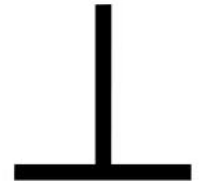




$|x|$

$\sqrt{x}$



**When Am I Ever Gonna Use This  
in My Real Life Anyway?!?**



$\pi$

$\leq$



# Two Goals

1. Unpack the “Million Dollar Question”



2. Have Some Fun Along The Way

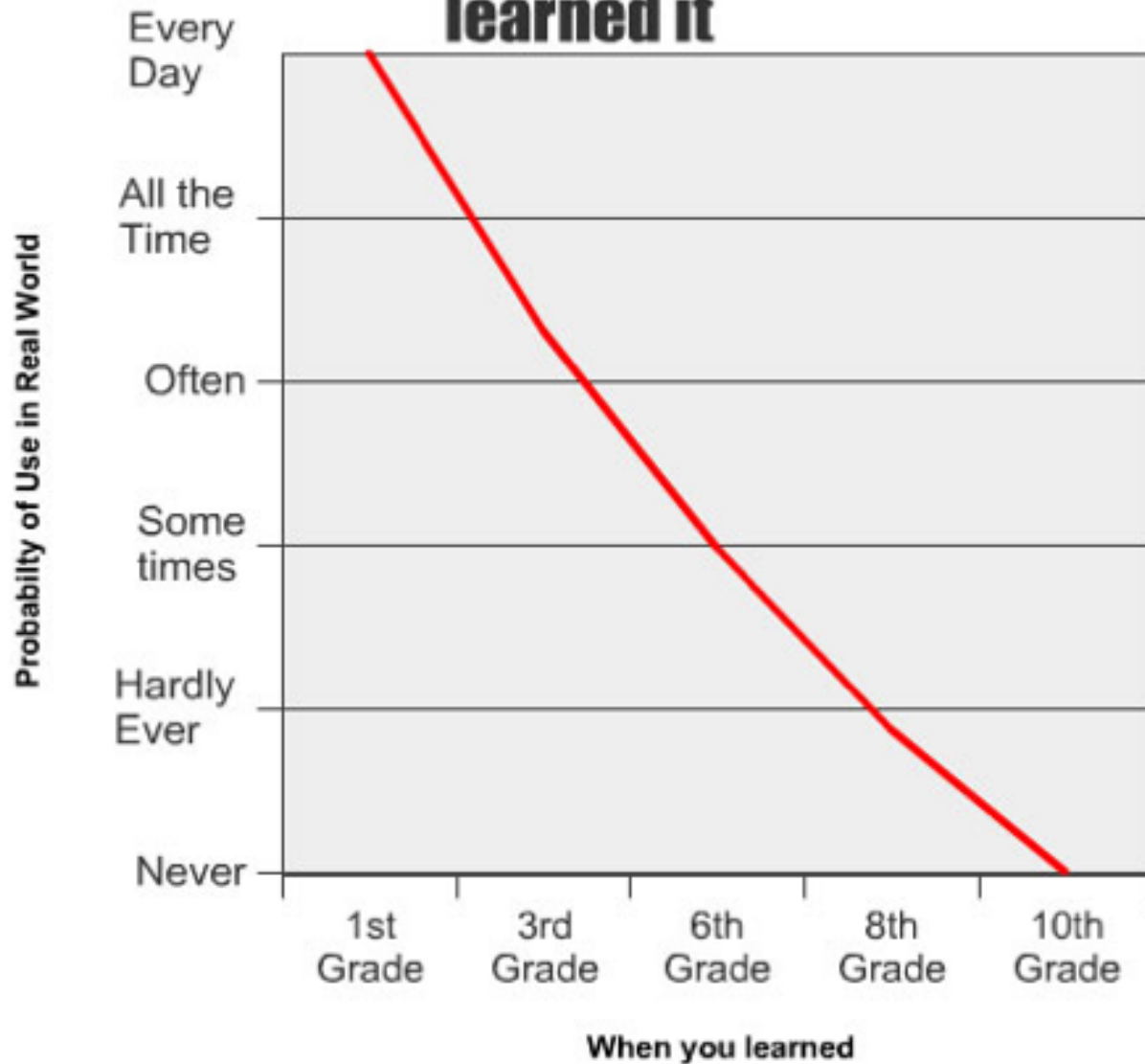


# Turn & Talk

- Name
- School/Position
- When was the last time you got asked the “million dollar question”?

