Embracing rich contexts,
complex tasks and experiments in
Algebra 1 and 2

Making Math Class Awesomer

What my math classes look like:

Teacher Cred

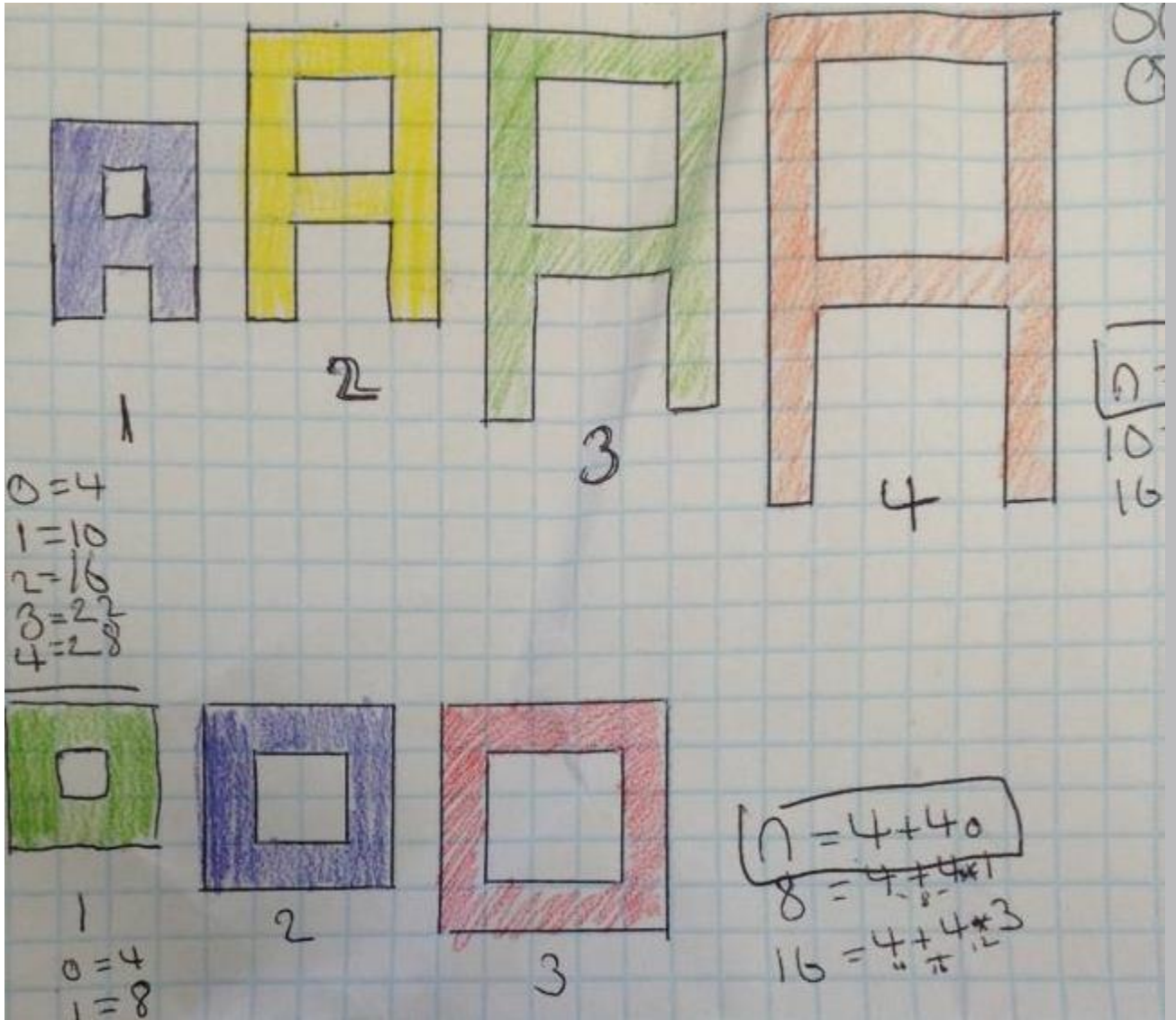
Proportions / Similar Figures

Proportions / Similar Figures

Rates

Linear Relationships

Creating Equations from Patterns



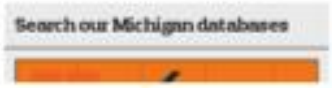
Modeling local events

Grand Rapids Flooding 2013

On Sunday, April 21st, 2013 at about 10pm the Grand River, which runs through downtown Grand Rapids, crested at 21.85 feet and started to recede. Flood stage for the river is 18 feet.

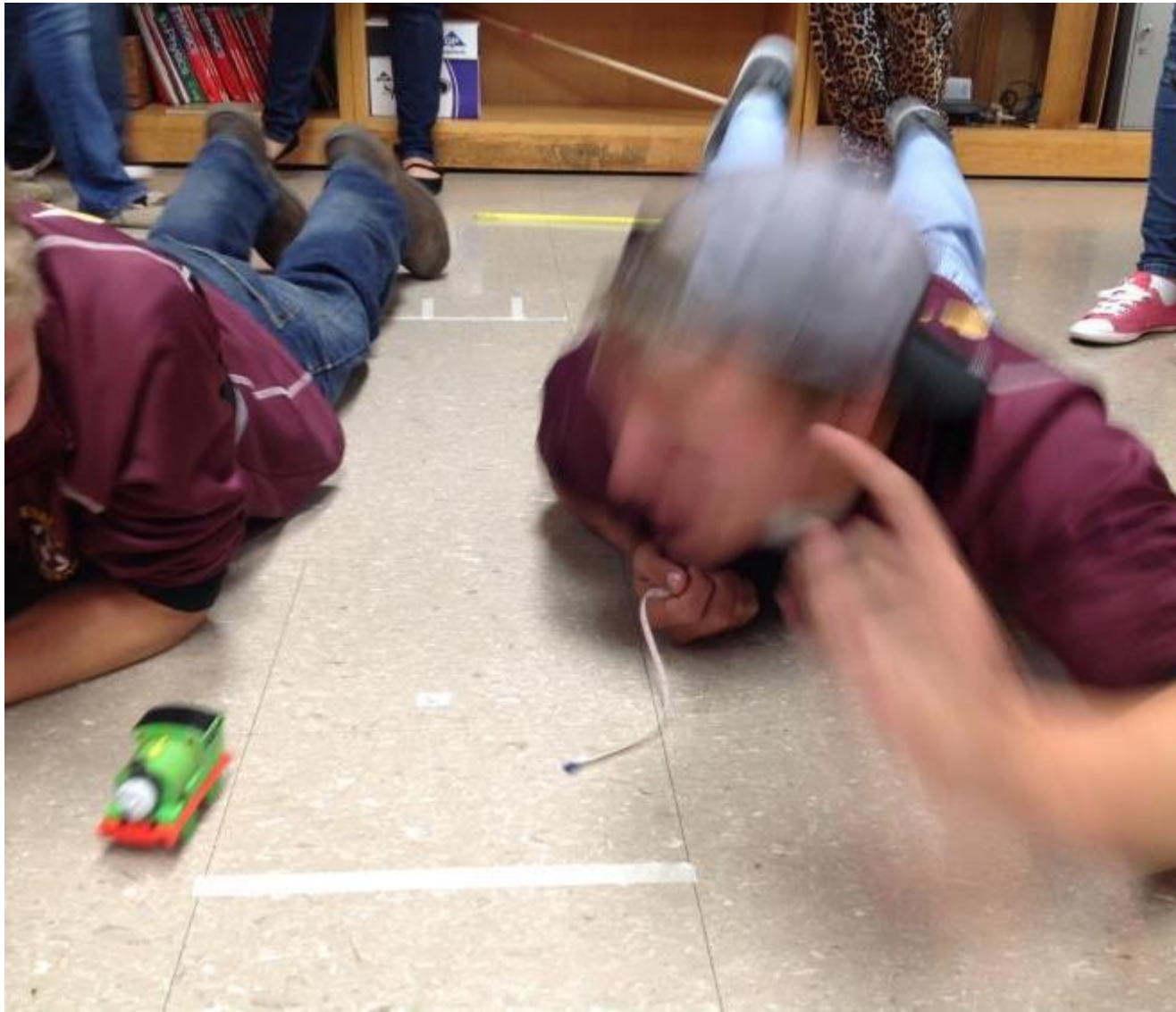
Photo from: http://www.mlive.com/news/grand-rapids/index.ssf/2013/04/must_see_photos_from_historic.html

Lowell flooding update: With crest past, Grand River receding by 1 inch every 2 hours



Based on this information, when will the river be below flood stage?

