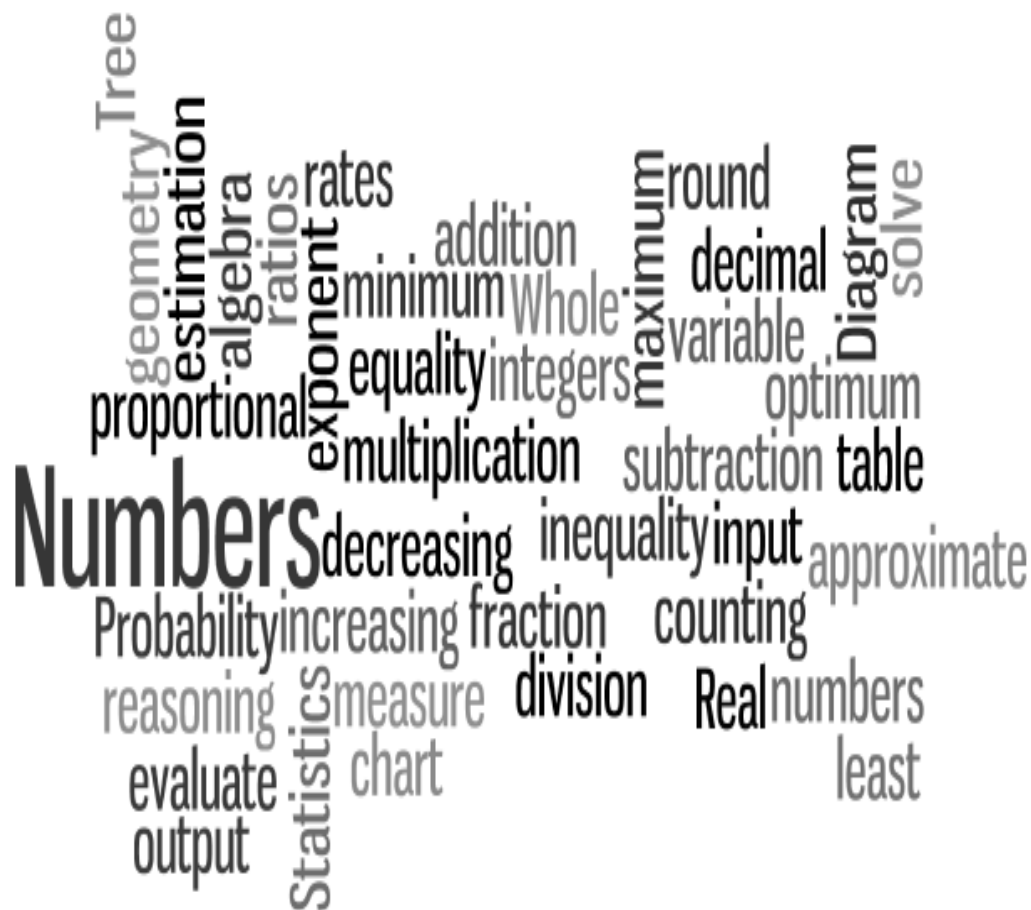


Generating the BIG Ideas Math Classroom



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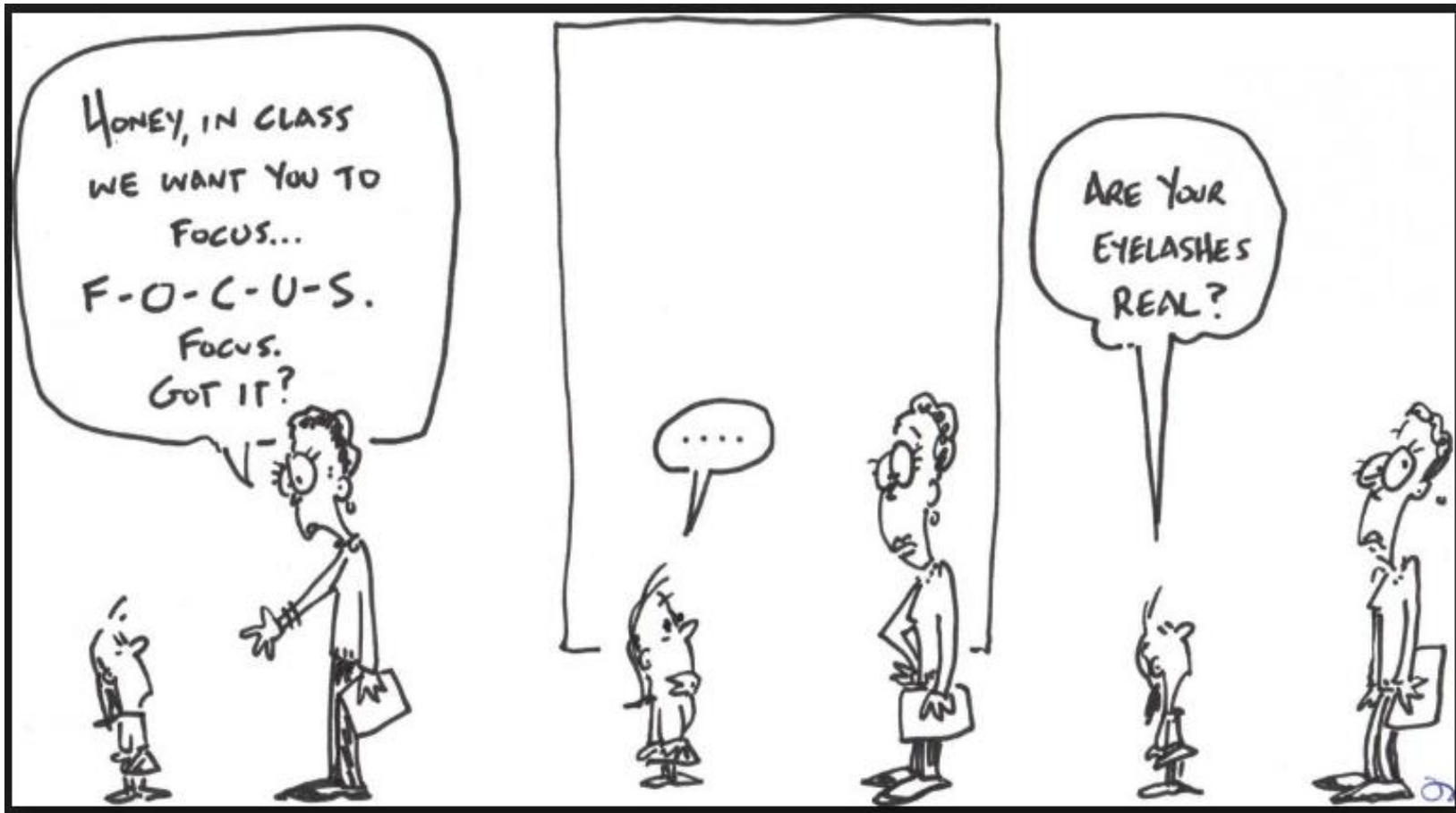
While we are gathering, try these:

- 1-**Represent** “increasing” numerically, algebraically and graphically.
- 2-**Show** “a steadily decreasing rate” in two different ways.
- 3-**Illustrate** “the mean is the same as the median” using a list of 10 different values.
- 4-**Demonstrate** five inputs and their five outputs and explain why.
- 5-**Show** 10%, 20% and 50% with money.
- 6-**Show** 5% as half of 10% and 25% as 5% more than 20% with a drawing of objects.
- 7-**Provide an example** of when rounding up or rounding down is not a good answer for an approximation problem.
- 8-**Illustrate** a RATE by writing a everyday situation.

Today's workshop:

- (20 minutes) Eight situations to start
- (5 minutes) discussion of CCSS in a nutshell
- (10 minutes) discussion of Quantitative Literacy
- (45 minutes) problem solving, discussion and formation of the BIG ideas
- Questions and resources

FOCUS!



On Standards

FOCUS

Conceptual understanding
Procedural skill and fluency
Application

R
I
G
O
R

Coherence

Across grades

Link to major topics within grades

A minute on RIGOR

RIGOR is NOT:

Something extra

More HW

More pages

More problems

RIGOR is :

The driving force of quality instruction.

A critical part of a quality school experience.

A FOCUS on what students are asked to do.

Active, communicative lessons.

The Eight Standards for Mathematical Practice

CCSS.Math.Practice.MP1 Make sense of problems and persevere in solving them.

CCSS.Math.Practice.MP2 Reason abstractly and quantitatively.

CCSS.Math.Practice.MP3 Construct viable arguments and critique the reasoning of others.

CCSS.Math.Practice.MP4 Model with mathematics.

CCSS.Math.Practice.MP5 Use appropriate tools strategically.

