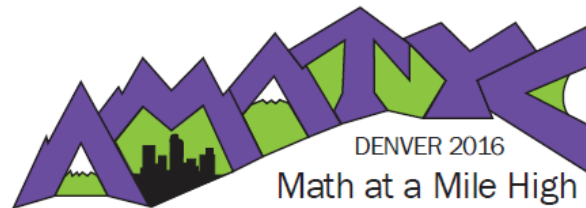


# ACTIVE LEARNING and ENGAGEMENT

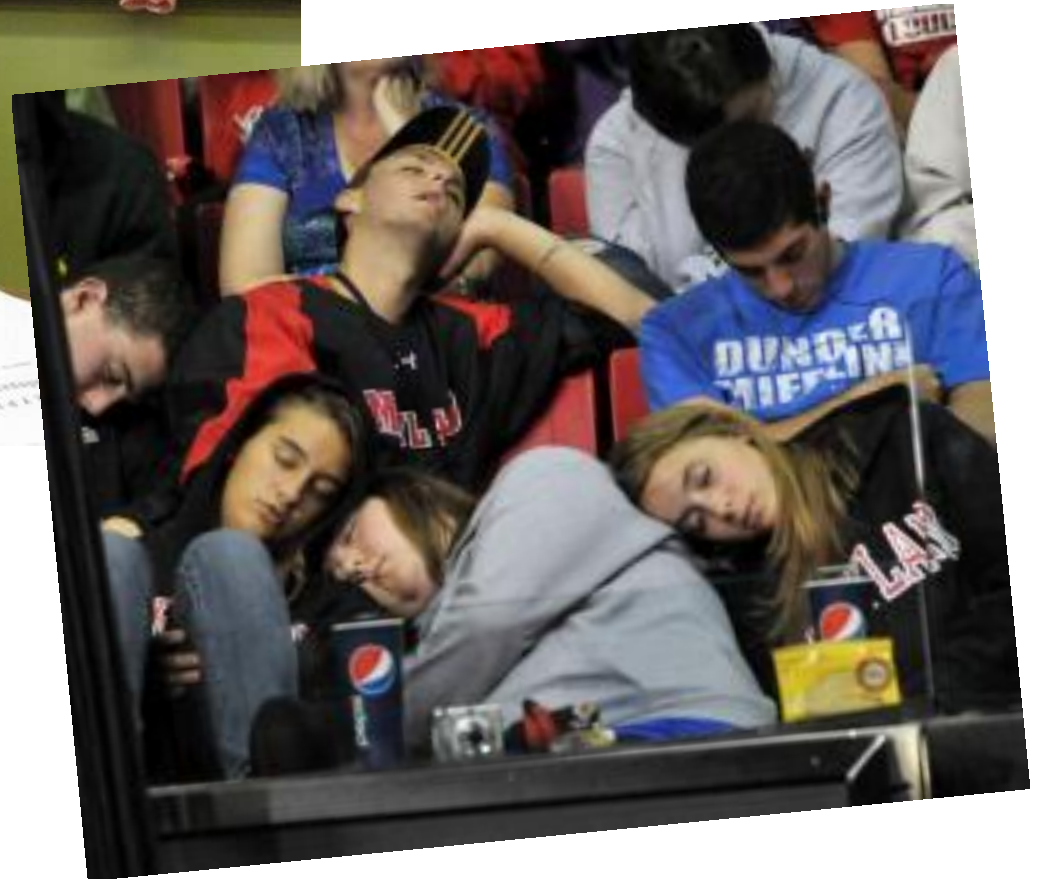
“The Freddie and Eddie Show!”



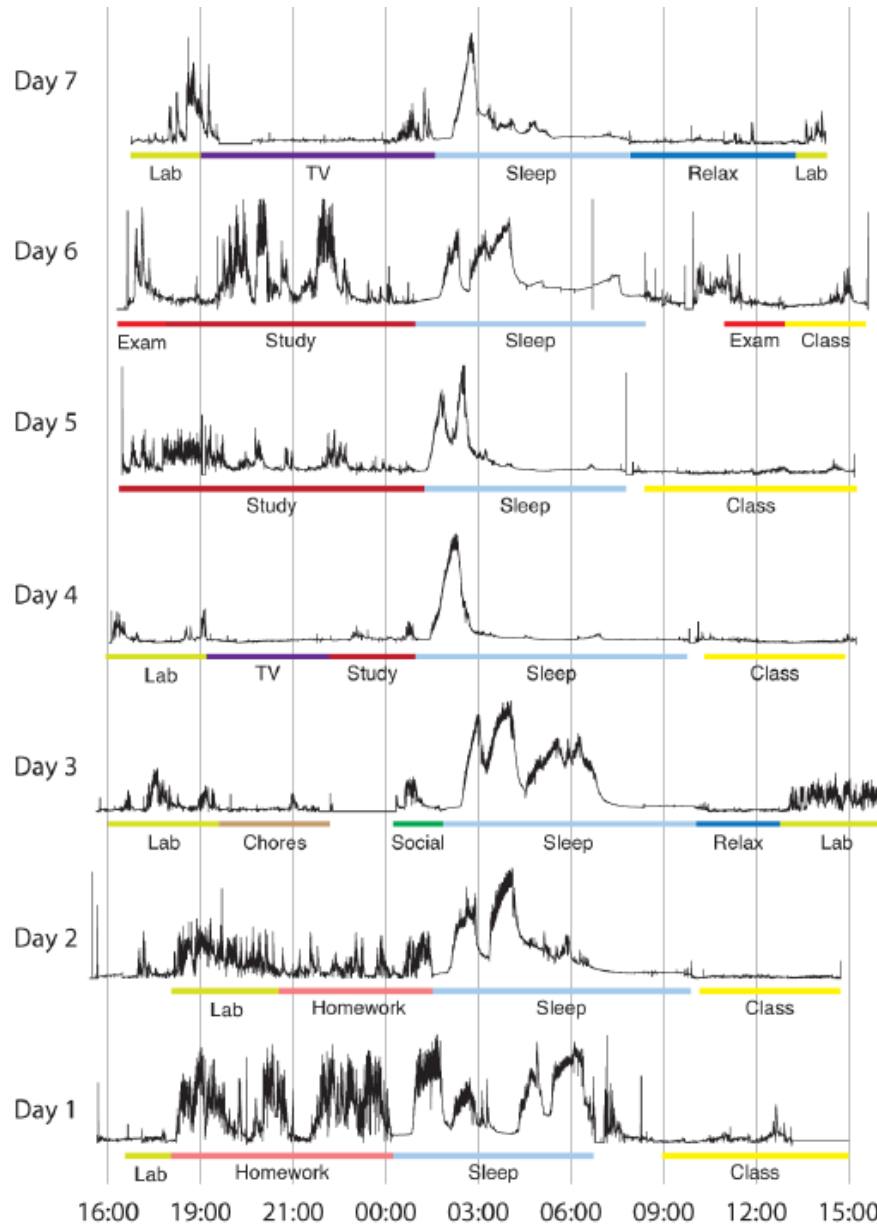
**Edouard Tchertchian / Los Angeles Pierce College**  
**Fred Feldon / Coastline Community College**  
**42<sup>nd</sup> AMATYC Annual Conference**  
**November 18, 2016, Denver, CO**

**This presentation is  
available for download at  
<http://www.slideshare.net/ffeldon>**





# One Week of a Student's Electrodermal Activity (EDA)

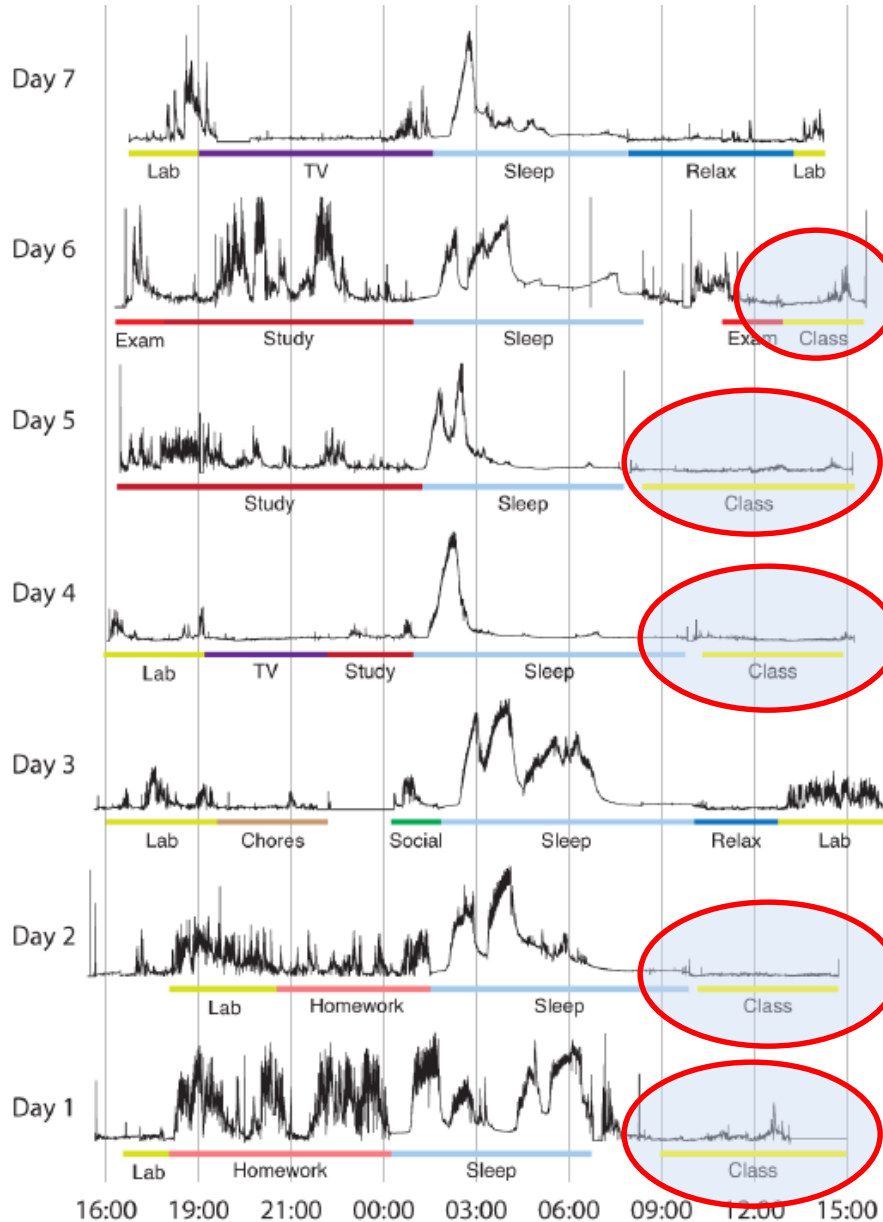


*Poh, Swenson & Picard, 2010*  
<http://affect.media.mit.edu/pdfs/10.Poh-et al-TBME-EDA-tests.pdf>

