Strategies and Attitudes to Increase Student Engagement in Math

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The Math Forum
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VTSS Tier One Forum, August 2015
http://mathforum.org/workshops/vtss/

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Reflections on RtI, PBIS, and Core Instruction

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Attitudes

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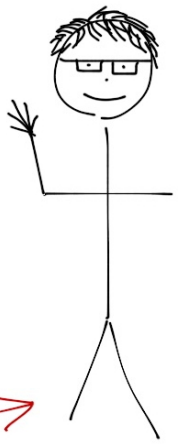
Three Stories of Things We Should Care About More

as told by me



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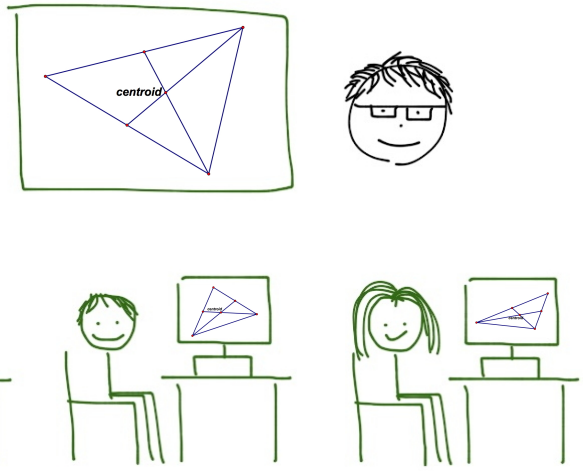
Story 1: Centers of Triangles, 1998 - High School Sophomores



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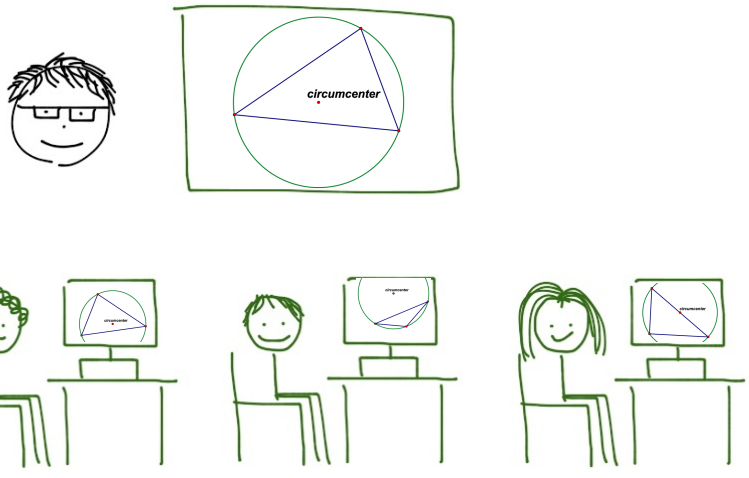

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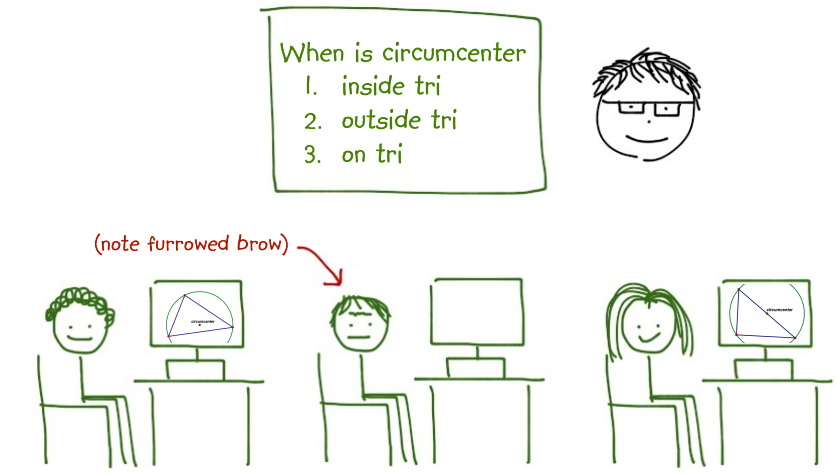