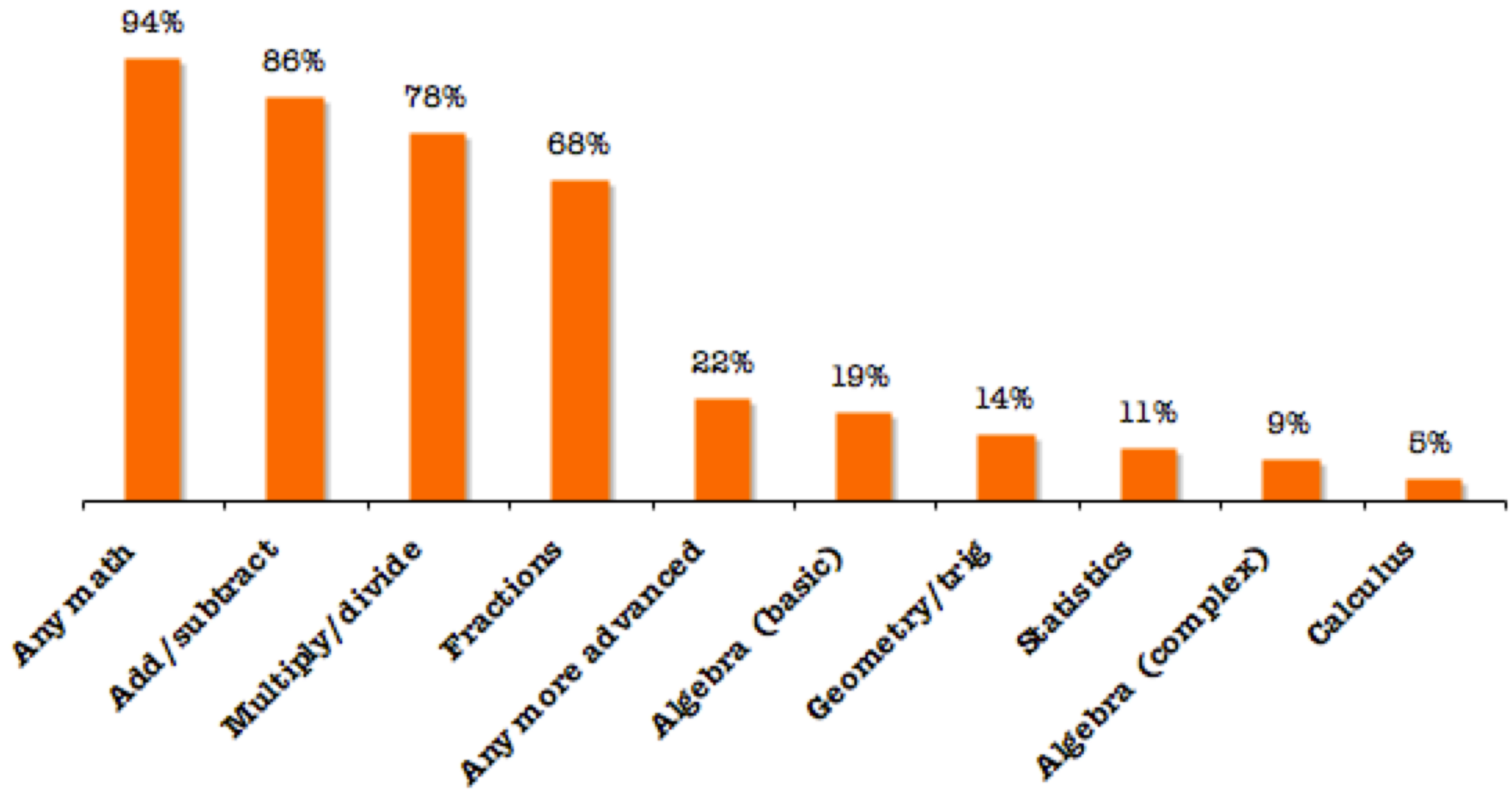


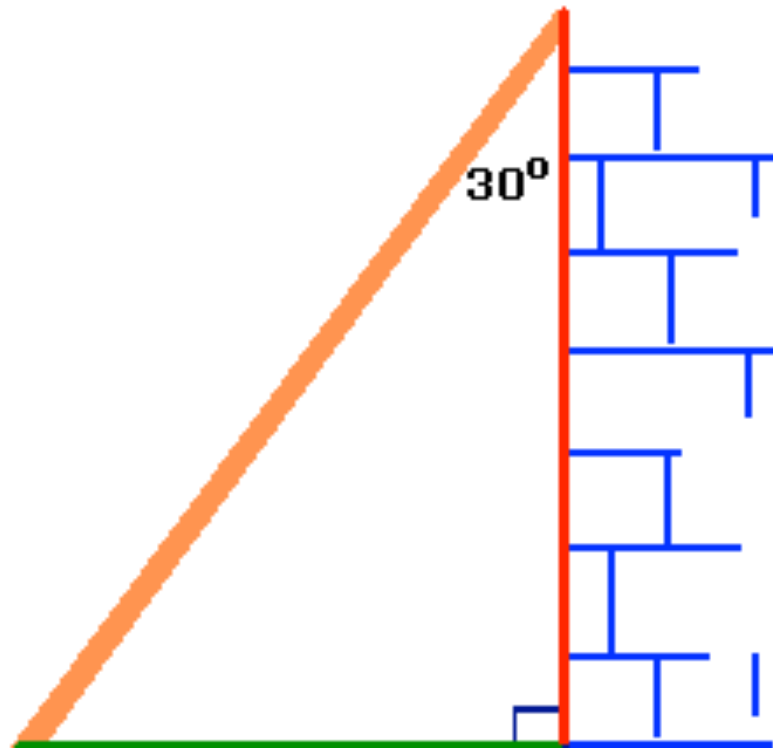
# Use of Math in the Real World vs. when you learned it



# What Percentage of Americans Actually Use Math at Work?

Data: Michael Handel, "What Do People Do at Work? A Profile of U.S. Jobs from the Survey of Workplace Skills, Technology, and Management Practices (STAMP)"





A ladder leans against a wall at a  $30^\circ$  angle. If the ladder is 15 feet long, how far is the base of the ladder from the wall?

WHY LEARN  
MATH AT ALL?

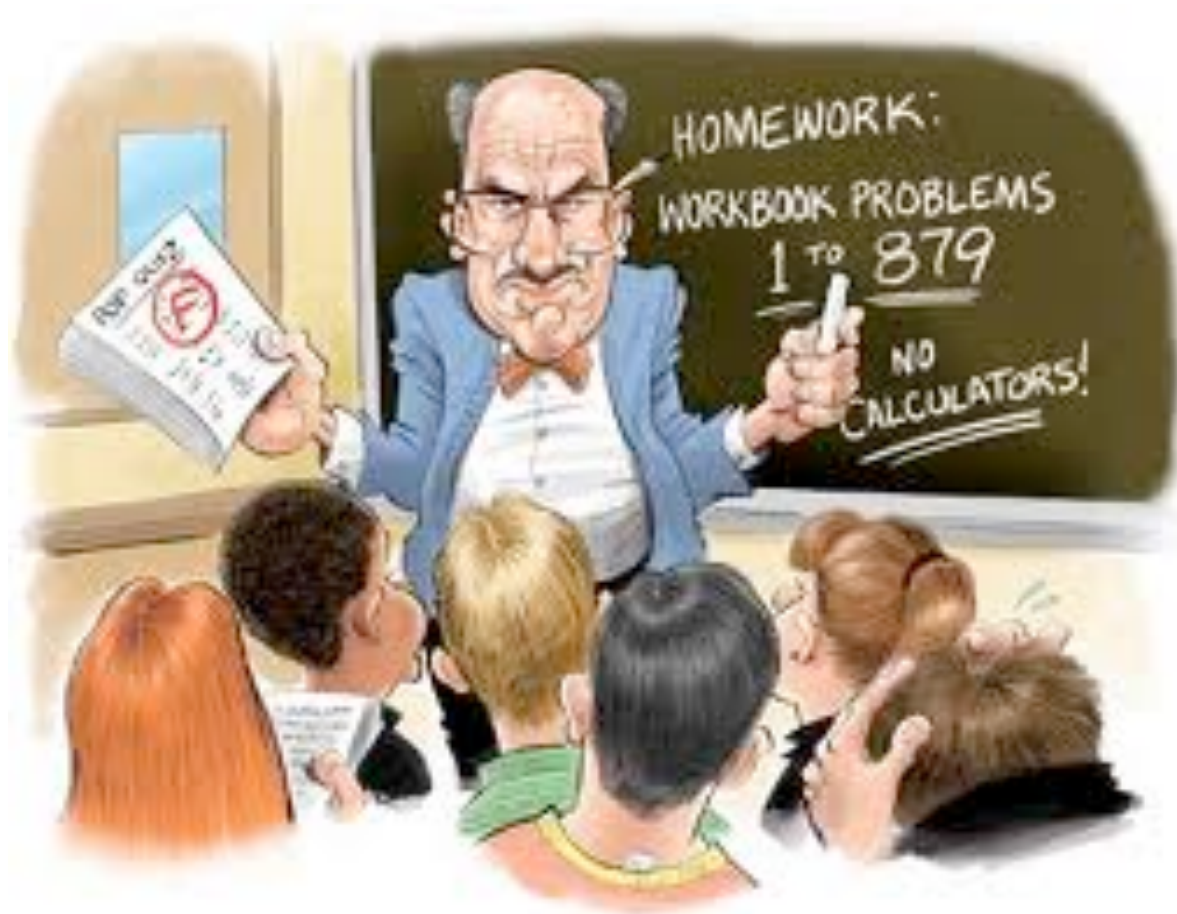


# Math Ambassadors

*am·bas·sa·dor/am'basədər* (noun)

- 1) An accredited diplomat sent by a country as its official representative to a foreign country.
- 2) A person who acts as a representative or promoter of a specified activity.