# One Week of a Student's Electrodermal Activity (EDA)

## Hi-level activity

- Lab
- Study
- Exams
- Homework
- Sleep



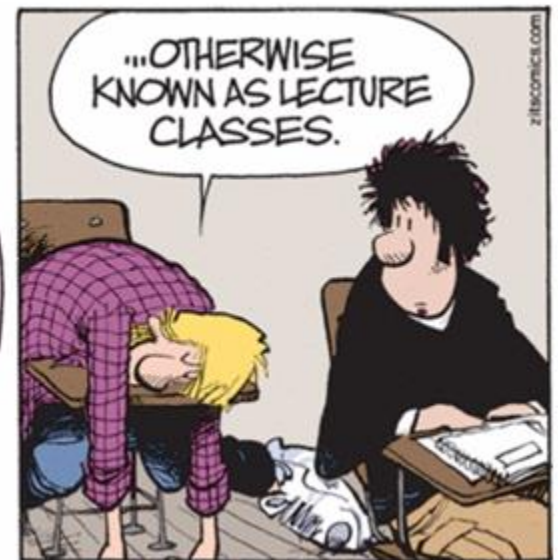
## Lo-level activity

- TV
- Relax
- Chores
- Class

Poh, Swenson & Picard, 2010  
<http://affect.media.mit.edu/pdfs/10.Poh-et al-TBME-EDA-tests.pdf>

# Zits

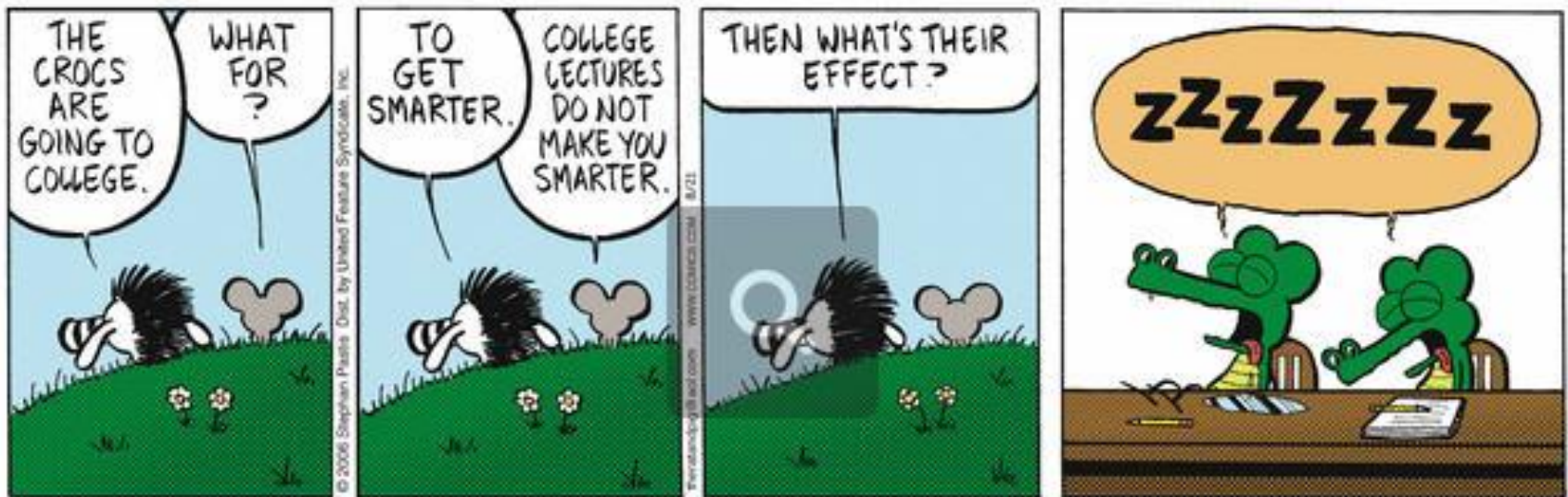
by JERRY SCOTT and JIM BORGMAN





**“Some people talk in their sleep.  
Lecturers talk while *other* people  
sleep.” -- Albert Camus, 1913-1960**

Cited by Eric Mazur in “Twilight of the Lecture,” *Harvard Magazine*, March-April, 2012



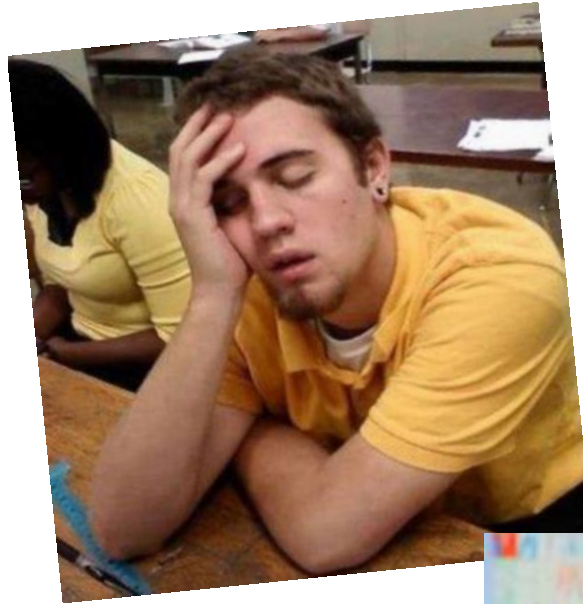




**“There must be far less  
telling on the part of the  
teacher, and far more  
doing on the part of the  
student.”**

***-- Jean Piaget, 1896-1980***

**Instead of giving the answer ...**

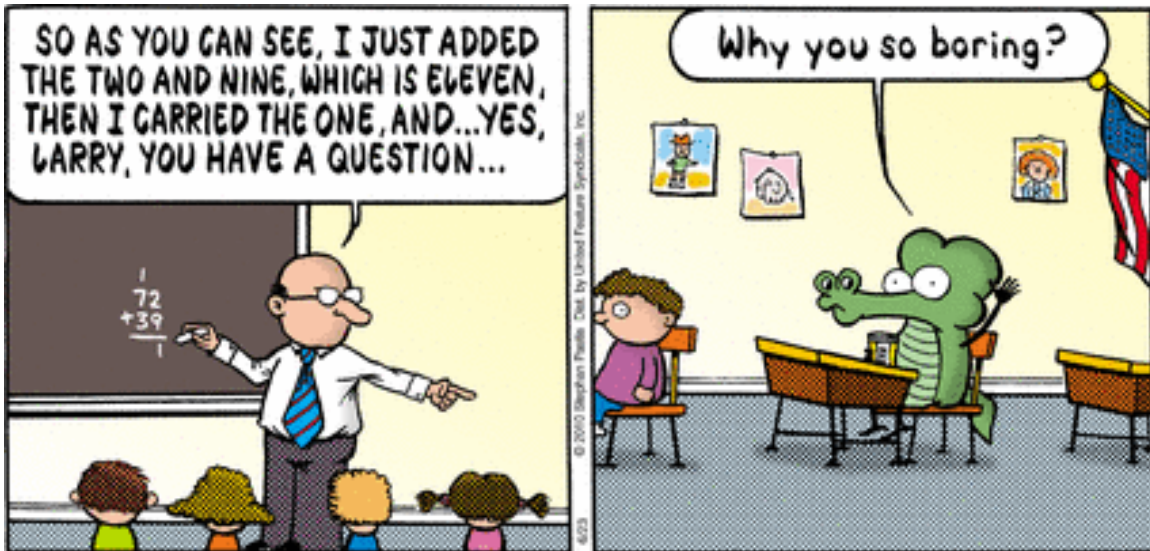


**ask a question!**



- Teaching is no longer about the lecture
- Content is everywhere!

Hot Tip: Google  
"Oxford University  
Twenty Terrible  
Reasons for  
Lecturing"

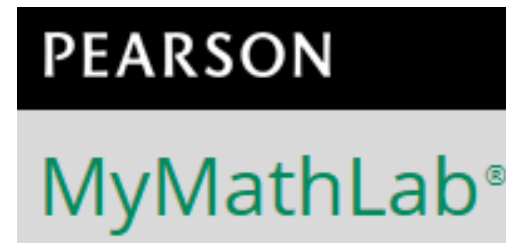




Enter what you want to calculate or know about:



PatrickJMT



# What a Student Who Resisted Learned:

**“Not only *can* you learn on your own,  
you already *do* learn on your own and  
you will continue to learn on your own  
for your whole life!”**



*-- Robert Talbert, Chronicle of Higher Education, “An  
Inverted Calculus Course: The Overture,” Jan 27, 2014*

# Advantages of Flipping

Promotes peer  
interaction and  
collaboration  
skills

Makes  
*learning*  
central,  
rather than  
*teaching*

Fosters  
independent  
learning

Encourages  
higher  
student  
engagement

Provides  
increased  
individualized  
attention



- *Hot Tip: Visit <http://www.scoop.it/t/flipped-classroom-in-higher-ed> and follow #flipclass on Twitter!*



# Course Redesign with Technology

Strategies for Student and Faculty Success

**In 2013, the Chancellor's Office selected 44 courses as Proven Course Redesign models to be scaled across other CSU campuses. Models include fully online, flipped, supplemental instruction services and technology-enhanced methods. 100 CSU faculty attended hands-on "eAcademies" and engaged in Professional Learning Communities.**

<http://courseredesign.csuprojects.org/wp/>



# The Bottom Line

- **“Move traditional tasks of homework, rote memorization, lecture and recitation into an anytime role, which feeds the final benefit of liberation. Use technology to provide immediate feedback.”**

# The Bottom Line

- **“Move traditional tasks of homework, rote memorization, lecture and recitation into an anytime role, which feeds the final benefit of liberation. Use technology to provide immediate feedback.”**
- **“In class, engage students in higher order tasks and discussion; have them collaborate, explain, interpret and predict outcomes based on their lower level knowledge.”**

*-- David Huckleberry, Educational Technologist,  
Purdue University, 2014*

# The Bottom Line

- **“The 21<sup>st</sup> century Internet has changed everything. Now, knowledge and expertise can be transferred remotely and practiced locally. This profoundly changes the teaching/learning process... It will insinuate itself into the practices of everyone. Everyone!”**

-- *Keith Hamon, Instructor of English, Middle Georgia State University, 2016*



**USA TODAY**

## 'Flipped classrooms' may not have any impact on learning

Emily Atteberry, USATODAY 3:25 p.m. EST December 5, 2013

*Professors at Harvey Mudd College in Claremont, Calif. who are studying the effectiveness of a flipped classroom have bad news for advocates of the model: it might not make any difference.*



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- Professors Nancy Lape, Karl Haushalter, Rachel Levy and Darryl Yong received an NSF grant to study the effects of the flipped classroom on students' learning... Results suggest the benefits of flipping a classroom are dubious.
- "If you're not a good instructor, flipping the classroom won't really ensure better learning. If you aren't doing something to fill the space, it won't do you any good." *Education Consultant*



# Another Caveat...

Modern 'reform' is taking place at the wrong end... They put the cart before the horse, lipstick on the pig. Group work! Technology! Inquiry learning! Flipped classroom!



