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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?

How far they live from work.

Response Variable (If we want to predict...)	**Possible Explanatory Variables (...it might be good to know...)**
Height of a son	Height of mom & dad
Number of points scored in a game by a basketball player	• Avg. per game. • Number of shots made
Number of hamburgers to make for a family picnic	• Number of people.
Time it takes a person to run the mile	• Age • Weight • Height above sea level
Amount of money won by a contestant on Jeopardy!	• # of questions answered • IQ • Amt wagered in FINAL JEOPARDY!
Fuel efficiency for a car	• Weight of a car. • Size of engine
Number of honey bees in a beehive at a particular time	• Size of hive • Amt. of honey
Number of blooms on a dahlia plant	• Amt. of fertilizer • Amt. of H_2O
Number of forest fires in a state during a particular year	• Rainfall amt. • # of acres of forest

NUMB-ERS

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Possible Response Variables (...in order to find out...)	**Explanatory Variable (It will help to know....)**
Grade level	Age of a student
Length of the clubs	Height of a golfer
# of annoying students in class	Amount of pain reliever taken
Salary	Number of years of education
# of tomatoes	Amount of fertilizer used on a garden
Price	Size of a diamond ring
Wins, team batting avg., team ERA	Total salary for a baseball team

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

rate. How much x affects y.

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

Starting point of y.

Value of y when x has no effect.

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

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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.

Total cost: response

# of texts: explanatory

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.

The cost of your monthly cell phone plan is equal to the number of texts you send times the cost per text plus the monthly fee

Write the function using symbolic language.

$y = 40 + .15x$

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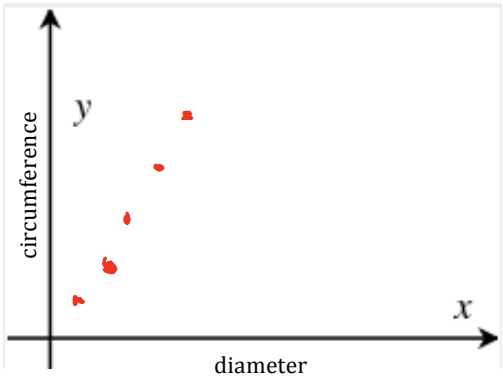
Navin and Jessi are curious about the size of coins. They measured the diameter and circumference of several coins and found the following data.

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. multiply diam by π to get C.

What is the value of the response variable when the explanatory variable is 0? Why does this make sense?

0

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

π

Write the function in descriptive words.

The circumference of a coin equals the diameter times pi

Write the function using symbolic language.

$y = \pi x$

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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.

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

What is the rate of the function?

Write the function in descriptive words.

Write the function using symbolic language.

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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.

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.

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

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

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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:

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