Unit 2 Lesson 9
Average Rate of Change

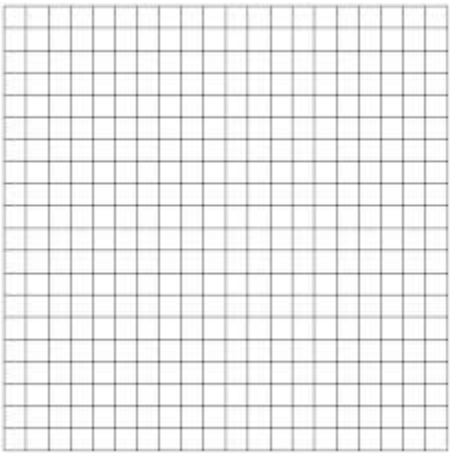
Objectives:

- I can **find the average rate of change**
- I can compare the average rates of change

Warm up:

The table below compares the numbers of hours a cashier works to her total earnings, in dollars. **Write a linear equation to represent the cashier's earnings**. **Graph the equation**.

Cashier's Earnings	
Time in hours **x**	Earnings in $, **y**
0	0
2	15
4	30



Think back….. what information do you remember about slope?

Average Rate of Change

Given two ordered pairs, (x_1, y_1) and (x_2, y_2).

You can calculate the rate of change using this formula:

$$\frac{y_2 - y_1}{x_2 - x_1}$$

A rate of change shows how one quantity changes relative to another quantity. This is the SLOPE of a linear equation.

Let's try……..

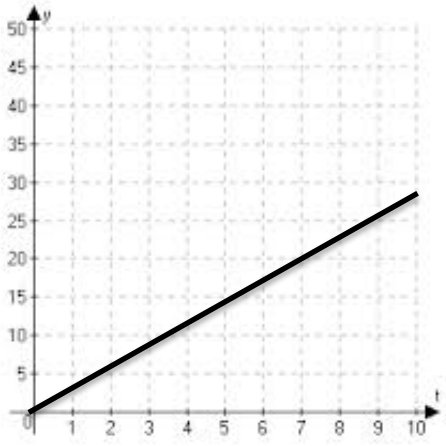
Look back at our cashier's problem at the beginning of the notes.

Pick two points. Find the average rate of change. Use the formula above.

Cashier's Earnings	
Time in hours **x**	Earnings in $, **y**
0	0
2	15
4	30

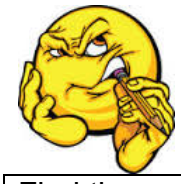
Let's try another…….

Look at the graph below. Pick two points to find the average rate of change.



$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

Determine the average rate of change between (-3, 7) and (4, -2)



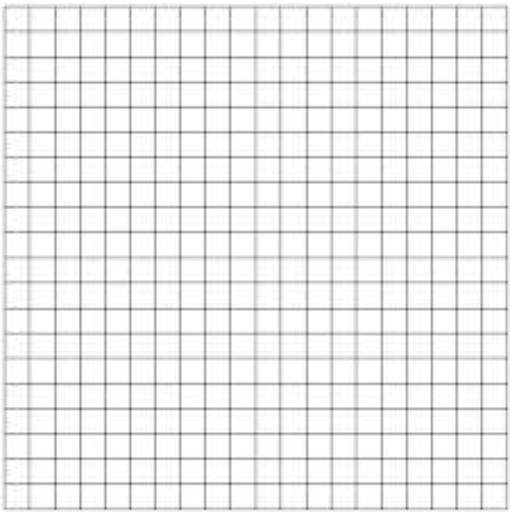
You Try!!!!!!

Find the average rate of change between (19, 0) and (-2, -5)

Find the average rate of change between (8,-8) and (-1,-4)

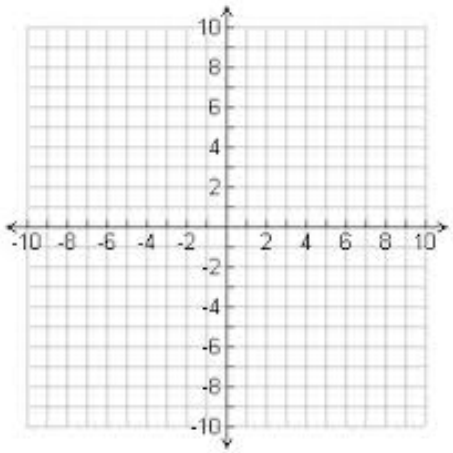
Let's Try…….

A basketball championship begins with 64 teams. Every time a team wins a game, it goes on to the next round. Once a team loses a game it is eliminated. The number of teams in each round of the championship is a function of the round. That function is represented on the graph below. **Compare the rate of change between rounds 1 and 2 to the rate of change between rounds 2 and 3.**



You Try……..

Graph $f(x) = 2^x + 1$. Find the average rate of change between any 2 consecutive x values.



Compare your rate of change with someone near you.

Rate of Change of a Linear Function

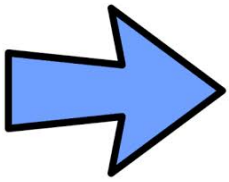
This table shows the values of a linear function.

x	0	1	2	3	4	5
f(x)	1	3	5	7	9	11

What do you notice?

What is the equation of the function?

What part of the equation is the rate of change?



A linear function has a constant rate of change. It is called the SLOPE.

Exponential functions have a graph that is a CURVE.

An exponential growth function is always_____

An exponential decay function is always _____

The table below represents an exponential function.

x	0	1	2	3	4	5
f(x)	1	2	4	8	16	32

What do you notice?

The value of the function, f(x) does not grow by constant amounts over equal intervals. It does **NOT** have a constant rate of change.

The function **DOES** grow by the same **factor** over equal intervals. It has an average rate of change.

GROWTH FUNCTIONS

The factor of change is greater than 1

DECAY FUNCTIONS

The factor of change is less than 1

Let's Try……

Find and describe the average rate of change for four consecutive pairs of values in the table.

x	-3	-2	-1	0	1
f(x)	64	16	4	1	1/4

Determine the average rate of change between 3 consecutive pairs of points for the function f(x) = -3 + 2

X	f(x) = -3x + 2	f(x)

What type of function is this?

You Try……..

Find the average rate of change for 3 intervals of f(x)

x	f(x)
-1	1/3
0	1
1	3
2	9

Compare the rates of change for $f(x) = 10^x$ and function g represented in the table.

x	g(x)
-1	1/8
0	1
1	8
2	64
3	512

What is the same?

Name_____

Unit 2 Lesson 9
Average Rate of Change

Fill in the blanks by writing an operation sign and a number to show how the f(x) –values are changing in each unit interval. Then classify each function as linear or exponential.

1.

x	-1	0	1	2	3	4
f(x)	1/6	1	6	36	216	1296

_____

2.

x	-3	2	-1	0	1	2
f(x)	11	7	3	-1	-5	-9

_____

Fill in the blanks with an appropriate word or phrase

3. The average _____between two ordered pairs (x,y) is the ratio $\frac{\text{Change in y}}{\text{Change in x}}$

4. In a linear function, the rate of change is also known as the _____.

5. The average rate of change for a _____ function is constant.

6. The average rate of change for an exponential function grows by equal _____ per unit interval.

7. Determine the average rate of change between, (-1, 4/3) and (0, 2)._____

8. Determine the average rate of change between (0,2) and (1,4). _____

9. Determine the average rate of change between (1,4) and (2,10). _____