**Viktor Blåsjo**

@viktorblasjo

Historian of mathematics, radical calculus textbook author, mathematical agent infiltrating history and philosophy of science.

*"Manifesto on the Teaching of Mathematics"*

[www.intellectualmathematics.com](http://www.intellectualmathematics.com)

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We need to reform mathematical substance, not pedagogy... The question isn't, "How can we make students understand Concept X?" We must ask, "Should we even teach Concept X in the first place? If so, why?"



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# What About Online Classes??

# What About Online Classes??

**RSI**

# What About Online Classes?



\$ \$ \$ \$



\$ \$ \$



The DOE Is Looking for...

**RSI**

\$ \$ \$ \$

Or they want  
their money  
back!

**Instructor-initiated,  
Regular  
and Substantive  
Interaction!**



# What About Online Classes??

10/6/2015 8:04:58 PM

**Instructor: Feldon**

**ELITE EIGHT - Preparing for the Midterm: When To Use Which Formula**

Dear Students -- In Chapter 4 "Managing Money" there are several complicated formulas for personal finance. They're not easy to use, it can get a little tricky, and they're easy to confuse with one another. It KILLS ME when I see students lose 10, 20, 30, and even 40 points on the Midterm because they mix up the formulas. So, to help you prepare for the exam, keep reading...

In NCAA College Basketball there's the Sweet 16, Elite 8, Final 4, etc. Well, here's the **Elite Eight of Personal Finance Formulas** from your book in Chapter 4. Take a look at each formula. Let's start a discussion. Do NOT answer for ALL of them, please. Just pick one or two so many different students can participate. Where did these formulas come from? Which pages in your book? When do you use them? What's the difference between them? How do you know when to use each one? And where did formulas #3 and #6 come from? Good luck! -- Fred Feldon

**(1) The Compound Interest Formula (for Interest Paid Once a Year)**

$$A = P \times (1 + APR)^Y$$

where

- A = accumulated balance after Y years
- P = starting principal
- APR = annual percentage rate (as a decimal)
- Y = number of years

**(2) Compound Interest Formula for Interest Paid N Times Per Year**

$$A = P \left( 1 + \frac{APR}{n} \right)^{nY}$$

where

- A = accumulated balance after Y years
- P = starting principal
- APR = annual percentage rate (as a decimal)
- n = number of compounding periods per year
- Y = number of years

**(3) P =  $\frac{A}{\left(1 + \frac{APR}{n}\right)^{nY}}$**

**(4) Compound Interest Formula for Continuous Compounding**

$$A = P \times e^{APR \times Y}$$

where

- A = accumulated balance after Y years
- P = starting principal
- APR = annual percentage rate (as a decimal)
- Y = number of years

The number e is a special irrational number with a value of  $e \approx 2.71828$ . You can compute e to a power with the ( $e^x$ ) key on your calculator.

**(5) Savings Plan Formula (Regular Payments)**

$$A = PMT \times \frac{\left(1 + \frac{APR}{n}\right)^{nY} - 1}{\left(\frac{APR}{n}\right)}$$

where

- A = accumulated savings plan balance
- PMT = regular payment (deposit) amount
- APR = annual percentage rate (as a decimal)
- n = number of payment periods per year
- Y = number of years

**(6) PMT =  $\frac{A \times \frac{APR}{n}}{\left[\left(1 + \frac{APR}{n}\right)^{nY} - 1\right]}$**

**(7) Loan Payment Formula (Installment Loans)**

$$PMT = \frac{P \times \left(\frac{APR}{n}\right)}{\left[1 - \left(1 + \frac{APR}{n}\right)^{-nY}\right]}$$

where

- PMT = regular payment amount
- P = starting loan principal (amount borrowed)
- APR = annual percentage rate
- n = number of payment periods per year
- Y = loan term in years

**(8) Total and Annual Return**

Consider an investment that grows from an original principal P to a later accumulated balance A. The total return is the percentage change in the investment value:

$$\text{total return} = \frac{(A - P)}{P} \times 100\%$$


The annual return is the annual percentage yield (APY) that would give the same overall growth over Y years. The formula is

$$\text{annual return} = \left(\frac{A}{P}\right)^{\frac{1}{Y}} - 1$$

This formula gives the annual return as a decimal; multiply by 100% to express it as a percentage.

# What About Online Classes??

10/6/2015 8:04:58 PM

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 $Y$  = number of years

**(6) PMT =  $\frac{A \times \frac{APR}{n}}{\left[ \left( 1 + \frac{APR}{n} \right)^{nY} - 1 \right]}$**

**(2) Compound Interest Formula for Interest Paid  $n$  Times Per Year**

$$A = P \left( 1 + \frac{APR}{n} \right)^{nY}$$

where  
 $A$  = accumulated balance after  $Y$  years  
 $P$  = starting principal  
 $APR$  = annual percentage rate (as a decimal)  
 $n$  = number of compounding periods per year  
 $Y$  = number of years

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$$A = P \times e^{(APR \times Y)}$$


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 $A$  = accumulated balance after  $Y$  years  
 $P$  = starting principal  
 $APR$  = annual percentage rate (as a decimal)  
 $Y$  = number of years

 **Dominic**  reply to Instructor Feldon 




10/15/2015 1:46:02 AM

## RE: ELITE EIGHT - Preparing for the Midterm: When To Use Which Formula

thank you to everyone contributing to this...I looked everywhere in the book and watched lectures without much luck, but you all explained everything so clearly as if in a real classroom discussion, this is a big help thanks

 Reply



Show Less

 **Instructor Feldon**  reply to Dominic 

10/15/2015 2:38:24 PM

## RE: ELITE EIGHT - Preparing for the Midterm: When To Use Which Formula

WoW! Thank you, Dominic. That is an awesome comment. That's my goal, as an online instructor, to replicate online the kind of discussion that normally takes place in the classroom. You made my day! -- Fred Feldon

 Reply  Edit

Show Less

# What About Online Classes??

U.S. Department of Education Code of Federal Regulations, Title 34, Subpart A, Paragraph 602.3 establishes that correspondence courses do not qualify for Title IV federal financial aid, and that Distance Education is distinct from Correspondence Education (2015, p.12).

Similar stipulations exist in the California Department of Education California Community Colleges Distance Education California Code of Regulations; and in the Accrediting Commission for Community and Junior Colleges (ACCJC) Guide to Evaluating Distance Education and Correspondence Education.



**Define Regular:** Instructors shall interact weekly with online students for a duration equivalent to onsite classes. Interaction and feedback will be personal (as opposed to computer-generated).

**Define Substantive:** Feedback is academic rather than administrative. Instructors shall initiate scholarly dialogue and require student-to-student and student-to-teacher interactions.

**Define Interaction:** Dynamic synchronous or asynchronous academic, timely and reactive announcements; chat rooms with instructor participation; discussion board; e-mails; messaging; phone calls; review sessions; rubrics; social networking; video conferences; webcats; webinars; podcasts; etc.



**Define Non-Interactive:** Announcements, e-mails, messages, etc. that are administrative; course orientations; discussion board messages with non-academic or administrative content such as generic praise or clarification of class policies; Internet resources, links to external sites; computer or publisher-generated or pre-loaded content; webcasts, webinars, podcasts or other audio-video material that are generic, impersonal, passive or non-timely.

# How Do You Get It??

- Non-routine problems
- Current events
- Comics, cartoons, movies & videos
- “Hot Tips” for the exams
- Extra Credit
- Group Projects
- Funnel phone calls, e-mails, and *ALL* student questions and concerns to a Discussion Forum
- Require participation as part of their grade
- Model the behavior you are trying to get them to emulate



# **Wink, Wink!**



**In one system each day has 20 naps and each nap has 40 winks. How many seconds are in a wink?**

## *Answer*

Do a unit conversion:

$$\frac{1 \text{ day}}{20 \text{ naps}} \cdot \frac{1 \text{ nap}}{40 \text{ winks}} \cdot \frac{24 \text{ hours}}{1 \text{ day}} \cdot \frac{60 \text{ min}}{1 \text{ hour}} \cdot \frac{60 \text{ sec}}{1 \text{ min}} = \frac{108 \text{ sec}}{\text{wink}}$$

**108** seconds = 1 wink

# Soup Can



**A standard soup can measures  $2 \frac{11}{16}$  inches in diameter and 4 inches in height. If the same amount of soup is in a cubical container, will more or less tin be used? How much?**

# Answer

The cubical container uses about **3 square inches more** material.

$$V_{\text{cyl}} = \pi r^2 h = \pi (43/32)^2 (4) \approx 22.691 \text{ in}^3$$

$$SA_{\text{cyl}} = 2\pi r^2 + 2\pi r h = 2\pi (43/32)^2 + 2\pi (43/32)(4) \approx 45.117 \text{ in}^2$$

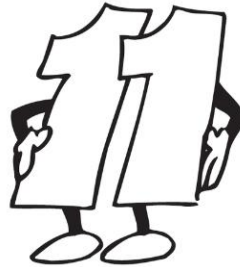
Let cubical container have side  $x$  and let  $V_{\text{cube}} = V_{\text{cyl}}$

$$x^3 = 22.691 \rightarrow x = 2.831 \text{ in}$$

$$SA_{\text{cube}} = 6x^2 = 6(2.831)^2 \approx 48.087 \text{ in}^2$$

Therefore the cubical container will require  $48.087 - 45.117 = 2.97$  or about 3 in<sup>2</sup> more tin.

# Elevenesses



In the word ELEVEN, each of the different letters  $E$ ,  $L$ ,  $V$ , and  $N$  is assigned a unique integer value from 0 through 9 to create a six-digit number. For example, if  $E=4$ ,  $L=5$ ,  $V=6$ , and  $N=1$  then ELEVEN would represent the number 454641. This is particularly delicious since ELEVEN is exactly divisible by 11.

Determine the values of  $E$ ,  $L$ ,  $V$ , and  $N$  which make ELEVEN as large as possible and exactly divisible by 11; and determine the values of  $E$ ,  $L$ ,  $V$ , and  $N$  which make ELEVEN as small as possible and exactly divisible by 11.  
(Remember,  $E \neq L \neq V \neq N$ .)