# Math Ambassadors



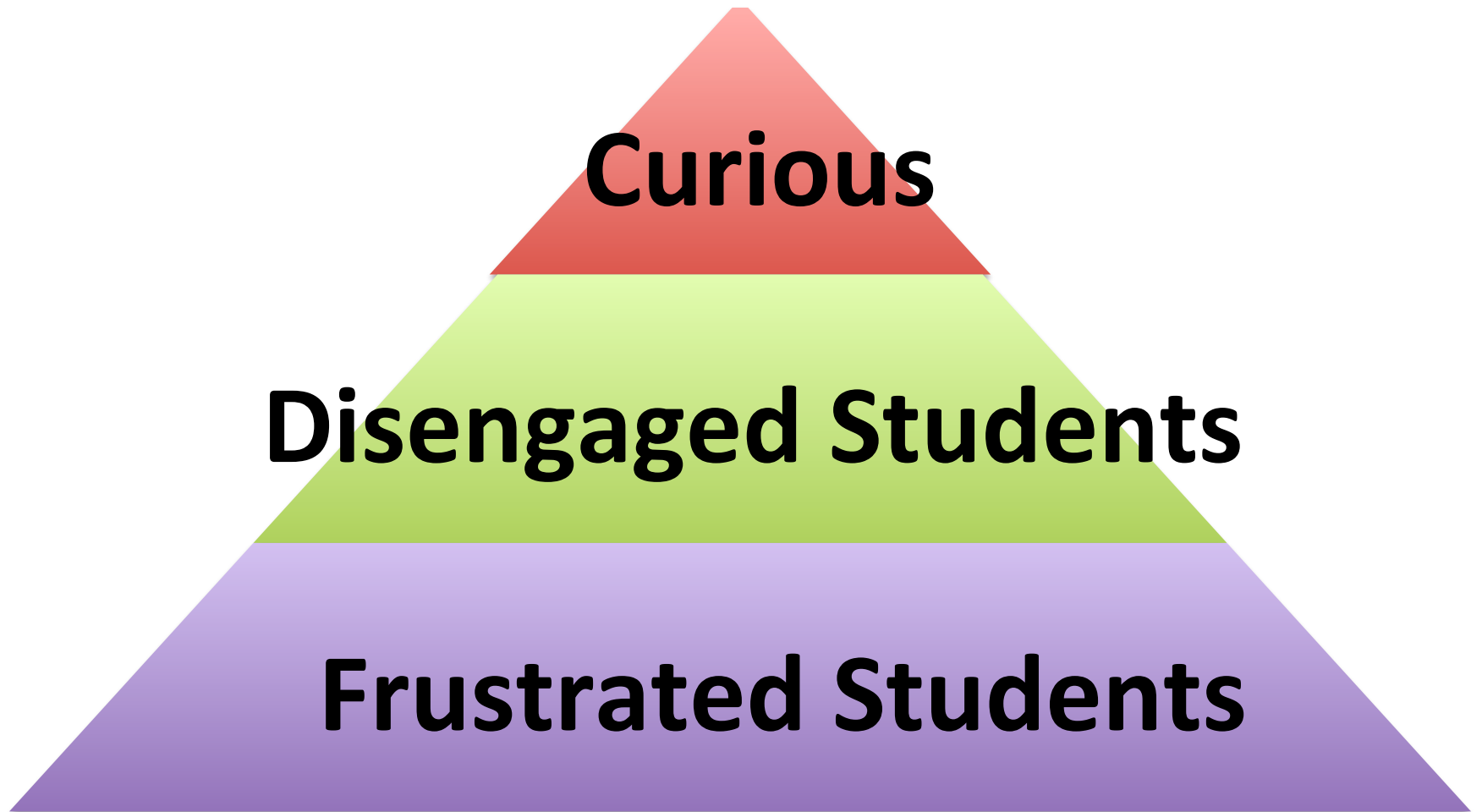
# Math Ambassadors

**“The teachers of mathematics are primarily the ones who should be able to ‘sell’ mathematics to the ‘doubting public’.”**

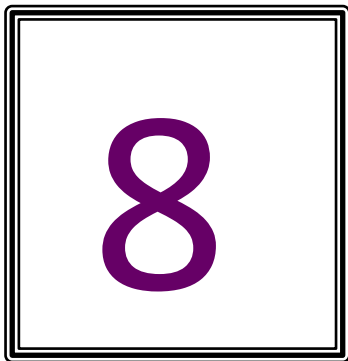
# Three Ways of “Selling Mathematics”



# Who Asks the Question?

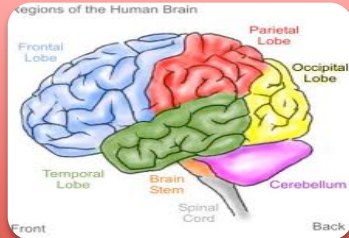


# #1: Weightlifting



28 in

# Three Ways of “Selling Mathematics”



## Brain Power



# What Kind of "Brain Power"?



	Anahi	Bryant	Jadyn	Lauren	Nikolas	american	colby-jack	feta	monterrey jack	provollone
1937	X									
1946	X									
1961	X			X						
1971	X	●	X	X	X					
1975	X									
champagne										
merlot										
pinot noir										
port										
zinfandel										



## #2: Math Dividends

Given:  $AB = CD = IH$ ,  $m\angle EFG = m\angle FGI$

Prove:  $AE = IG$

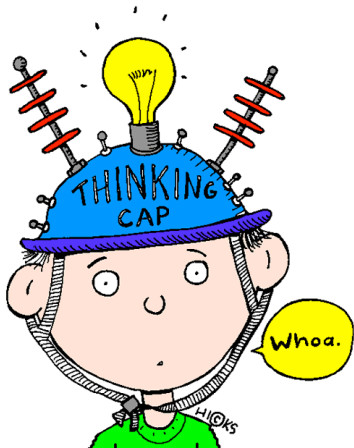
23

---

**DIVIDENDS**

---

“One of the best things about mathematics is that it teaches you to think clearly, no matter what you are thinking about.”



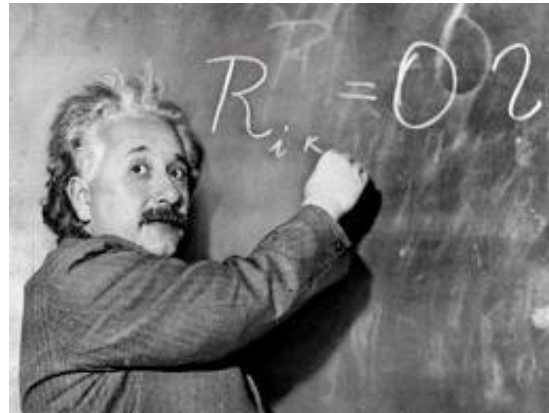
- Maria Chudnovsky, PhD.

# Math “Dividends”

- Recognizing Crucial Features of a Problem
- Breaking Complex Problems into Parts
- To Think Carefully without Fallacy
- Devise Symbols & Diagrams to Aid Thinking
- Communicating Clearly and Logically
- Search for Proof, Not Just Opinion
- Uncovering Assumptions at Play

“A mind once stretched,  
never returns to  
its original dimensions.”

- Albert Einstein



# Brain Changing!

- According to Clancy Blair, a professor of psychology at NYU, the act of performing mathematical calculations improves reasoning, problem-solving skills, behavior, and the ability to self-regulate. These skills are associated with the pre-frontal cortex part of the brain, which continues to develop into your early 30s.

# Life Lessons Learned from Math

- **Mistakes** are part of any learning process, embrace them and learn from them!
- **Growth** occurs at the edge – when we are challenged at the edge of our comfort zone
- **Work Backwards** – Start with the end in mind and lay out steps to get there
- **Perseverance** – Math can be hard, so can life. The only failure that is certain is when we do not try.

# Promoting “Brain Power”

- Post process goals in your classroom
- Publicly recognize and value student strategies, ideas, and explanations
- “Exercises” vs. “Problems” → Meaningful tasks
- “Sell” the brain benefits of math regularly!



# Turn & Talk

- What is one way you sell “brain power” in your classroom?
- What is an idea have you learned at this conference that you can use to sell the benefits of math to your students?



# #3: My Family Vacation

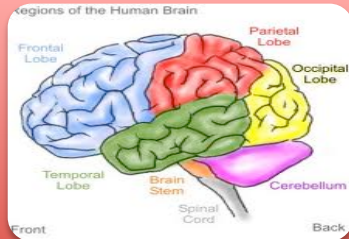
Suppose you work in a lab. You need a 15% acid solution for a certain test, but your supplier only ships a 10% solution and a 30% solution. Rather than pay the hefty surcharge to have the supplier make a 15% solution, you decide to mix 10% solution with 30% solution, to make your own 15% solution. You need 10 liters of the 15% acid solution. How many liters of 10% solution and 30% solution should you use?

11



**“CUT!”**

# Three Ways of “Selling Mathematics”



Brain Power



Opportunity



## #4: "Reading the Future"

$$2x - 3y = 20$$

$$5x + 8y = 32$$

5



# Can You Tell The Future?

- Members of the baby boomer generation held an average of 11 different jobs between the ages of 18 and 42, a trend that will continue to grow with new generations of workers.

Bureau of Labor Statistics News Release. (2008, June) Number of Jobs Held, Labor Market Activity, and Earnings Growth Among the Youngest

Baby Boomers: Results from a Longitudinal Survey. Washington, DC: Author.

