# Tustin USD

AUGUST 21, 2014









DOUBLE-DOUBLE Double Cheese 265 CHESEBURGER HAMBURGER FRENCH FRIES SHAKES Chocolate Strawberry



OPEN 10:30 a.m. to 1:00 a.m. Fri. and Sat. until 1:30 a.m.

# YOUR GUEST NUMBER IS

IN-N-OUT BURGER LAS VEGAS EASTERN 2004-10-31 165 1 5 98 8:21 PM

Cashier: SAM

GUEST #: 98

### Counter-Eat In

98 Meat Pty XChz 2.65 88.20

Counter-Eat In 90.85
Amount Due 97.66

CASH TENDER
Change \$97.66

2004-10-31

Cashier: SAM

GUEST 98

#### Counter-Eat In

140140 98 Meat Pty Xchz

Counter-Eat In

TAX 7.50%

Amount Due

CASH TENDER Change

2004-10-31

2,65 88.20

90.85 6.81 97,66

\$97.66 \$.00

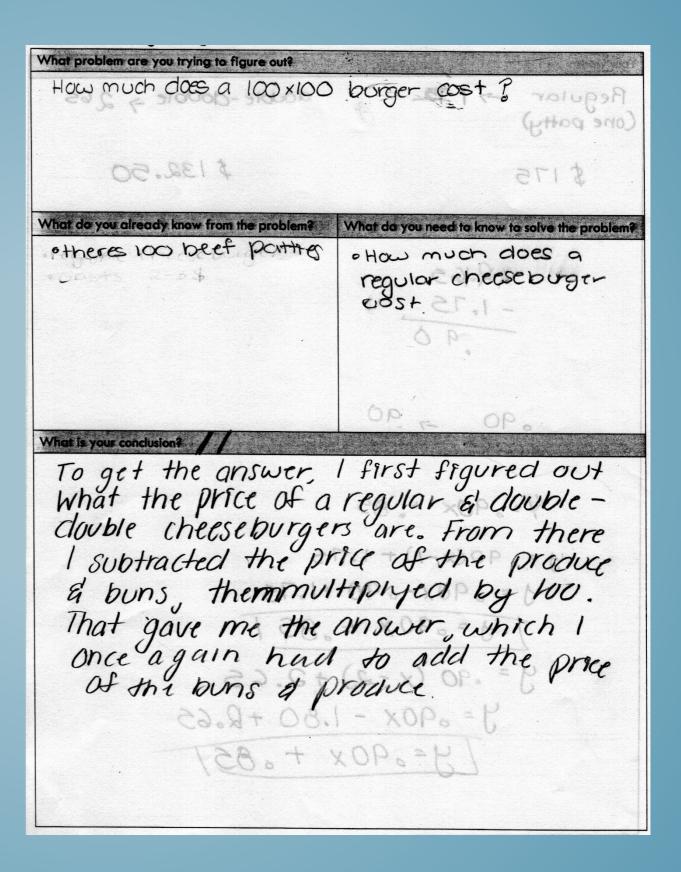
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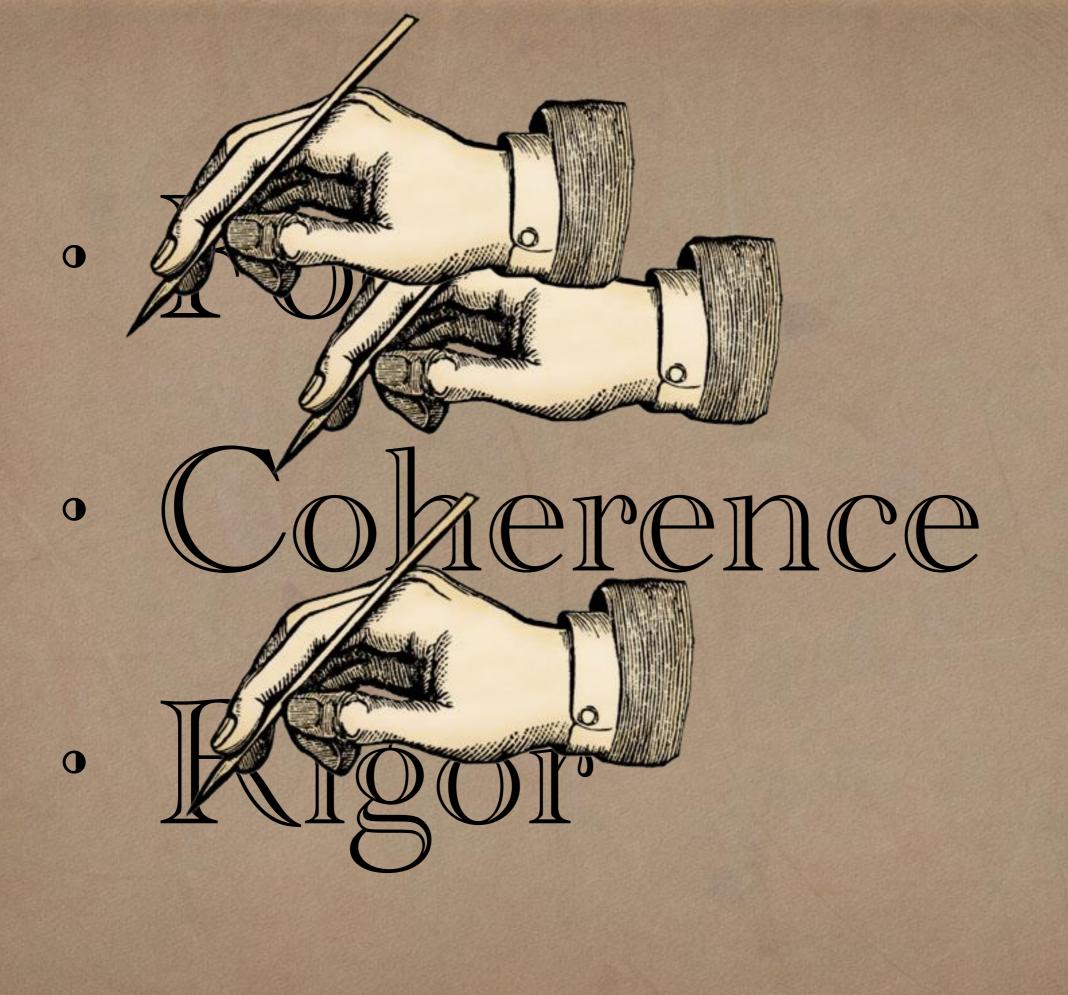
	Serving Size (g)	Calories
Hamburger w/Onion	243	390
Cheeseburger w/Onion	268	480
Double-Double w/Onion	330	670

### The Reality

- Students needed guidance to figure out a layer's cost
- Not every class is ready to go straight to 100x100
- Common wrong answers included:
  - \$175.00 (\$1.75 x 100 cheeseburgers)
  - \$132.50 (\$2.65 x 50 Double-Doubles)
- Students had equations that had more than X patties
- Students were surprised to see three different equations:
  - Starting with a Double-Double
  - Starting with a cheeseburger
  - Starting with produce and bun only

#### STUDENT WORK





Layers	Cost
1	\$1.75
2	\$2.65
3	\$3.55
4	\$4.45
•	•
•	•
20	\$18.85
•	•
•	•
100	\$90.85
•	•
N	\$1.75 + (N-1)*\$0.90

bun + produce + meat + cheese + meat + cheese = \$2.65

bun + produce + meat + cheese = \$1.75

meat + cheese = \$0.90

# WHAT ISN'T MATHEMATICAL MODELING?

- It is not modeling in the sense of, "I do; now you do."
- It is not modeling in the sense of using manipulatives to represent mathematical concepts.
- It is not modeling in the sense of a "model" being just a graph, equation, or function.
- It is not just starting with a real world situation and solving a math problem.
- It is not beginning with the mathematics and then moving to the real world.