# Answer

To make the number as large as possible,  $E=9$ . The number becomes  $9L9V9N$ . Then use the largest number available which is 8, so let  $L=8$ . We have  $989V9N$ . Again, use the largest available number to make  $V=7$ . The number becomes  $98979N$ . By using trial and error (or by making the sum of digits in odd–even positions divisible by 11)  $N=1$  and the number is **989791**. This number is  $11 \times 89981$ .

To make the number as small as possible,  $E=1$  (if  $E=0$  we no longer have a six-digit number) then let  $L=0$  and we have  $101V1N$ . By trial and error (or by making the sum of digits in odd–even positions divisible by 11)  $V=5$ ,  $N=9$  and the number is **101519**. This number is  $11 \times 9229$ .

# Cube Root



**What positive number is three times its cube root?**

# Answer

Translating words into symbols gives you:

$$x = 3\sqrt[3]{x} \rightarrow x^3 = 27x$$

Since we seek a positive number, we can divide both sides of the equation by  $x$ , leaving:

$$x^2 = 27 \rightarrow x = \sqrt{27}$$



# Foxy Lady



**Suppose that 2 human years are equivalent to 12 fox years. If Ms. Fox spends 2 and a half fox minutes brushing her teeth, how many human seconds will have elapsed?**

## *Answer*

**25 human seconds.** If 12 fox years = 2 human years, then 6 fox years = 1 human year and 6 fox minutes = 1 human minute. Multiply both sides of the second equation by  $\frac{5}{12}$ . Then 2 and a half fox minutes =  $\frac{5}{12}$  human minutes which is 25 human seconds.

# Jell-O



**Jell-O is the state snack of Utah. If the Great Salt Lake was filled with Jell-O, how many calories would there be?  
Explain your answer.**

## *Answer*

**20 quadrillion Calories.** The volume of the Great Salt Lake is about  $6.68 \times 10^{11}$  cubic feet. Each cubic foot is 119.7 Cups. One serving is  $\frac{1}{2}$  Cup. Then do the math. Depending on the type of Jell-O and the calories per serving, your answer will vary.

$$6.68 \times 10^{11} \text{ ft}^3 \times \frac{119.7 \text{ C}}{1 \text{ ft}^3} \times \frac{2 \text{ servings}}{1 \text{ C}} \times \frac{126 \text{ Cal}}{1 \text{ serving}} = 2.0 \times 10^{16} \text{ Cal}$$

# ***Buying Tires***



**Charlie is preparing for a 42,000-kilometer trip in his truck. He wants to start out with all new tires. If he buys tires that each last 24,000 kilometers, what is the *least* number of tires Charlie will need for the trip? Explain.**

# *Answer*

**7 tires.** The trip is  $42,000 \times 4 = 168,000$  “tire kilometers.” Divide that by 24,000. That means you should be able to make the trip with only 7 tires.

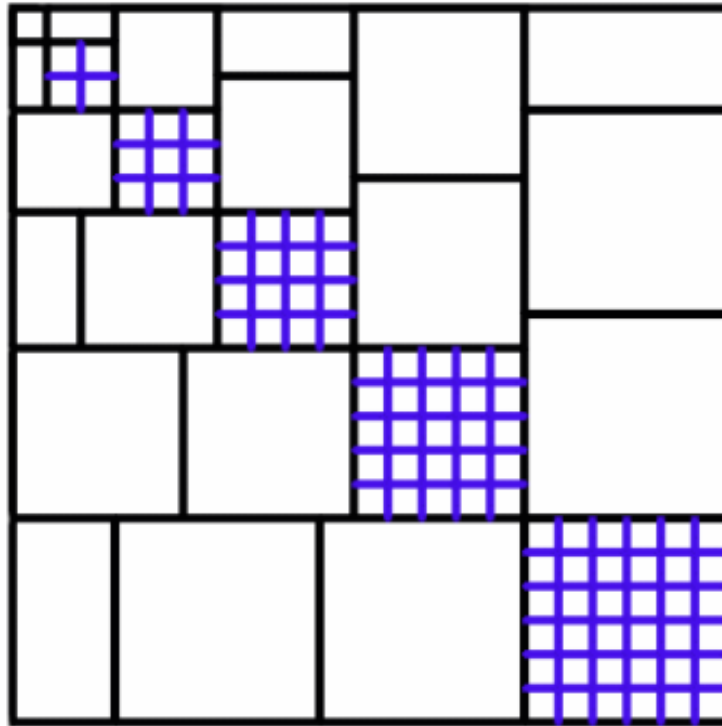
Charlie will have to rotate them as he travels, every 6,000 kilometers, to make the tires last through the trip. If the tires are numbered 1 through 7 one way is to rotate through the following sequence: 1, 2, 3, 4---2, 3, 4, 5---3, 4, 5, 6---4, 5, 6, 7---5, 6, 7, 1---6, 7, 1, 2---7, 1, 2, 3. Each tire is used for 4 cycles of 6,000 km. = 24,000 km.



# ***Proof Without Words***

How does this picture illustrate the following:

$$1^3 + 2^3 + 3^3 + \dots + 6^3 = (1 + 2 + 3 + \dots + 6)^2 ?$$





## Answer

The area of the large square is  $1 + 2 + 3 + 4 + 5 + 6 = 21$  by  $21$  or **441** square units, which represents  $(1 + 2 + 3 + \dots + 6)^2$ .

Another way to find the area of the large square is notice that the small square in the upper left corner represents  $1^3 = 1$  square unit. The next largest square in the upper left corner is a  $3 \times 3$  square  $= 9$  square units, or  $1 + 8$  which represents  $1^3 + 2^3$ . The next largest square in the upper left corner is a  $6 \times 6$  square  $= 36$  square units, or  $1 + 8 + 27$  which represents  $1^3 + 2^3 + 3^3$ . And so on. The pattern continues. Therefore the area of the same large square can also be represented by the expression  $1^3 + 2^3 + 3^3 + \dots + 6^3$ .

$$\begin{array}{l} 1^3 + 2^3 + 3^3 + 4^3 + 5^3 + 6^3 \\ 441 \\ (1+2+3+4+5+6)^2 \\ 441 \end{array}$$

The picture “proves without words” that the sum of the first  $n$  positive integers cubed is the square of the sum of the first  $n$  positive integers!

# ***Math Fun Facts***

These are pretty big numbers, so express your answers in scientific notation. Which is largest? Which is smallest?

**A. # of Stars in the Universe**



**B. # of Seconds since the Big Bang**



**C. # of Orderings of a Deck of 52 Cards**



**D. # of Ways to Fill out an NCAA Bracket**



# *Answers*

A. # of Stars in the Universe  $10^{23}$

B. # of Seconds since the Big Bang  $10^{17}$  **smallest**

C. # of Orderings of a Deck of 2 Cards  $10^{68}$  **largest**

D. # of Ways to Fill out an NCAA Bracket  $10^{18}$

# **$\frac{3}{5}$ of a Bucket**



**If  $\frac{2}{9}$  gallon of water fills a bucket  $\frac{3}{5}$  full,  
how many gallons of water are needed to fill  
the bucket?**

**And, how many buckets of water are needed  
to make a gallon?**

# Answer

Set up the proportion  $\frac{\frac{2}{9} g}{\frac{3}{5} b} = \frac{x g}{1 b}$

and cross multiply. You get  $\frac{3}{5} x = \frac{2}{9} \rightarrow x =$   
**10/27 or about 0.37 gal.**

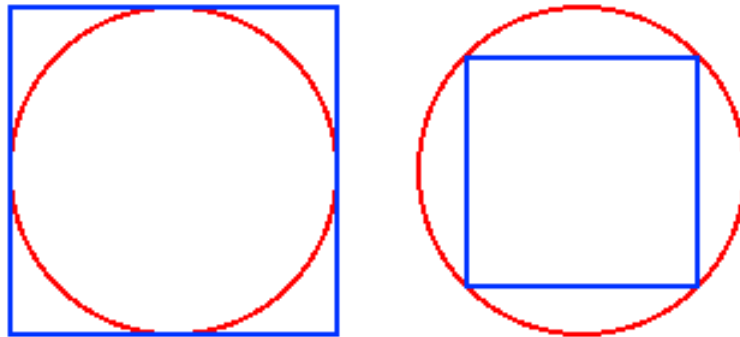
Set up another proportion  $\frac{\frac{2}{9} g}{\frac{3}{5} b} = \frac{1 g}{x b}$

and cross multiply. You get  $\frac{2}{9} x = \frac{3}{5} \rightarrow x =$   
**2.7 buckets.**

# *Mathematical Misfit*

**Which fits best: a square peg in a round hole, or a round peg in a square hole?**

**To be more precise, if you take a circle and fit it just inside a square, or take a square and fit it just inside a circle, which fills up proportionally the most space?**



**Answer: Round peg in a square hole.** Take a Square whose side = 1 unit, and a circle which just fits inside. Area of Circle/Area of Square =  $\pi(1/2)^2 / 1 = \pi/4$ .

Take a Circle whose diameter = 1 unit, and a square which just fits inside. Area of Square/Area of Circle =  $(1/\sqrt{2})^2 / (\pi(1/2)^2) = 2/\pi$ .

Since  $\pi/4 = 0.785 > 2/\pi = 0.637$ , the round peg fills up proportionally more space and therefore fits better in the square hole than the square peg fits in the round hole!

# Cats in a Bag



**Seven girls are on a bus. Each girl has 7 bags. Each bag has 7 cats. Each cat has 7 kittens. How many legs are on the bus?**



# *Answer*

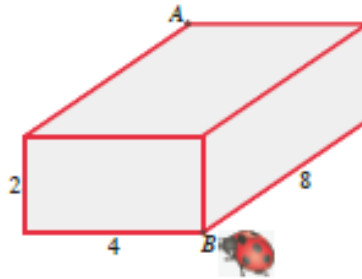
**10,990.** 7 girls  $\times$  7 bags each = 49 bags total.

49 bags  $\times$  7 cats each = 343 cats total.

343 cats  $\times$  7 kittens each = 2401 kittens total.

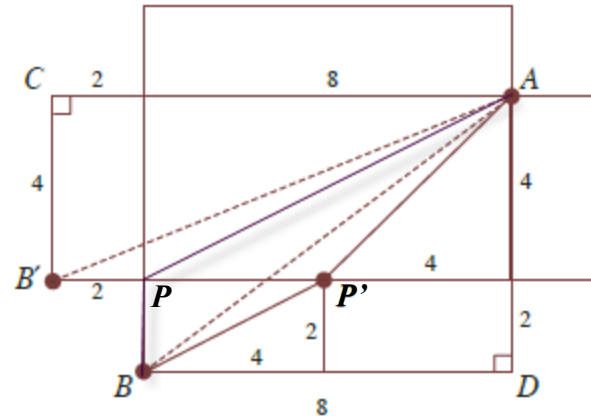
(7 girls  $\times$  2 legs) + (343 cats  $\times$  4 legs) + (2401 kittens  $\times$  4 legs) = 14 girl legs + 1372 cat legs + 9604 kitten legs = 10,990 legs total.

