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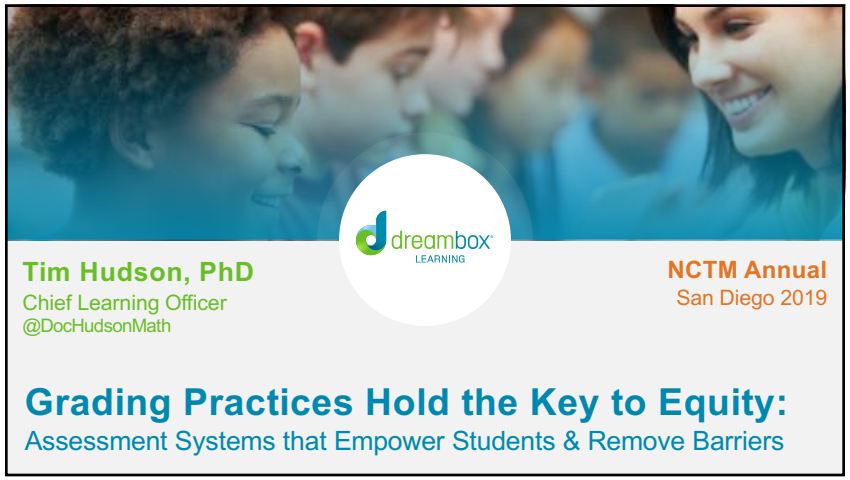

Access & Equity

Grading policies are overlooked as a leading cause of inequity because the ways they disadvantage students are unintentional and hard to detect.

When we report proficiency without percentages, we can improve achievement, rigor, and differentiation.

The Problem is the Grading System

The final exam for Math 96 ["developmental math"] would make up 35 percent of the total grade, and as the day of the test approached, Mr. de Jesus knew that with the demerits he would face for his poor attendance and his unfinished homework, there was little chance he would pass.

On the morning of the exam, he didn't show up, and he failed the class for the third time. As it happened, more than 40 percent of the students in the class also failed.

Community College Students Face a Very Long Road to Graduation by Ginia Bellafonte, NY Times, October 5, 2014

Levi Patrick @_levi_ · Apr 1

Paul LeMahieu: Collegiate level developmental math is truly where dreams go to die. // Dang.
#assm2017 #statemathleaders

It's not the students' fault.

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Bad Math in Grading Practices

- Over-weighted final exam
- Likely use of arithmetic mean
- Penalties unrelated to content achievement
  - Attendance is not a proxy for understanding
  - A zero means evidence of learning was not collected
- Thinking, "I don't weight my grades… I just use 'Total Points'."

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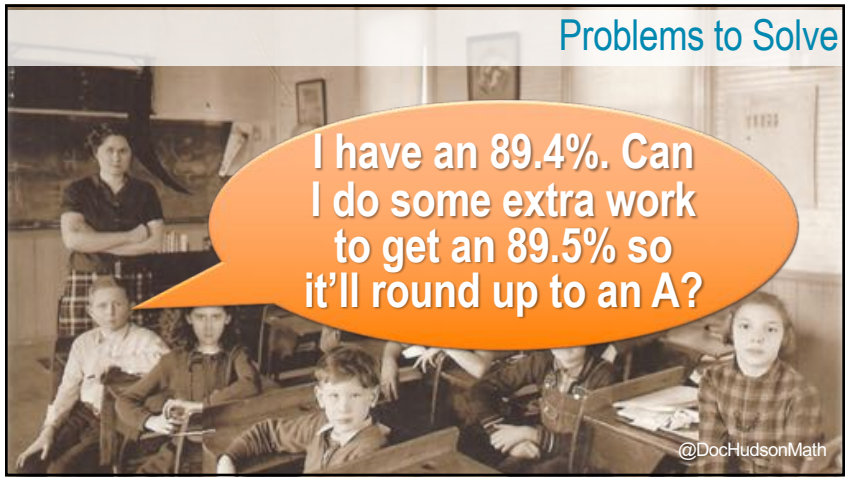