Source: http://www.cde.ca.gov/be/cc/cd/documents/modelingaprilreview.pdf

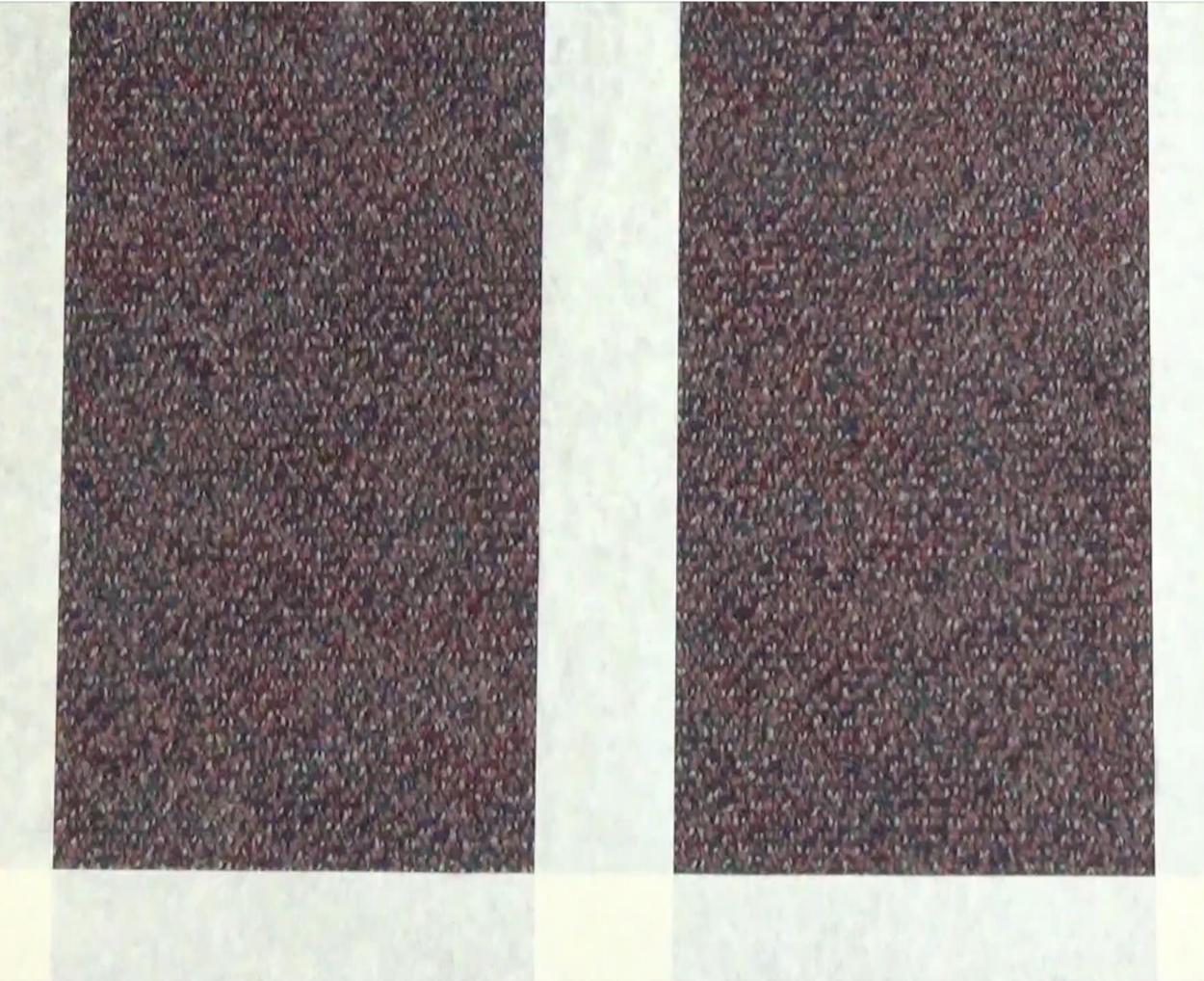
#### PROBLEM-BASED LEARNING FAQ

- How often do teachers do problem-based learning?
- How long do problem based lessons take?
- Do teachers use problem-based lessons to introduce a topic or after you've already taught it?
- How is problem-based learning assessed?
- How much time does it take to create a problem-based lesson?