# ***Bugged***



**A ladybug sits at the corner of a wooden block with dimensions  $2 \times 4 \times 8$ , as shown. She wishes to travel from point B to point A. Determine the shortest distance for the ladybug to walk there.**

*Answer*

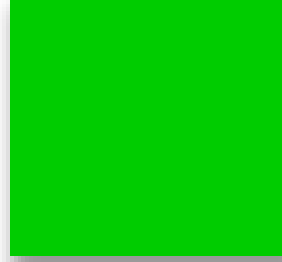


**10.** Many paths are possible. Walk along the edges and travel  $8 + 2 + 4 = 14$  units. Or perhaps walk from B up to the corner P then across the top diagonally to A. Or walk horizontally from B to the midpoint then straight up to P' and diagonally across to A. But if you “unfold” the sides of the box upward so all the sides lie on the same plane as the top, other shorter routes become clear, as shown in the dotted lines. Notice the corner B appears twice, labeled as B and B' in the diagram above. Using the Pythagorean Theorem, the route from B' to A is:

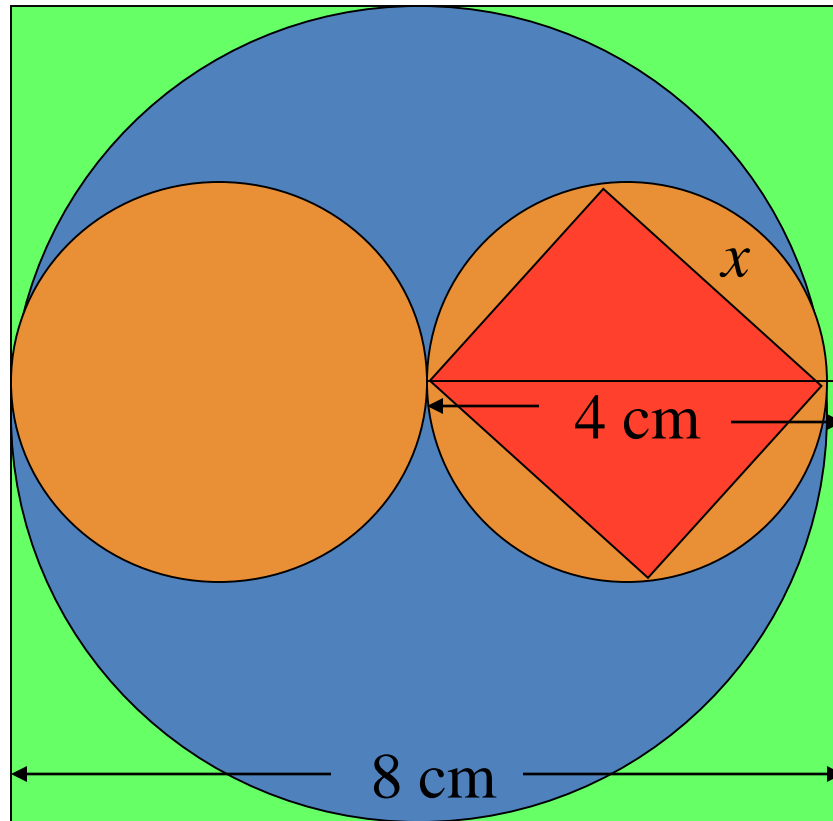
$$(B'A)^2 = (B'C)^2 + CA^2 = 4^2 + 10^2 = 116 \text{ and } B'A = \sqrt{116} \doteq 10.77$$

But the shortest turns out to be the path from B to A. That route is:

$$BA^2 = BD^2 + DA^2 = 8^2 + 6^2 = 100 \text{ and } BA = 10$$



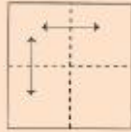
**A green square is 8 cm on a side.  
Determine the area of a red square if a  
blue circle fits exactly into the green  
square and the red square just fits inside  
an orange circle, two of which just fit into  
the blue circle.**



*Answer:* **8 sq cm**. Let  $x$  = side of red square. So area of red square is  $x^2$ . But  $x^2 + x^2 = 4^2$  by the Pythagorean Theorem. So  $2x^2 = 16$  and  $x^2 = 8$ .

### Five-Sided Box Folding Instructions

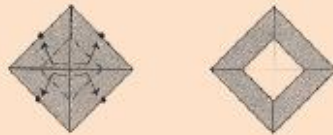
1. Fold the square in half vertically and unfold, and then fold it horizontally and unfold.



2. Fold each corner of the square in to meet the center.



3. Fold each of the original corners under so that they touch the midpoints of their respective sides.



4. Turn the paper over to the back side. Fold the left and right edges in so that they meet in the center of the paper.



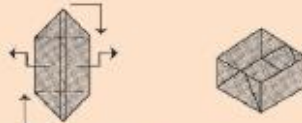
5. a. Fold just the left flap over to meet the right edge.  
b. Fold the small triangles on the top and bottom of the left side in to the midline.  
c. Fold the flap back over along the midline to meet the left edge.



6. Repeat step 5 using the right flap so that the paper looks like the shape below.

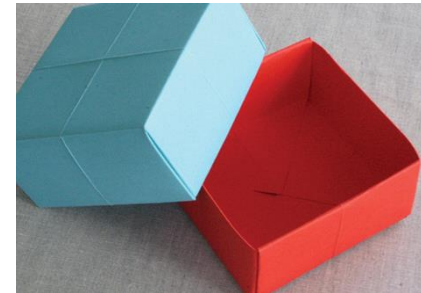


7. Crease where indicated by the dashed lines and pull the sides out while pushing the top and bottom in to finish the box.



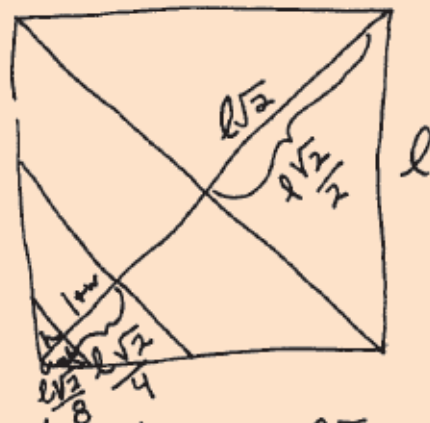
Adapted from AIMS Education Foundation 2000

# Make a Box



**Follow the directions at the left. If the square piece of paper has side length  $L$ , then what is the Volume of the box?**

# Answer



$$\text{diagonal across} = l\sqrt{2}$$

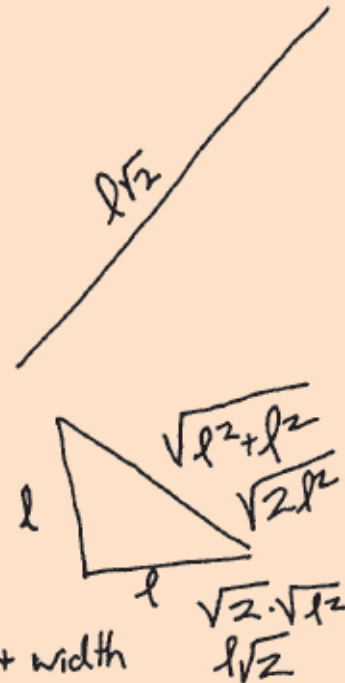
$$\frac{1}{2} \text{ diagonal} = \frac{l\sqrt{2}}{2}$$

$$\frac{1}{4} \text{ diagonal} = \frac{l\sqrt{2}}{4} = \text{length} + \text{width}$$

$$\frac{1}{8} \text{ diagonal} = \frac{l\sqrt{2}}{8} = \text{height}$$

$$V = l \cdot h \cdot w$$

$$V = \frac{l\sqrt{2}}{4} \cdot \frac{l\sqrt{2}}{4} \cdot \frac{l\sqrt{2}}{8} = \frac{2l^3\sqrt{2}}{128} = \frac{l^3\sqrt{2}}{64}$$



# ***Best Buy***

A Florida newspaper published an article in which consumers were asked the following question. What do you think is the answer? Explain.

**SunSentinel**

Bad math skills cause customers to miss  
bargains, study finds

By Melissa Caceres

Which is better? To get 1/3 Off the  
price of an item? Or 1/3 More for  
the same price?



## *Answer*

**1/3 off.** If an amount  $a$  of a product cost  $x$  dollars, the price per unit is  $x/a$  dollars. 1/3 off means the new price per unit is  $(2/3)(x/a)$  or **2/3** of the old price... 1/3 more would be  $x$  over  $4/3a$ . That simplifies to  $3x$  over  $4a$  or  $(3/4)(x/a)$ . So this new price per unit is **3/4** of the old price. Since  $2/3 < 3/4$  then 1/3 off is the better buy.

Or, make up an example say, a six-pack of beer for \$12. 1/3 off would be 6 bottles for \$8 or  $\$8/6 = \$4/3 = \$1.33$  per bottle. 1/3 more would be 8 bottles for \$12 or  $\$12/8 = \$3/2 = \$1.50$  per bottle. Clearly, 1/3 off is the better buy!

