Math 9 – Unit 7: Coordinate Geometry Name: _____

Lesson #4: Slope as a Rate of Change Part 1 Date: May 17

Learning Goal: We are learning to connect rate of change to the slope of a line.

To explore what "rate of change" is, we first need to refamiliarize ourselves with "rate". A **rate** is a comparison of two quantities expressed as different units:

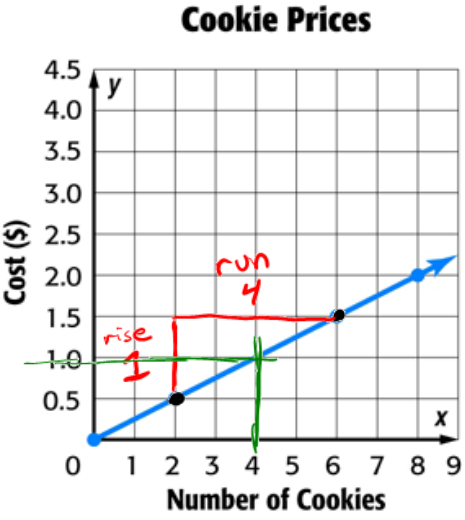
Examples: Speed: $\frac{130\ km}{hr}$ population: $\frac{100\ crickets}{year}$ Gas: $\frac{\$1.149}{L}$ All single units

A line on a graph is always changing (unless it is flat or $m = 0$). Rate of change, then, is the rate at which a line on a graph is changing. Thankfully, we know how to calculate this change by calculating the slope! Thus,

Rate of change = slope = $m = \frac{Rise}{Run} = \frac{y_2 - y_1}{x_2 - x_1}$ = Rate of change

* Be mindful of the scales.

Example 1: Given the graph to the right:



a) Calculate the rate of change. Include the units (always include units).

Slope = ROC $\Rightarrow m = \frac{rise}{run} = \frac{\$1.00}{4\ cookies}$ ÷4 ÷4 ROC $\frac{\$0.25}{1\ cookie}$

b) What does the rate of change represent?

Is the cost of 1 cookie.

c) How much would 7 cookies cost? $7 \times \$0.25 = \$1.75$

If I spent one dollar, how many cookies would I get? 4 cookies!

When you look at info within a graph, it is called interpolation.

d) ~~The information~~ for question c) was in the graph. The rate of change allows us to go beyond the graph. How much would 20 cookies cost?

$20 \times \$0.25 = \$5.00$ or $20\ \cancel{cookie} \times \frac{\$0.25}{1\ \cancel{cookie}}$

Extrapolation

Example 2: Timmy drives a cab. He charges $5 for every trip plus $1.50 for every kilometer driven.

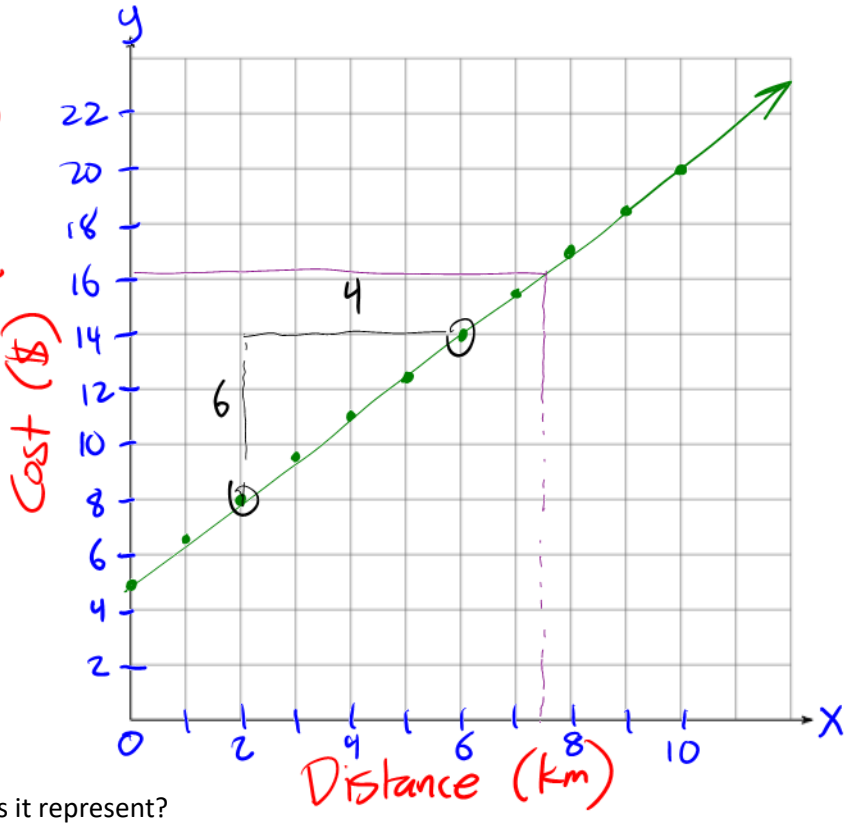
a) Create a table to represent 0 to 10 kilometers, then graph the table. Label the axes and give the graph a title.

x Distance (km)	y Cost ($)
0	5
1	6.50
2	8.00
3	9.50
4	11.00
5	12.50
6	14.00
7	15.50
8	17.00
9	18.50
10	20.00

+1.50

+1.50

Is the ROC



b) What is the rate of change, and what does it represent?

RoC is $1.50/km

Power of Slope $m = \frac{\text{rise}}{\text{run}} = \frac{6}{4} = \frac{1.5}{1}$

It represents your cost per km.

c) What is the cost of a 7.5km cab ride with Timmy?

$16.50
or
$16.25
Solved graphically.

Solve Algebraically:

$7.5\,\text{km} \times \frac{\$1.50}{1\,\text{km}} = \$11.25$

$+\$5.00$ (start)

$\$16.25$

Success Criteria

- I can recognize that slope and rate of change are the same thing
- I can find rate of change on a graph, by finding its slope
- I can find the rate of change in a table of values, by finding the common difference