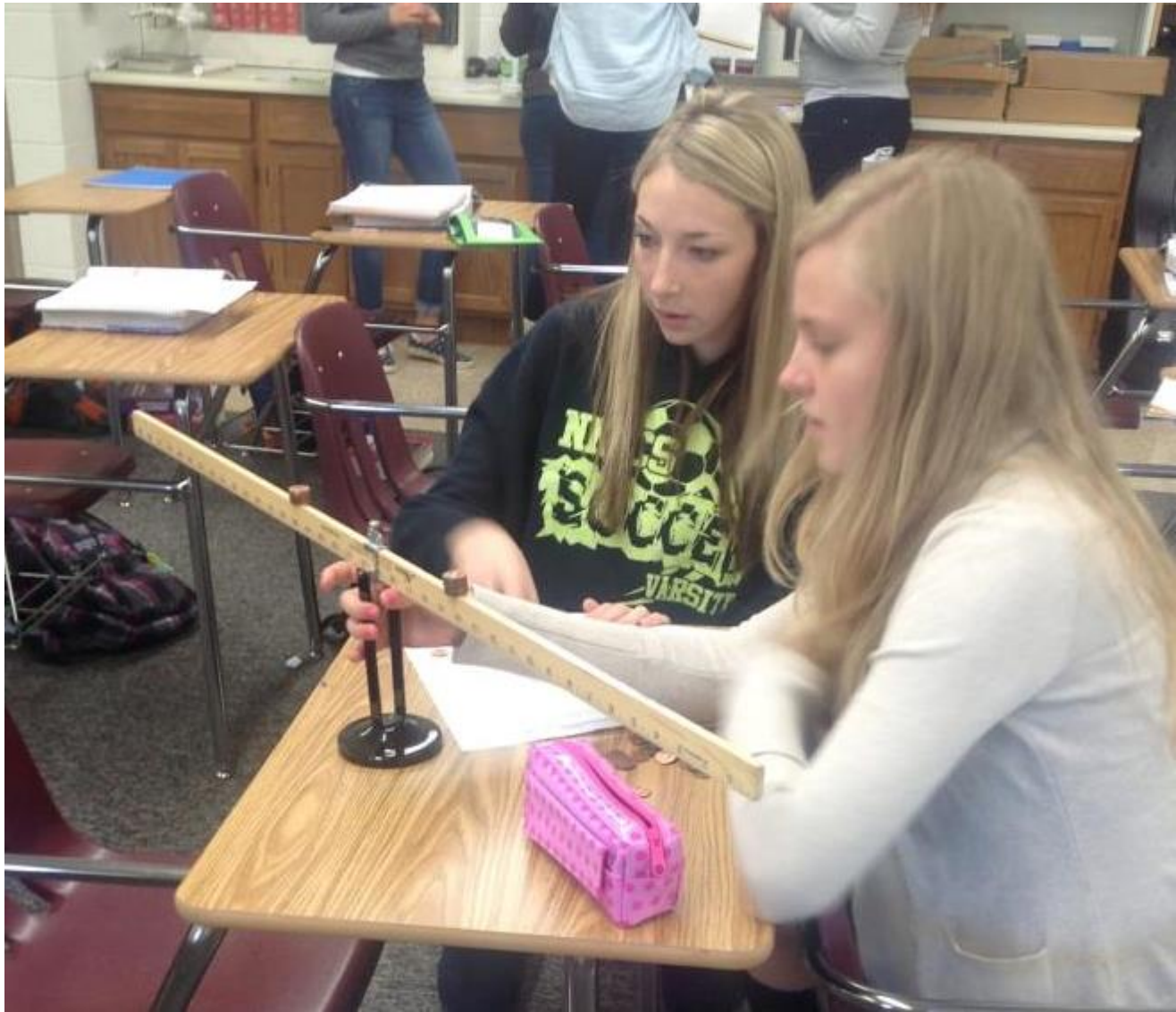
Linear/Exponential Modeling



Graphing

Least Squares Regression

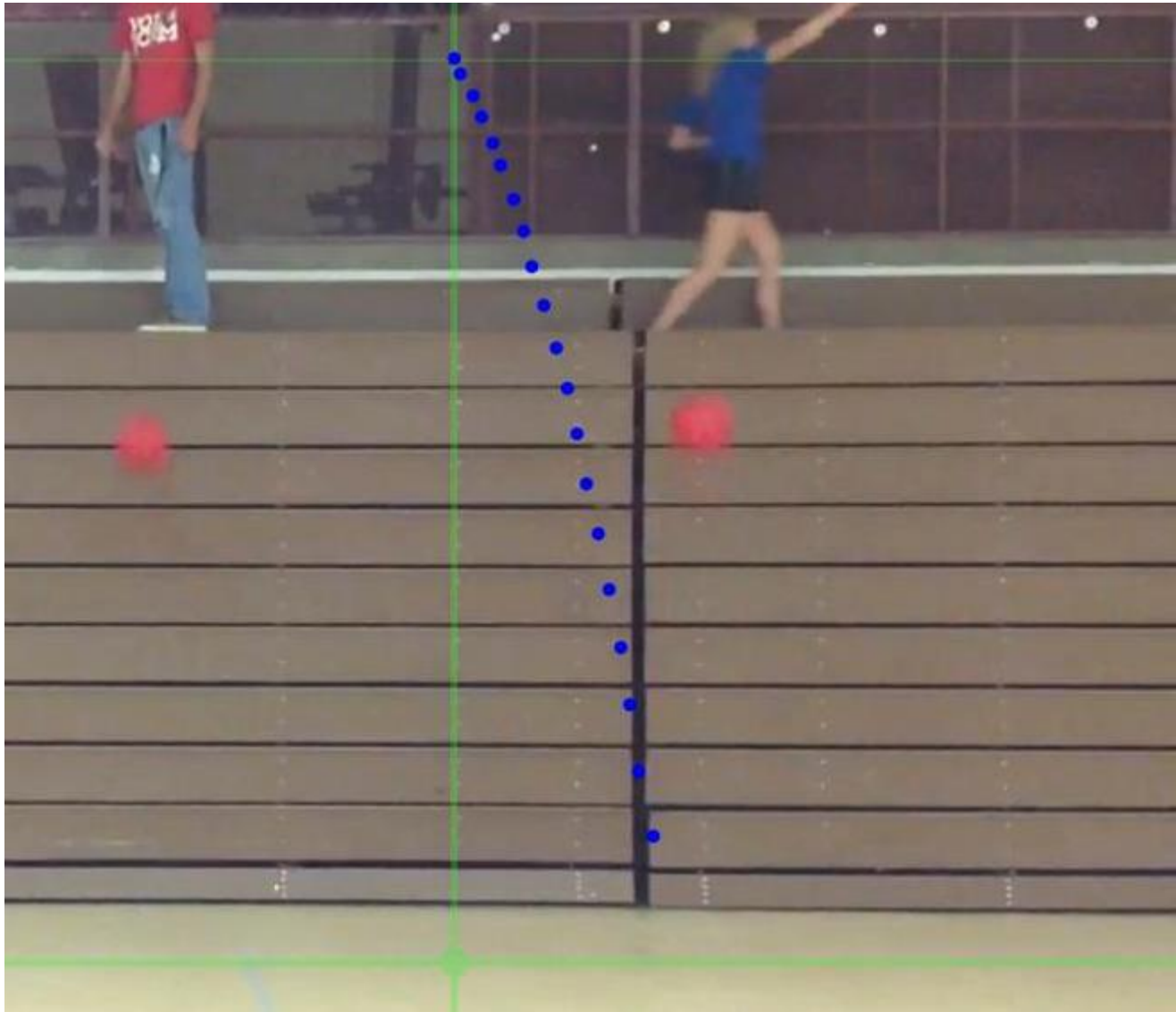
Variation Functions



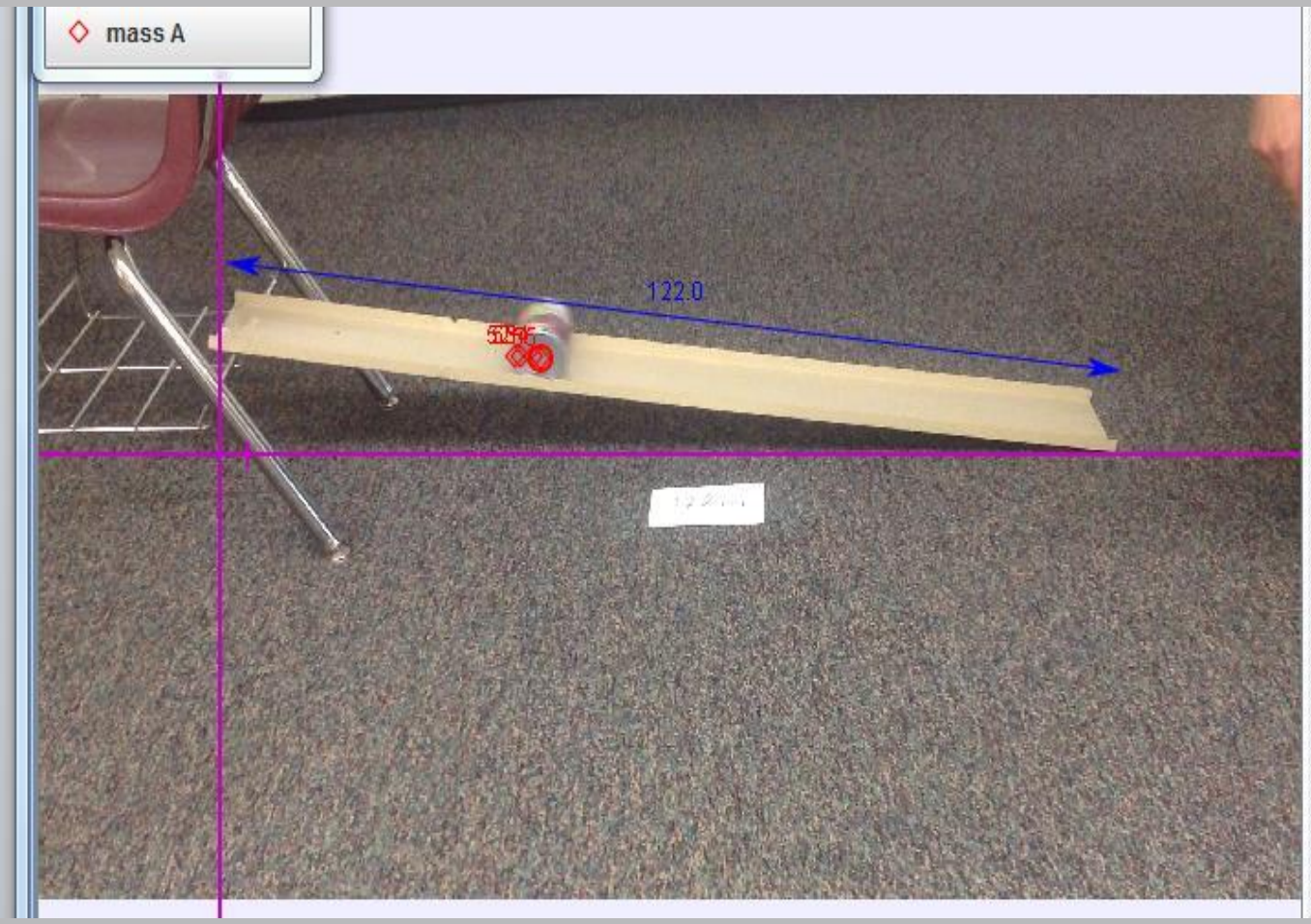
Combined Variation

Inverse Square Variation

Quadratics and Linearity



Quadratics



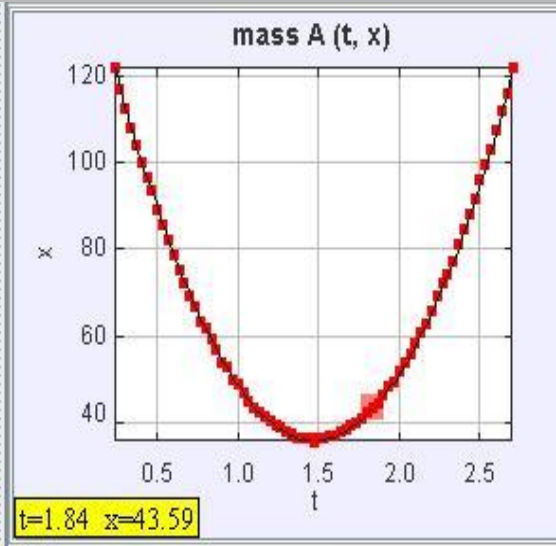
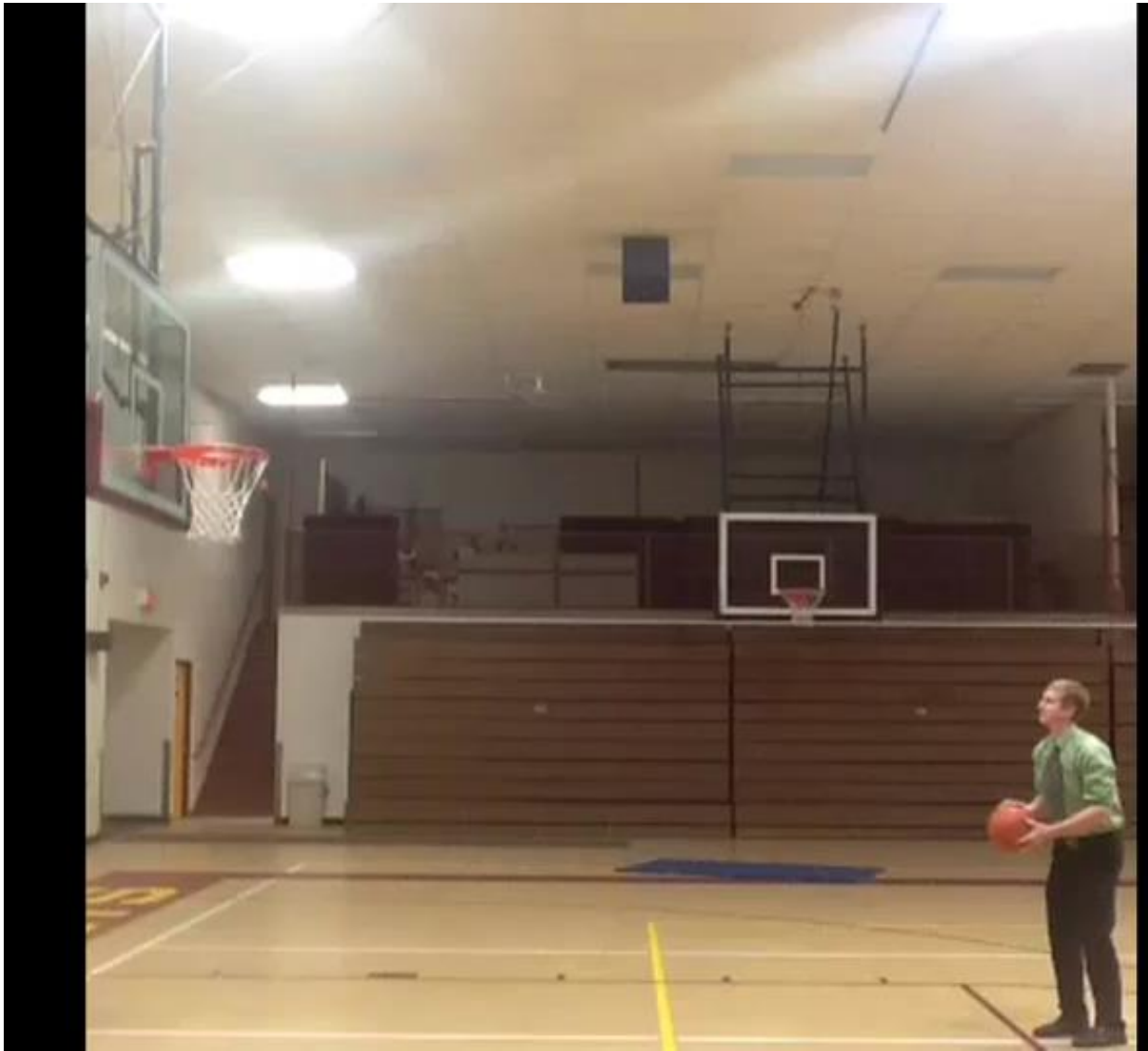


Table mass A

t	x	y
0.233	122.058	4.484
0.267	117.076	5.231
0.3	112.343	5.48
0.333	108.108	5.729
0.367	103.874	5.729
0.4	100.137	6.477
0.433	96.401	6.726

Quadratic Transformations



Quadratics

Quadratic Transformations and Projectiles

Intro to Sine and Cosine on the Unit Circle

Quadratic Modeling

Exponential Decay

Exponential Growth and Decay

New for Me: Using the Computer Lab

DAY 1: SNOWBOARD QUADRATIC – INTRO TO QUADRATIC TRANSFORMATIONS

Here are 10 time-elapse photos of people being awesome while someone with a camera is freezing:

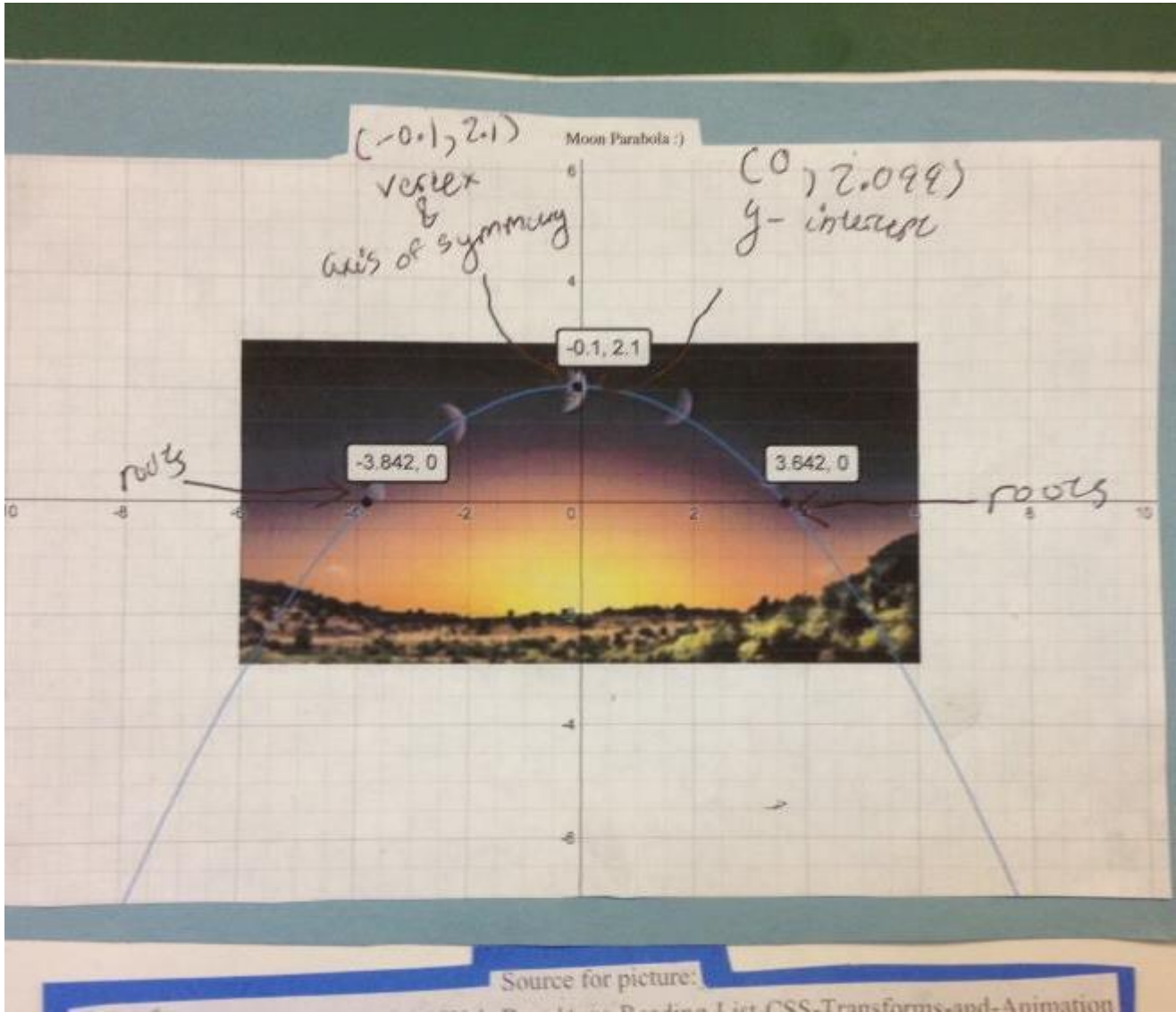
SECTION 1:

1) Choose 2 of the pictures of skiers in Section 1.
2) Click on either the heading or the picture to go to the attached Desmos file.
3) Using the sliders, find 'a', 'h', and 'k' values to fit a quadratic equation onto the skier/snowboarder's path while they are in the air.
4) Describe how you got your function to match the path of the athlete.
5) What relationships can you find between the graph and your 'a', 'h', and 'k' values?