# Job Growth

- Growth in math-intensive science and engineering jobs is outpacing overall job growth by three to one, including a number of jobs that are available to individuals with some postsecondary education, but less than a four-year degree, and strong math and science skills.

Animators

Game Designers

Computer Programmer

Robotics Engineer

Contractors

Electricians

Pipe Fitters

Pilots

Sports Announcers

Special Effects Director

Business Analyst

Architect

Teacher

Carpenter

Statistician

Forensic Scientist

Medical Professions

Business Owner

Meteorologist

Fashion Designer

Stock Broker

Interior Designer

Political Scientist

Engineer

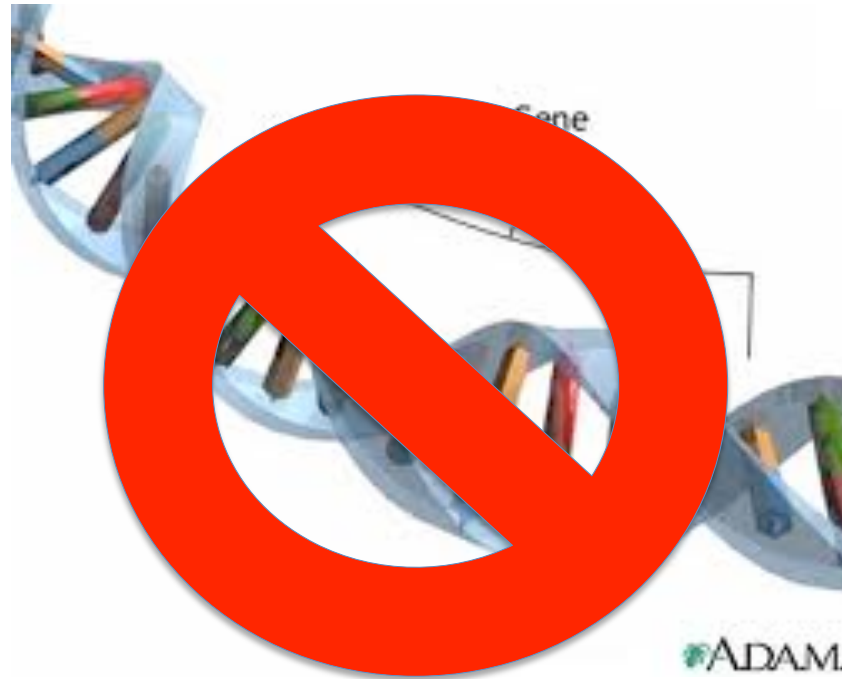
# Another Math Test?

- According to the Association of General Contractors, electricians, pipe fitters, sheet metal workers and draftsman all need courses like algebra, geometry and trigonometry to be successful on the job. Indeed, the International Brotherhood of Electrical Workers has created a test to screen prospective apprentices—and it includes algebra problems.

Issues of ACCESS

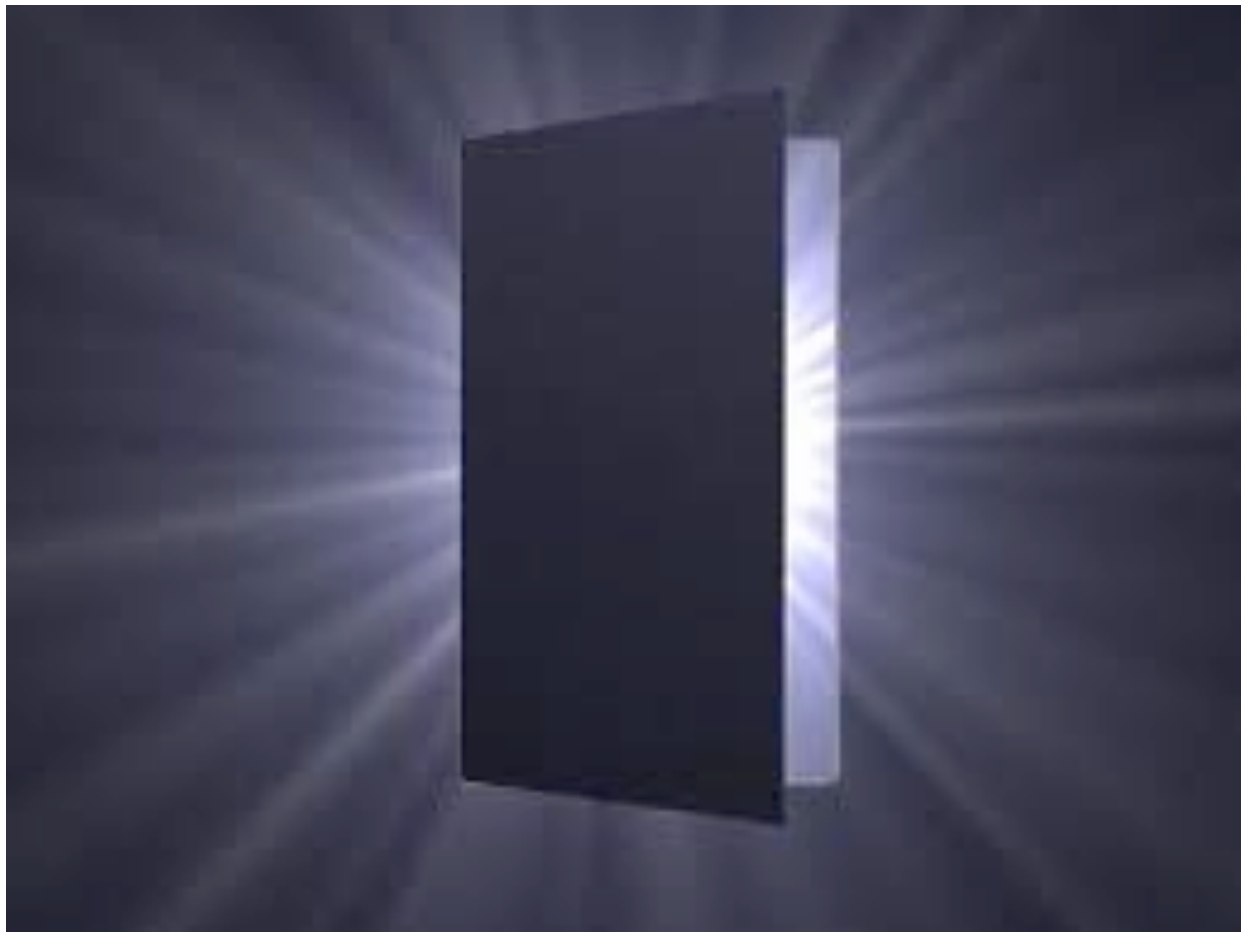
SAT/ ACT/ Community College/ Universities

# The Myth of the Math Gene!





Hard Work, Attitude, Perseverance





**“CUT!”**

# WeUseMath.org

WHEN WILL I USE MATH?

SUPPORT SOCIAL SIGN IN REGISTER SEARCH

WeUseMath.org

- HOME
- CAREERS
- BLOG
- HOW TO SUCCEED
- DID YOU KNOW?
- RESOURCES FOR TEACHERS
- STORE



- Be Creative
- Fight Terrorism
- Model Your Body
- Predict the Future
- Quantify Risk

The most common question students ask math teachers at every level is "When will I use math?" WeUseMath.org is a non-profit website that helps to answer this question. This website describes the importance of mathematics and many rewarding career opportunities available to students who study mathematics.