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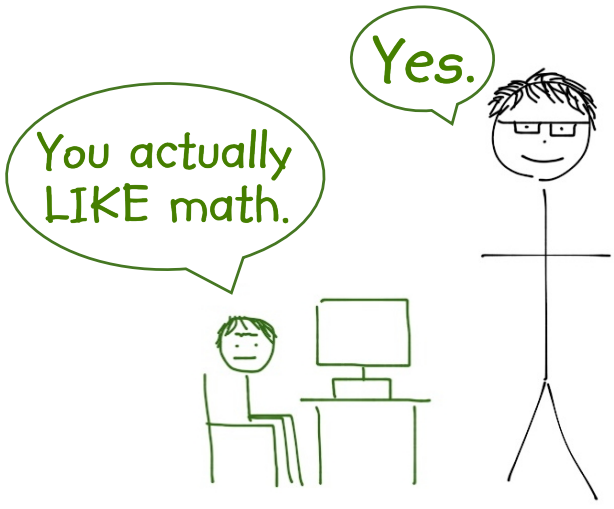

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Three Things We Should Care About More

1. Math

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Story 2: Neyanee and Dominique, 2004 – 4th Graders

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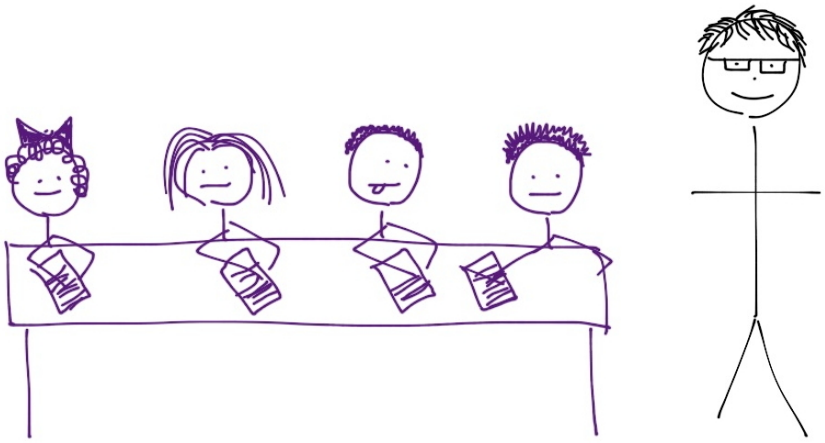

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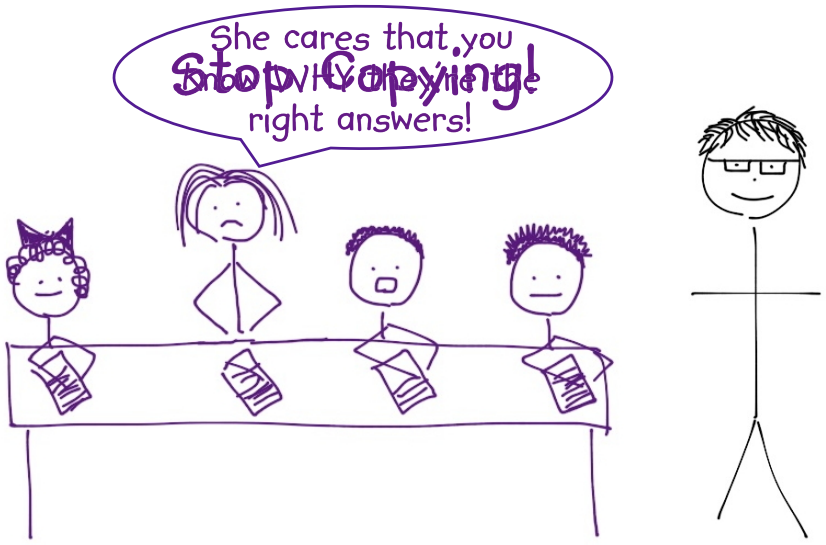

