

Creating Problem-Based Lessons

ROBERT KAPLINSKY









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

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YOUR GUEST NUMBER IS
98

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

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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

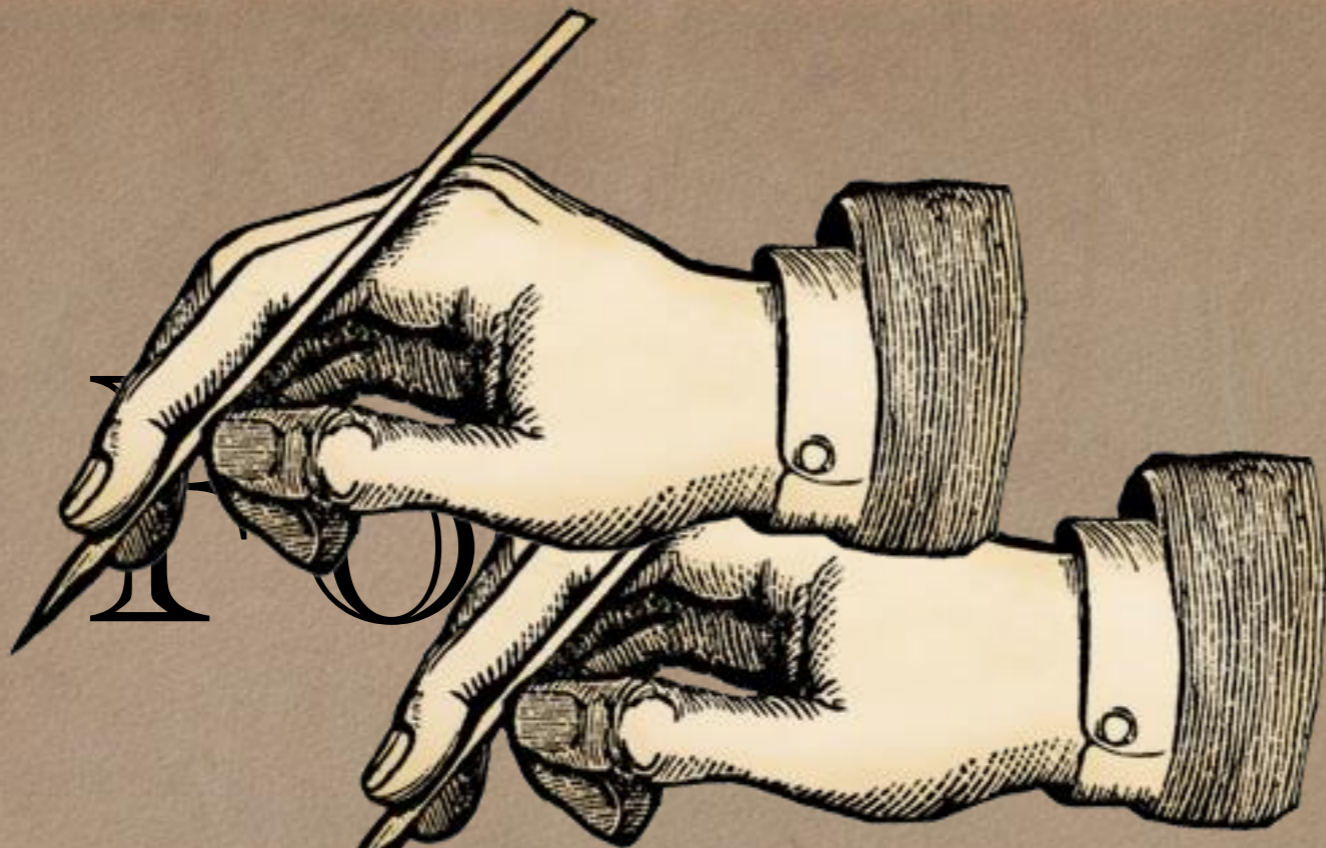
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	Serving Size (g)	Calories
Hamburger w/Onion	243	390
Cheeseburger w/Onion	268	480
Double-Double w/Onion	330	670



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COHERENCE

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RIGOR

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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

The Reality

- Students needed guidance to figure out a layer's cost
- Not every class is ready to go straight to 100×100
- 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?	
How much did it cost? $25.1 \times 100 = 2510$ $25.1 = 0.01 \times 2510$	
What do you already know from the problem?	What do you need to know to solve the problem?
*100 meats *100 cheeses *price of average cheeseburger	*price of meat & cheese 25.1 0.1 <hr/> $28.$
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?

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 two. That gave me the answer, which I once again had to add the price of the buns & produce.

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



OVERSIZE LOAD

TEXAS
X10-809
265

TRAVEL
FREE
WIG





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 do you already know from the problem?

What do you need to know to solve the problem?

What is your conclusion?

The Four C's

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

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?*
- *What makes a problem great?*

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GUEST #: 98

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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.*

When I Let Them Own the Problem

- Blog post by Fawn Nguyen
- Helpful at showing how students experience a problem.
- Download a PDF copy of the blog post by going to <http://robertkaplinsky.com/hmh> and clicking on “When I Let Them Own the Problem”

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