Rate of Change & Slope

Unit 2

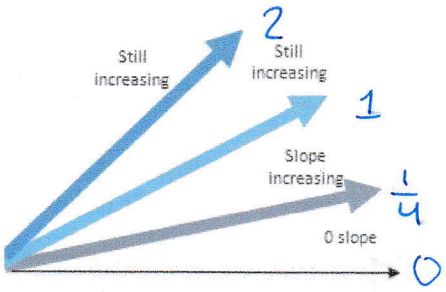
Lesson 4

Essential Question: How do you calculate the slope between two points? Answer on your response card.

The **slope** of a non-vertical line is ratio of the change in the y-values (compared) to the change in the x-values. **Slope** describes how steep a line is. **Rate of change** describes how one quantity changes in respect to another quantity.

(used in word problems)

SLOPE = $\frac{\Delta y}{\Delta x}$ = $\frac{\text{change in ys}}{\text{change in xs}}$



The greater the absolute value of the slope, the steeper the line.

Slope starts at ZERO and slowly increases as the line goes UP.

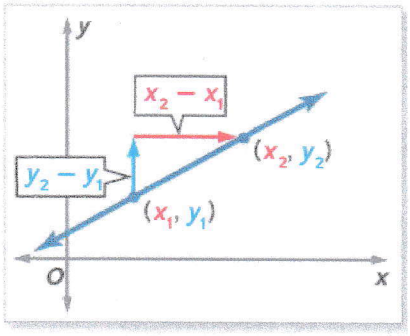
How to Find Slope/Rate of Change

Words The slope of a nonvertical line is the ratio of the rise to the run. $m = \frac{\text{rise}}{\text{run}}$

Symbols The slope m of a nonvertical line through any two points, (x_1, y_1) and (x_2, y_2), can be found as follows.

$$m = \frac{y_2 - y_1}{x^2 - x_1}$$

Graph



Find the rate of change for each of the following.

Number of Computer Games	Total Cost ($)
x	y
2	78
4	156
6	234

Choose any 2 rows

(2, 78) (4, 156)

x_1 y_1 x_2 y_2

$m = \frac{156 - 78}{4 - 2} = \frac{78}{2}$

= $39 per game

(−4, −2) and (0, −2)

x_1 y_1 x_2 y_2

$M = \frac{-2 + (+2)}{0 - (-4)} = \frac{0}{4}$

M = 0

x	−3	2
y	4	−3

(−3, 4) (2, −3)

x_1 y_1 x_2 y_2

$M = \frac{-3 - 4}{2 - (-3)} = \frac{-7}{5}$

$M = \frac{-7}{5}$

Practice STAAR Questions

What is the meaning of the slope of the line?

A. The line increases by 1 unit in y for every 1 unit of increase of x.

B. The line increases by 2 units in y for every 1 unit of increase of x.

C. The line decreases by 2 units in y for every 1 unit of increase of x.

D. The line decreases by 1 unit in y for every 1 unit of increase of x.

x	y
1	4
3	0
8	−10
10	−14

(1, 4) (3, 0)
x_1 y_1 x_2 y_2

$$m = \frac{0-4}{3-1} = \frac{-4}{2}$$

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

Leah drew a line that passes through the points (7, -1) and (7, 8). What type of slope will the line have? x_1 y_1 x_2 y_2

A. Slope is undefined.

B. Slope is zero.

C. Slope is positive.

D. Slope is negative.

$$M = \frac{8-(-1)}{7-7} = \frac{9}{0}$$

Find the value of r so the line that passes through each pair of points has the given slope.

$(-2, 6), (r, -4); m = -5$
x_1 y_1 x_2 y_2

$$-5 = \frac{-4-6}{r-(-2)} \quad \text{Sub.}$$

$$\frac{-5}{1} = \frac{-10}{r+2} \quad \text{Cross Multiply}$$

$$-10 = -5(r+2)$$

$$-10 = -5r - 10$$

$+10$ $+10$

$$0 = -5r$$

-5 -5

$$0 = r$$