## 40+ CAREERS IN MATH

<a href="#">Physician</a>	.....\$166,400/yr
<a href="#">Cryptanalyst</a>	.....\$112,780/yr
<a href="#">Operations Research Analyst</a>	.....\$119,140/yr
<a href="#">Actuary</a>	.....\$158,240/yr
<a href="#">Attorney</a>	.....\$166,400/yr
<a href="#">Market Research Analyst</a>	.....\$111,900/yr
<a href="#">Biologist</a>	.....\$100,580/yr
<a href="#">Computer Scientist</a>	.....\$155,420/yr
<a href="#">Nuclear Engineer</a>	.....\$140,140/yr
<a href="#">Inventory Control Specialist</a>	.....\$146,030/yr

*Figures represent salary potential.*

22  
AUG

### Math = Power

Scientists have discovered that by altering the shape of the surface area of each particle where it presses against the next, it is possible to change how the energy moves. While this finding is yet to be demonstrated experimentally, Sen said that "mathematically, it's correct. We have proven it."

*read more*

# Promoting Opportunity

- Easier to sell to traditionally “successful” math students
- Harder to sell to those that aren’t



# Dan Meyer

<http://blog.mrmeyer.com/>

**“Don't promise students they'll enjoy the math they hate now in a career later. Let them experience math they enjoy now.”**

# Dan Meyer

<http://blog.mrmeyer.com/>

- **“When a student asks “The Question”, they are not asking about the future, they are complaining about their present.”**

# Motivation (Ford 1992)

**INTEREST**



**CURIOSITY**

# Turn & Talk

- What is an idea/strategy you will take away from this conference to help engage your students in the learning of mathematics?



# Strategies from NCTM Boston!

- Use Modeling problems (ex: 3 Act Tasks) that begin with students forming questions and deciding what is important

# mathtwitterblogosphere.weebly.com

- Go to “Why you should join”
- Select “Cool things we’ve done together”

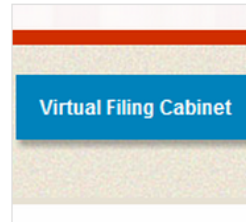
## Open Middle

A site crowdsourced with many problems which have an ‘open middle’ (meaning all problems start out the same, all problems end with the same answer, but there are multiple ways to approach and ultimately solve the problem).

## Watch them teach

Joseph Kremer, on [Observations](#)  
An observant person might  
rox\_normal, on [Approximate](#)

Letters to a First Year Teacher, a compilation of 20-something letters to newbie teachers



A set of virtual filing cabinets which curate the best ideas from blogs by topic (others [here](#), [here](#), and [here](#))

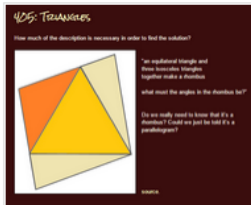
## Better Assessments

Learning how to rock the formative and summative.

Home

## Algebra 1 Mid-unit Test •

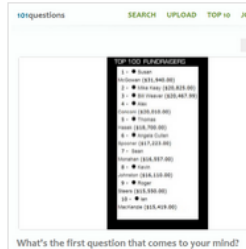
A blog devoted to improving assessments for our students. Teachers submit assessments, teachers give comments on these assessments.



MathArguments180 has an extensive series of discussion-provoking questions for teachers to use in their classrooms.



#Made4Math Mondays, an ongoing series of crafty projects that can improve the math classroom... published every



Dan Meyer's 101Questions database, and 3 Act Lessons (collaborative work of

## #mathe

This page lists all of the c blog, don't know what to b theme. Anyone who woul #mathe, emailing me o always welcome!

#mathe is a math theme that arises spontaneously on blogs (e.g. writing in math classrooms).

# Strategies from NCTM Boston!

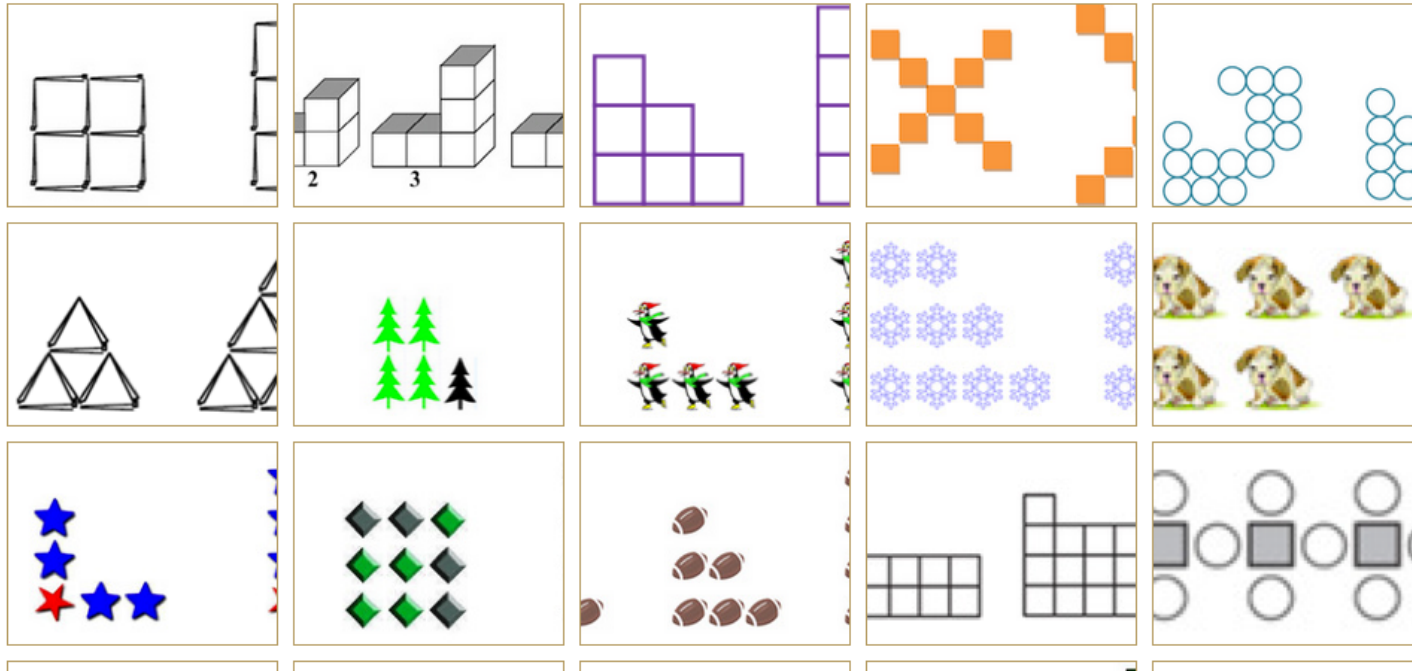
- Start with visuals and pose low-risk Q's that rely on intuition
- Use Modeling problems (ex: 3 Act Tasks) that begin with students forming questions and deciding what is important

# VisualPatterns.org

## Visual Patterns

[1-20](#)[21-40](#)[41-60](#)[61-80](#)[81-100](#)[101-120](#)[121-140](#)[141-160](#)[TEACHERS](#)[GALLERY](#)[CONTACT](#)

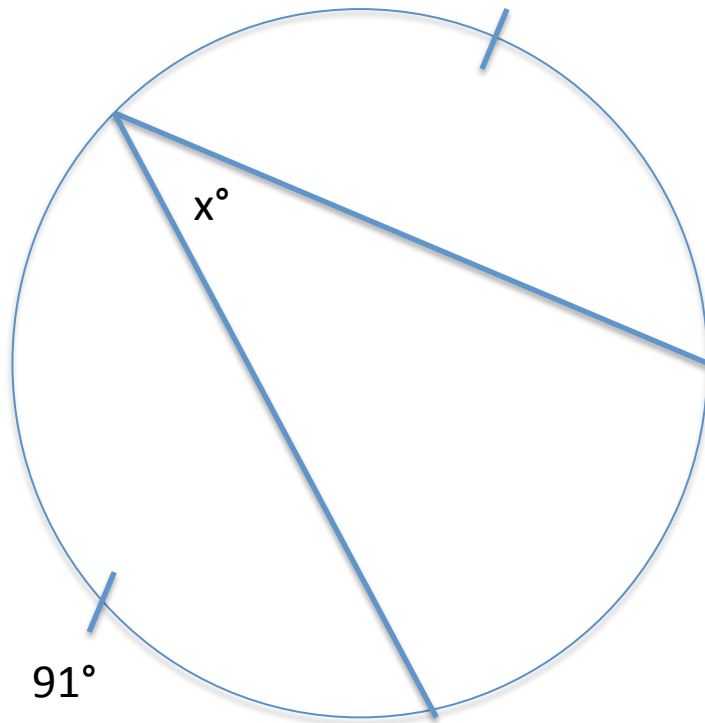
Click on a pattern to see a larger image and the answer to step 43. What is the equation?