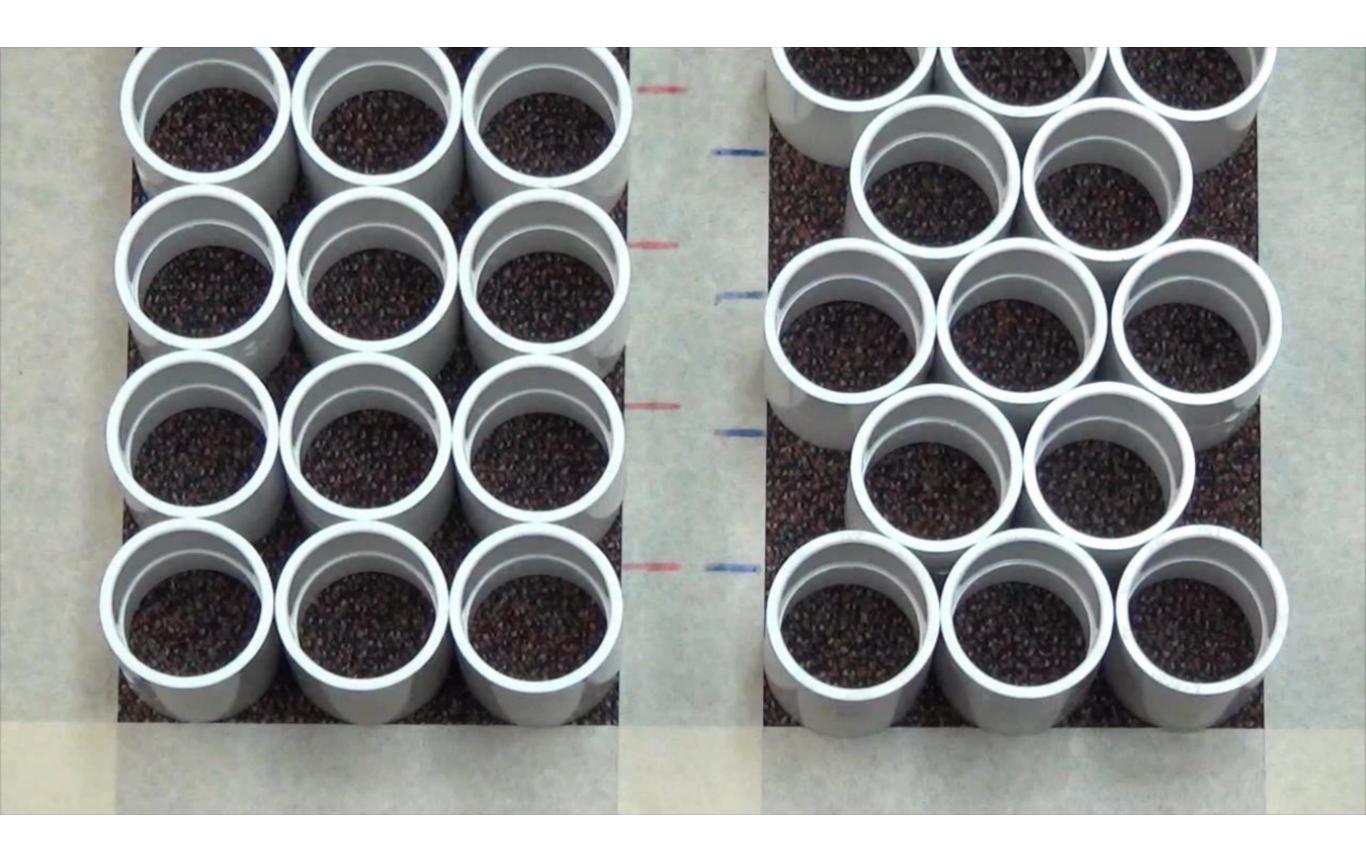
Why 2 > 4

A proof by induction by Max Ray



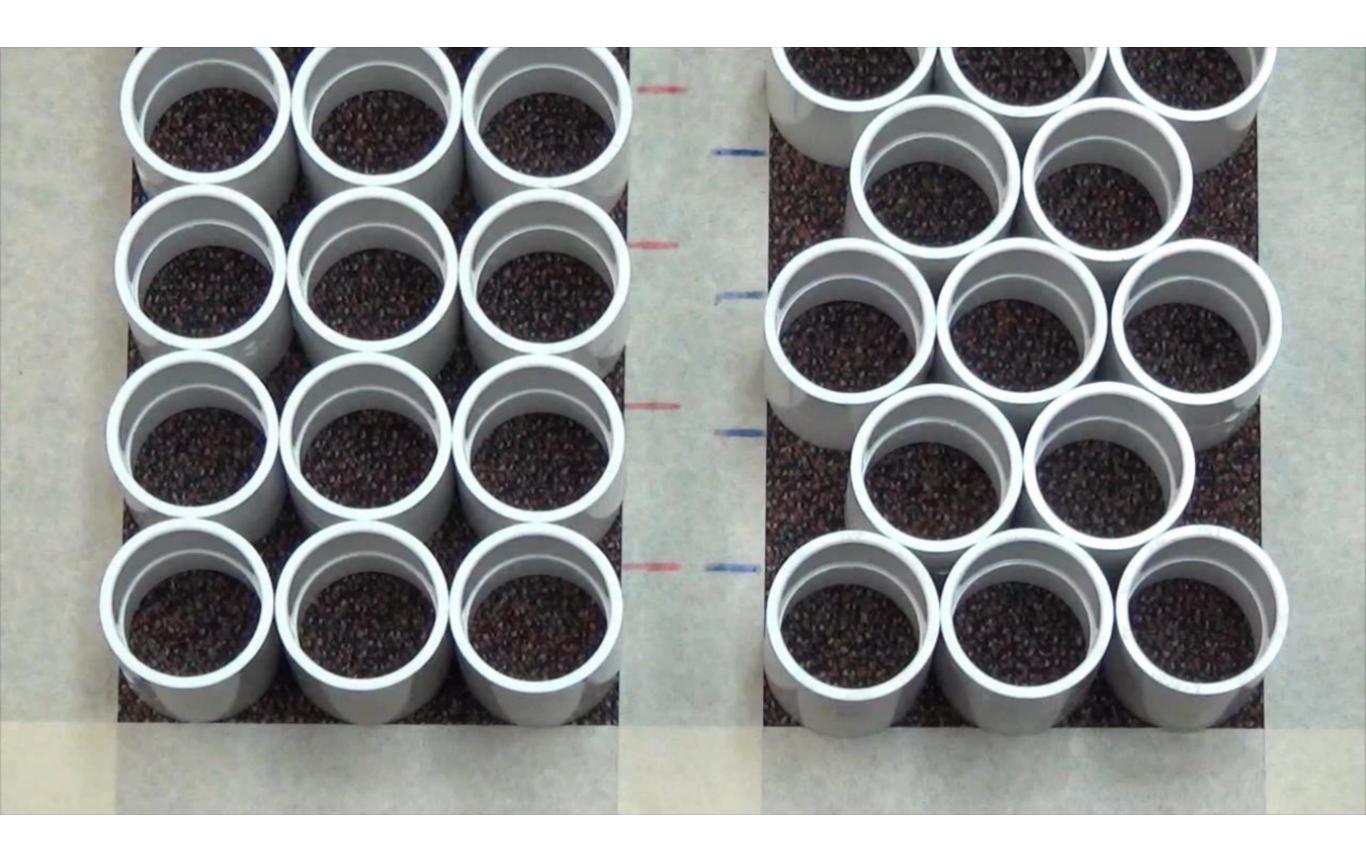


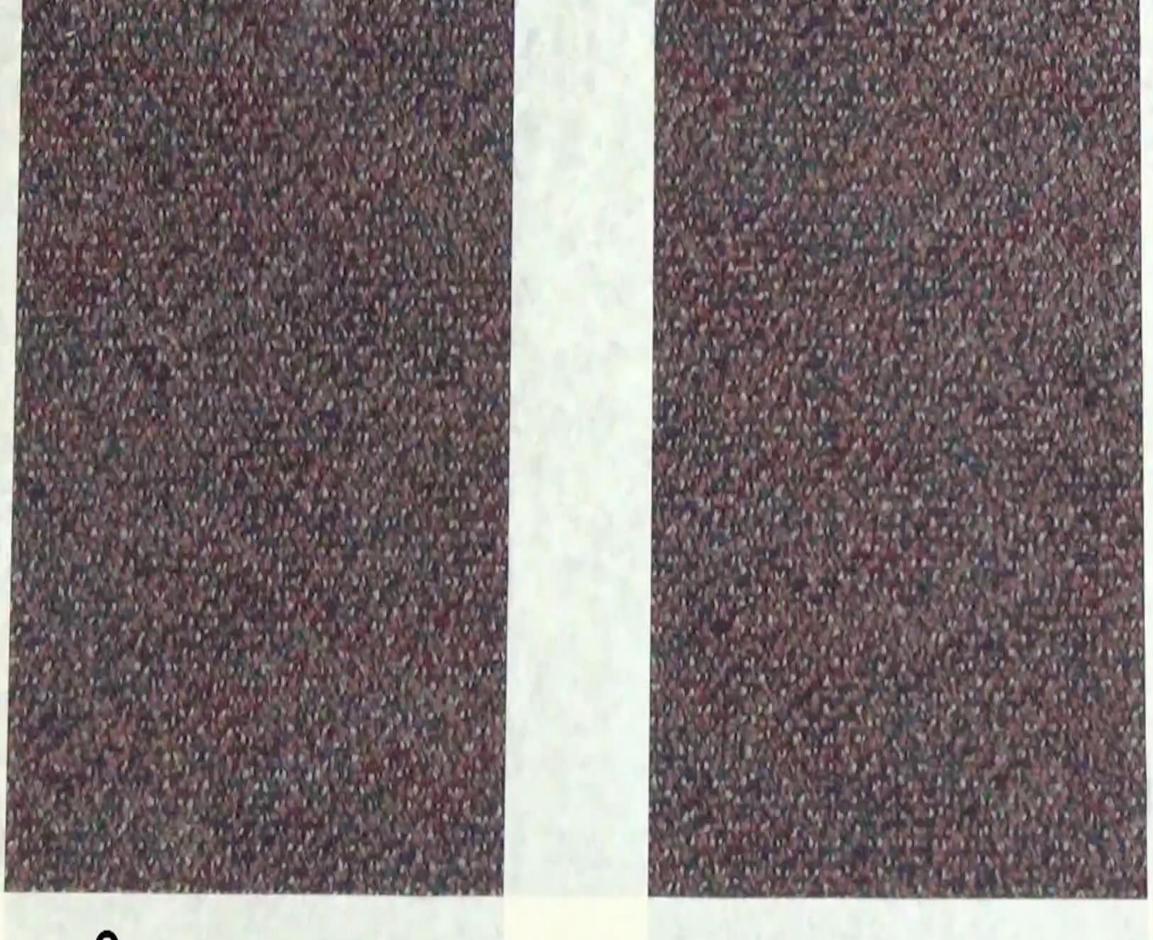
How much shorter are 20 layers of staggered pipe stacks?











Layers: 0



### The Four C's

- Communication
- Curiosity



A-CED.1 - Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions. F-IF.7a - Graph linear and quadratic functions and show intercepts, maxima, and minima.



G-CO.4 - Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.



## The Four C's

- Communication
- Curiosity
- Critical Thinking

### Problem Solving Framework

Inspired by Geoff Krall's resources at emergentmath.com

Name:	Period:	Date:		
What problem are you trying to figure out?	What quess	es do you have?		
The production and you trying to trigeto con-	Janes Gana			
What do you already know from the problem?	What do yo	u need to know to solv	e the problem?	
What should we title this lesson?				
vynat snould we title this lesson?				
What is your conclusion? How did you reach that conclusion?				

## The Four C's

- Communication
- Curiosity
- Critical Thinking
- Content Knowledge





#### WHO THINK

THEY HAVE THEIR CHILD IN THE RIGHT SEAT.



#### KNOW FOR SURE

IF YOUR CHILD IS IN THE RIGHT CAR SEAT.

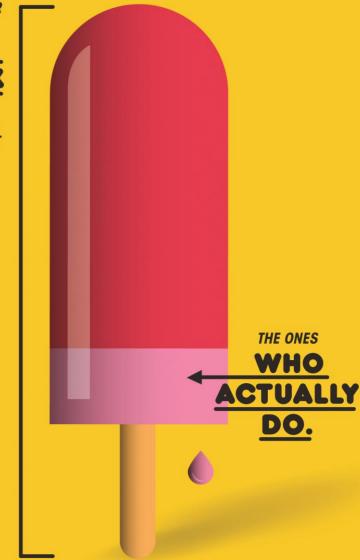








THINK
THEY HAVE
THEIR CHILD
IN THE RIGHT
SEAT.



#### **KNOW FOR SURE**

IF YOUR CHILD IS IN THE RIGHT CAR SEAT.

**VISIT SAFERCAR.GOV/THERIGHTSEAT** 







# Math Question

- Solve the problem on your own. Do not work or share your answer with anyone else.
- You will have 30 seconds to complete it.
- Write your answer down on a paper.

# There are 125 sheep and 5 dogs in a flock. How old is the shepherd?

## Of the 32 students I interviewed...

- 75% of them gave me numerical responses
- 2 students calculated the answer to be 130 (125 + 5)
- 2 students calculated the answer to be 120 (125 5)
- 12 students calculated the answer to be 25 (125  $\div$  5)
- 0 students calculated the answer to be 625 (125 x 5)
- 4 students stated that they guessed their answer (90, 5, 42, and 50)
- 4 students tried to divide 125 by 5 but could not correctly implement the procedure

# Takeaways

- Making sense of mathematics
- Intellectual autonomy
  - •Intellectual autonomy is about being able to think for yourself and not being dependent on others for the direction and control of one's thinking.

# What Does the NHTSA Say?

#### **Key Statistics and Consumer Insights:**

Motor vehicle crashes are the leading cause of death for children age 1 through 12 years old.<sup>1</sup>

According to a NHTSA study, 3 out of 4 kids are not as secure in the car as they should be because their car seats are not being used correctly.

be reduced by about half if the correct child safety seats were always used.

 $<sup>^1</sup>$  Source: Based on the latest mortality data currently available from the CDC's National Center for Health Statistics.



- "because they have their child in the right seat"
- "because their car seats are not being used correctly"

#### IF YOUR CHILD IS IN THE RIGHT CAR SEAT.











OF PEOPLE

#### WHO THINK

THEIR CAR SEATS ARE BEING USED CORRECTLY.



# KNOW FOR SURE

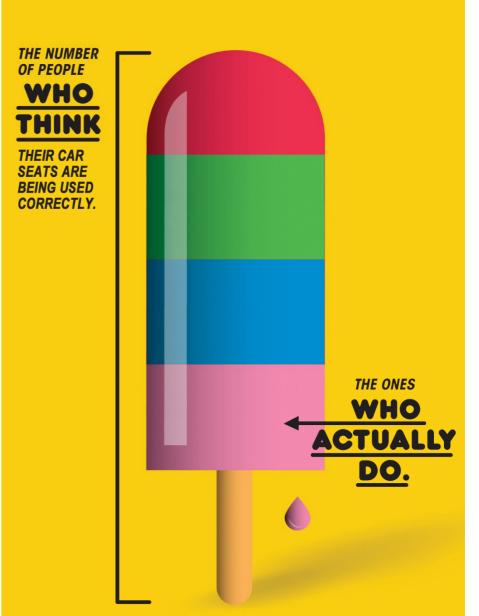
IF YOUR CHILD IS IN THE RIGHT CAR SEAT.