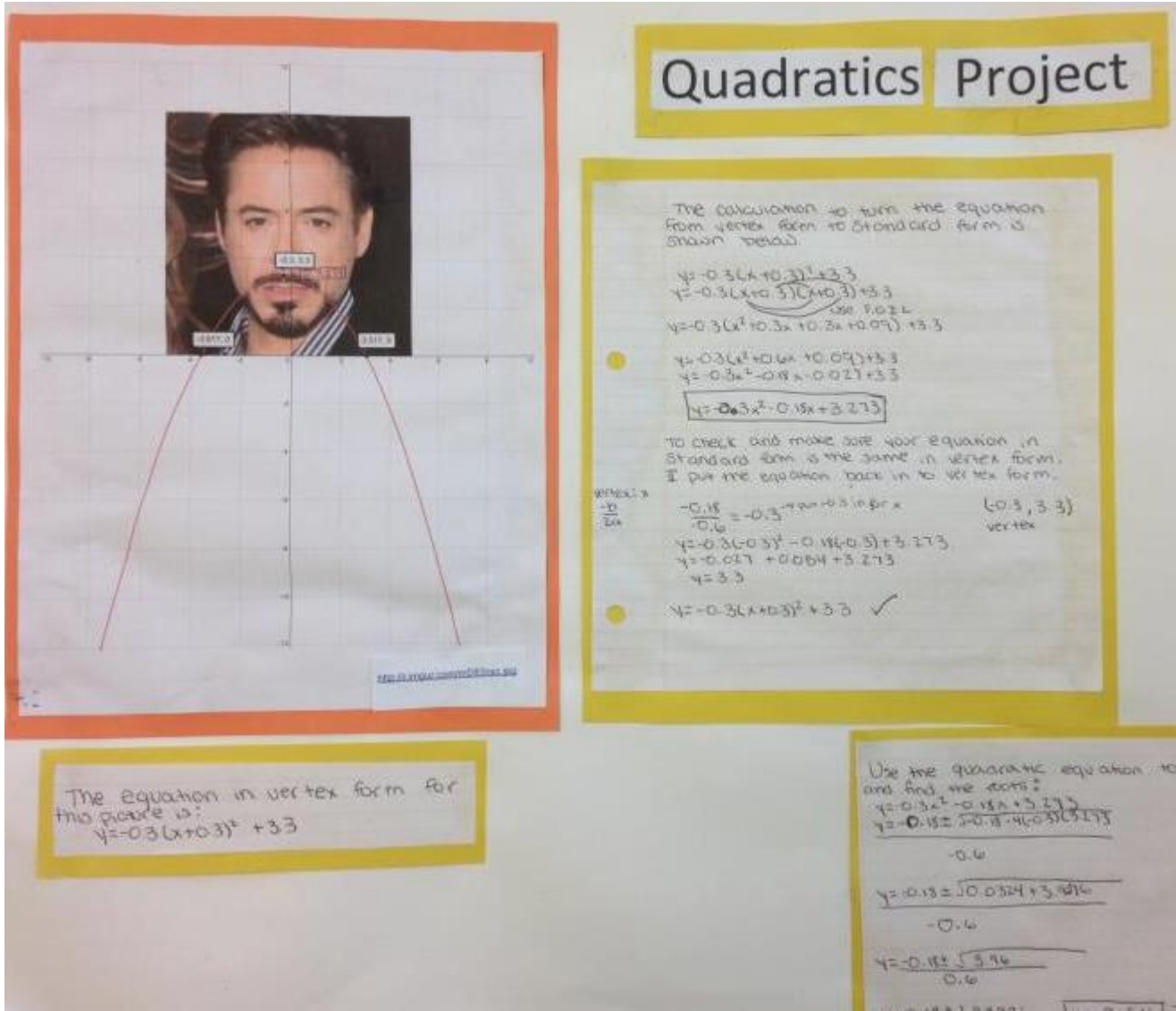
1) Aerial Ski Jump

2) Aerial Ski Jump

New for Me: Project Assessments



New for Me: Project Assessments

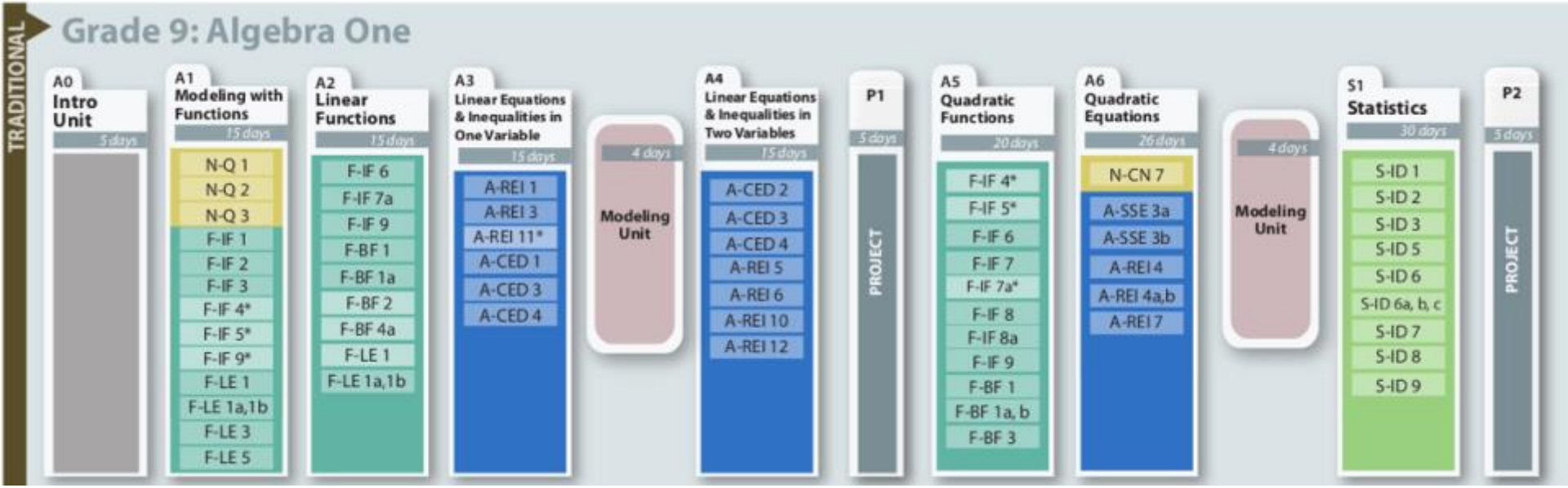


Enter witty yet inspirational saying here.

Starting the Process

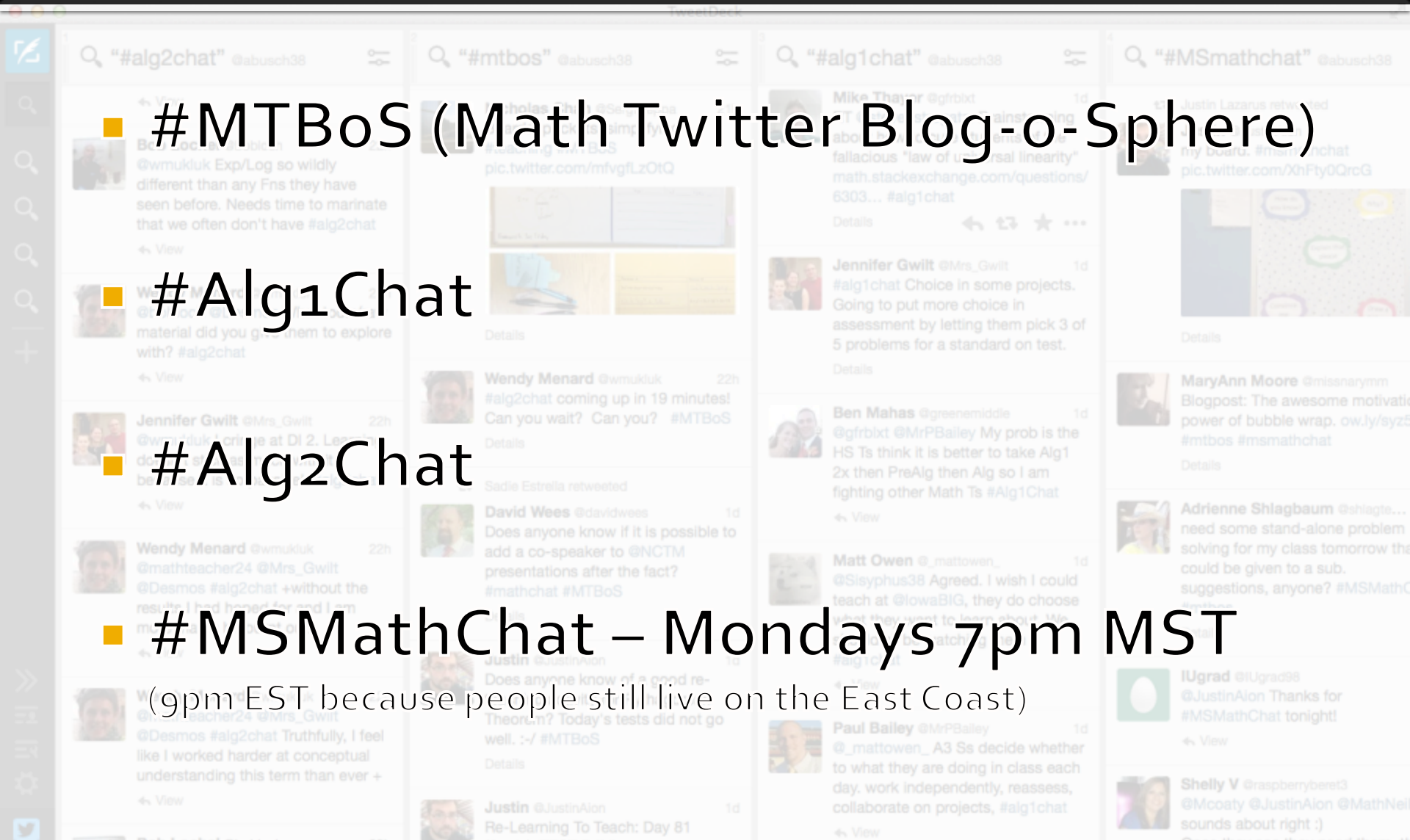
Math Blogs

- Dan Meyer – blog.mrmeyer.com
- Fawn Nguyen – fawnnguyen.com
- Geoff Krall – EmergentMath.com
  This is THE place to start.



UNIT: Linear Equations in One Variable	**A-REI 1,3,11*; A-CED 1,3,4**	**15**
KD vs. Lebron (Dane)	A-REI.1,3, A-CED.1	½
Pepsi Points (Timon)	A-REI.1, 3,A-CED.1	2
Gas Pump (Dane)	A-REI.1, 3, A-CED.1	1
Bottomless Coffee Mug (Andrew)	A-REI.1, 3,A-CED.1	1
The Perfect Chocolate Milk Mix (Yummymath)	A-CED.1, 8.EE.7	1
Styrofoam Cups (Andrew)	A-CED.1,2,3,4, A-REI.3	2
M&M's (Dane)	A-CED.1,2, A-REI.1	1

Twitter – No, Really.



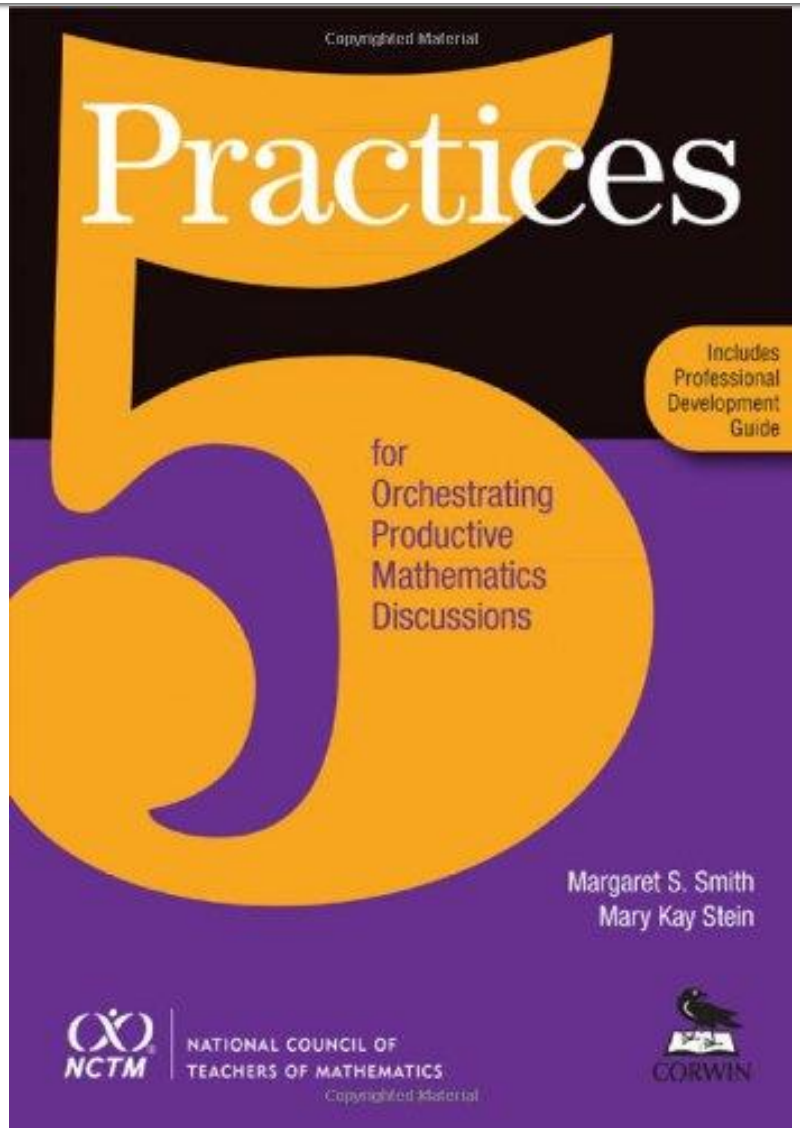
- #MTBoS (Math Twitter Blog-o-Sphere)
- #Alg1Chat
- #Alg2Chat
- #MSMathChat – Mondays 7pm MST