# Strategies from NCTM Boston!

- Start with visuals and pose low-risk Q's that rely on intuition
- Use Modeling problems (ex: 3 Act Tasks) that begin with students forming questions and deciding what is important
- Target Math Practice Standards #3!  
“Construct viable arguments and critique the reasoning of others”

# #5: 1,000,000<sup>th</sup> Caller



45

Math Teacher Hotline

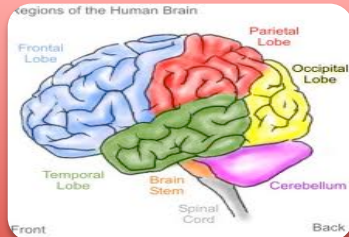
**1-800-GOT-MATH**





**“CUT!”**

# Three Ways of “Selling Mathematics”



Brain Power



Opportunity



Relevant Tool

## #6: Meeting the Wizard

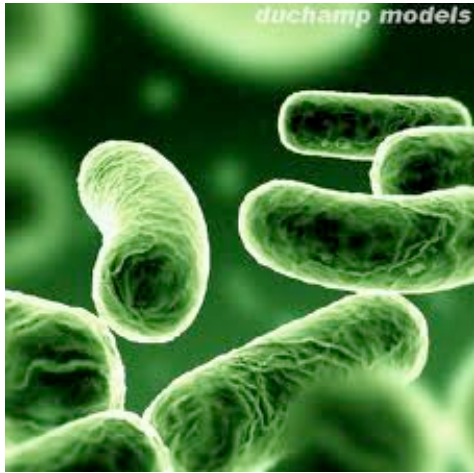
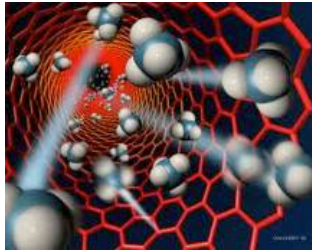
*Simplify*

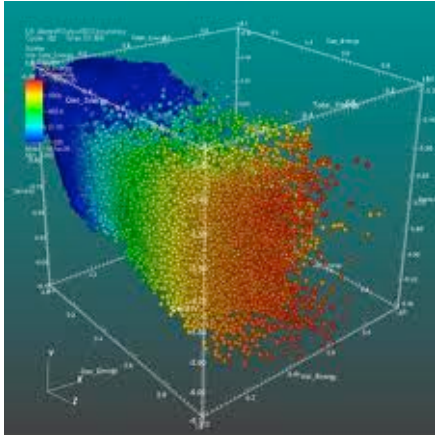
$$(2i + 3)(i - 4)$$

31

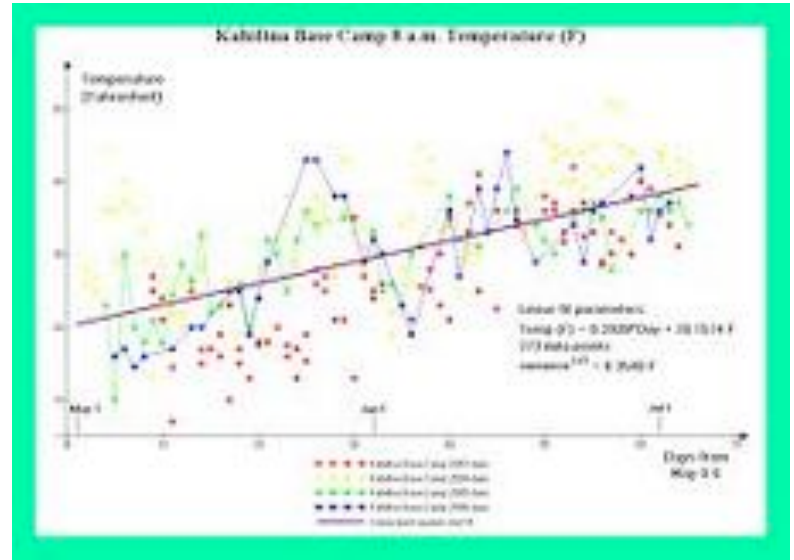
# Meeting the Wizard

- “Wizard of Oz Clip”

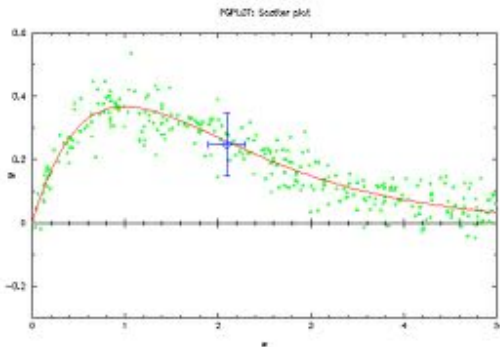
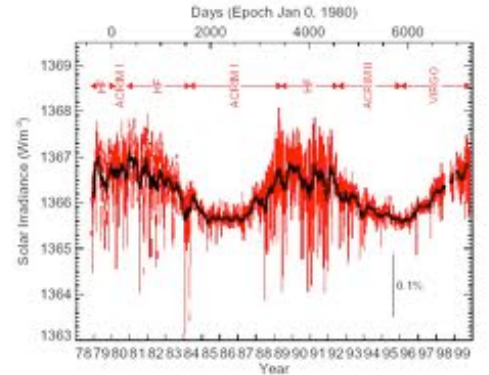
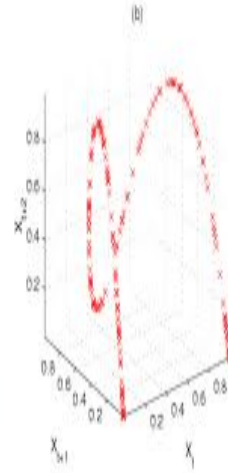
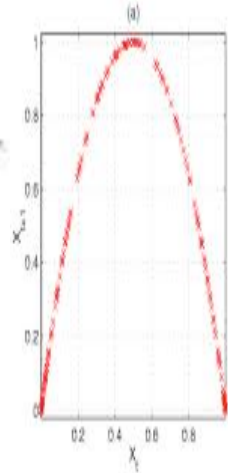




$$E = m \frac{v^2}{2}$$



$$R_z = \frac{n\pi \frac{\theta + \psi}{2}}{\left(\frac{\theta + \psi}{2}\right)^2 + \left(\frac{1}{2} \log \left| \frac{B}{A} \right| \right)^2}$$