# Concrete Sidewalk



**The concrete for a sidewalk is being poured outside the perimeter of a new subdivision, which is a 280 ft.  $\times$  by 720 ft. rectangle. Building code requires the sidewalk to be 5 feet wide and 8 inches deep. If the price per cubic yard is \$74.50 and an extra 5% of concrete is being ordered, how much will the concrete cost to the nearest dollar?**

# *Answer*

**Sidewalk area is  $(290 \times 730) - (280 \times 720) = 10,100$  square feet  $\times$  8 inches ( $2/3$  of a foot) deep gives a volume of 6,733 cubic feet. One cubic yard = 27 cubic feet, so divide by 27 and the volume is about 249.38 cubic yards. Finally,  $249.38 \times 1.05 \times \$74.50$  gives a total cost of the concrete at about **\$19,508.****

## Sources for Non-Routine Problems That Stimulate Discussion

### Books

Math Contests Grades 4-6, by Conrad & Flegler, Math League Press  
Math Contests Grades 7-8 and Algebra, by Conrad & Flegler, Math League Press  
Math Contests High School, by Conrad & Flegler, Math League Press  
Principles to Actions: Ensuring Mathematical Success for All, NCTM  
The Scientific American Book of Mathematical Puzzles and Diversions, by Martin Gardner,  
Empowering Students by Promoting Active Learning in Mathematics, NCTM  
What Students Abroad Are Expected To Know About Mathematics: Exams from France, Germany and Japan  
Challenging Math Problems, by Terry Stickels (or any of his other books)

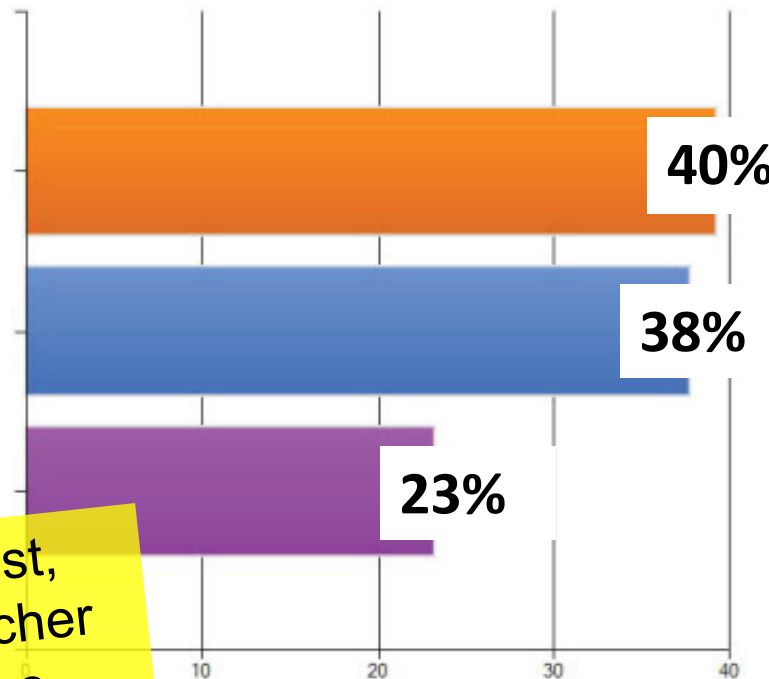
### Websites

[http://mathforum.org/problems\\_puzzles\\_landing.html](http://mathforum.org/problems_puzzles_landing.html)  
<http://cemc.uwaterloo.ca/resources/potw.php>  
<http://www.mathleague.com>  
<https://www.mathcounts.org/resources/problem-of-the-week>  
<https://www.math.purdue.edu/pow>  
<http://orion.math.iastate.edu/ehjohnst/PoW/PoW.html>  
<http://www.numberphile.com>      <http://www.openmiddle.com>  
<http://www.sixtysymbols.com>      <http://www.estimation180.com>  
<http://mathmistakes.org>      <https://twitter.com/ExploreMTBoS> (Math Twitter Blogosphere)  
<http://www.sciencealert.com>      <https://twitter.com/MathVault>  
<http://www.iflscience.com>      <http://wodb.ca> (Which One Doesn't Belong)  
<http://www.ted.com>      <http://www.visualpatterns.org>  
<http://www.smartereveryday.com>      <http://mathquest.carroll.edu/>  
[https://www.youtube.com/channel/UC1\\_uAIS3r8Vu6JjXWvastJg](https://www.youtube.com/channel/UC1_uAIS3r8Vu6JjXWvastJg) (Mathologer)

### Journals

Journal for Research in Mathematics Education, NCTM  
Mathematics Teacher, Monthly Calendar Problems, NCTM  
Mathematics Teaching in the Middle School, Monthly Palette of Problems, NCTM

1,000 HS and college students were asked,  
“What percentage would you assign to the  
importance of each of the following”:



**FACILITATING** ~ Primarily  
student-led work

**COACHING** ~ You help  
students perform, give  
feedback and advice

**DIRECT TEACHING** ~  
Instruction on  
knowledge and skills

Might we suggest,  
then, that a teacher  
should lecture no  
more than 25% of  
the time?

-- “The More I Lecture, The Less I Know What they Understand,”  
Grant Wiggins, *Authentic Education*, NJ, 2014

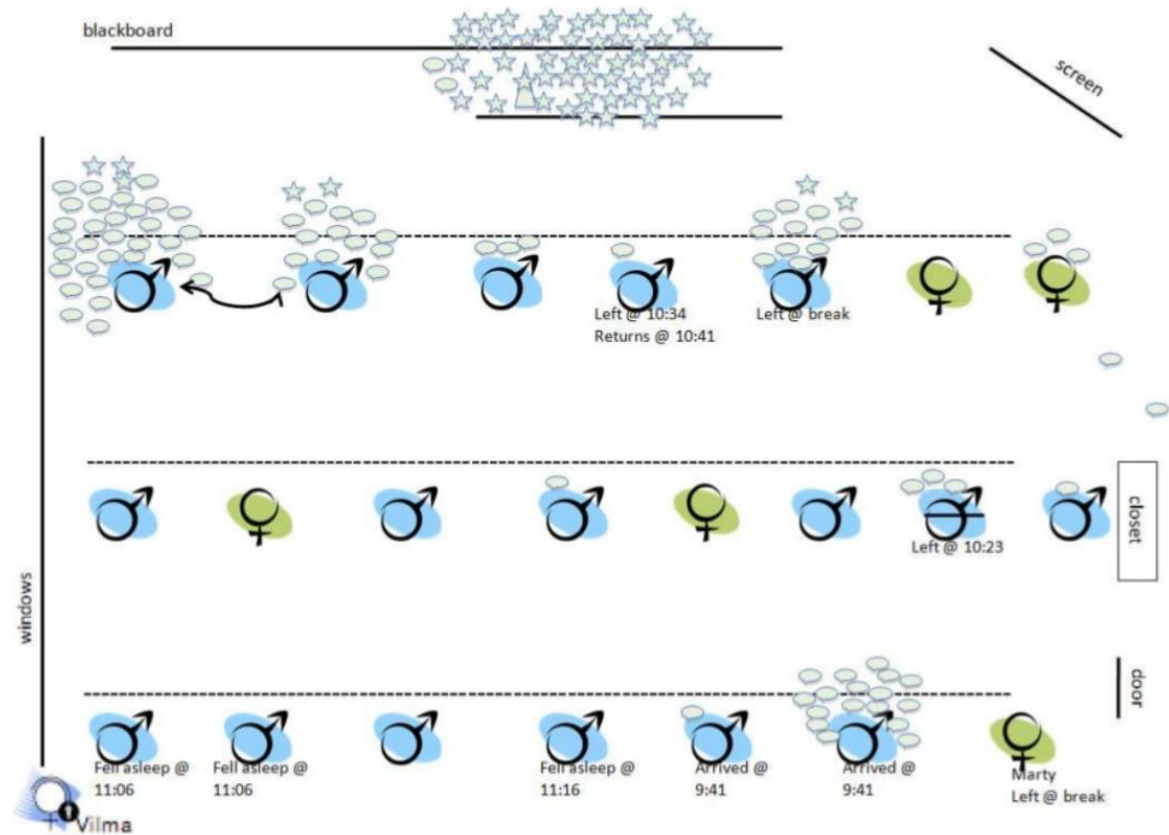
**“Students like to be spoon fed. It’s easier for them. But they need to learn to feed themselves. That means putting a plate of food in front of them and giving them a spoon. Those of us who have kids know what happens next and it isn’t pretty. But is there a better way to learn how to eat?”**



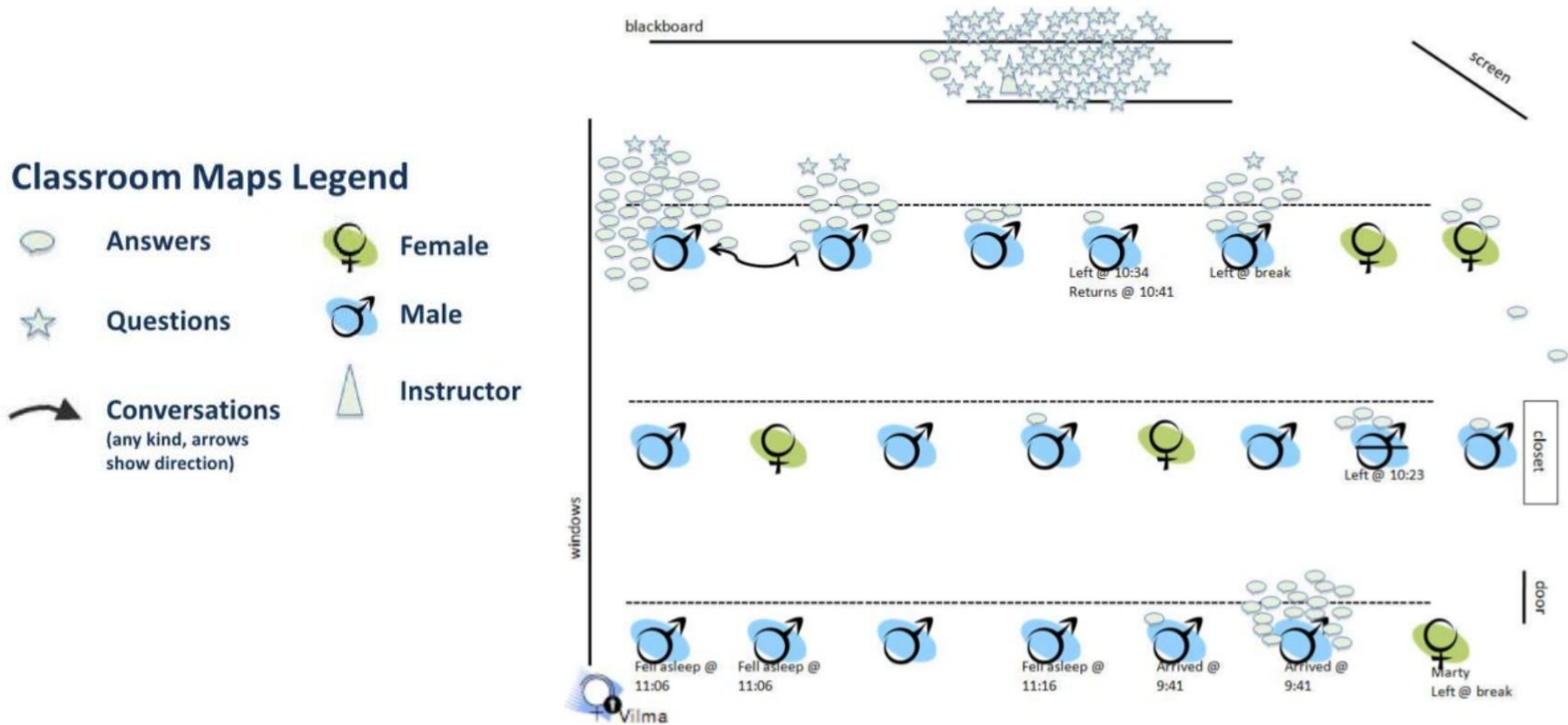
-- Maryellen Weimer, PhD  
Professor Emeritus of Teaching and Learning  
Penn State University

# Math Classroom Mapping Research

## Classroom Maps Legend



# Math Classroom Mapping Research



**This classroom is highly engaging and interactive (for about 3 students)!**

-- Vilma Mesa, University of Michigan



# Even the Furniture Makes a Difference!



Go to  
<http://www.youtube.com/watch?v=0sf1g303nTY> for more info

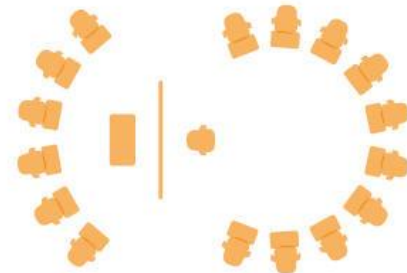
## LECTURE



## SMALL GROUP PROJECT



## LARGE GROUP DISCUSSION AND INTERACTIVE LECTURE



# Questions



- How much class time will I lose?
- How do I cover all the content?
- How do I quit being the “sage on stage”?
- How do I keep them from taking shortcuts?
- How do I teach them the “easy way” or the “right way” to get an answer?
- How do I make sure they don’t Facebook, text or e-mail during class time?
- How can students possibly learn everything on their own that I normally cover in my lectures????

