

Motivating Our Students with Real World Problem- Based Lessons

ROBERT KAPLINSKY

 @robertkaplinsky









DOUBLE-DOUBLE[®] *Double Meat & Double Cheese* **2⁶⁵**

CHEESEBURGER **1⁷⁵**

HAMBURGER **1⁵⁰**

FRENCH FRIES **1⁰⁵**

SHAKES *Chocolate
Strawberry
Vanilla* **1⁵⁵**

<u>SM</u>	<u>MED</u>	<u>LG</u>	<u>X-LG</u>
99	1¹⁰	1²⁹	1⁴⁹
COKE <i>Classic or Diet</i>			
SEVEN-UP			
ROOT BEER			
DR PEPPER			
LEMONADE			
ICED TEA			

MILK	70
COFFEE	70



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

2004-10-31

8:21 PM

YOUR GUEST NUMBER IS
98

IN-N-OUT BURGER LAS VEGAS EASTERN
2004-10-31

8:21 PM

165 1 5 98

Cashier: SAM

GUEST #: 98

Counter-Eat In

Db Db	2.65
98 Meat Pty XChz	88.20
Counter-Eat In	90.85
TAX 7.50%	6.81
Amount Due	97.66
CASH TENDER	\$97.66
Change	\$.00

2004-10-31

Cashier: SAM

GUEST #: 98

Counter-Eat In

Db Db	
98 Meat Pty XChz	2.65
	88.20
Counter-Eat In	
TAX 7.50%	90.85
Amount Due	6.81
	97.66
CASH TENDER	
Change	\$97.66
	\$.00

2004-10-31

8:21 PM

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

Mathematical Process Standards

- (A) apply mathematics to problems arising in everyday life, society, and the workplace;
- (B) use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;
- (C) select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems;

Mathematical Process Standards

- (D) communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;
- (E) create and use representations to organize, record, and communicate mathematical ideas;
- (F) analyze mathematical relationships to connect and communicate mathematical ideas; and
- (G) display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

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 ($\1.75×100 cheeseburgers)
 - \$132.50 ($\2.65×50 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

What problem are you trying to figure out?	
<p>How much does a 100x100 burger cost?</p> <p style="text-align: right;">Regular (one patty) \$1.25</p> <p style="text-align: center;">\$132.50</p>	
What do you already know from the problem?	What do you need to know to solve the problem?
<ul style="list-style-type: none"> • there's 100 beef patties • costs 2.50 	<ul style="list-style-type: none"> • How much does a regular cheeseburger cost. 25.1 - <p style="text-align: center;">OP.</p> <p style="text-align: center;">OP. OP.</p>
What is your conclusion?	
<p>To get the answer, I first figured out what the price of a regular & double-double cheeseburgers are. From there I subtracted the price of the produce & buns, then multiplied by 100. That gave me the answer, which I once again had to add the price of the buns & produce.</p> <p style="text-align: center;"> $22.8 + 00.1 - xOP_0 = P$ $128_0 + xOP_0 = P$ </p>	

What is your conclusion?

The only difference between a double double and a cheeseburger is one patty and one slice of cheese. So you subtract the prices of the two to find the price of only one patty & cheese. You then use that number (.90) & subtract it from the cost of one whole cheeseburger to find the price of all the extra stuff. Multiply by 100

What is your conclusion?

A 100x100 at In-n-Out cost \$90.85. To solve that, you start by subtracting the price of a cheeseburger from a double double. The answer (.90) is the price of a patty and cheese slice. You multiply (.90) by one less patty than what you want. (x-1), and you add the price of a cheeseburger (1.75). You end up with the eq. $[y = .90(x-1) + 1.75]$. For the 100x100, you plug in 100 to the (x) and you end up with \$90.85.

$$\left[\begin{array}{l} y = .90(100-1) + 1.75 \\ y = 89.10 + 1.75 \\ y = 90.85 \end{array} \right]$$



What is your conclusion?

Figure the price difference from the Double-Double with a cheeseburger.

Then find out the price for the produce and cheese-beef.

get total into \$90.85

The Four C's

- o Communication
- o Curiosity

REGAL

- HANCOCK
- KIT KITTREDGE
- WANTED
- KUNG FU PANDA
- SEX AND THE CITY
- IRONMAN
- GET SMART

- WALL E
- THE FOOT FIST WAY
- INCREDIBLE HULK
- THE HAPPENING
- DONT MESS WITH THE ZOHAN
- INDIANA JONES
- HELL BOY JULY 11



Bar Office

Bar Office









SALTED PEANUTS
IN MESH BAG
20 OZ
\$3⁵⁹

Fresh Roasted
PEANUTS
\$2.59 lb

Salted
PEANUTS
\$2.59 lb



The Four C's

- o Communication
- o Curiosity
- o 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 guesses do you have?
What do you already know from the problem?	What do you need to know to solve the problem?
What should we title this lesson?	
What is your conclusion? How did you reach that conclusion?	

The Four C's

- o Communication
- o Curiosity
- o Critical Thinking
- o Content Knowledge

PROBLEM- BASED LEARNING FAQ

- *How long do problem based lessons take?*
- *How often do teachers do problem-based learning?*
- *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?*



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

Operations with rational numbers



Why Choose Us?