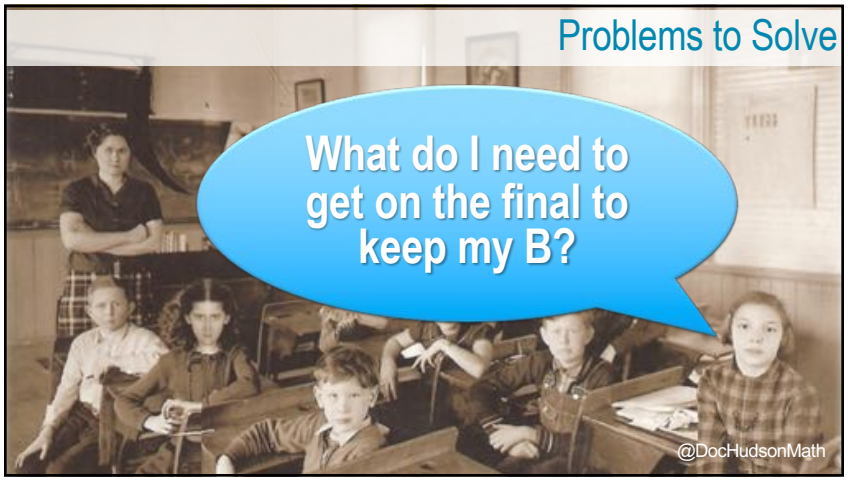

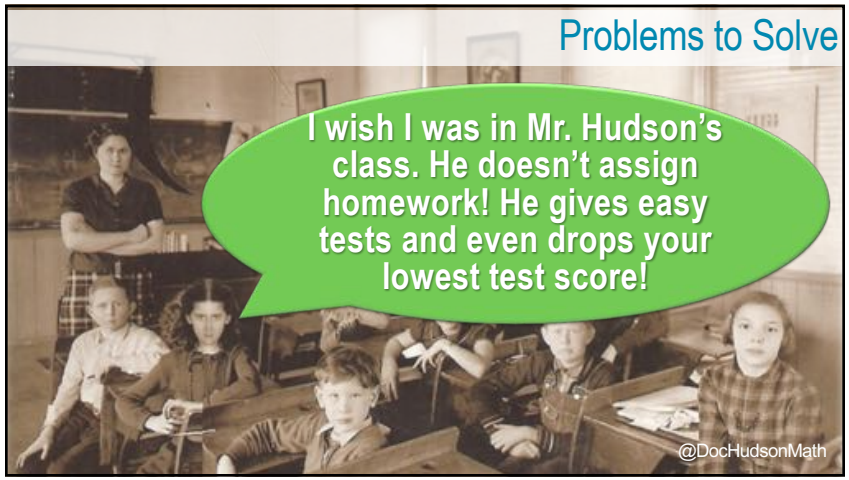

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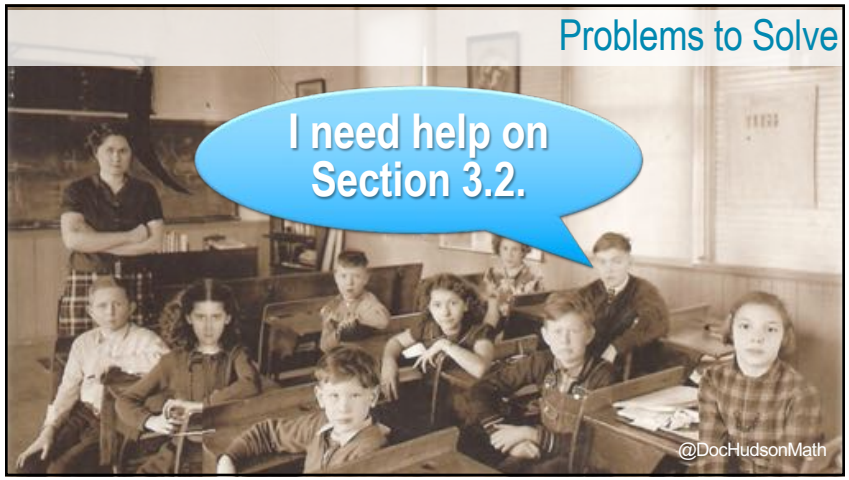