# LANGUAGES

español

française

Deutsch

日本

русский

$$e = \lim_{n \rightarrow \infty} \left( 1 + \frac{1}{n} \right)^n$$

한국

中国

English

العربية

ελληνικά

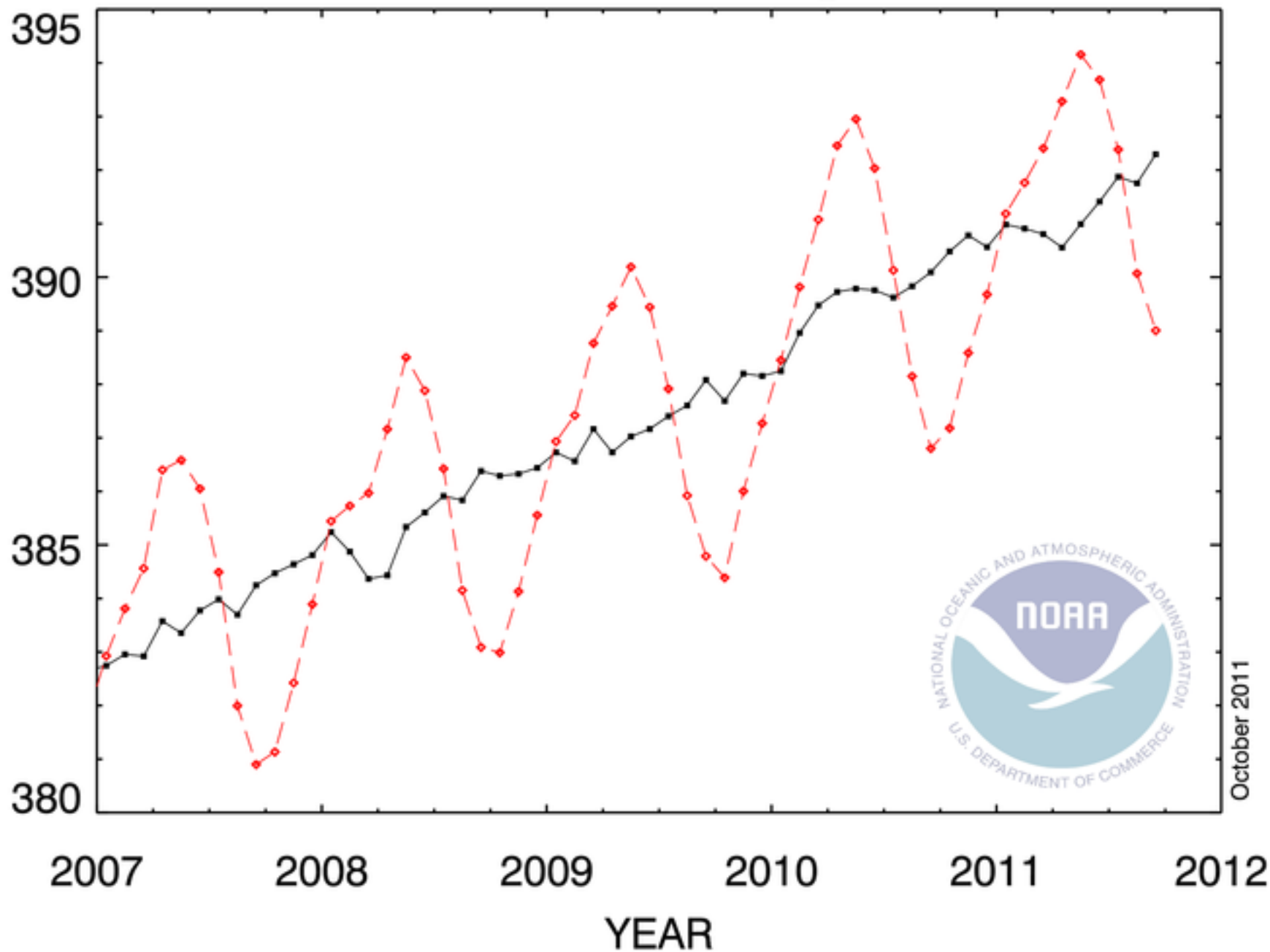
# One Story: Mauna Loa



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
1958	-99.99	-99.99	315.70	317.45	317.50	317.26	315.86	314.93	313.20	312.44	313.33	314.67	-99.99
1959	315.62	316.38	316.71	317.72	318.29	318.16	316.54	314.80	313.84	313.26	314.80	315.58	315.98
1960	316.43	316.97	317.58	319.02	320.03	319.59	318.18	315.91	314.16	313.84	315.00	316.19	316.91
1961	316.93	317.70	318.54	319.48	320.58	319.77	318.57	316.79	314.80	315.38	316.10	317.01	317.64
1962	317.94	318.56	319.68	320.63	321.01	320.55	319.58	317.40	316.25	315.42	316.69	317.70	318.45
1963	318.74	319.08	319.86	321.39	322.24	321.47	319.74	317.77	316.21	315.99	317.12	318.31	318.99
1964	319.57	-99.99	-99.99	-99.99	322.24	321.89	320.44	318.70	316.70	316.79	317.79	318.71	-99.99
1965	319.44	320.44	320.89	322.13	322.16	321.87	321.39	318.80	317.81	317.30	318.87	319.42	320.04
1966	320.62	321.59	322.39	323.87	324.01	323.75	322.39	320.37	318.64	318.10	319.79	321.08	321.38
1967	322.06	322.50	323.04	324.42	325.00	324.09	322.55	320.92	319.31	319.31	320.72	321.96	322.16
1968	322.57	323.15	323.89	325.02	325.57	325.36	324.14	322.03	320.41	320.25	321.31	322.84	323.05
1969	324.00	324.42	325.64	326.66	327.34	326.76	325.88	323.67	322.38	321.78	322.85	324.12	324.63
1970	325.03	325.99	326.87	328.14	328.07	327.66	326.35	324.69	323.10	323.16	323.98	325.13	325.68
1971	326.17	326.68	327.18	327.78	328.92	328.57	327.34	325.46	323.36	323.57	324.80	326.01	326.32
1972	326.77	327.63	327.75	329.72	330.07	329.09	328.05	326.32	324.93	325.06	326.50	327.55	327.45
1973	328.55	329.56	330.30	331.50	332.48	332.07	330.87	329.31	327.51	327.18	328.16	328.64	329.68
1974	329.35	330.71	331.48	332.65	333.09	332.25	331.18	329.40	327.43	327.37	328.46	329.57	330.25
1975	330.40	331.41	332.04	333.31	333.96	333.60	331.91	330.06	328.56	328.34	329.49	330.76	331.15
1976	331.75	332.56	333.50	334.58	334.87	334.34	333.05	330.94	329.30	328.94	330.31	331.68	332.15
1977	332.93	333.42	334.70	336.07	336.74	336.27	334.93	332.75	331.59	331.16	332.40	333.85	333.90
1978	334.97	335.39	336.64	337.76	338.01	337.89	336.54	334.68	332.76	332.55	333.92	334.95	335.51
1979	336.23	336.76	337.96	338.89	339.47	339.29	337.73	336.09	333.91	333.86	335.29	336.73	336.85
1980	338.01	338.36	340.08	340.77	341.46	341.17	339.56	337.60	335.88	336.02	337.10	338.21	338.69
1981	339.23	340.47	341.38	342.51	342.91	342.25	340.49	338.43	336.69	336.86	338.36	339.61	339.93
1982	340.75	341.61	342.70	343.57	344.13	343.35	342.06	339.81	337.98	337.86	339.26	340.49	341.13
1983	341.37	342.52	343.10	344.94	345.75	345.32	343.99	342.39	339.86	339.99	341.15	342.99	342.78
1984	343.70	344.50	345.28	347.08	347.43	346.79	345.40	343.28	341.07	341.35	342.98	344.22	344.42
1985	344.97	346.00	347.43	348.35	348.93	348.25	346.56	344.68	343.09	342.80	344.24	345.55	345.90
1986	346.30	346.96	347.86	349.55	350.21	349.54	347.94	345.90	344.85	344.17	345.66	346.90	347.15
1987	348.02	348.47	349.42	350.99	351.84	351.25	349.52	348.10	346.45	346.36	347.81	348.96	348.93
1988	350.43	351.73	352.22	353.59	354.22	353.79	352.38	350.43	348.72	348.88	350.07	351.34	351.48
1989	352.76	353.07	353.68	355.42	355.67	355.13	353.90	351.67	349.80	349.99	351.29	352.52	352.91
1990	353.66	354.70	355.39	356.20	357.16	356.23	354.82	352.91	350.96	351.18	352.83	354.21	354.19
1991	354.72	355.75	357.16	358.60	359.33	358.24	356.17	354.02	352.15	352.21	353.75	354.99	355.59
1992	355.98	356.72	357.81	359.15	359.66	359.25	357.02	355.00	353.01	353.31	354.16	355.40	356.37
1993	356.70	357.16	358.38	359.46	360.28	359.60	357.57	355.52	353.69	353.99	355.34	356.80	357.04
1994	358.37	358.91	359.97	361.26	361.68	360.95	359.55	357.48	355.84	355.99	357.58	359.04	358.89
1995	359.97	361.00	361.64	363.45	363.79	363.26	361.90	359.46	358.05	357.76	359.56	360.70	360.88
1996	362.05	363.25	364.02	364.72	365.41	364.97	363.65	361.48	359.45	359.60	360.76	362.33	362.64
1997	363.18	364.00	364.56	366.35	366.79	365.62	364.47	362.51	360.19	360.77	362.43	364.28	363.76
1998	365.33	366.15	367.31	368.61	369.30	368.87	367.64	365.77	363.90	364.23	365.46	366.97	366.63
1999	368.15	368.87	369.59	371.14	371.00	370.35	369.27	366.93	364.63	365.13	366.67	368.01	368.31
2000	369.14	369.46	370.52	371.66	371.82	371.70	370.12	368.12	366.62	366.73	368.29	369.53	369.48