### **KNOW FOR SURE**

IF YOUR CHILD IS IN THE RIGHT CAR SEAT.

**VISIT SAFERCAR.GOV/THERIGHTSEAT** 







# Questioning Scenarios

- The activity begins with teachers in groups of three taking the roles of teacher, student, or observer.
- The individuals playing the role of teacher and student each receive a slip of paper describing their scenario.
- The individual playing the role of observer waits to record all of the teacher's questions to the student.
- Once the activity begins, the teacher will talk to the student in the context of the scenario they read about on the slips of paper.

What did you get for the area of the circle with a radius of 2 units?

4 pi

Great. Do you have any questions?



What did you get for the area of the circle with a radius of 2 units?

4 pi

Great. How did you get your answer?

The radius is 2 so I plugged it into 2 pi r and got 4 pi.

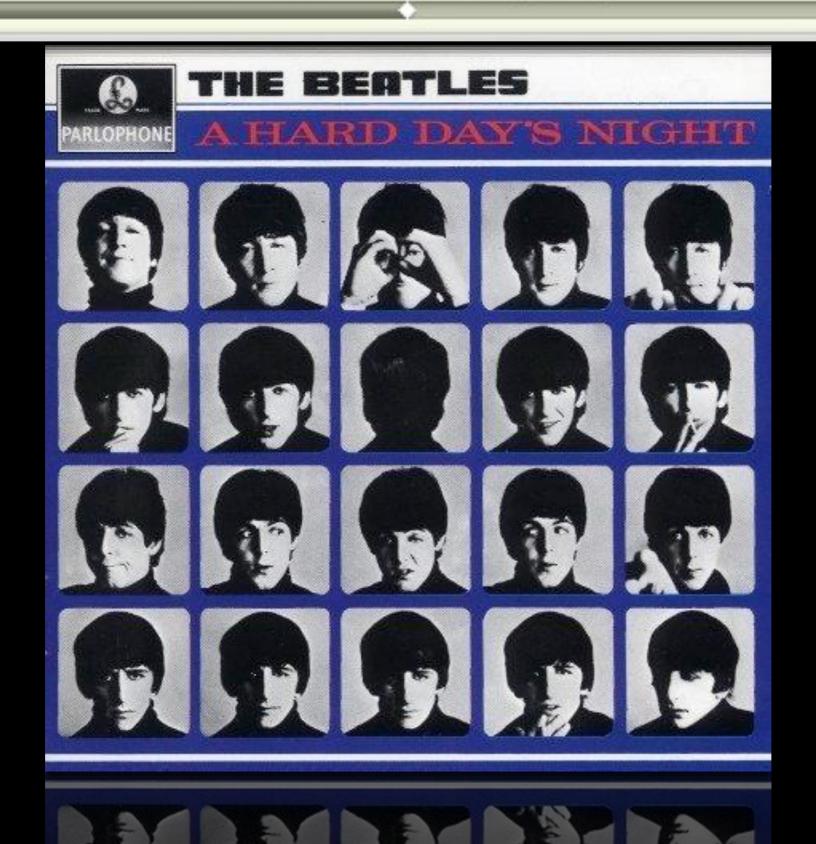


### How long is Can't Buy Me Love?

Can't Buy Me Love The Beatles — A Hard Day's Night



1:07



Building number sense one day at a time

The I			
м	А	м	ь

Day #	Description	↓ Too Low	Too High †	My Estimate	My Reasoning

Building number sense one day at a time

Day #	Description	↓ Too Low	Too High <b>f</b>	My Estimate	My Reasoning

Building number sense one day at a time

Day #	Description	↓ Too Low	Too High 🕇	My Estimate	My Reasoning
	Can't Buy Me Love				

Building number sense one day at a time

|--|

Day #	Description	↓ Too Low	Too High <b>1</b>	My Estimate	My Reasoning
	Can't Buy Me Love				

Building number sense one day at a time

1000			_
		100	F
	_		

Day #	Description	↓ Too Low	Too High 🕇	My Estimate	My Reasoning
	Can't Buy Me Love				

Building number sense one day at a time

NAME:

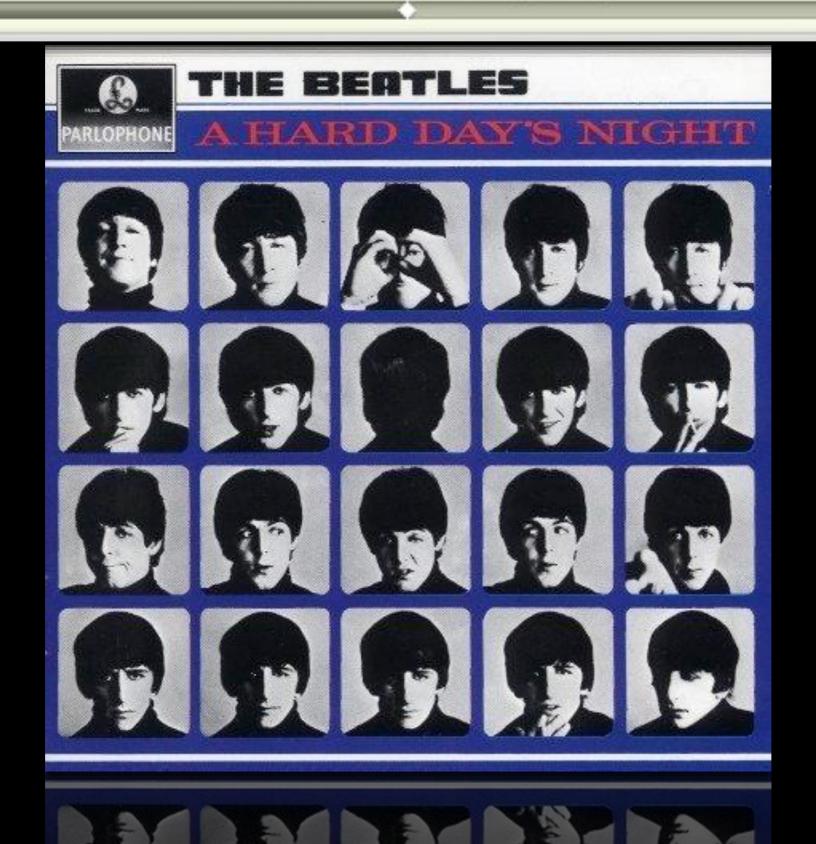
Day #	Description	↓ Too Low	Too High <b>1</b>	My Estimate	My Reasoning
	Can't Buy Me Love				I noticed, so I

### How long is Can't Buy Me Love?

Can't Buy Me Love The Beatles — A Hard Day's Night



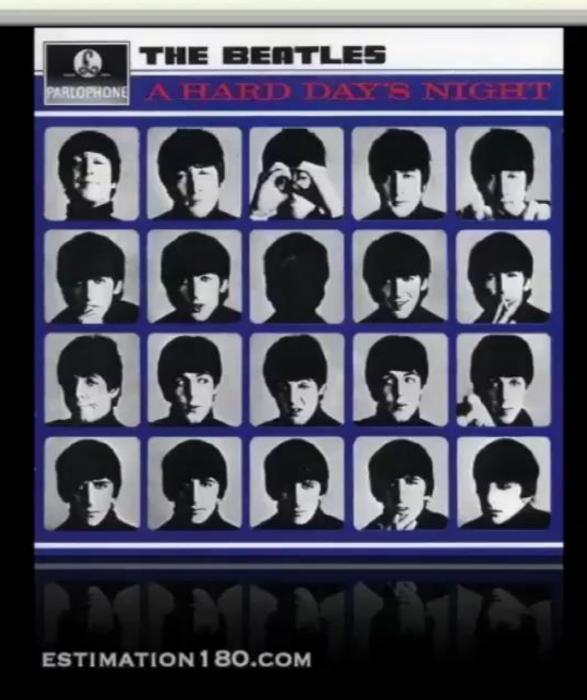
1:07



#### Can't Buy Me Love The Beatles — A Hard Day's Night



0:00 0



-0:00





#### THE BEATLES

#### A HARD DAY'S NIGHT





## How long is We Will Rock You?

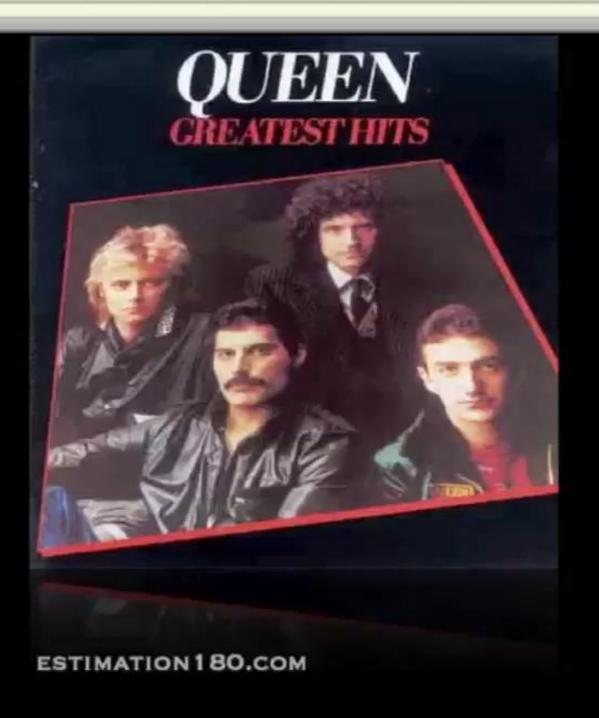
We Will Rock You Queen — Greatest Hits I