1

Math content expert

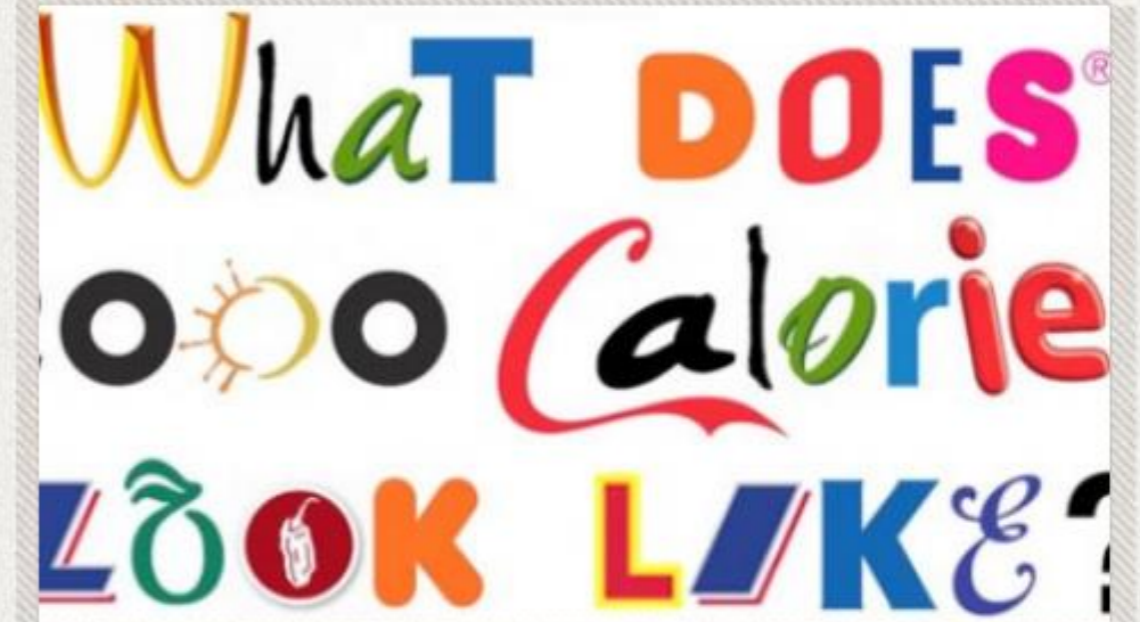
Robert graduated from University of California, Los Angeles (UCLA) with a Bachelors of Science in Mathematics. He has taught mathematics to students at the elementary, middle, and high school levels. As an instructor for UCLA, he also taught math

Lessons





How Many Hot Dogs And Buns Should He Buy?



What Does 2000 Calories Look Like?



Robert Kaplinsky's Problem-Based Lessons

File Edit View Insert Format Data Tools Help All changes saved in Drive

\$ % 123
Arial
10
B
I
U
A

	A	B	C	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-M
3	How Much Money IS That?!	Volume of rectangular prism	5.MD.3	5.MD.4	5.MD.5	5.MD.5b	5.M
4	How Much Money Should Dr. Evil Demand?	Exponential Growth	N-RN.2	A-SSE.1	A-SSE.3c	A-SSE.4	A-R
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-S
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.N
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-M
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-C
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-M
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-M
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
31	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.M
32	How Many Sheets Do You Need To Break Out Of Prison?	Integer Operations	5.NBT.6				
33	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
34	How Many Hot Dogs Did They Eat?!	Linear and Quadratic Functions	8.F.3	8.F.4	F-BF.1	F-BF.2	F-IF
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			
37	Which Chinese Food Coupon Should I Use?	Percent Discount	7.RP.3				
38	How Big Is The Vehicle That Uses Those Tires?	Ratio and Proportions	7.RP.2				
39	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
40	How Many Movies Can You See In One Day?	Adding Times	3.MD.1	4.MD.2			
41	Which Carrots Should You Buy?	Unit Rates	6.RP.1	6.RP.2	6.RP.3		
42	How Fast Can You Throw A Baseball?	Converting Units and Unit Rates	5.MD.1	6.RP.2			



Google Search

I'm Feeling Lucky

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):

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](#)

Subscribe to Lessons

Enter your email address below to receive emails whenever a new lesson is published.

Subscribe to Blog

Enter your email address below to receive emails whenever a new blog post is published.

Problem-Based Lessons

101qs.com

Andrew Stadel

Dan Meyer

Mathalicious

Problem Based Curriculum Maps

Problem-Based Lesson Resources

- Problem-based lesson search engine: <http://robertkaplinsky.com/prbl-search-engine/>
- My lessons: <http://www.robertkaplinsky.com/lessons>
- Dan Meyer: <http://threeacts.mrmeyer.com>
- Andrew Stadel: <http://tinyurl.com/mrstadel>
- Graham Fletcher: <http://gfletchy.com/3-act-lessons/>
- Geoff Krall: <http://tinyurl.com/PrBLmaps>
- Mathalicious: <http://www.mathalicious.com>
- Yummy Math: <http://www.yummymath.com>

Contact

Robert Kaplinsky



robert@robertkaplinsky.com



robertkaplinsky.com/nash15



[@robertkaplinsky](https://twitter.com/robertkaplinsky)