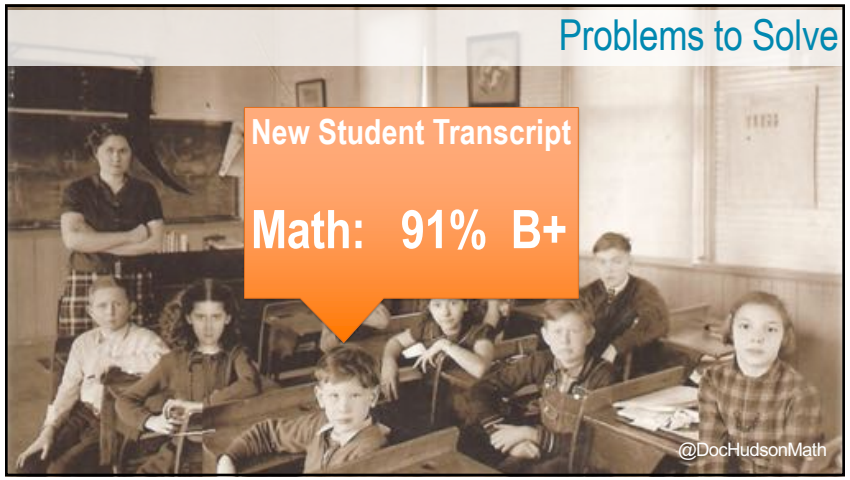

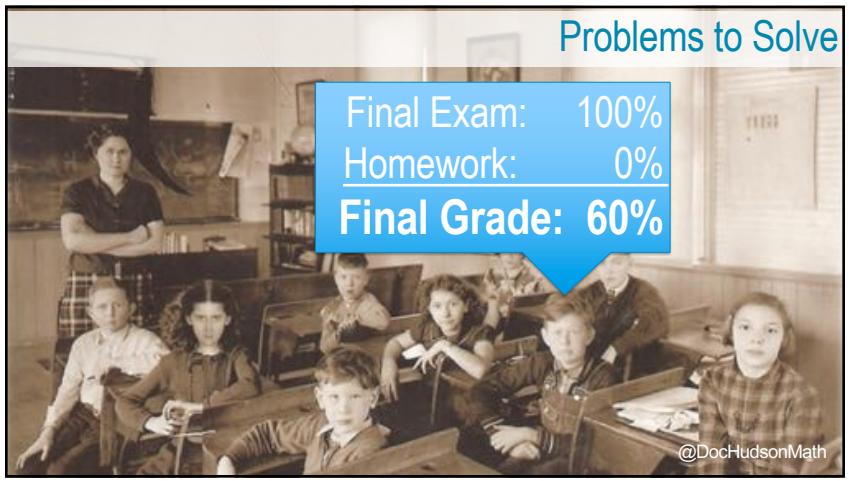

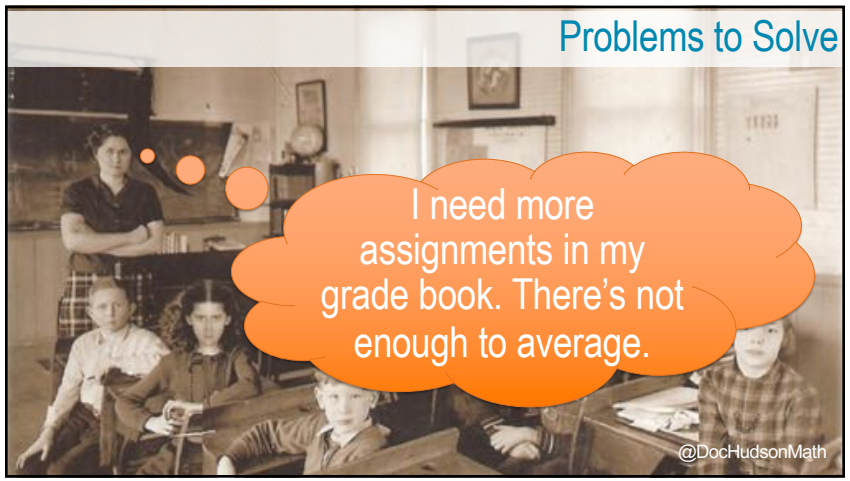

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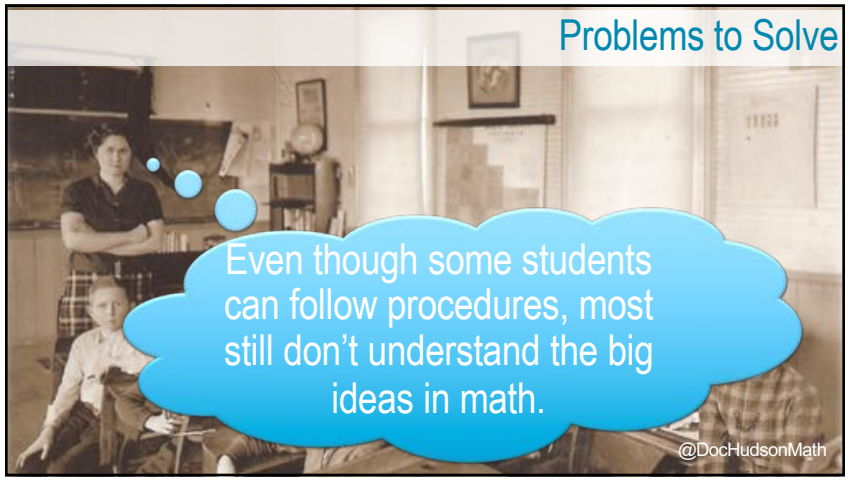

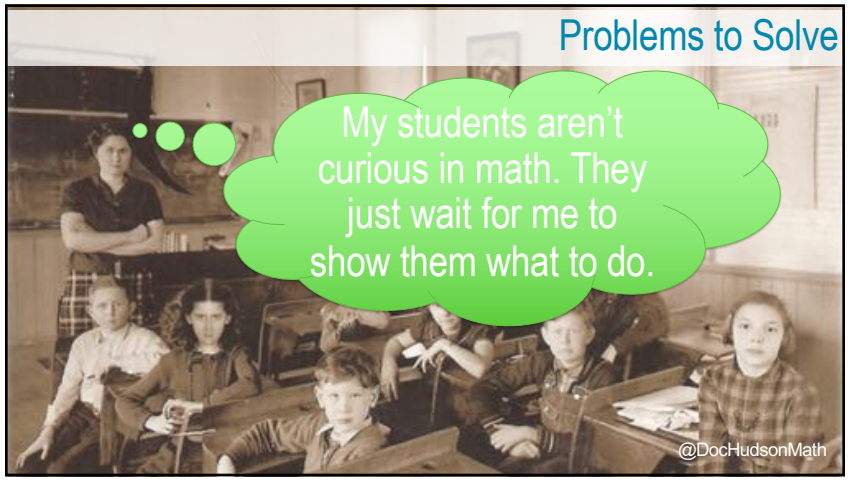

You Can't Always Get What You Want

Unless It's Assessed

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You Can Try Sometimes But You Will Find

You Get What You Test

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Math gradebooks are recording & reporting the wrong things.