# RECENT MONTHLY MEAN CO<sub>2</sub> AT MAUNA LOA

PARTS PER MILLION





**“CUT!”**

**When Am I Gonna Use  
This in My Real Life?**

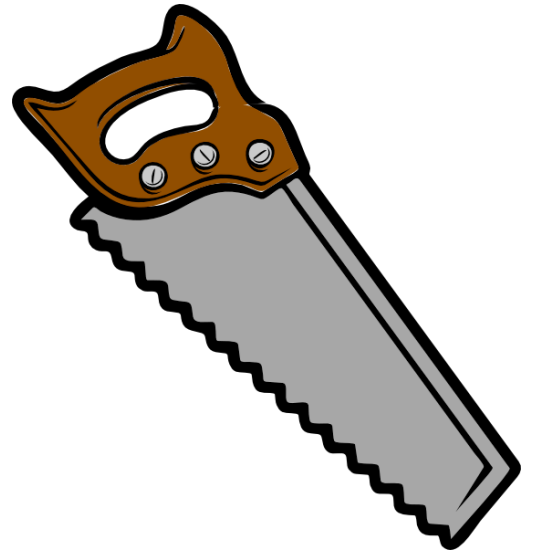
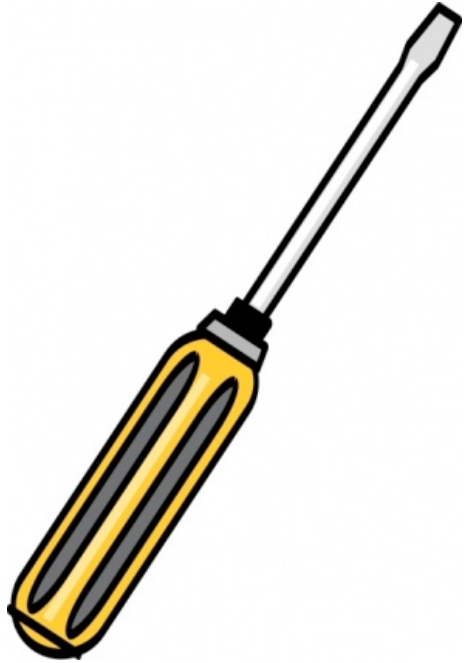
# CHANGE THE QUESTION

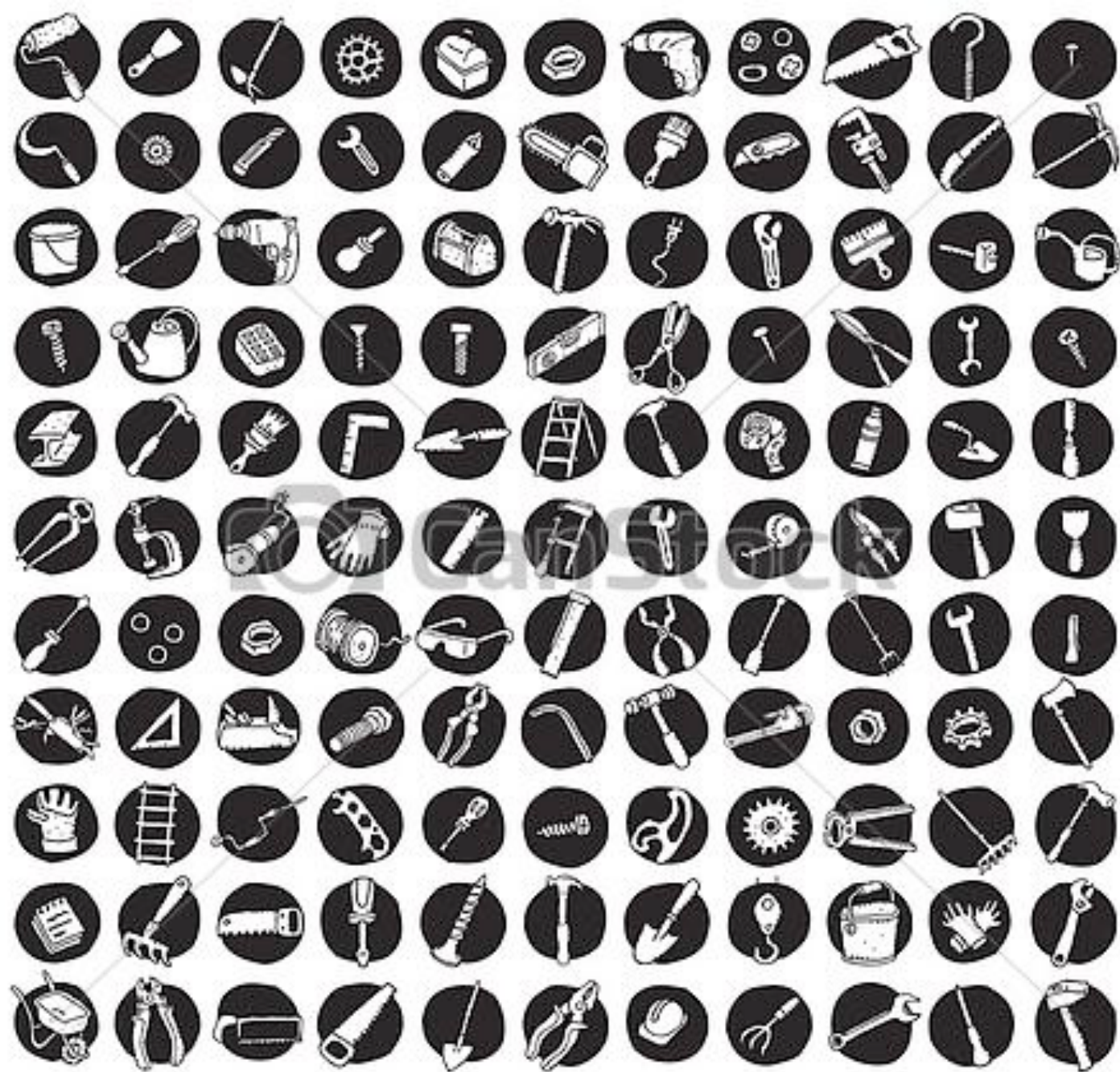
When Am I Gonna Use  
This in My Real Life?

# CHANGE THE QUESTION

Where Is This Used  
in Real Life?







# Promoting Math as a Relevant Tool

- CCSSM Mathematical Modeling Focus
- Data! Data! Data!
- Unit Hooks → Start with a Question
- Share Interesting Real World “Math Stories”



• ONE MORE!

**R**igor

**R**elevance

**R**elationships

**“I’ll care about what you  
know when I know how  
much you care.”**

# Relationship Tips

- Greet by name
- Aim to positively address each student by name at least once each class
- “I believe you can do this. I want you to succeed”
- Teacher-Student Mini Conferences





**Presenter: Adam Poetzel (apoetzel@illinois.edu)**