Algebra 1: 4.1 Part 2 Linear Real World Modeling

So far we've been dealing with lines as purely theoretical things. Linear relationships occur all over the place in everyday jobs and life. Today we'll look at how slope is thought of in applications, and how to model various situations. Also. Much of this lesson will be verbally explained, so the notes may not convey the lesson all that well. It's unavoidable unless I want to write a huge essay per slide.

"Slope" is how much the Y changes with every 1 increase in X.

Y is usually the Total Cost (When money is involved) and X is the thing that can vary in the situation.

Dave and Buster's Example:

You want to go to Dave and Buster's with your friends. You call the store and figure out that each game is $1.25 and it costs $12 to get in. Part a) Model the cost of the trip per game played.

Part b) Your parents give you 50 dollars to spend for the trip. How many games can you play before you run out of money?

Strategy: In situations with a total cost, make that the y variable. Then choose x to be the thing that you are changing throughout the situation.

When "per something" is mentioned, that is almost always going to be your x variable.

x : # of games played

y : total cost of trip.

a) $y = 1.25x + 12$

represents the flat cost of entering

price per game.

Key Strategy: multiply price per something by # of times you do the thing.

b) plug 50 in for y, because y is the variable for cost. Solve for x.

$$50 = 1.25x + \cancel{12}$$
$$-12 \qquad \cancel{-12}$$

$$\frac{38}{1.25} = \frac{1.25x}{1.25}$$

$x = 30.4$ games

4.1 Part 2 Modeling Linear Real World Scenarios

Many situations where there's a "buy in" and then an additional "running tally" are Linear.

Car Rentals and Taxi's are this way.

There's a flat fee to take a taxi or rent a car, then you have to pay by the mile you drive.

Ex: You're planning a trip to Miami, Florida and you need to drive. The best car rental company near you charges a $125 dollar fee to use their hybrid Prius plus an additional $0.10 for every mile you drive past their 1000 mile limit.

Part a) The trip to Florida and back would be 3322 miles. Write a formula for the rental cost per mile driven past 1000 miles.

x: miles driven past 1000   y: total cost

$$y = .10x + 125$$

Part b) The Prius gets 57 miles per gallon of gas. Assuming a price of $3.50 per gallon, what would the total cost of gas and car rental be?

Price of Rental + cost of Gas.

3322 − 1000. # of miles you pay for.
2322

$y = .1(2322) + 125 = \$357.20$

$\$3.50 \frac{\$}{gal} \cdot$ $= 203.9$

$\frac{3322 \cancel{miles}}{57 \frac{\cancel{miles}}{gal}} = 58.280$ gal

add

Total cost 561.18

Part c) You are going with a friend that has a truck that gets 11 mpg and you own a car that gets 29 mpg. Assuming the same gas price, compare the price to drive these vehicles instead and determine if its cheaper or more expensive to rent the Prius.

gas: $\$3.50 \frac{\$}{gal}$ · # of gallons the cars use.

# of gallons for 11 mpg truck: $\frac{3322 \cancel{miles}}{11 \frac{\cancel{miles}}{gal}} = 302$ gallons.

$302 \cancel{gal} \cdot 3.50 \frac{\$}{\cancel{gal}} = \$1057$

# of gallons for 29 mpg car: $\frac{3322 \cancel{miles}}{29 \frac{\cancel{miles}}{gal}} = 114.55$ gallons

$114.55\ gal \cdot 3.50 \frac{\$}{gal}$

$= \$400.93$

Total Prius Price: $561.18 ← 2nd cheapest

Total 11 mpg Truck cost: $1057 ← most Expensive

Total 29 mpg car cost: $400.93 ← Cheapest

4.1 Part 2 Modeling Linear Real World Scenarios

Your mom is throwing a birthday party for you at McDonalds. She's reserving the PlayPlace and buying a Big Mac Meal for everyone who shows up. It costs $215 to reserve the PlayPlace for the party and each Big Mac Meal costs $8.67.

Part a) Write a linear equation that models the price the mom will pay for the party based on the number of attendees.

y : total cost   x : # of people

$y = 8.67x + 215$ ← Flat cost

price of Big Mac · # of People (x)

Part b) You invited 24 people to the party (they all show up), how much will the party cost? (assume adults don't eat)

25 people are eating Big Macs (24 plus the birthday child)

plug in 25 for x

$y = 8.67 \cdot (25) + 215 = \boxed{\$431.75}$

Part c) Your mom only has $530 dollars to spend on your party. How many people could she afford to host?

plug in $530 for y. solving for x.