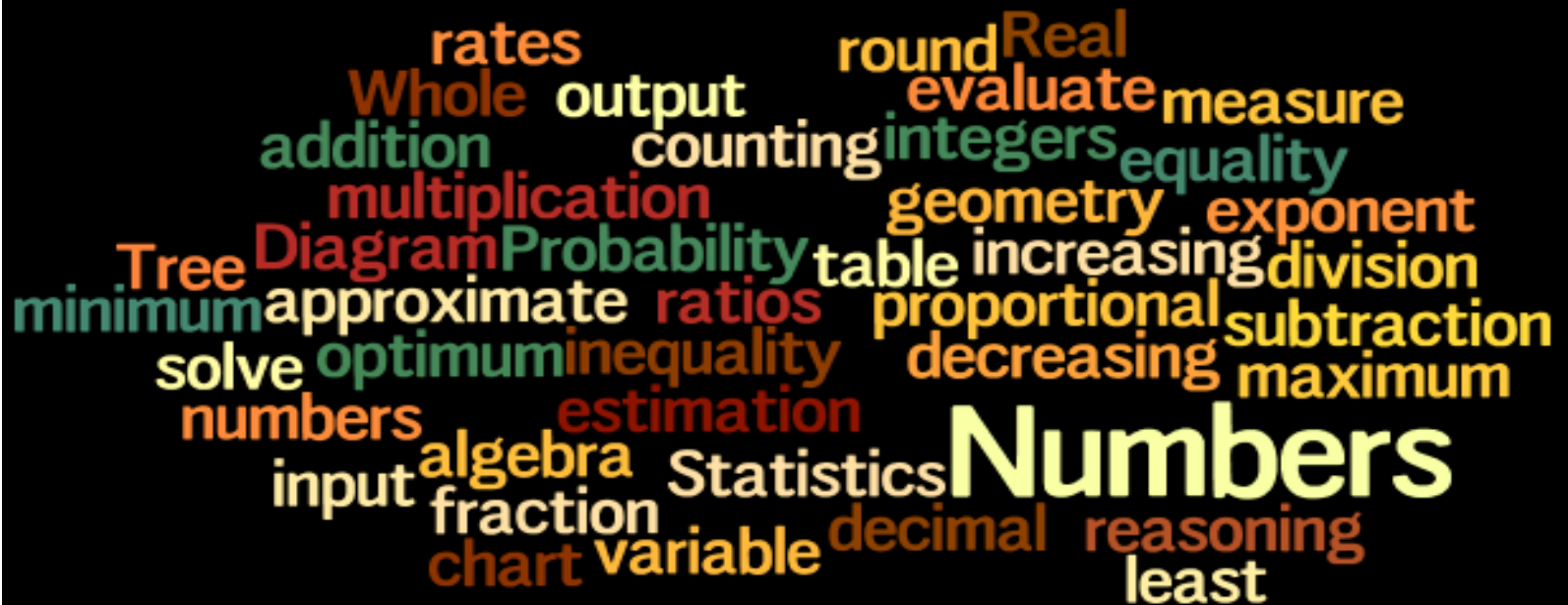
CCSS.Math.Practice.MP6 Attend to precision.

CCSS.Math.Practice.MP7 Look for and make use of structure.

CCSS.Math.Practice.MP8 Look for and express regularity in repeated reasoning.

<http://www.corestandards.org/Math>

Quantitative
Literacy
Drives our
BIG Ideas



What is Quantitative Literacy

- “The ability to identify understand and use elementary mathematics in everyday contexts” —*Deborah Hughes Hallett, mathematics professor, University of Arizona*
- “Quantitative Literacy involves understanding the mathematical concepts and skills that are necessary for everyday life”. —*Glenda Price, President Emeritus, Marygrove College*

Continued...

- “[Quantitative Literacy includes] confidence in mathematics, cultural appreciation, interpreting data, logical thinking, making decisions, mathematics in context, number sense, practical skills, prerequisite knowledge, symbol sense” –*Lynn Arthur Steen, mathematics professor at St. Olaf College, former MAA president, and executive editor, Mathematics and Democracy: The Case for Quantitative Literacy(2001).*
- “The heart of quantitative literacy is real world problem solving –the use of mathematics in everyday life, on the job, and as an intelligent citizen.” –*Henry Pollak, Visiting Professor of Mathematics Education, Teacher’s College, Columbia University*

What can we believe about QL?