(9pm EST because people still live on the East Coast)

Best Math Ed Book… EVER

5 Practices for Orchestrating Productive Mathematics Discussions

-Margaret S. Smith and Mary K. Stein



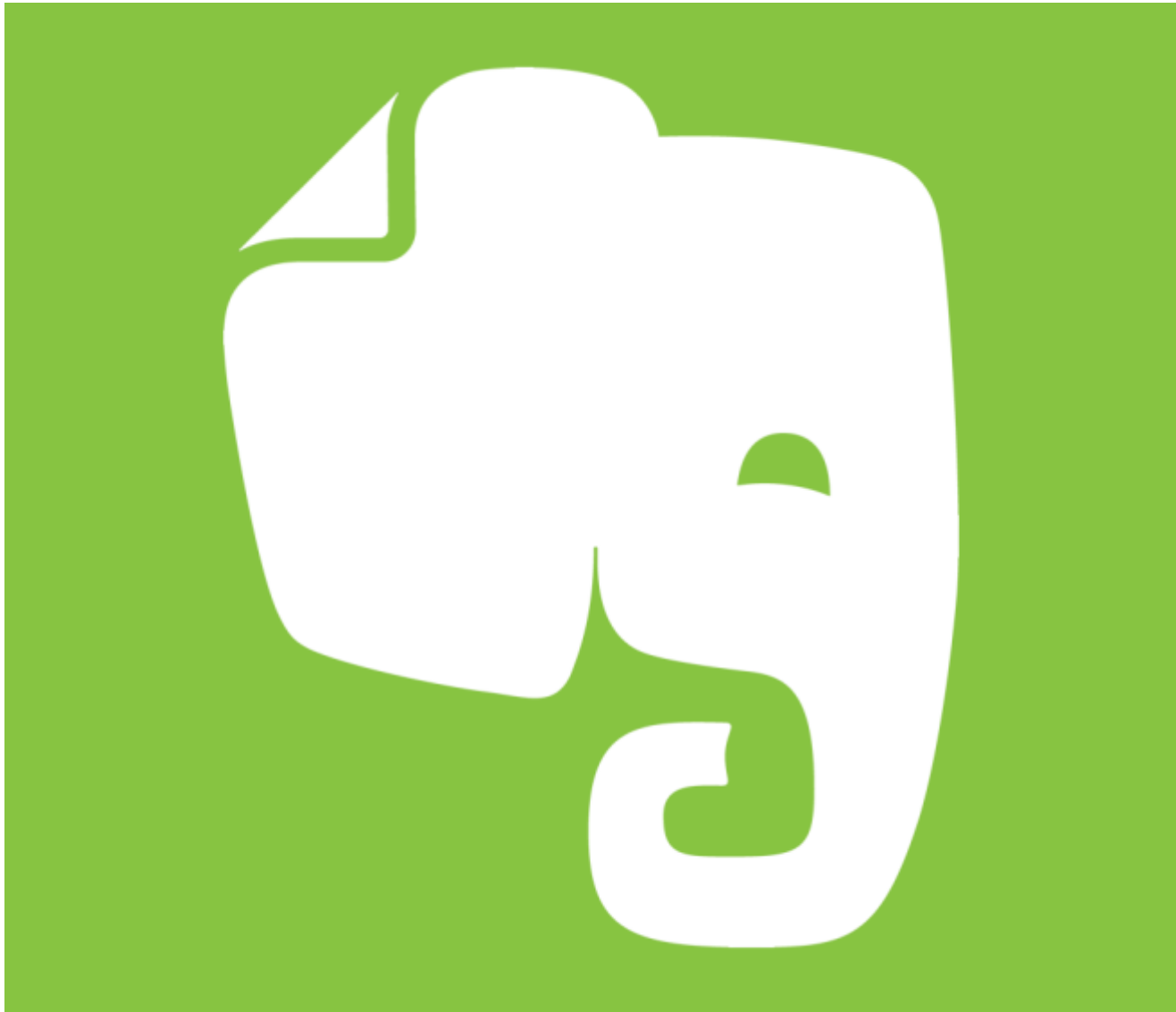
What to do with and where to put all your brilliant ideas.

Organization

Evernote

For gathering all the stuff you find, the notes you make and almost anything else you can think of…

and syncing them across multiple devices



Evernote Web Clipper

rewbusch.us/math-tasks.html

-BVSD G-Python Calendar Weebly NPR NetChess Chess.com YMail Outlook TweetDeck Codecademy facebook »

ALGEBRA 1 AND 2 - PRBL TASKS

This tab and all the pages under it are works in progress. I thought a
them until they were finished but then thought none of you would a

I know the CCSS are searchable but when I think of covering a topic, I think "Exponential Functions"--not "HSA-REI.D.11". So, I'm organizing based on topic

Math Tasks

Save

Clip

Article
Simplified article
Full page
Bookmark
Screenshot

Organize

Math

prbl

prbl

task ×

Add remark

Options

Text Doc

Outline course concepts and how you plan to teach them.

Linearity Cont'd – Chapter 8: 8.1, 8.2 (2 weeks)

*8a Project: Hybrids – Robert Kaplinsky - Focusing on Domain and Range

- HSN-Q.A.1
  - Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

Lines of Best-Fit

*8b Bungee Apparatus (no HW)

*8c Spaghetti Bridges (HW on correlation and lines of best fit.)

*8d Racing Day (NEED better pull-back cars.)

Regression

Correlation

*8e Gender Gap

*8 Project Barbie Bungee jump

- **Interpreting Categorical & Quantitative Data**
  - *HSS-ID.B.6*
    - *Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.*
  - *HSS-ID.C.7*
    - *Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.*
  - *HSS-ID.C.8*
    - *Compute (using technology) and interpret the correlation coefficient of a linear fit.*
  - *HSS-ID.C.9*
    - *Distinguish between correlation and causation.*

NEED LESSON ON DISTINGUISHING BETWEEN CORRELATION AND CAUSATION. (Use Spurious Correlations Website)

Interpreting Functions

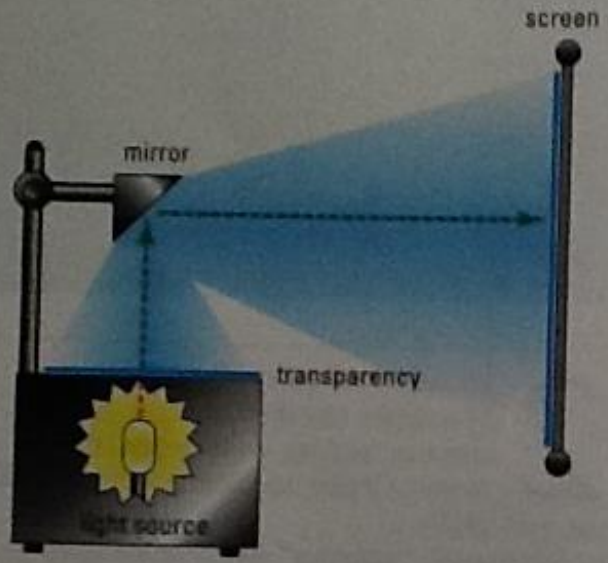
- *HSF-IF.A.3*
  - *Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.*

Your Textbook

Look at the project section at the end of the chapters.

3 Overhead Projectors as Size Changers

Overhead projectors are used because they project images of figures under a size change. A light source passes through a transparency (preimage), reflects off the mirror and projects a picture onto the screen (image). As you move the projector away from the screen, the image gets larger, and as you move the projector closer to the screen, the image gets smaller. Investigate whether the following is true.