# The Answers



- **YOU are still the Professor**
- **YOU provide a course outline, syllabus, schedule, learning resources, supplemental material, student support, tutorial resources, academic rigor and standards of behavior**
- **YOU must highlight, summarize, motivate**
- **YOU create a safe, non-threatening classroom environment**
- **YOU make sure students participate and are involved in their work**

# The Results

- **YOU will discover the joy of doing what is uniquely human and more interactive, rather than simply delivering lectures.**
- **YOU will have more time to interact personally with students, to mentor, advise, review individual work, and answer questions**
- **YOU will learn more than ever about your subject matter and the way students learn!**



Tim Gunn, Fashion Consultant, *Project Runway*

# Good Teachers = Good Coaches

Communicating

Questioning

Challenging

Accountability

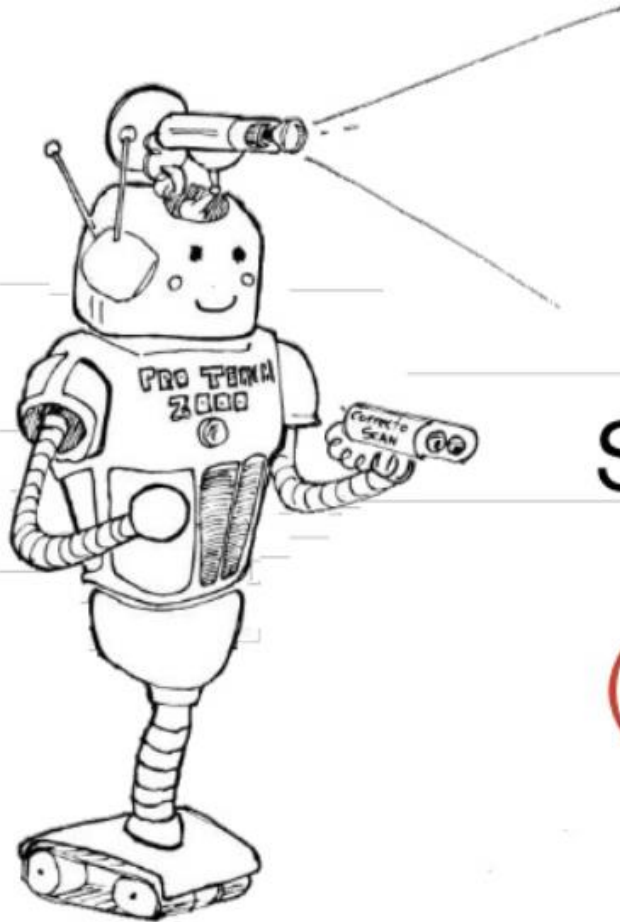
Encouraging

Showing new perspectives

Monitoring



-- Maria Andersen, [busynessgirl.com](http://busynessgirl.com)



Stop wasting time doing  
things that a computer  
(or robot) can do better.

-- Maria Andersen, [busynessgirl.com](http://busynessgirl.com)  
Illustrations by Mat Moore



**“The best thing to learn first  
is how to learn.”**

**“Studies show active learning increases student performance and decreases failure rates... Teachers need to build social interaction into their classes.”**



Samuel Gedeberg, student in math education at Utah State University, NCTM Focus Issue “Teaching Mathematics Online,” November, 2016





***Presenters...***

# ACTIVE LEARNING AND ENGAGEMENT — USING FACEBOOK IN THE CLASSROOM



Eddie Tchertchian (Los Angeles Pierce College)

&

Fred Feldon (Coastline Community College)



# A GREAT ICE BREAKER...



# A GREAT ICE BREAKER...



**Edouard Tchertchian**

August 20, 2013

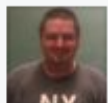


Welcome to my Calculus I course! I'm looking forward to working with you this semester! This is the facebook group page for section number 0503 which meets daily from 9:35 to 10:45 am. Feel free to use this group to get to know one another, to ask each other (and myself!) for help when needed, share notes, and just about everything else related to our class!

[Like](#) · [Comment](#)

 3 people like this.

 Seen by everyone



Write a comment...



# A GREAT ICE BREAKER...



**Edouard Tchertchian** uploaded a file.

August 25, 2013

The moodle page for our class is now available. There you will find the course syllabus, which I'm also posting here...



**math261\_syllabus\_fall2013.pdf**

Portable Document Format

Download

Preview

Upload Revision

Like · Comment



3 people like this.

✓ Seen by everyone



Write a comment...



# A GREAT ICE BREAKER...



**Edouard Tchertchian** uploaded a file.

October 14, 2013



The AMATYC competition at Pierce takes place Friday, October 25. I will give you more details in class!



**AMATYC Fall 2013.pdf**

Portable Document Format

Download

Preview

Upload Revision

Like · Comment

 2 people like this.

✓ Seen by 27



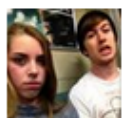
Write a comment...



# A VIRTUAL TUTORING ROOM...



# A VIRTUAL TUTORING ROOM...



**Dashiell Hamingson**

October 15, 2013

On section 4.1 for problem 17 b why is there no local minima

[Like](#) · [Comment](#)

✓ Seen by 27




**Matt Dylan Morales** Since  $f$  is increasing for all of  $x$ ,  $f'$  stays positive. By the first derivative test, there is no local maxima or minima.

October 15, 2013 at 7:37pm · [Like](#)



**Dashiell Hamingson** thank you

October 15, 2013 at 8:03pm · [Like](#) ·  1



Write a comment...





# A VIRTUAL TUTORING ROOM...



**Douglas Valle**

October 9, 2013

#15 3.8

$$\sinh(0) = \frac{e^0 - e^{-0}}{2} = \frac{e - e^{-e}}{2} = \frac{1-1}{2} = \frac{0}{2} = 0$$
$$\textcircled{15} \quad \cosh(\ln t) = \frac{e^{\ln t} + e^{-\ln t}}{2} = \left( \frac{t + \frac{1}{t}}{2} \right) t = \frac{t^2 + 1}{2t}$$

Unlike · Comment

👍 You and 2 others like this.

✓ Seen by 27



**Douglas Valle** Multiply by t/t not t

October 9, 2013 at 12:14pm · Like



**Kevin Sanchez** wow haha I should've known how to do that thanks though

October 9, 2013 at 12:47pm · Like · 👍 1



# A VIRTUAL TUTORING ROOM...



 You and 2 others like this.

✓ Seen by 27



**Douglas Valle** Multiply by  $t/t$  not  $t$

October 9, 2013 at 12:14pm · Like



**Kevin Sanchez** wow haha I should've known how to do that thanks though

October 9, 2013 at 12:47pm · Like ·  1



**Christian Andrés** Why do you multiply everything by  $t$ ?

October 9, 2013 at 8:22pm · Like



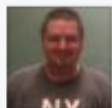
**Armine Khachatryan** Christian A. Santos I think it's to get rid of the fraction in the numerator.

October 9, 2013 at 9:02pm · Like



**Christian Andrés** Oh ok thanks 😊 Armine Khachatryan

October 9, 2013 at 11:10pm · Like



**Edouard Tchertchian** Great job!

October 11, 2013 at 3:34pm · Like



# A VIRTUAL TUTORING ROOM...



**Janet Reyes**

October 15, 2013

Did anyone do 23 on 3.10? Help! Lol I'm kinda lost

Like · Comment

✓ Seen by 27

View 2 more comments



🔒 **Karina Lyubenkova** 😞 I don't understand the last few problems of 3.10 at all

October 21, 2013 at 8:26am · Like



**Edouard Tchertchian**

Since  $f''(t) \leq 7$  for  $0 \leq t \leq 2$ , if we apply the Racetrack Principle with  $a = 0$  to the functions  $f'(t) - f'(0)$  and  $7t$ , both of which go through the origin, we get

$$f'(t) - f'(0) \leq 7t \quad \text{for } 0 \leq t \leq 2.$$

The left side of this inequality is the derivative of  $f(t) - f'(0)t$ , so if we apply the Racetrack Principle with  $a = 0$  again, this time to the functions  $f(t) - f'(0)t$  and  $(7/2)t^2 + 3$ , both of which have the value 3 at  $t = 0$ , we get

$$f(t) - f'(0)t \leq \frac{7}{2}t^2 + 3 \quad \text{for } 0 \leq t \leq 2.$$

That is,

$$f(t) \leq 3 + 4t + \frac{7}{2}t^2 \quad \text{for } 0 \leq t \leq 2.$$

In the same way, we can show that the lower bound on the acceleration,  $5 \leq f''(t)$  leads to:

$$f(t) \geq 3 + 4t + \frac{5}{2}t^2 \quad \text{for } 0 \leq t \leq 2.$$

If we substitute  $t = 2$  into these two inequalities, we get bounds on the position at time 2:

$$21 \leq f(2) \leq 25.$$

October 22, 2013 at 4:03pm · Like · 👍 1



🔒 **Karina Lyubenkova** Thank you!