Involves “everyday” mathematics.

Involves application of basic mathematics.

Involves communication.

Involves math confidence.

Involves decision making.

Involves mathematics in context.

*Reasoning, purposefulness, relevance,
coherence, precision...ARE ALL IMPORTANT*

Can QL become a Habit of Mind?

One word,

YES!

“Once a person is determined to help themselves, there is nothing that can stop them.”

Nelson Mandela

How do we encourage our students to have a QL Habit of Mind?

- Math lessons must be active, collaborative, verbose, relevant, interesting...
- We must do math, always, everywhere, in all circumstances where we can imagine it!
- We must show OUR passion for math (develop it if we don't have it!).
- Learn from our colleagues – our best mentors/teachers are our teachers!
- Empower, empower, empower!

Cheerleading matters

What cheerleading is:

Encouragement,
redirecting and
scaffolding

Confidence that the
student can do it

Pushing the student on to
“bigger” things

Forming a nurturing
relationship so that
math is not scary

What cheerleading is NOT:

Giving false hope- its not okay to
say its okay if its not okay!

Letting them get by without doing
all of the work just this once

No work = No Understanding

If they don't need to do the work,
then they need more of a
challenge!

Our **Math Content** Focus Today:

- Creating a RICH Math Environment
- Quantitative Literacy and the BIG Ideas always drive the lesson
- Decision making; Confidence and precision; Logical thinking; Mathematics in everyday life; WHY is math important; and yes, **Where we use this in the REAL WORLD!**

5 9

| | |
|--------------------------|--|
| Counting/Sets of objects | The fraction of puppies in the litter who are female. There are ___ puppies, ____ of which are female. |
| Ratio | Ratio of dogs to cats in an animal shelter: There are 55 dogs in the shelter, therefore there are ____ cats. |
| Division | The food each dog receives from a bag of dog food: A five lb bag of dog food is used to feed the ____ puppies. |
| Length | The fraction of the dog run that has grass: A dog run is 63 feet long. Therefore, there are ____ feet of the run with grass. |
| Area | The fraction of the kennel used by dogs: 1500 square feet out of the _____sq. ft. shelter are used by the dogs. |
| Rate | The rate of growth of a puppy: Each puppy gains 10 lbs every _____ weeks. |

Connections

Numbers are representations of “things.”

Create ideas that connect the numbers to ideas.

| | | |
|--|--|--|
| Insert Number to be represented here! | Represent the number in these ways: | Create a unifying problem that has numbers to fill in from the original number. |
| | Counting/Sets of objects | Problem with fill in |
| | Ratio | Problem with fill in |
| | Division | Problem with fill in |
| | Length | Problem with fill in |
| | Area | Problem with fill in |
| | Other | Problem with fill in |

You try!