0:21





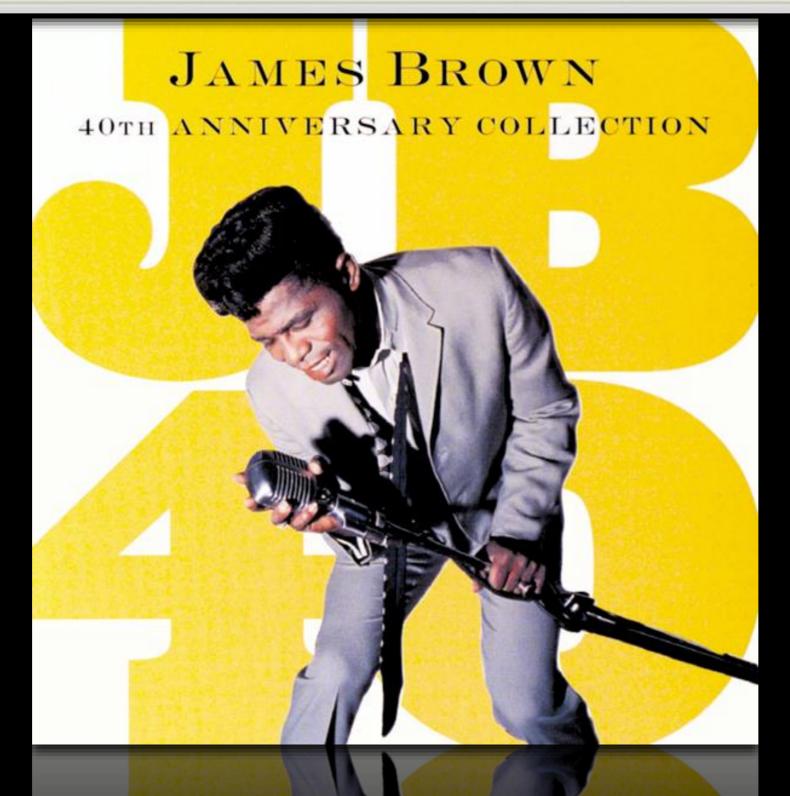


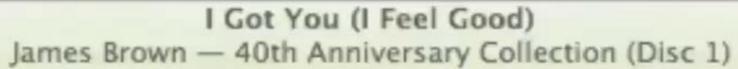




### How long is I Got You (I Feel Good)?

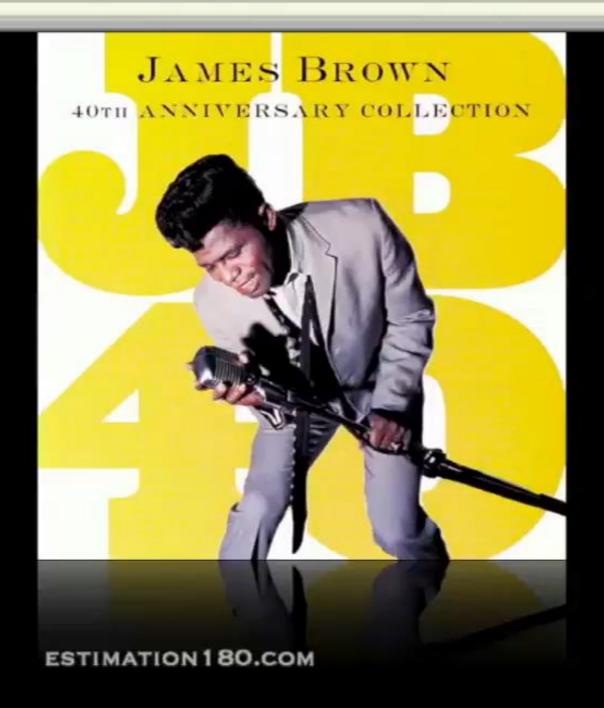








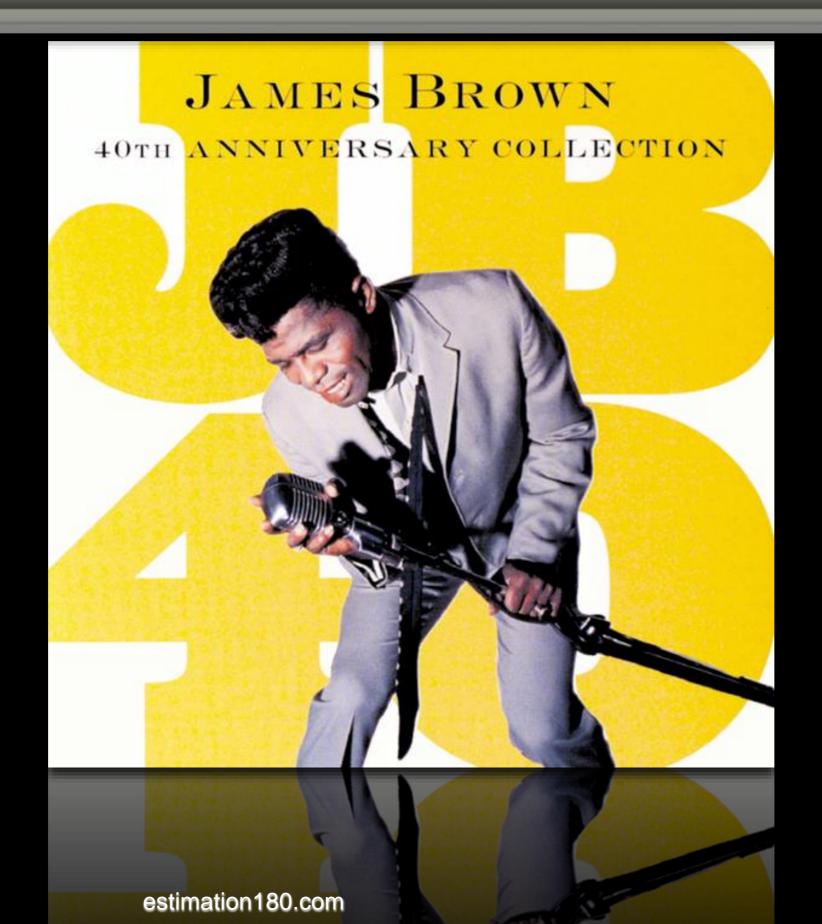
0:00 0







0:00



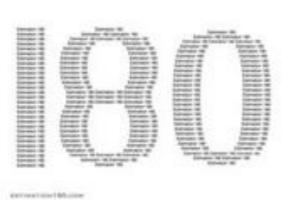


Building number sense one day at a time.

Days Blog Lessons Presentations & Workshops About/Contact

#### Word Count Estimates!!!

(days 187-190)









Days 1-20



Days 101-120



Days 21-40



Days 121-140



Days 41-60



Days 141-160



Days 61-80



Days 161-180



Days 81-100

Days 181-200







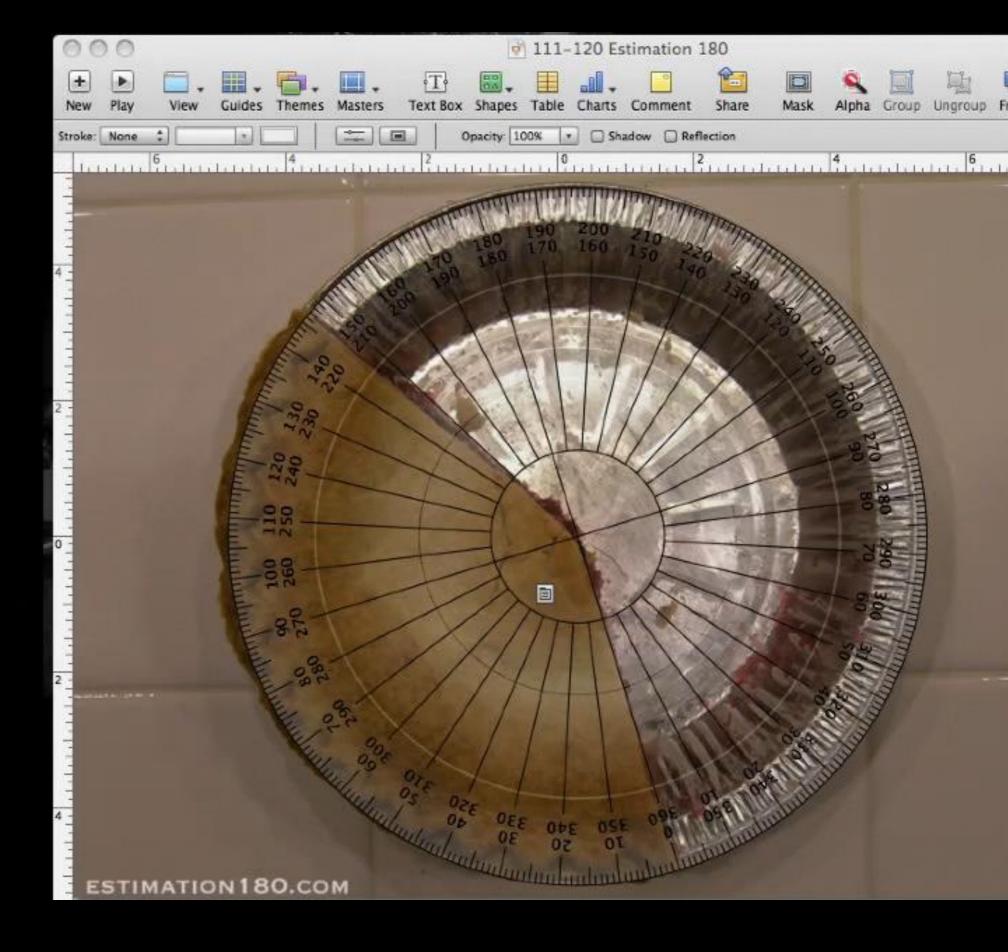






# DEGREES:

PERCENT:
O %





#### Dr. Clayton Edwards @Doctor\_Math





Amazing to see 6th graders w/ no % background learn so much in 20 min w/ pie pics @mr\_stadel bit.ly/1ilros1 #mathchat #iaedchat