Overhead Projector

4 Translations using Matrix Multiplication

The translations in this chapter are done using matrix addition. All other transformations of points here are performed using matrix multiplication and a 2×2 matrix particularly chosen for that transformation. A translation cannot be done using multiplication of 2×2 matrices. However, to translate a point using matrix multiplication, first write the point $\begin{bmatrix} x \\ y \end{bmatrix}$ in *homogeneous form* as $\begin{bmatrix} x \\ y \\ 1 \end{bmatrix}$. In homogeneous form, the translation

$$T_{h,k}: \begin{bmatrix} x \\ y \end{bmatrix} \rightarrow \begin{bmatrix} x + h \\ y + k \end{bmatrix}$$

becomes $T_{h,k}: \begin{bmatrix} x \\ y \\ 1 \end{bmatrix} \rightarrow \begin{bmatrix} x + h \\ y + k \\ 1 \end{bmatrix}$.

a. Multiply $\begin{bmatrix} 1 & 0 & h \\ 0 & 1 & k \\ 0 & 0 & 1 \end{bmatrix} \cdot \begin{bmatrix} x \\ y \\ 1 \end{bmatrix}$ to see how matrix multiplication can be used for translations.

b. When a point is written in homogeneous form, the 2×2 matrices for transformations for size changes, scale changes, reflections, and rotations need to be written as 3×3 matrices in this form. For example,

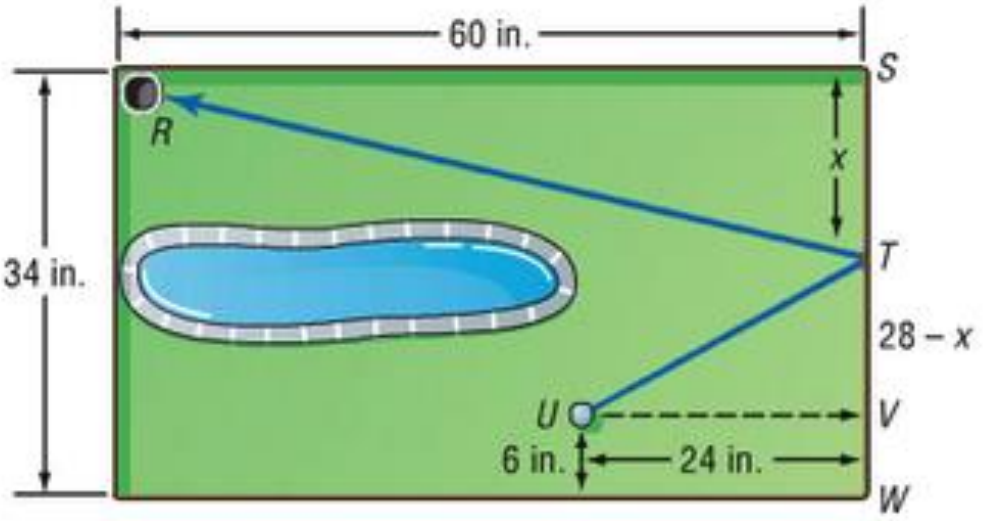
Size Change Matrices

Book problems often need to be reworked but at least it's a place to start.

Fawn Nguyen

Original textbook problem

24. GOLF Jessica is playing miniature golf on a hole like the one shown at the right. She wants to putt her ball U so that it will bank at T and travel into the hole at R. Use similar triangles to find where Jessica's ball should strike the wall.

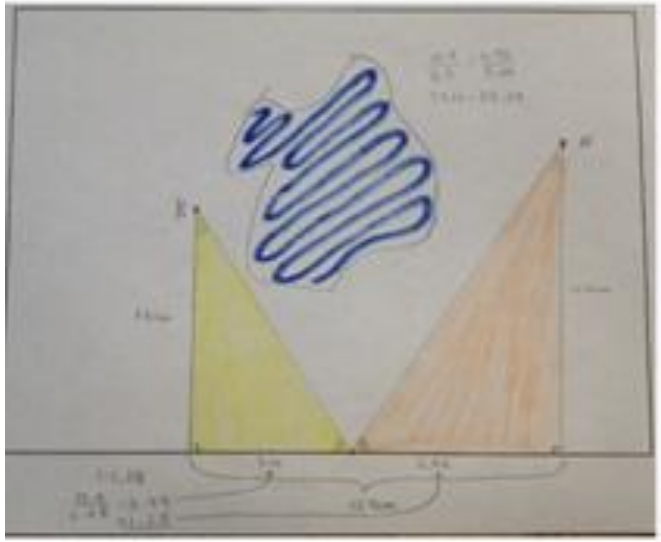


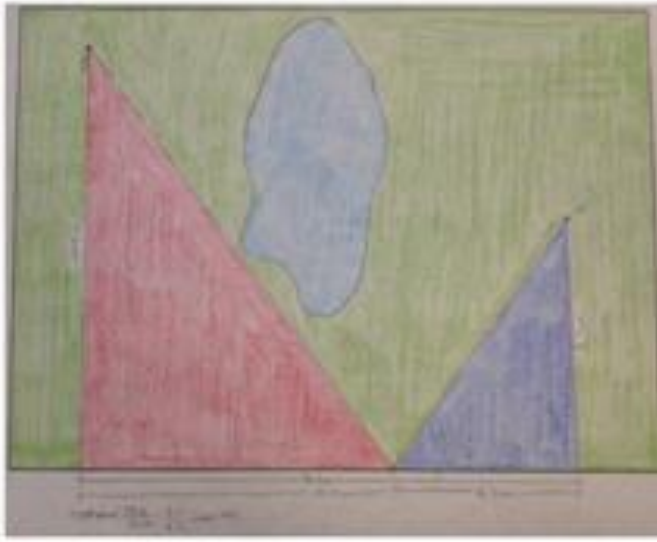
fawnnguyen.com/let-problem/

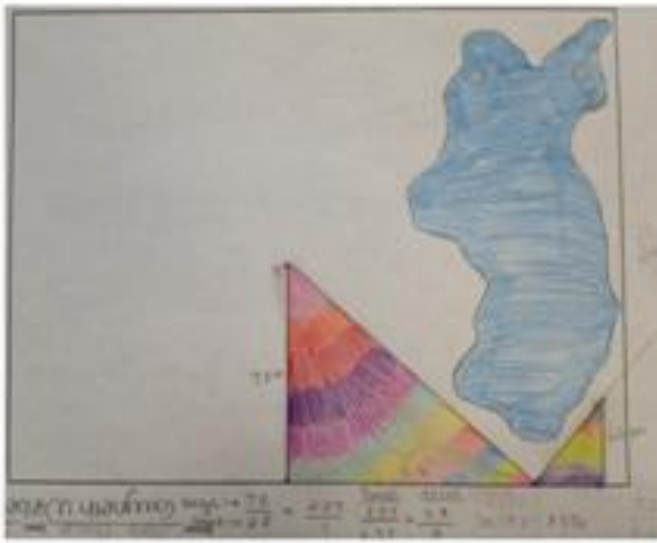
Similar Triangles

Instructions: Draw a blob. Put two points on the paper so you can't draw a straight line between them. Mini-Golf course!

She re-worked the task to increase both complexity and student engagement



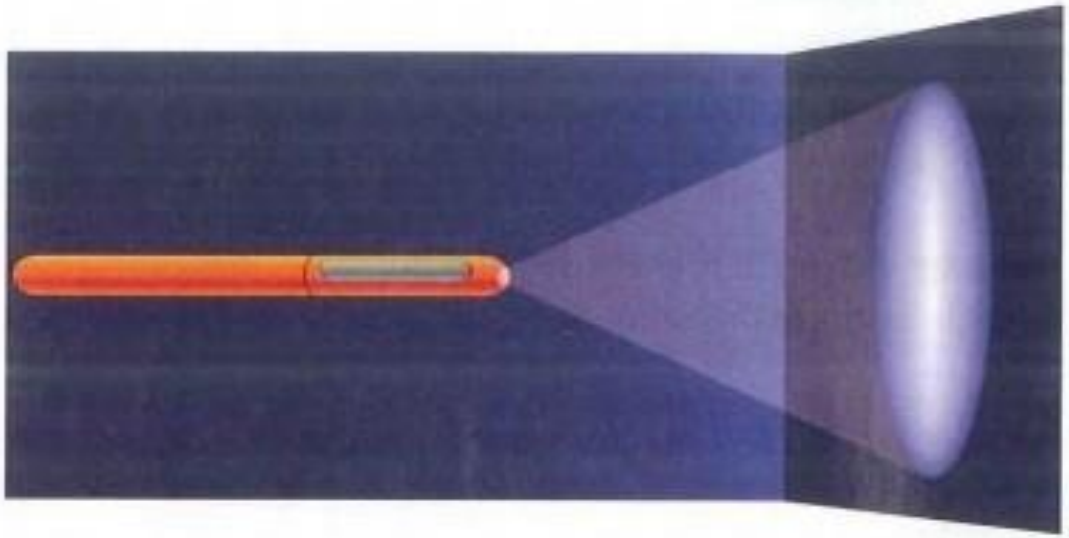




Taking a promising task and making it better -ish

Re-Working a Task

2 You could test your ideas about the (*distance, intensity*) relationship by collecting data from an experiment. But you can also get good ideas by mathematical reasoning alone. Consider what would happen if you were to enter a dark room and shine a small flashlight directly at a flat surface like a wall. The flashlight will create a circle of light on the wall.



a. Complete entries in the following table that contains measurements of light circle diameter for one flashlight that has been held at several distances from a wall. Distance and diameter measurements are in feet. Express the area in terms of π.