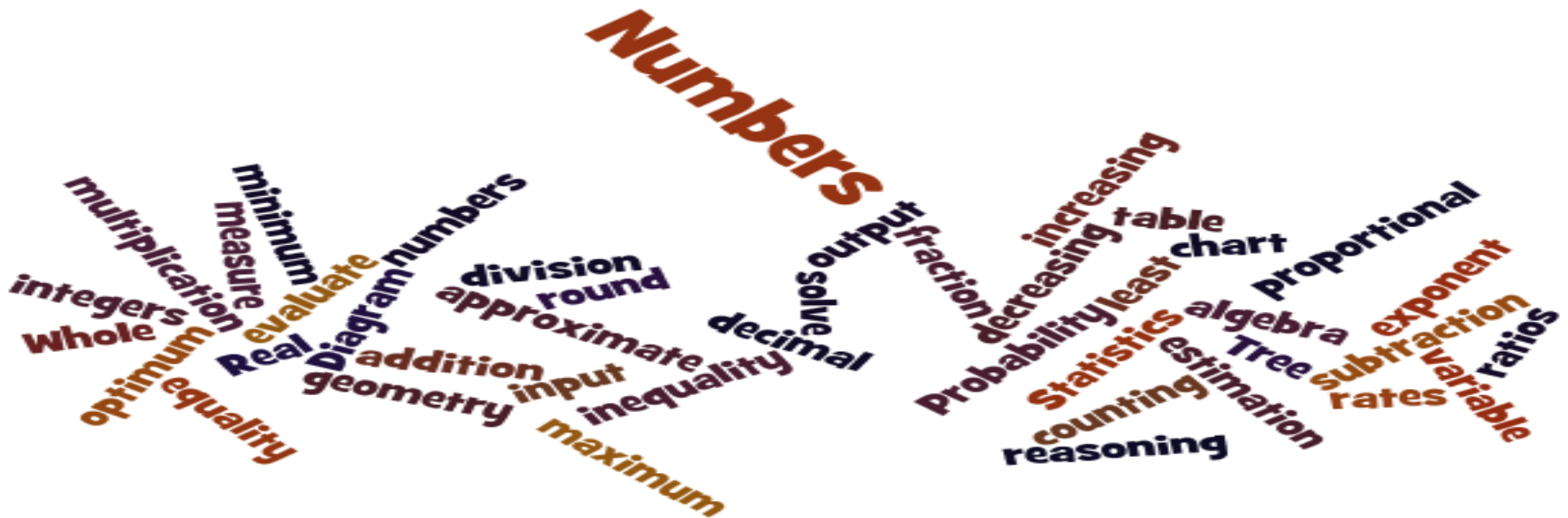
7
12

| | Represent the number in these ways: | Create a unifying problem that has numbers to fill in from the original number. |
|--|--|--|
| | Counting/Sets of objects | Problem with fill in |
| | Ratio | Problem with fill in |
| | Division | Problem with fill in |
| | Length | Problem with fill in |
| | Area | Problem with fill in |
| | Other | Problem with fill in |

How could this template be used as a collaborative activity?

With someone near you, discuss the possibilities.

Let's share!



Completing a Math “Story”

You are the owner of the _____ Rescue Group for _____ (breed of dogs). You have determined that you need to add a new area for dog kennels. In order for the area to meet the requirements of the county, the room must provide a minimum of 8 square feet per dog. Your budget allows you to add no more than 600 square feet, and you want to help as many dogs as possible. You decide that to stay within your budget, the new area is to hold _____ dogs in a room that is _____ feet wide and _____ feet long.

Another Story

_____ is the manager of your company, _____, and you have asked him/her to ship _____ (number) of _____ (“widgets”) In order to complete this task, 50 boxes must be ordered. The boxes cost \$_____ each, and with contents the shipping costs are \$8 per lb. You have set a budget of \$280 to ship as many _____ as possible. How many _____ will there be in this shipment?

Elements of a “story”

- Setting is realistic; fun; interesting
- Earlier grades – less sentences; later grades – more sentences/more constraints.
- Some choice for student(s) to make
- Student “is” in the story
- A fact or facts are provided that drive the thinking
- Blanks in the story drive the work to be completed.

Length and Measuring

A dog run for medium dogs, 15 – 28 lbs, is 14 feet 8 inches long. New guidelines require that the minimum length for a dog run for medium dogs to be 18 ½ feet long.

Now what...

A dog run for medium dogs, 15 – 28 lbs, is 14 feet 8 inches long. New guidelines require that the minimum length for a dog run for medium dogs to be $18 \frac{1}{2}$ feet long.

- 1- Draw a picture of how you see this situation.
- 2- What is one important piece of the problem that might pose a problem with your calculation?
- 3- How much more length is needed for your dog run to meet the minimum requirement?

Discuss

A dog run for medium dogs, 15 – 28 lbs, is 14 feet 8 inches long. New guidelines require that the minimum length for a dog run for medium dogs to be 18 ½ feet long.

How could you change this problem to support the students who would have no difficulty?

How could you add scaffolding to this problem to support the students who would struggle?

Modeling (1)

The distance a car travels is a function of the gallons of gas based on the following model:

$$D(g) = 22g$$

What does the 22 represent?

What is the input/independent variable?

If you have traveled 125 miles, what can you determine?

Modeling (1) continued...

The distance a car travels is a function of the gallons of gas based on the following model:

$$D(g) = 22g$$

A mid-size car holds between 12 and 20 gallons.

Is -4 a reasonable input? Why or why not?

Is 100 a reasonable input? Why or why not?