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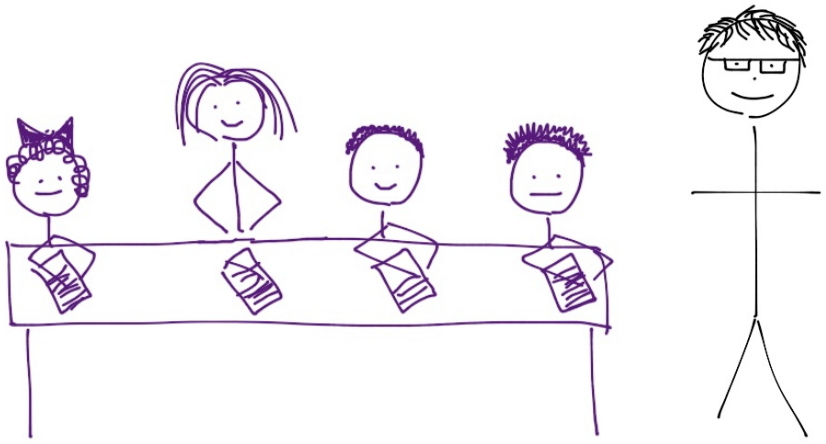

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Three Things We Should Care About More

1. Math
2. The Whys

see my previous Ignite, "Hidden Decisions", for more on this topic

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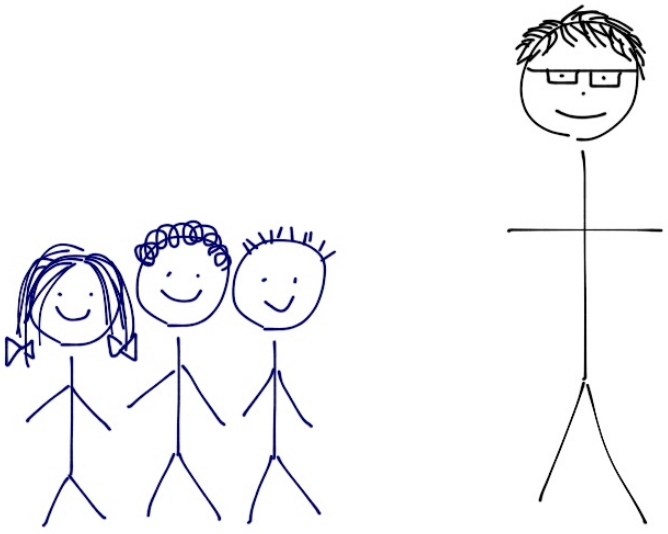
Story 3: The Excited First Graders, 2009



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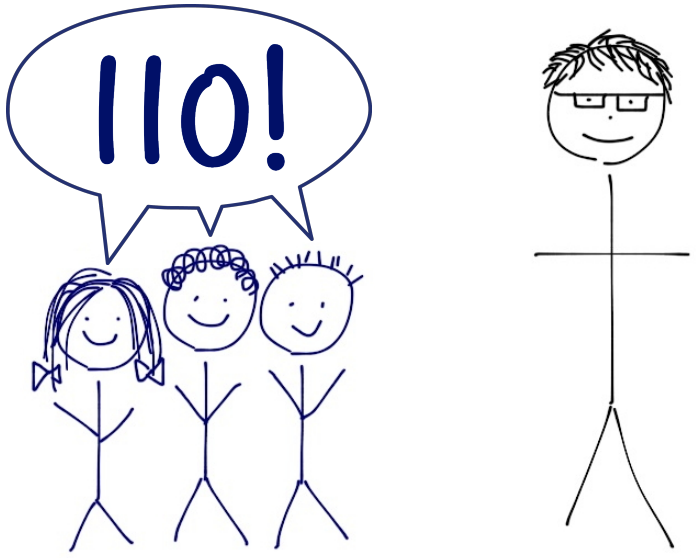

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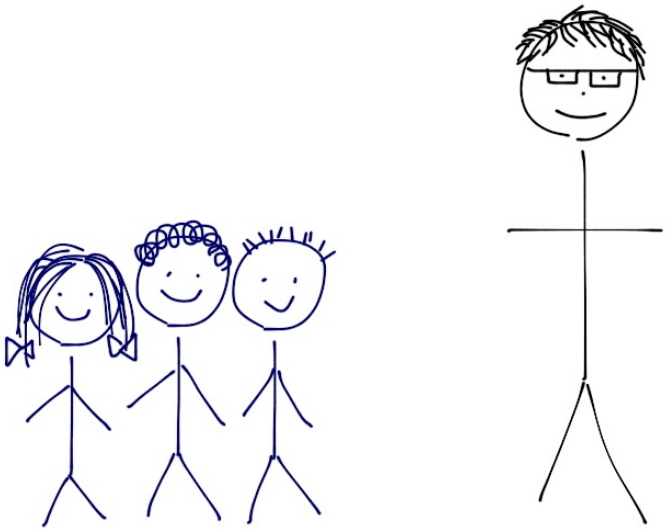

