NAME:_____   Math _____, Period _____

Mr. Rogove   Date:_____

Learning Objective: We will define variables of **exact** linear models, and use written and verbal descriptions to interpret the equation for the line where appropriate. (G8M6L7)

Concept Development:
Defining our variables (a bit more precisely):
Dependent variable: This is called the **response variable** or the **predicted variable**.

Independent variable: This is called the **explanatory variable** or **predictor variable**.

We USE the information we have about our independent variable to make predictions about the values of the dependent variables.
Example: What might be a predictor of how many miles a person drives each month?

· Distance from work   Numerical data only!
· How many "chores" they have

Response Variable (If we want to predict…) *Dependent y-axis*	Possible Explanatory Variables (…it might be good to know…) *independent x-axis*
Height of a son	Height of parents, age of son
Number of points scored in a game by a basketball player	# of shots taken, average ppg. # of minutes played, fg %
Number of hamburgers to make for a family picnic	# of people at picnic
Time it takes a person to run the mile	stride length, weight, bmi, height above age, Amount of exercise sea level
Amount of money won by a contestant on Jeopardy!	IQ, # of questions answered correctly
Fuel efficiency for a car	weight
Number of honey bees in a beehive at a particular time	Time of day/year, # of nearby size of hive flowers
Number of blooms on a dahlia plant	Amount of H₂O, T° Sunlight hrs. , amt. of fertilizer
Number of forest fires in a state during a particular year	Amount of rain, humidity level acreage of trees

y - Variable   *x- Variable*

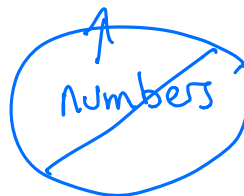| Possible Response Variables (…in order to find out…)	Explanatory Variable (It will help to know….)
reading *length* Grade level, shoe size, time for mile	Age of a student
Distance they can drive ball	Height of a golfer
time for pain to go away	Amount of pain reliever taken
How much $ you make	Number of years of education
# of tomatoes	Amount of fertilizer used on a garden
Price of the diamond	Size of a diamond ring
Wins, team batting avg. ad revenue	Total salary for a baseball team

When we talk about linear models, what does slope **mean**?

Rate of change. How much x affects y.

What does the y-intercept **mean**?

Starting point for y.   The value of y when x has no effect.

We will use descriptive words first (not symbolic language to write linear functions)

Numbers

Guided Practice:

Steps for Evaluating Functions using Exact Linear Models
1. Read the scenario carefully and determine the response variable and the explanatory variable.
2. Determine the value of the response variable when the explanatory variable is 0.
3. Determine the rate of the function (usually by reading carefully).
4. Write the function using descriptive words.
5. Write the function using symbolic language.

A cell phone company charges the following basic cell plan to its customers: A customer pays a monthly fee of $40.00. In addition, the customer pays $0.15 per text message sent from the cell phone. There is no limit to the number of test messages per month and there is no charge for receiving texts.

What is the response variable? What is the explanatory variable? Explain how you know.

$$\text{Text messages sent : explanatory } (x)$$
$$\text{\$ spent} \qquad : \text{response } (y)$$

What is the value of the response variable when the explanatory variable is 0?

$$40$$

What is the rate of the function?

$$.15$$

Write the function in descriptive words.

$$\text{Total Cost} = \left(\text{cost per text}\right) \times \left(\text{\# of texts}\right) + \text{monthly}$$
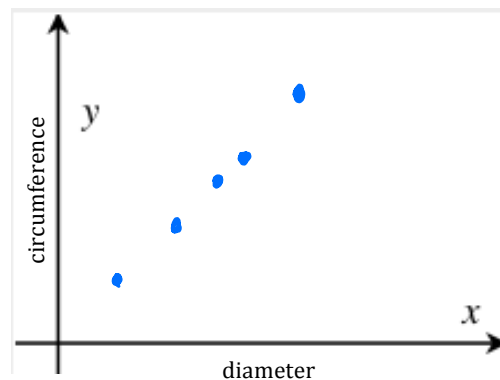
Write the function using symbolic language.

$$y = .15x + 40$$

Navin and Jessi are curious about the size of coins. They measured the diameter and circumference of several coins and found the following data.

US Coin	Diameter (mm)	Circumference (mm)
Penny	19.0	59.7
Nickel	21.2	66.6
Dime	17.9	56.2
Quarter	24.3	76.3
Half-Dollar	30.6	96.1

In order to see if there was a relationship between the two, they decided to draw a picture. Draw a scatterplot that displays circumference in terms of diameter.

In the context of the situation above, what is the response variable and the explanatory variable? How do you know?

Diameter → explanatory

Circumference → response

Do you think that circumference and diameter are related? Yes.

Rate → π (3.14)

What is the value of the response variable when the explanatory variable is 0? Why does this make sense? 0   If diameter =0, then circumference=0

What is the rate of the function? Why does this make sense?

3.14 (π) $C = \pi d$

Write the function in descriptive words.

Circumference = π × diameter.

Write the function using symbolic language.

$y = \pi \, x$

PG&E charges $51.80 for electric power generation to your home each month. In addition to this, they charge $0.15 for each kilowatt hour (kWh) of energy used.

What is the response variable? What is the explanatory variable? Explain how you know.

Response variable = $ spent on electricity

explanatory variable = # of kWh

What is the value of the response variable when the explanatory variable is 0?

$51.80

What is the rate of the function?

.15

Write the function in descriptive words.

PG&E Bill equals = (Rate/kWh) · (# of kWh) + Monthly fee for power

Write the function using symbolic language.

$$y = .15x + 51.80$$

The bridge club meets every Friday. Its wonderful teacher advisor decides that the awesome kids who participate deserve a pizza party. This teacher decides to get a few orders of breadsticks for a total of $11.98, and then figures that each student will eat about 2 slices of pizza each. Each slice of pizza costs $2.75.

What is the response variable? What is the explanatory variable? Explain how you know.

Response variable   — $

Explanatory variable — number of kids

Find an equation that relates the total cost to the number of students he thinks will attend the meeting. Write the problem in words first, and then use symbolic language.

$$y = 5.50x + 11.98$$

Total Cost = (# of student)(cost for 2 slices) + cost for breadstick

Interpret the slope in words in the context of the problem.

Cost for 2 slices of pizza

Interpret the intercept in words in the context of the problem. Does this make sense? Explain.

Price for breadsticks for everyone

Independent Practice:

Students take 5 minutes to complete the Car rental Quandary from the Math Forum and then 5 minutes to do Buy This Tune! From Math Forum for Independent Practice. This could also be homework.

Activating Prior Knowledge:

We know how to write linear equations when we are given two points

What is the linear equation for the line that passes through the points $(1,5)$ and $(11,0)$	What is the linear equation for the line that passes through the points $(153,1147)$ and $(136,1164)$.

Closure:

Suppose that a cell phone monthly rate plan cost the user 5 cents per minute beyond a fixed monthly fee of $20. This implies that the relationship between monthly cost and monthly number of minutes used is linear.

Write an equation (in both words and symbolic language) that relates the total monthly cost *(y)* to monthly minutes used *(x)*.

Notes:

Lesson 10 Grade 8 Mod 6