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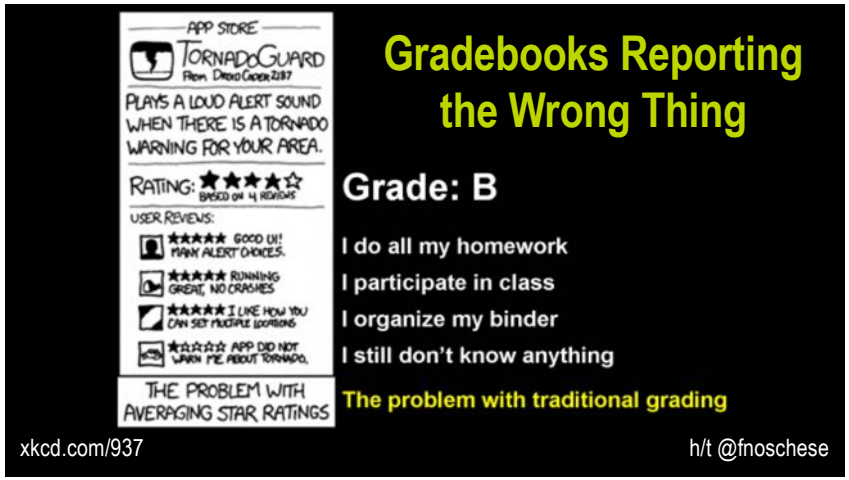

Course Grades vs State End of Course Exams

	Below Basic	Basic	Proficient	Advanced
Algebra 1A Grade	7 **1%**	94 **18%**	303 **58%**	118 **23%**
A	0	0	57	49
B	**1**	**20**	116	40
C	**1**	31	**83**	**20**
D	3	32	**33**	**8**
F	2	11	**14**	**1**

	Below Basic	Basic	Proficient	Advanced
Algebra 1B Grade	68 **18%**	220 **59%**	84 **23%**	2 **0.5%**
A	**2**	**18**	23	1
B	**6**	**61**	28	0
C	**16**	60	**22**	**1**
D	23	63	**6**	0
F	21	18	**5**	0

Assessing the Wrong Goals
+ Poor Feedback (Percentages)

Low Achievement

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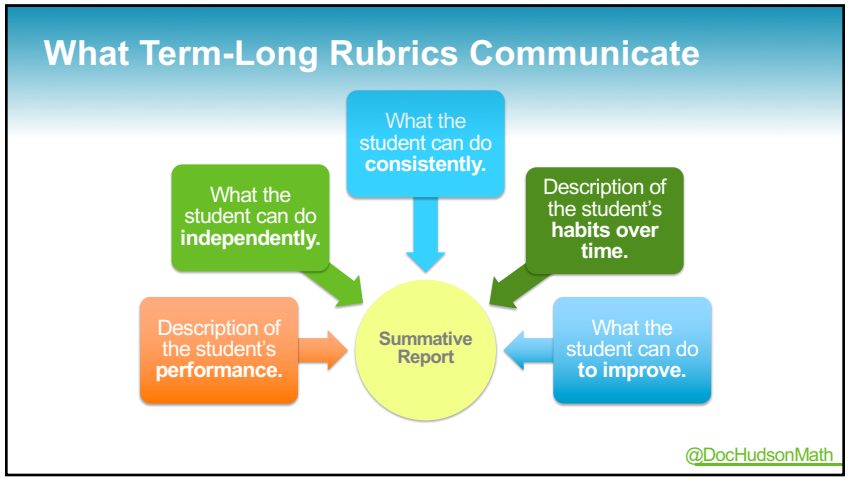

