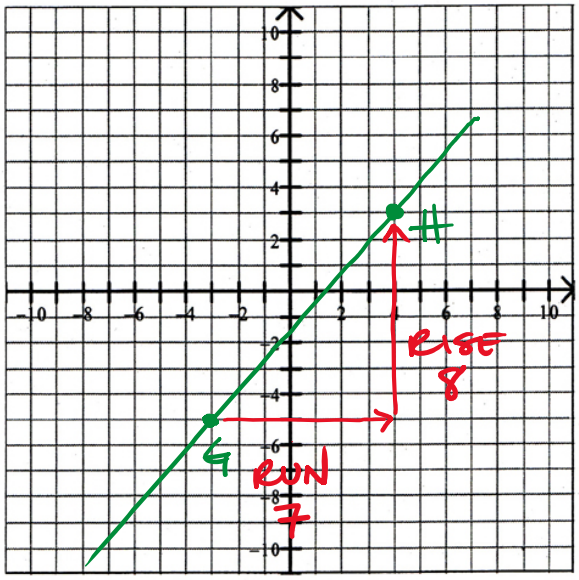
1) PLOT POINTS

2) JOIN POINTS

3) COUNT RISE & RUN

4) $m = \frac{\text{RISE}}{\text{RUN}}$

$= \frac{8}{7}$

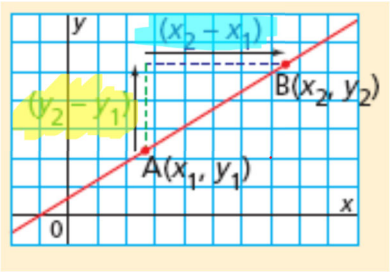


Slope of a Line

A line passes through A(x_1, y_1) and B(x_2, y_2), you can use this formula to determine the slope of a line.

LITTLE NUMBERS ARE SUBSCRIPTS

$$\text{slope } (m) = \frac{y_2 - y_1}{x_2 - x_1}$$ ← Δy ← Δx



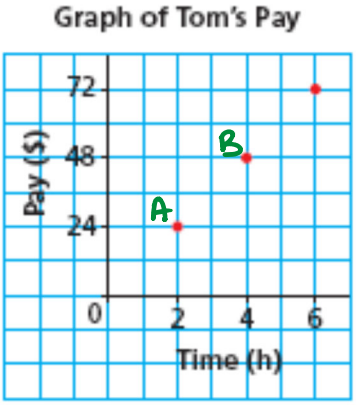
Example 4: Find the slope of a line passing through A(4, -1) and B(-5, 6).

x_1 y_1 x_2 y_2

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{6 - (-1)}{-5 - 4} = \frac{7}{-9}$$

$$\boxed{m = \frac{-7}{9}}$$

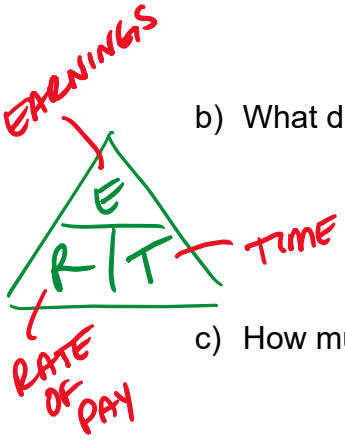
Example 5:
Tom has a part-time job. He recorded the hours he worked and his pay for 3 different days.
Tom plotted these data on a grid.



a) What is the slope of the line through these points?

* PICK ANY TWO POINTS: A(2, 24)
B(4, 48)

$$m = \frac{\$48 - 24}{4 - 2\ h} = \frac{\$24}{2\ h} = \frac{\$12}{1\ h}$$ or $\$12/h$



b) What does the slope represent? TOM'S HOURLY RATE OF PAY = $12 PER HOUR

c) How much does Tom earn in 3½ hours? $\frac{\$12}{h} \cdot 3.5\ h = \$42$

d) How long did it take Tom to earn $30? $\frac{\$30}{\$12/h} = 2.5\ h$

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