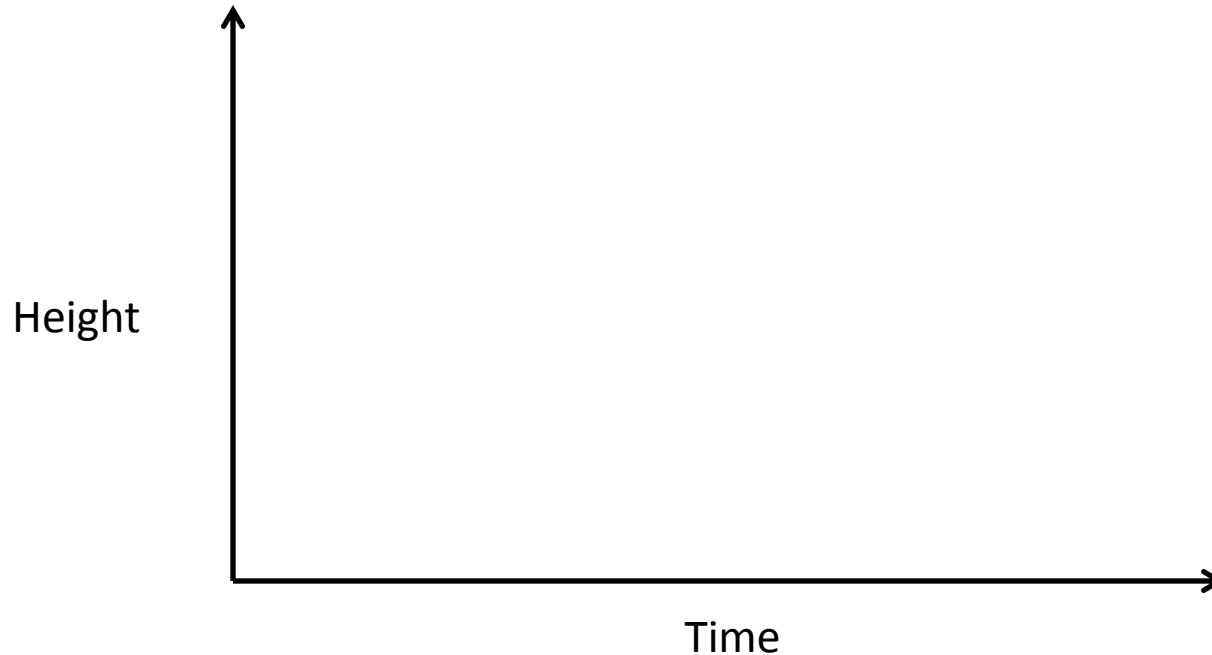
How could the model change to a function of TANKS of gas if you knew the number of gallons a car could hold?

Could you expect a car to travel 800 miles on one tank of gas? Two tanks? Five tanks? How many tanks is a good approximation?

Graphs and Modeling

Create a plane with the horizontal axis and the vertical axis beginning at zero and continuing in the positive direction. This is called a first quadrant graph and is very useful in modeling. Label the horizontal axis as time and the vertical axis as height.

Graphs and Modeling continued...

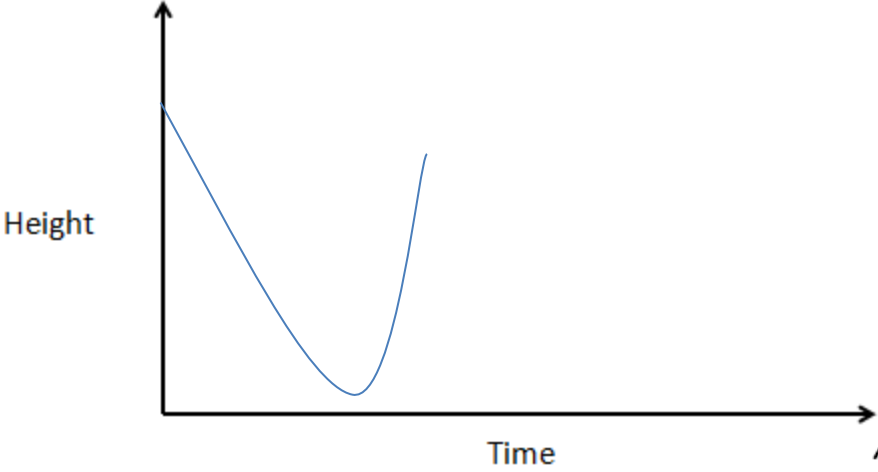


Now, sketch a graph of this situation:

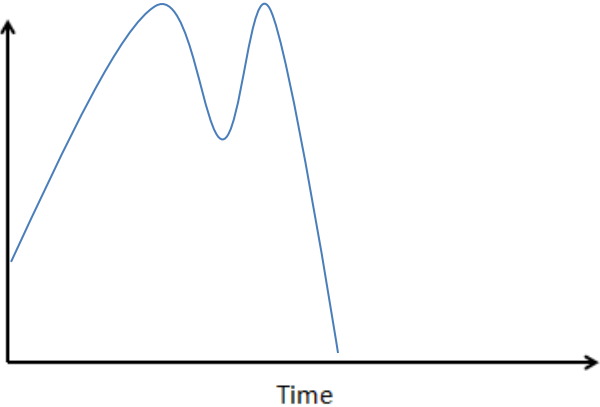
You have just taken your first bungee jump! When you describe your experience to your mother you say that when you jumped off of the platform you felt weightless until the bungee-cord tightened right before you hit the ground!

Describe which graph is the best?

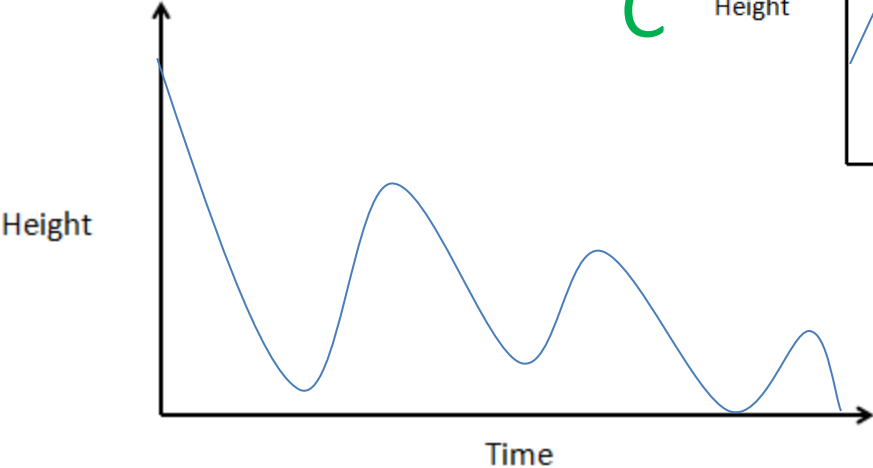
A



C



B



Based on the graph...

- Is time a function of height?
- Is height a function of time?
- How could you describe when the function values are increasing?
- How could you describe when the function values are decreasing?
- Is speed throughout your jump the same?
How do you know?

Marketing the “truth”

25 light bulbs are tested to see the number of consecutive hours that they can burn without burning out. All values shown are the nearest hour. The numbers are as follows:

| | | | | |
|-----|-----|-----|-----|-----|
| 400 | 402 | 411 | 425 | 436 |
| 437 | 437 | 440 | 441 | 441 |
| 443 | 444 | 444 | 444 | 450 |
| 450 | 450 | 450 | 450 | 450 |
| 452 | 452 | 452 | 455 | 455 |

Marketing the “truth”

| | | | | |
|-----|-----|-----|-----|-----|
| 400 | 402 | 411 | 425 | 436 |
| 437 | 437 | 440 | 441 | 441 |
| 443 | 444 | 444 | 444 | 450 |
| 450 | 450 | 450 | 450 | 450 |
| 452 | 452 | 452 | 455 | 455 |

Competition is fierce in this market, and new technology greatly impacts marketing.

Which of the following should be the label used for the packaging?

The bulbs burn approximately 400 hours.

The bulbs burn approximately 444 hours.

The bulbs burn approximately 450 hours.

The bulbs burn approximately 460 hours.

Describe your marketing strategy:

- You must convince your boss that your marketing strategy is the best and honest.
- Write a paragraph citing the key components of your decision.
- Include a graph that backs up your results.

A few Best Practices

- Use a system for self-assessment at the beginning of an activity (smiley faces/frowns, checks +/- , etc...)
- **EVERYTHING** in Context!!!!
- In your own words...given a problem, student must explain to teacher/classmate the important elements and an approach to solving it
- Catch them using the correct math language! Give a bonus of sorts and call them when it is a positive/correct use of a math term.
- Interactive Notebooks
- Excel!!!!

Some really great links...

[Teaching Channel](#)

[NSA Math Units](#)

[Illustrative Math](#)

[Insidemathematics.org](#)

[NCDPI Wikispaces](#)

[Pinterest!!!!](#)

Contact info:

- The best way to contact me with questions about this presentation or additional resources is through my personal email:

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Thank you!