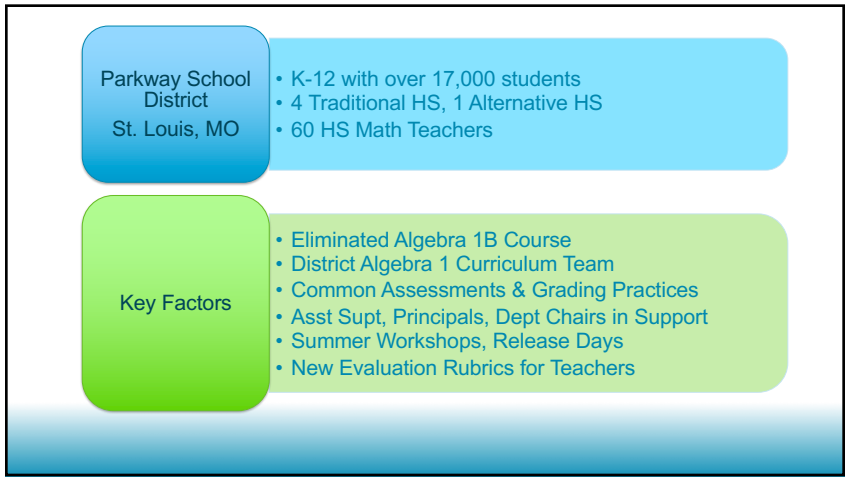

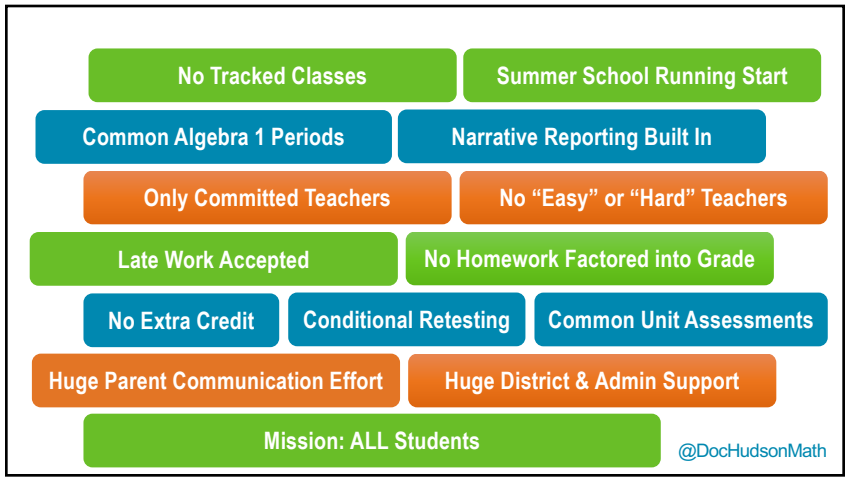

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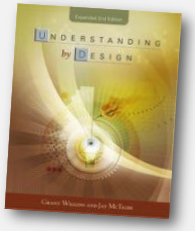
Plan "Backwards"

1. Identify desired results
2. Determine acceptable evidence
3. Plan learning experiences & instruction



Understanding by Design, Wiggins & McTighe, ©2005

Math Program Design

- Define Goals & Clarify Outcomes
- Design Reports with Meaningful Feedback
- Develop Assessments & Grading System
- Ensure Print & Digital Resource Alignment

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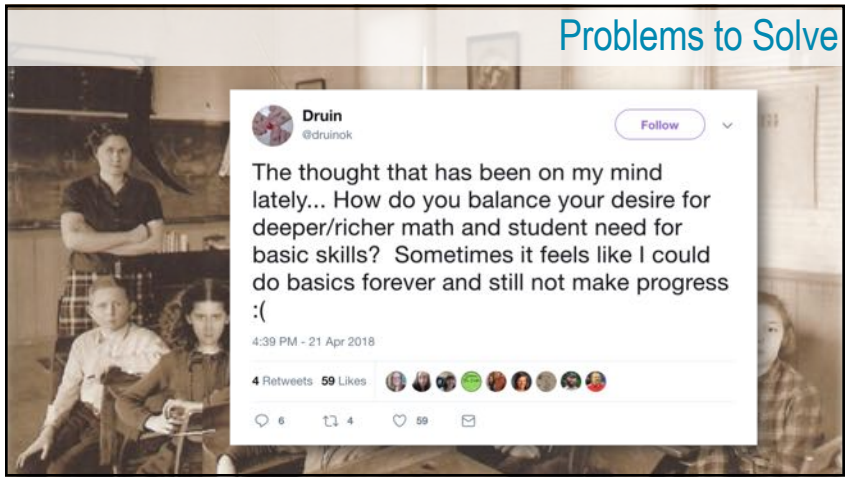
Problems to Solve