October 22, 2013 at 4:19pm · Like



# A VIRTUAL TUTORING ROOM...

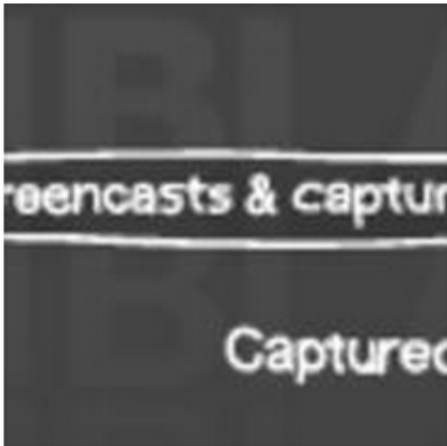


**Edouard Tchertchian**

March 25

8.5 #3

<http://screencast.com/t/nTDJAjpvA82l>



8.5\_3 - tchertea's library

SCREENCAST.COM

Like · Comment · Share

✓ Seen by 25



**Edouard Tchertchian** A very LOUD solution...

March 25 at 9:26pm · Like



# A SHOW AND TELL...



# A SHOW AND TELL...



**Edouard Tchertchian**

August 28, 2013

More review on 1.3 - Inverse of a Function

<http://www.youtube.com/watch?v=gXIRspXL6oc>



## Inverse of a function

Inverse of a function, step by step example. Learn how to find the inverse of a function, and more at <http://MathMeeting.com>

YOUTUBE.COM

Like · Comment · Share

👍 2 people like this.

✓ Seen by everyone



Write a comment...





# A SHOW AND TELL...



**Edouard Tchertchian**

May 20

Generate slope fields online for free - <http://www.mathscoop.com/.../differ.../slope-field-generator.php>



Slope Field Generator and Applet. Create images of custom slope fields

Create and download images of custom slope fields. Just type the equation and hit download. Works on ipad!

MATHSCOOP.COM

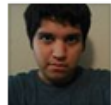
Like · Comment · Share

 Goudarz Faramarzyan likes this.

 Seen by 25



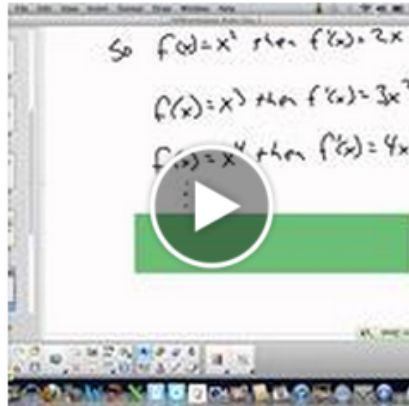
# A SHOW AND TELL...



**Michael Omar Vargas**

September 25, 2013

If anyone is still having trouble with the rules, I found this video that breaks it down for you: <http://www.youtube.com/watch?v=F60C-DTgIXA>



## 16 - Constant Rule, Power Rule, Constant Multiple Rule, Sum and Difference Rules

Chapter 2.2: Basic Differentiation Rules and Rates of Change Follow <http://bit.ly/19vbFbl> for description...

YOUTUBE.COM

Unlike · Comment · Share



You and 4 others like this.

✓ Seen by 27



**Edouard Tchertchian** Great!

September 26, 2013 at 12:09pm · Like



**Janet Reyes** Cool. Thnx.

September 26, 2013 at 6:08pm · Like





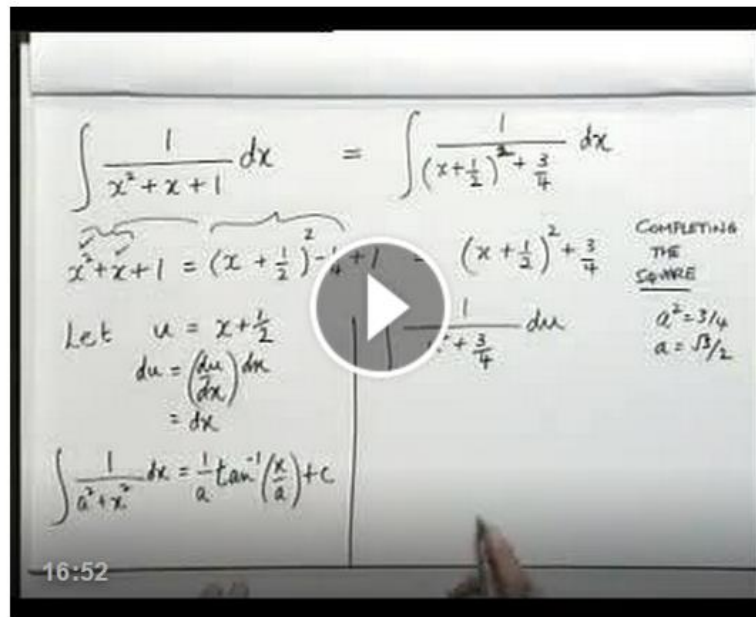
# A SHOW AND TELL...



**Daniel Cervantes**

November 20, 2013

Found a neat video with some examples for integrating algebraic fractions.



Like · Comment

👍 2 people like this.

✓ Seen by 27



Write a comment...



# A SHOW AND TELL...



**Beck Shafiei**

July 23

for people who don't have a calculator yet could use this website for the application hw... helps a lot lol



**Desmos Graphing Calculator**

A beautiful, free, online graphing calculator from  
desmos.com

DESMOS.COM

Like · Comment · Share

👍 3 people like this.

✓ Seen by 25



**Trip Kilgore** Beck ur a lifesaver lol...2.2 SP #7 was killing me trying to trace the input values  $1.4x+13$  and  $-.92x+1.35$  in my calculator

July 23 at 11:58pm · Like · 👍 1



**A HANGOUT PLACE...**



# A HANGOUT PLACE...



**Sam Altschuler**

August 8

Hey everybody, when/where is this study group being held?

[Like](#) · [Comment](#)

[Nhoj Onartsipac](#) likes this.

✓ Seen by 24



**Nhoj Onartsipac** Study group was for last Friday. I don't think there's any today. Wanna go study together this afternoon/evening?

August 8 at 12:11pm · [Like](#)



**Edouard Tchertchian** Always a great idea to help each other out with study groups - remember [Yiran Tong](#) will be at the CAS on Monday to help out, so form a study group and do group tutoring with him on Monday!!!

August 10 at 10:40pm · [Edited](#) · [Like](#)



**Nhoj Onartsipac** 🍏eating Knowledge

August 1

To the people who think they can help or be helped:

Dino had set a study group session for 9AM onwards. Group will meet at the blue benches/table area right beside the new library. You are encouraged to join.

We will see you there!

[Like](#) · [Comment](#)

[Jad Saad](#) likes this.

✓ Seen by 25

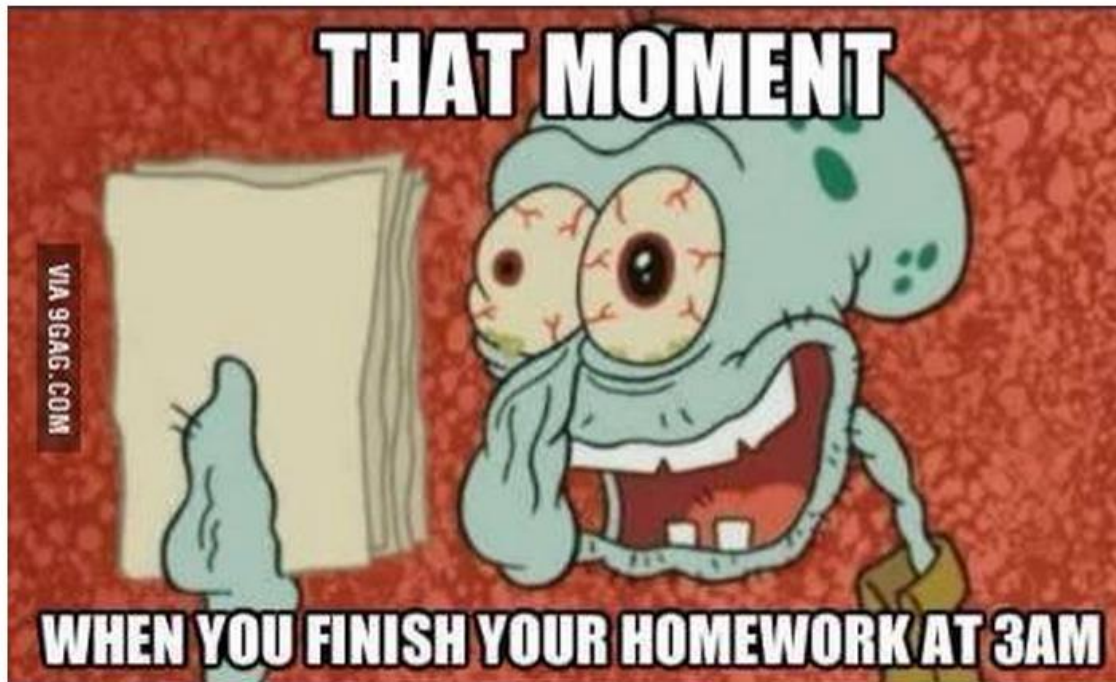


# A HANGOUT PLACE...



David Martin

May 7



DailyFailCenter.COM

Unlike · Comment

👍 You and 4 others like this.

✓ Seen by everyone





# A HANGOUT PLACE...



David Martin

March 28

hahaha 😊 we were all guilty one time or another.....

**EVERY TIME YOU DO THIS:**



$$f(x) = \frac{\cancel{x^2} + 2x + 1}{\cancel{x^2} + 3} = \frac{2x+1}{3}$$

**A KITTEN DIES.**

Unlike · Comment

👍 You and Victor Ramirez like this.

✓ Seen by everyone



Edouard Tchertchian YES!! THIS IS TRUE! Which is why you should never do this! 😊

March 31 at 8:57pm · Like · 👍 1



# A HANGOUT PLACE...



**Edouard Tchertchian** asked a question.

March 17

If this class had been offered at 7:25 am instead of 8 am, would that have affected your decision to take the class? Why? Would you prefer 7:25 am over 8 am, or not?



7.25 is too early! I think 8am is early :P

+15



It wouldn't make a difference. 30 minutes is not that significant

+4

Add an option...

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**Michael Bovshow** I would. I believe the demand for classes is probably strong enough to require students to take what they can get, even if the time isn't preferable. However, this is probably more viable for a class that isn't four days a week.

March 17 at 6:51pm · Unlike · 2



**Dustin Joseph Azure** 8 AM is fine.

March 17 at 6:59pm · Unlike · 1



**Edouard Tchertchian** Thanks for the response all!

March 18 at 8:24pm · Like



# A HANGOUT PLACE...



**Terence Malloy II**

August 31



I got an A as my final grade from this class! Thank you for your teaching, Professor [Edouard Tchertchian](#), even as it was going by very quickly!

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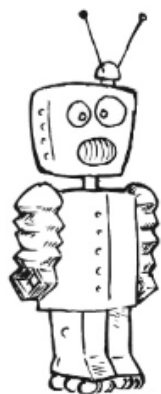




# *Thank You*



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