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Three Things We Should Care About More

1. Math
2. The Whys
3. Students' Thinking and Ideas

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Strategies

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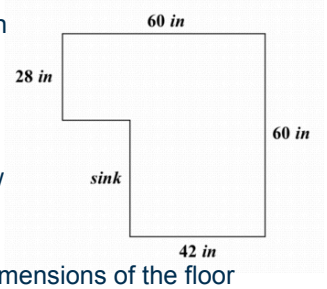
Teresa's Tiles

Teresa is going to put down new ceramic tiles on her bathroom floor. She has selected square tiles that are 4 inches on each side. These are the kind of tiles that can be placed right next to each other without leaving additional space for grout. At The Home Station, she learned how to cut the tiles in case she needs any fractional pieces to cover her floor completely.



This diagram of the bathroom floor shows the dimensions of the floor space she needs to cover. The sink area does not get tiled.

Questions: How many tiles will she need to buy to cover her floor? How many tiles will she have to cut in order to cover the entire space?

Extra: What is the size, using whole numbers, of the largest square tile that could be used to tile the entire floor with no cut pieces?

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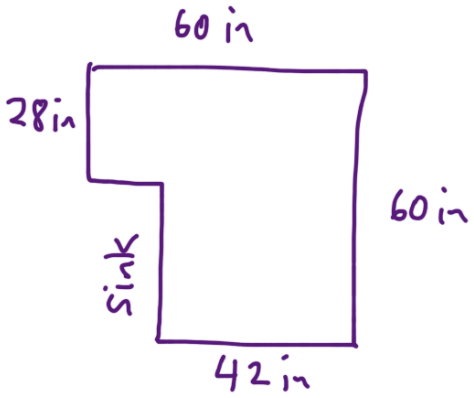
Teresa's Tiles "Scenario"

Instead, just draw the picture on the board and say, "Write down as many things as you can that you notice about this picture."



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Teresa's Tiles "Scenario"

Things that some "low-performing" 8th graders noticed about the picture:

- two sides are equal
- two sides are 60 inches
- one side is 28 inches
- they are longest
- one side is 42 inches
- it used to be a square
- your lines aren't very straight
- the short side of the sink is 18"
- the sink is a rectangle
- the long side of the sink is 32"
- can find the area of the whole thing by making it two pieces