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RETWEETS

FAVORITES





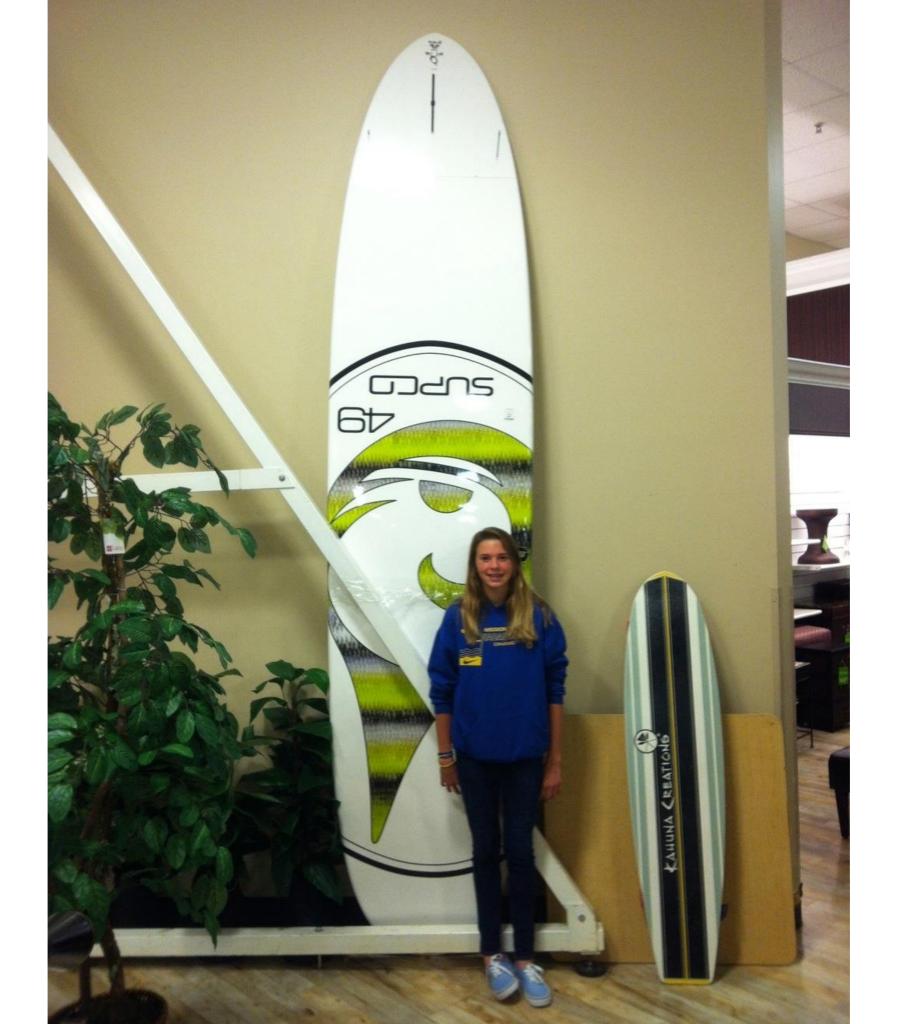




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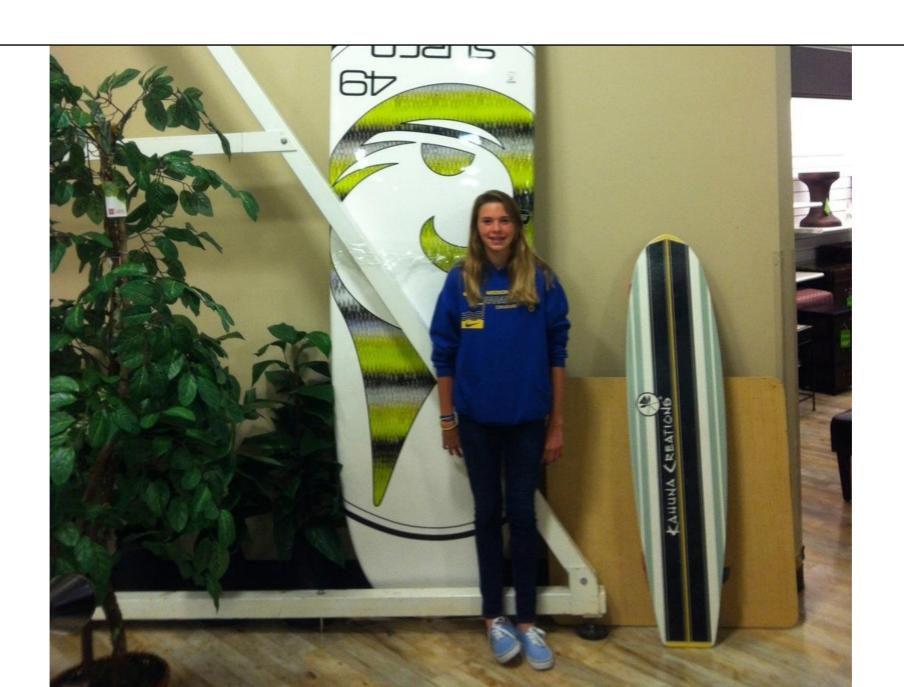








The height of the board is 12'2" and I am 5'6".







S brought in necklace she made for us to estimate! She also came with the answer!Now we have 181 days! #estimation180 pic.twitter.com/TgchZtZ1AT





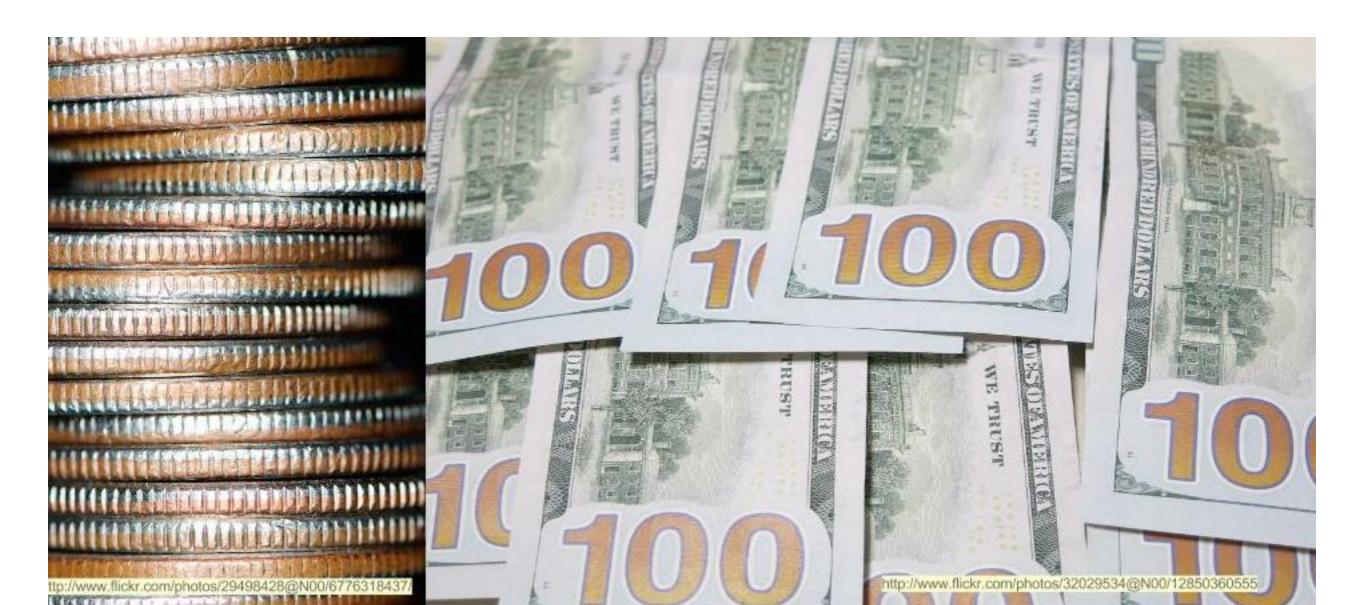
#### Would You Rather?