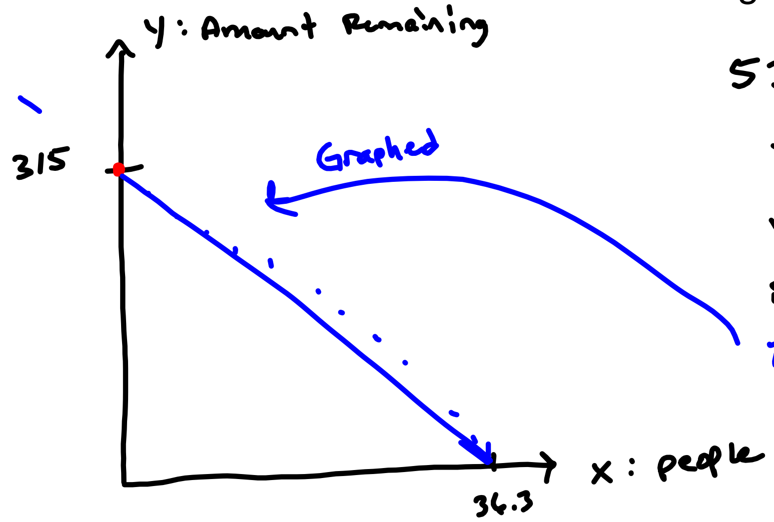
$530 = 8.67x + 215$

$-215 \qquad\qquad -215$

$\frac{315}{8.67} = \frac{8.67x}{8.67}$

$x = 36.33$ → Round to 36 people

Part d) Model the situation with "Amount Remaining" as the y-axis.



530 − 215

$ 315 for kids

y-int : 315

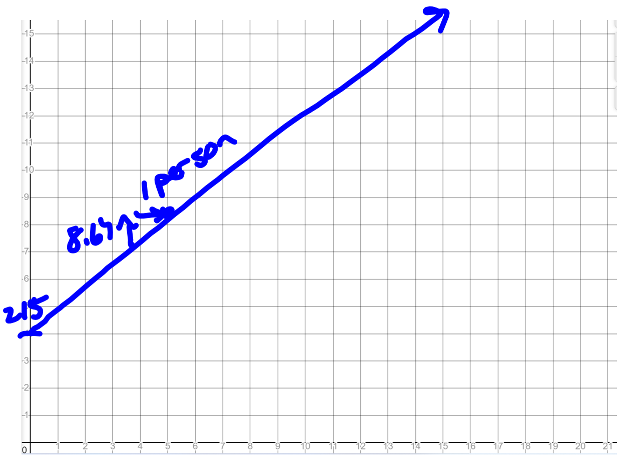
slope : −8.67

Equation :

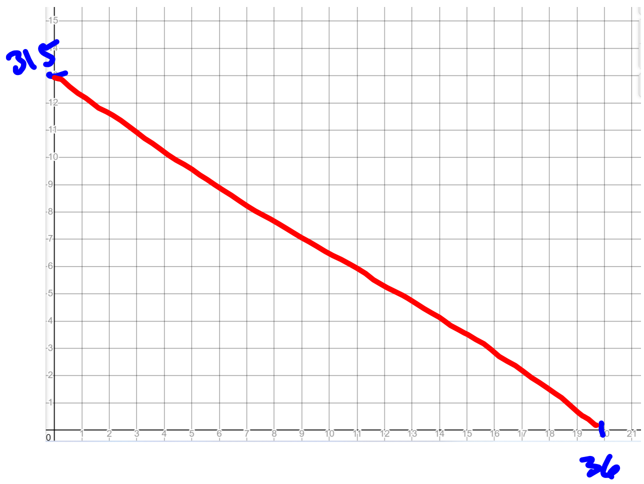
$y = -8.67x + 315$

Graph both functions from the McDonalds example on the coordinate planes below.

Bottom of last slide



$y = 8.67x + 215$



$y = -8.67x - 315$

Homework:

Nothing at the moment. You'll be receiving examples like this on the review for the chapter and probably randomly throughout the chapter.