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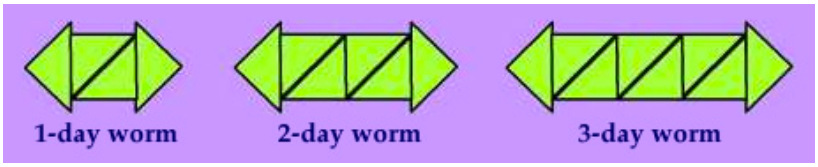
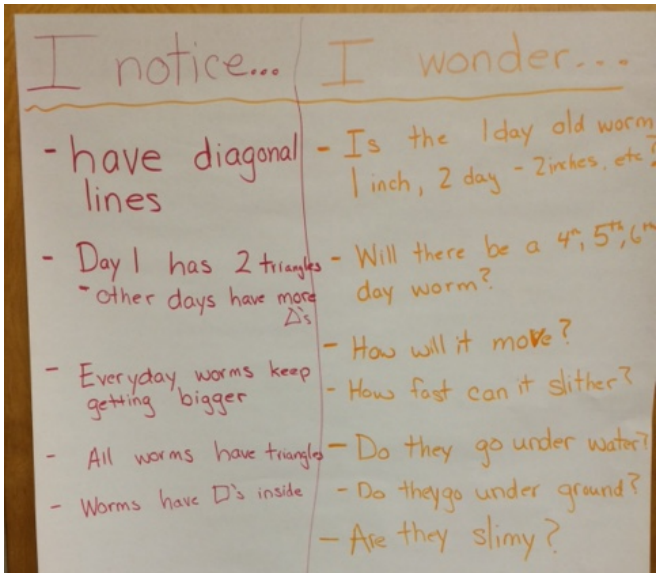
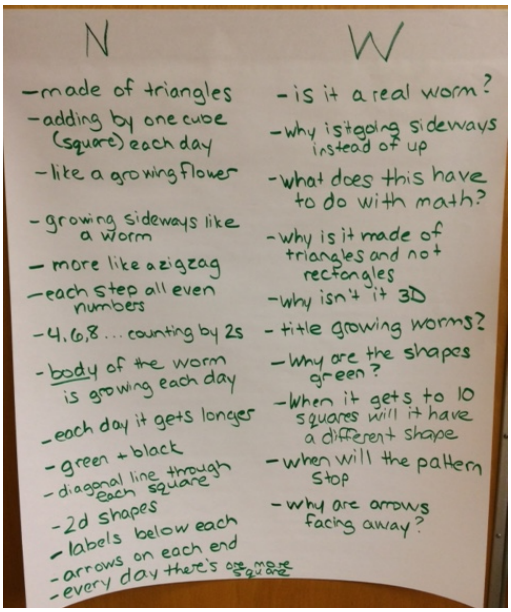
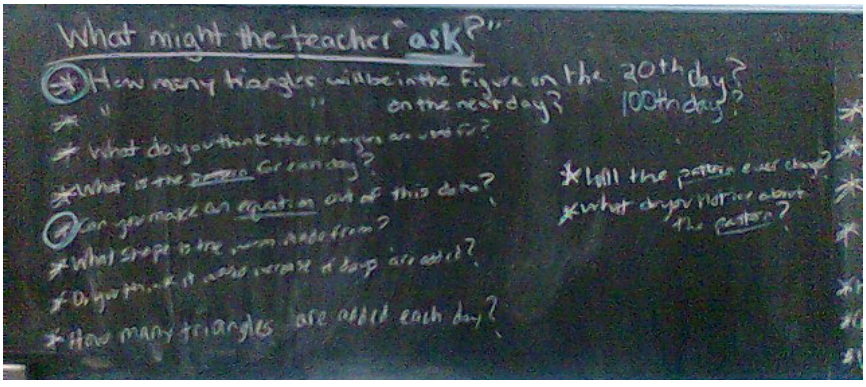
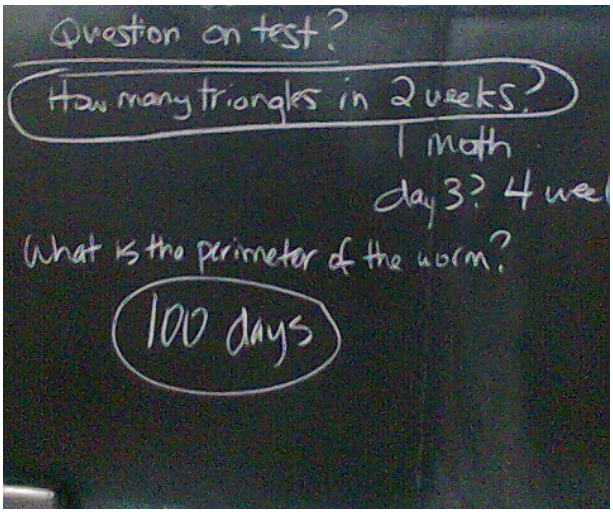
Growing Worms "Scenario"






N
W
-made of triangles
-adding by one cube (square) each day
-like a growing flower
-growing sideways like a worm
-more like a zigzag
-each step all even numbers
-4,6,8... counting by 2s
-body of the worm is growing each day
-each day it gets longer
-green + black
-diagonal line through each square
-2d shapes
-labels below each
-arrows on each end
-every day there's one more square
-is it a real worm?
-why is it going sideways instead of up
-what does this have to do with math?
-why is it made of triangles and not rectangles
-why isn't it 3D
-title growing worms?
-why are the shapes green?
-when it gets to 10 squares will it have a different shape
-when will the pattern stop
-why are arrows facing away?