ASKING STUDENTS TO CHOOSE THEIR OWN PATH AND JUSTIFY IT

By: John Stevens wyrmath.wordpress.com

### Would You Rather?

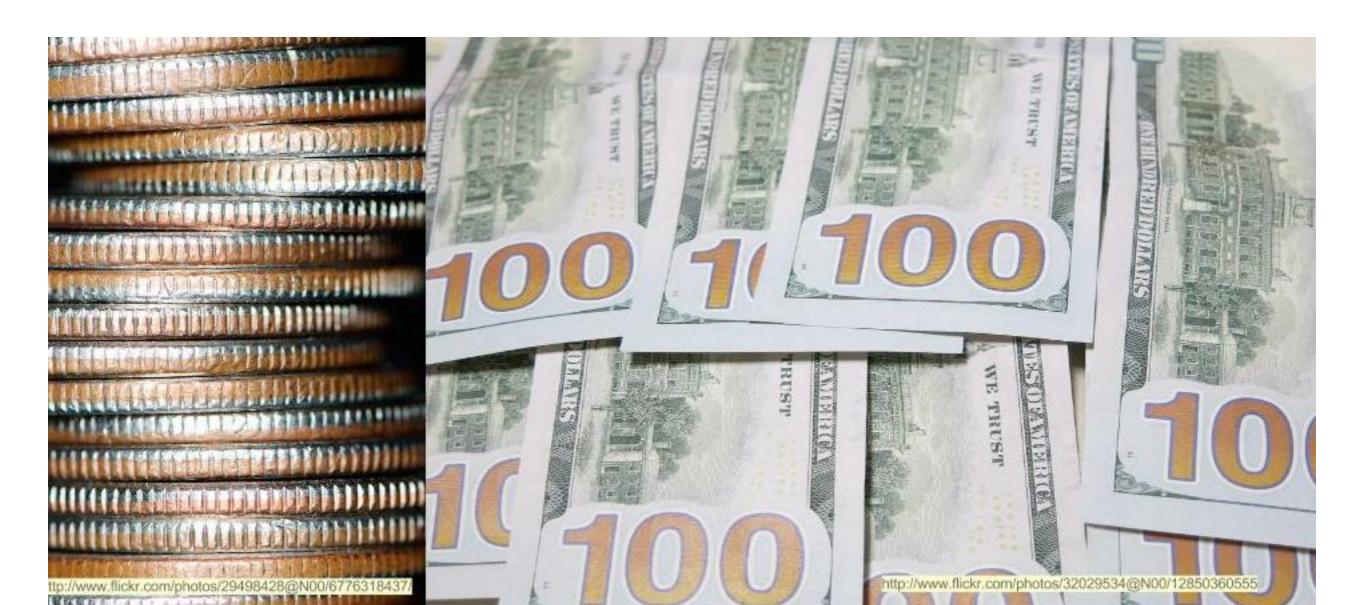
## A stack of quarters from the floor to the top of your head or \$250?



Name:
Situation:
My argument
My argument
I believe
The evidence I have to support this belief is
Someone might disagree with me because
Classmate
believes
The evidence they have to support their ballet is
The evidence they have to support their belief is

### Would You Rather?

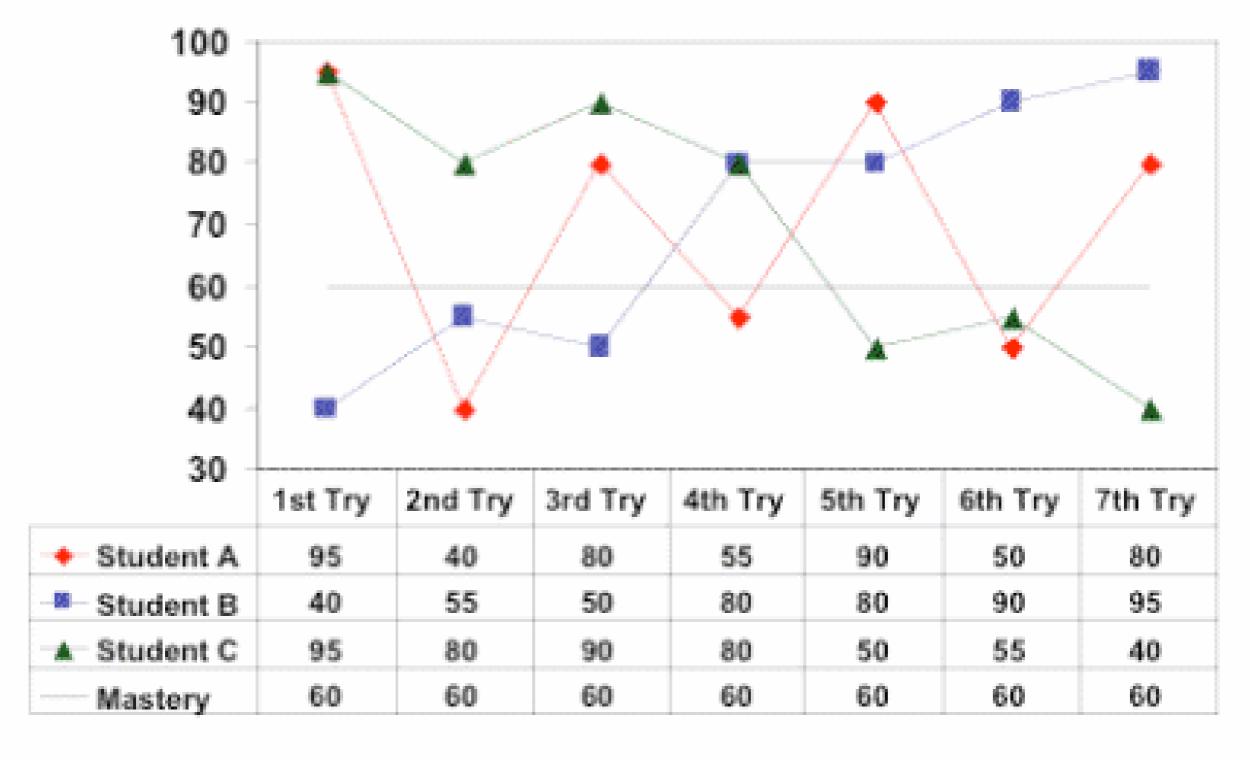
## A stack of quarters from the floor to the top of your head or \$250?



## MathArguments180.com

# Which student would you choose to pack your parachute?

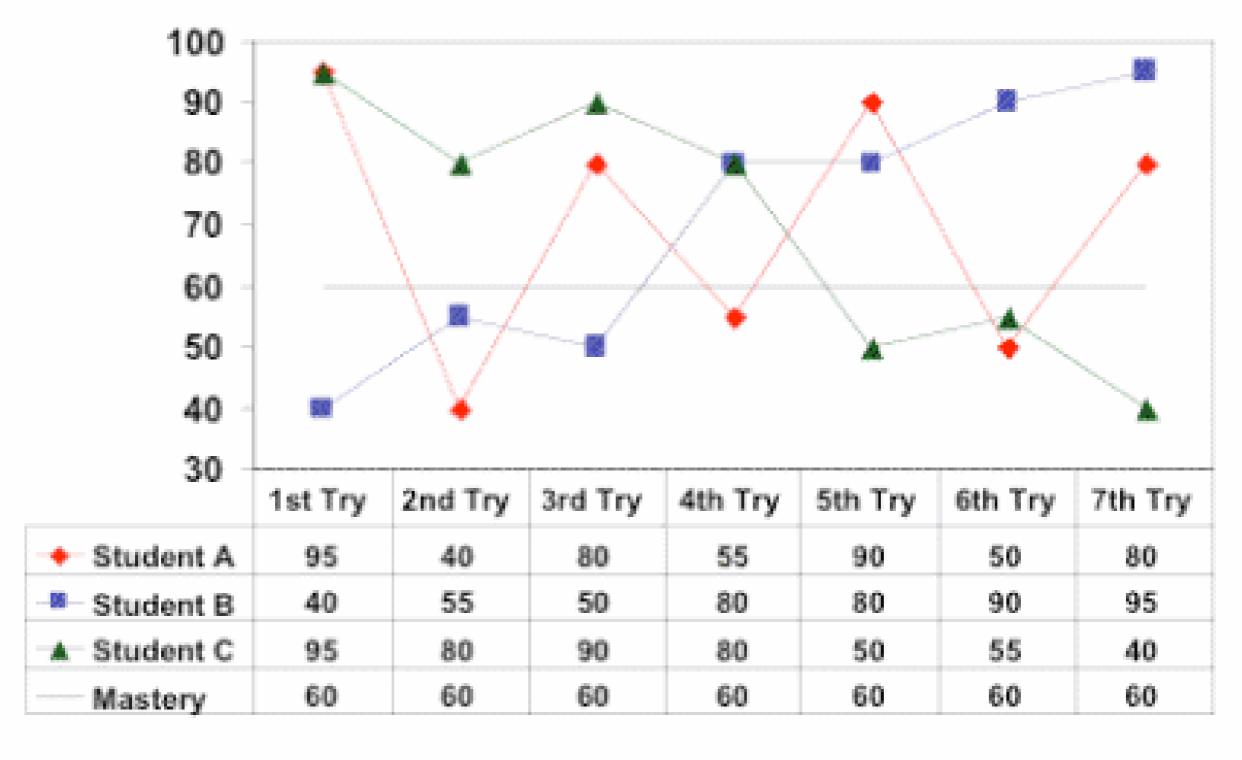




Adapted from How to Grade for Learning (O'Connor, 2002)

# Which student would you choose to pack your parachute? ◄))





Adapted from How to Grade for Learning (O'Connor, 2002)



Posts 🔯

Comments 🔕

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#### [Confab] Money Duck

April 30th, 2014 by Dan Meyer

Confab time! Let's make some magic here. This is a Money Duck. It's soap.