Light Circle Measurements

Distance from Light Source, *x*	1	2	3	4	5	6
Diameter of Light Circle, *d*	2	4	6	8	10	12
Radius of Light Circle, *r*						
Area of Light Circle, *A*						

b. Write rules that show:

i. diameter of light circle as a function of distance from the light source.

ii. radius of light circle as a function of distance from the light source.

iii. area of light circle as a function of distance from the light source.

c. Describe the relationships of the geometric variables diameter, radius, and area by completing sentences like this: "The variable _____ is _____ proportional to _____, with constant of proportionality _____."

d. Light energy is measured in a unit called *lumens*. The intensity of light is measured in lumens per unit of area. As the light circle of a flashlight or lamp increases in size, the intensity of light decreases.

To explore how that decrease in light intensity is related to distance from source to target, suppose that the flashlight that gave (*distance*, *diameter*) values in Part a produces 160 lumens of light energy. Use the area data from Part a to complete this table relating light intensity I to distance x.

Light Intensity Measurements

Distance from Light, x	1	2	3	4	5
Area of Light Circle, A	π	4π			
Light Intensity, I	$\frac{160}{\pi}$	$\frac{160}{4\pi}$			

a. Complete entries in the following table that contains measurements of light circle diameter for one flashlight that has been held at several distances from a wall. Distance and diameter measurements are in feet. Express the area in terms of π.

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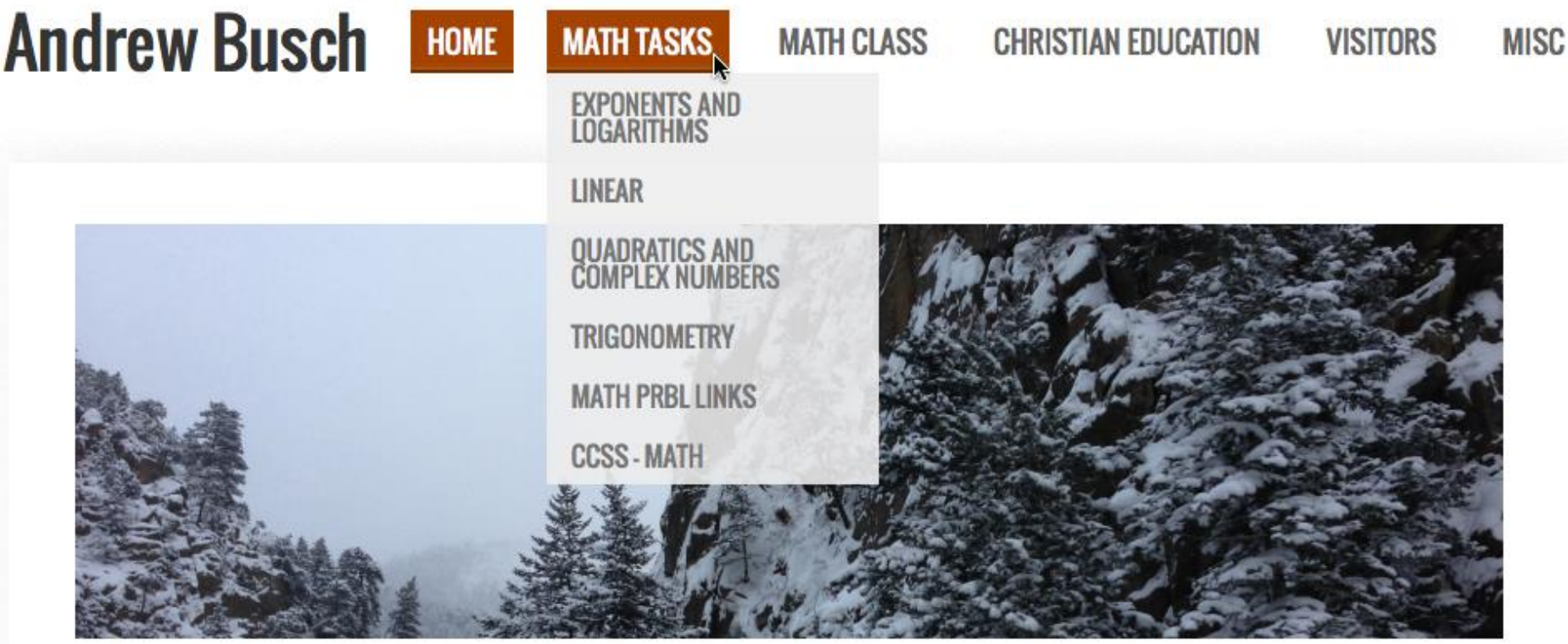
iii. area of light circle as a function of distance from the light source.

c. Describe the relationships of the geometric variables diameter, radius, and area by completing sentences like this: "The variable _____ is _____ proportional to _____,

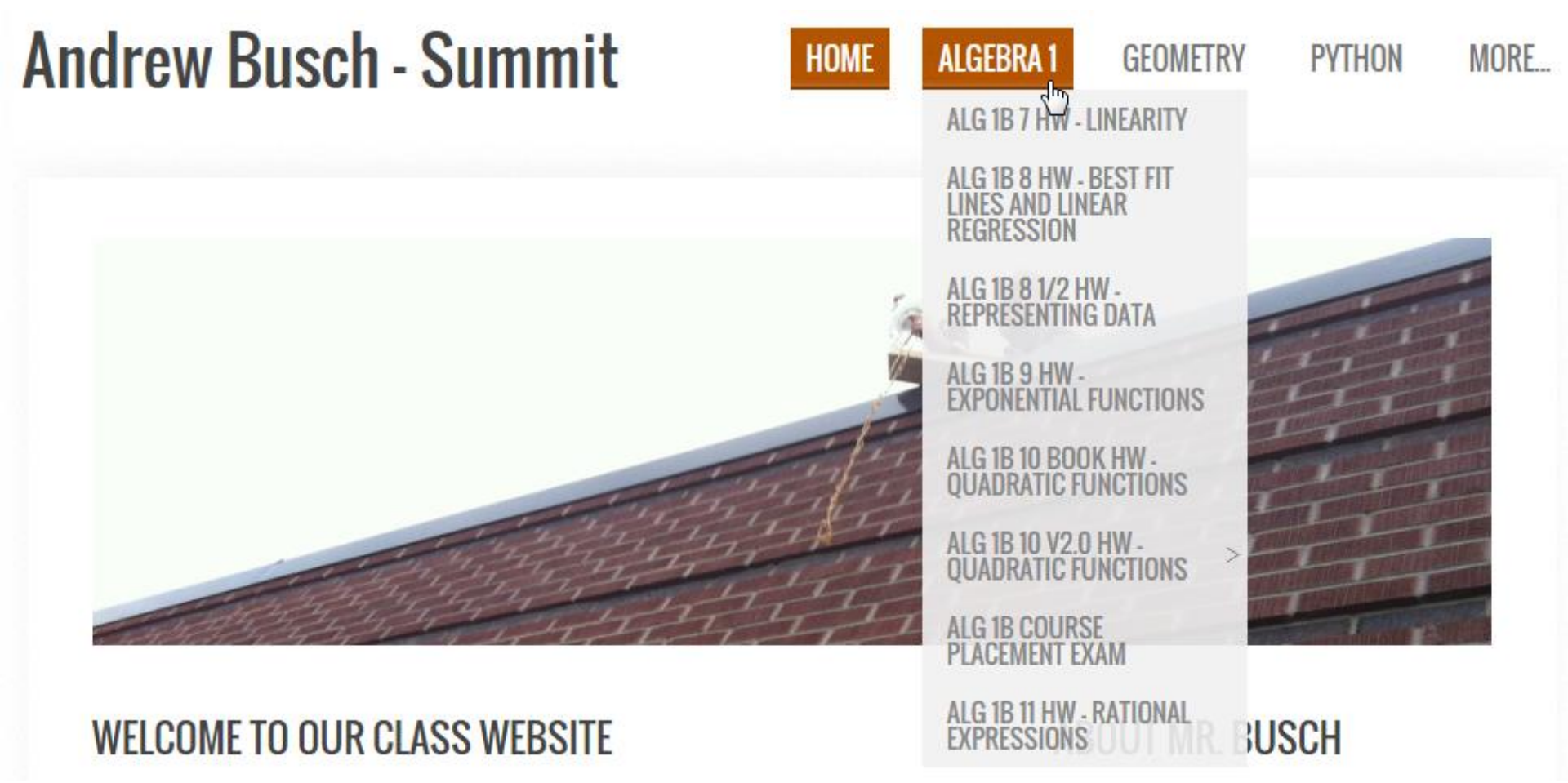
Making the task more accessible

- Can we delay the abstraction until later on?
- Can we reduce the literacy demand?
- Can we create an intellectual need?

andrewbusch.us



andrewbusch-bvsd.weebly.com



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Or Comments. Or Jokes.

Questions?