What might the teacher ask?"
How many triangles will be in the figure on the 20th day?
on the next day?
100th day?
What do you think the triangles are used for?
What is the pattern for each day?
Can you make an equation out of this data?
What shape is the worm made from?
If Do you think it will ever stop if days are added?
How many triangles are added each day?
Will the pattern ever change?
What do you notice about the pattern?



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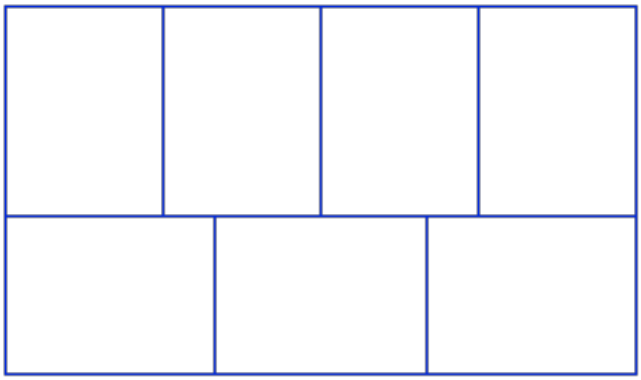
Congruent Rectangles "Scenario"

The seven small rectangles in this picture are congruent.



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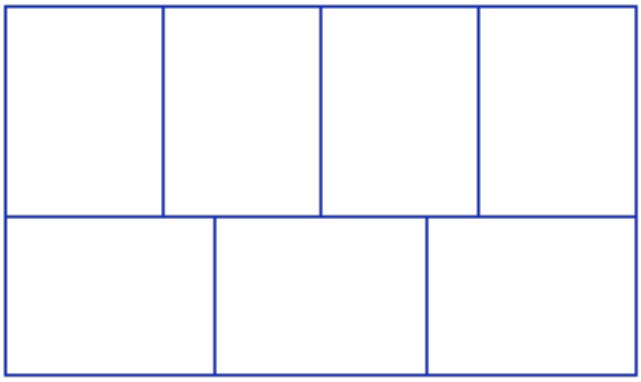
Congruent Rectangles "Scenario"

The seven small rectangles in this picture are congruent.
The area of the large rectangle is 756 square centimeters.



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Noticing and Wondering with Textbooks

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Apple juice costs 50¢. The juice machine accepts quarters, dimes, and nickels.

Mr. Gavin has a ladder that is 100 centimeters tall.
Ms. Cornell has a ladder that is 2 meters tall.

To make a stained glass window, Robert used 16 pieces of glass. Seven of the pieces were red.

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N & W with Textbooks

Apple juice costs 50¢. The juice machine accepts quarters, dimes, and nickels.

I Notice	I Wonder

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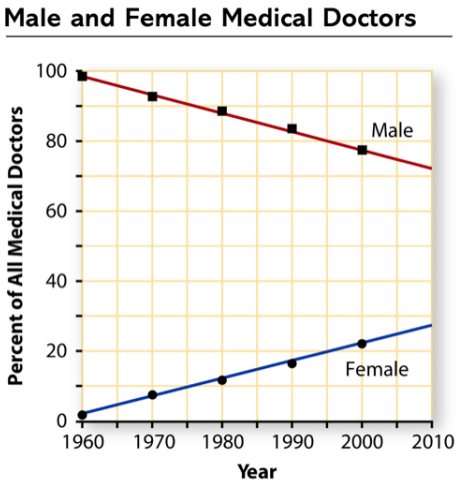
N & W with Textbooks

A store has the floor plan shown. The area of the women's department is

N & W from Textbooks



N & W from Textbooks

Think About This Situation

Study the trends in the percentage of male and female medical doctors in the United States between 1960 and 2000.

a. How would you describe the trends shown in the data plots and the linear models that have been drawn to match patterns in those points?

b. Why do you suppose the percentage of women doctors has been increasing over the past 40 years?

c. Would you expect the trend in the graph to continue 10 or 20 years beyond 2000?

d. How would you go about finding function rules to model the data trends?

e. If you were asked to make a report on future prospects for the percentages of male and female doctors, what kinds of questions could you answer using the linear models?