My name is

Dan Meyer

and I like to

teach.



### **Money Duck**

Buyer

Seller

Goal: Explore & plan to use today's resources.

Goal: Explore & plan to use today's resources.

Find a task to use this year. Solve it.

Goal: Explore & plan to use today's resources.

• Find a task to use this year. Solve it.

Practice some open-ended happenings.

Goal: Explore & plan to use today's resources.

• Find a task to use this year. Solve it.

O Practice some open-ended happenings.

Makeover a boring textbook problem.

Goal: Explore & plan to use today's resources.

• Find a task to use this year. Solve it.

O Practice some open-ended happenings.

• Makeover a boring textbook problem.

Choose a curious classroom activity.

#### Problem-Based Lesson Resources

- Problem-based lesson search engine:
  - http://robertkaplinsky.com/prbl-search-engine/
- My lessons: <a href="http://www.robertkaplinsky.com/lessons">http://www.robertkaplinsky.com/lessons</a>
- Dan Meyer: <a href="http://threeacts.mrmeyer.com">http://threeacts.mrmeyer.com</a>
- Andrew Stadel: <a href="http://tinyurl.com/mrstadel">http://tinyurl.com/mrstadel</a>
- Geoff Krall: <a href="http://tinyurl.com/PrBLmaps">http://tinyurl.com/PrBLmaps</a>
- Dan Meyer's TED talk: <a href="http://tinyurl.com/meyer-TED">http://tinyurl.com/meyer-TED</a>

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Lessons



Blog





Speaking









Contact



Home

How Many Sheets Do You Need To Break Out Of Prison?

Operations with rational numbers [NIII

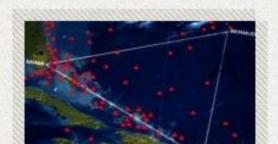
Why Choose Us?



Math content expert

Robert graduated from University of California, Los Angeles (UCLA) with a Bachelors of Science in Mathematics. He has taught mathematics to students at the elementary, middle, and high school levels. As an instructor for LICLA, he also taught math

#### Lessons









Blog

Speaking

Services

Beliefs About Contact

Geometry Modeling Numb & Quant 2nd 3rd 4th 5th 6th 7th 8th Algebra Functions Stats & Prob



How Much Is One Third Of A Cup Of Butter?



How Do Skytypers Write Messages?





#### Robert Kaplinsky's Problem-Based Lessons 🔅 🖿

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fx							
	A	В	С	D	E	F	
1	Task Name	Concept / Skill	Standard 1	Standard 2	Standard 3	Standard 4	Sta
2	How Can We Water All Of The Grass?	Circles, Pythagorean Theorem, trigonometric ratios	7.G.4	8.G.7	G-SRT.8	G-MG.1	G-I
3	How Much Money IS That?!	Volume of rectangular prism	5.MD.3	5.MD.4	5.MD.5	5.MD.5b	5.N
4	How Much Money Should Dr. Evil Demand?	Exponential Growth	N-RN.2	A-SSE.1	A-SSE.3c	A-SSE.4	A-F
5	How Tall Is Mini-Me?	Scale and Dividing Decimals	5.NF.5	5.NF.5a	5.NF.5b	6.NS.3	
6	How Did They Make Ms. Pac-Man?	Transformations (Rotations, Reflections, and Translations)	8.G.1	8.G.2	8.G.3	8.G.4	G-9
7	Which Ticket Option Is The Best Deal?	Unit Rates and Ratios	6.RP.2	6.RP.3	6.RP.3a	6.RP.3b	
8	How Far Apart Are The Freeway Exits?	Fractions on a Number Line and Subtracting Fractions	3.NF.2	3.NF.2b	4.NF.2	4.NF.3a	4.1
9	Do We Have Enough Paint?	Area	3.MD.5	3.MD.6	3.MD.7		
10	How Many Stars Are There In The Universe?	Scientific Notation	8.EE.3	8.EE.4			
11	What Rides Can You Go On?	Inequalities and Measurement	2.MD.1	6.NS.7a	6.NS.7b		
12	Do You Have Enough Money?	Money	2.MD.8				
13	Which Bed Bath & Beyond Coupon Should You Use?	Percent Discount	7.RP.3				
14	Is Gas Cheaper With Cash Or Credit Card?	Percent Discount	7.RP.3				
15	Where's The Nearest Toys R Us?	Pythagorean Theorem (Distance in coordinate system)	8.G.8	G-SRT.8	G-GPE.7		
16	How Sharp Is The iPhone 5's Retina Display?	Pythagorean Theorem (Length of a side)	8.G.7	G-SRT.8	G-GPE.7		
17	When Should She Take Her Medicine?	Operations with Time Intervals	4.MD.2				
18	How Big Are Sunspots?	Converting Units, Proportions, and Scientific Notation	5.MD.1	7.RP.2	7.G.4	8.EE.4	G-I
19	What Michael's Coupon Should I Use?	Percent Discount	7.RP.3	A-CED.3			
20	Is It Cheaper To Pay Monthly or Annually?	Decimal Operations and/or Systems of Equations	5.NBT.7	8.EE.8c	A-CED.3	A-REI.11	F-E
21	How Big Is The 2010 Guatemalan Sinkhole?	Volume of Cylinder	5.MD.3	5.MD.4	5.MD.5	8.G.9	G-(
22	How Can You Win Every Prize At Chuck E. Cheese's?	Decomposing Numbers and/or Systems of Equations	2.NBT.7	3.NBT.2	3.NBT.3	8.EE.8c	A-C
23	How Many Royal Flushes Will You Get?	Probability	7.SP.5	7.SP.6	7.SP.7	S-MD.5	S-N
24	How Much Does The Paint On A Space Shuttle Weigh?	Surface Area	6.G.4	7.G.6	8.G.7	G-MG.1	G-I
25	How Did Motel 6 Go From \$6 to \$66?	Percent Increase and Compound Interest	7.RP.3	A-SSE.1b	F-BF.1	F-IF.8b	F-L
26	How Much Does The Aluminum Foil Prank Cost?	Surface Area and Unit Rates	6.G.4	6.RP.2	6.RP.3	7.G.6	
27	How Many Laps Is A 5k Race?	Perimeter	4.MD.3				
28	Which Toilet Uses Less Water?	Systems of Equations/Inequalities	8.EE.8c	A-CED.3	A-REI.11	F-BF.1	
29	How Did Someone Get A \$103,000 Speeding Ticket In Finland?	Linear Equations	A-CED.2	F-BF.1	F-IF.4	F-IF.6	
30	Which Pizza Is A Better Deal?	Area or Circle, Square, and Unit Rates	3.MD.5	3.MD.6	3.MD.7	4.MD.3	6.R
	How Big Is The World's Largest Deliverable Pizza?	Area of Square	3.MD.5	3.MD.6	3.MD.7	4.NBT.3	4.N
	How Many Sheets Do You Need To Break Out Of Prison?	Integer Operations	5.NBT.6				$\top$
	Do Hybrid Cars Pay For Themselves?	Systems of Equations or Rates	6.RP.2	6.RP.3	8.EE.8c	A-CED.3	F-E
	How Many Hot Dogs Did They Eat?!	Linear and Quadratic Functions	8.F.3	8.F.4	F-BF.1	F-BF.2	F-II
35	How Much Purple Ribbon Will You Need?	Perimeter & Circumference	3.MD.8	4.MD.3	7.G.4		
36	Are We There Yet?	Adding Times	3.MD.1	4.MD.2			
	Which Chinese Food Coupon Should I Use?	Percent Discount	7.RP.3				
	How Big Is The Vehicle That Uses Those Tires?	Ratio and Proportions	7.RP.2				
	Where Would The Angry Birds Have Landed?	Create Equation From Quadratic Graph	A-CED.1	F-BF.1	F-IF.4	F-IF.7a	F-L
	How Many Movies Can You See In One Day?	Adding Times	3.MD.1	4.MD.2			
	Which Carrots Should You Buy?	Unit Rates	6.RP.1	6.RP.2	6.RP.3		$\top$
	How Fast Can You Throw A Baseball?	Converting Units and Unit Rates	5.MD.1	6.RP.2			$\top$



#### Problem-Based Lesson Search Engine

This search engine searches all of the sites below to quickly help you find a problem-based lesson (also called 3-Act Task, mathematical modeling, or application problem):

Submit

The links below are the pages that are being searched by the search engine:

- 101 Questions
- Andrew Stadel
- Dan Meyer
- · Dane Ehlert
- Emergent Math's Problem Based Curriculum Maps
- Estimation180
- · Geoff Krall

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101qs.com

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Problem Based Curriculum Maps

Robert Kaplinsky

- robert@robertkaplinsky.com robertkaplinsky.com/tusd/
- @robertkaplinsky