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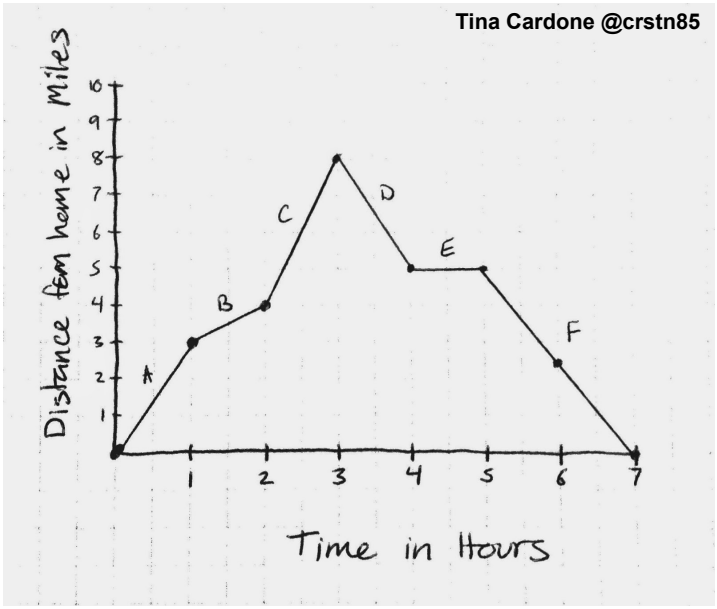

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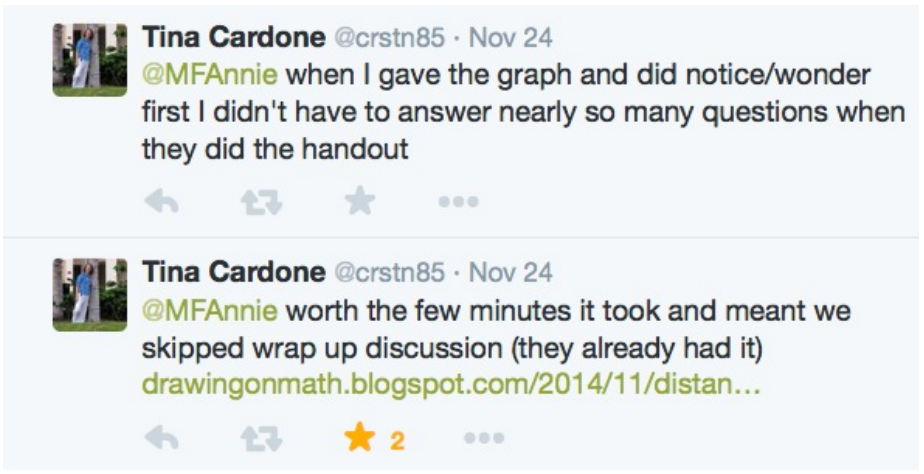

http://drawingonmath.blogspot.com/2014/11/distance-graph.html

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N & W in High School

Max Ray: "A buddy from Twitter Math Camp asked about the value of noticing and wondering for high school. She knew it could be powerful but wondered if colleagues and students would feel it was beneath them. Here are some things I've noticed, and some thoughts about them."

http://mathforum.org/blogs/max/noticing-and-wondering-in-high-school/

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Math Coaches Using N & W

"It's hard for me to believe that I've spent most of my teaching career in complete ignorance of noticing and wondering. This simple, elegant prompt has become an integral part of my practice, and its use is spreading throughout the school. Here are some examples from the past month."

http://exit10a.blogspot.com/2015/01/noticing-and-wondering-sampler.html

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Math Coaches Using N & W

"I love this strategy and use it in ALL subjects, not just math. In Washington County [MD] MANY of our elementary teachers use this strategy and can give you testimonials about it. We use this strategy from our Cubs (age 3) all the way through our elementary grades."

http://bbrandenburg.blogspot.com/2015/07/the-noticing-and-wondering-revolution.html

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It's Natural!

Is this One More Thing?

Go forth and Notice and Wonder

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