Learning Outcomes: A-M-T

Acquire Knowledge and Skills	Make Meaning	Transfer
Information	Concepts	Independent Use
Facts	Ideas	Unfamiliar Situations
Procedures	Contexts	
	Situations	

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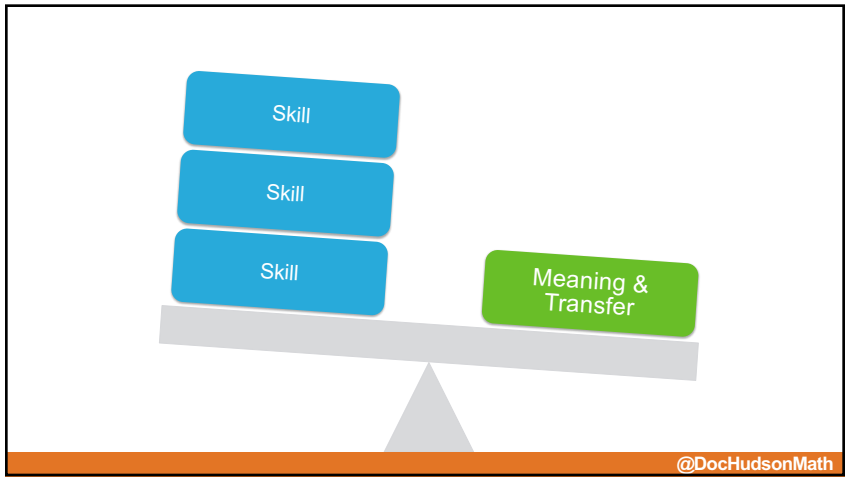

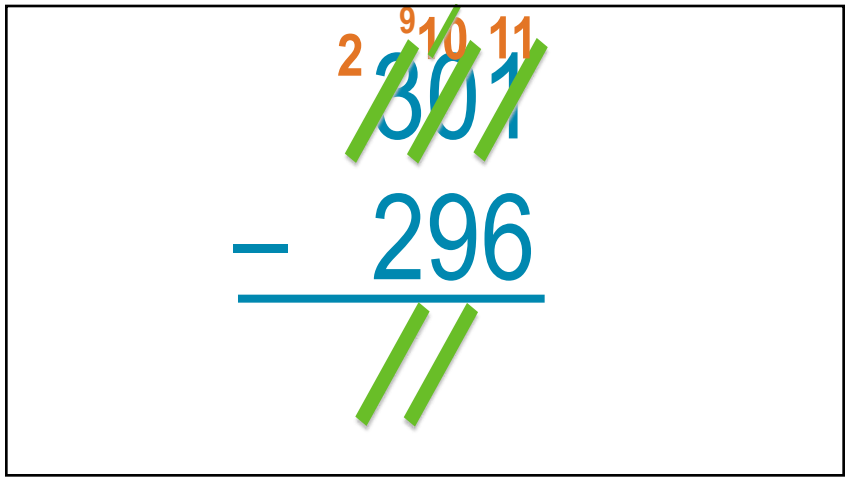

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Do you want students to be able to…

Acquisition	Meaning & Transfer
compute mean, median, and mode?	justify which measure is best for the situation?
know how to calculate the slope of a line?	estimate rates of change in multiple situations?
know their 12 x 12 "facts?"	compute 13 x 12 mentally?

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Do our students know we want all of these outcomes?

Acquisition
Meaning & Transfer
compute mean, median, and mode?
know which measure is best for the situation?
know how to calculate the slope of a line?
estimate rates of change in multiple situations?
know their 12 x 12 "facts?"
not grab a pencil or calculator to solve 13 x 12?
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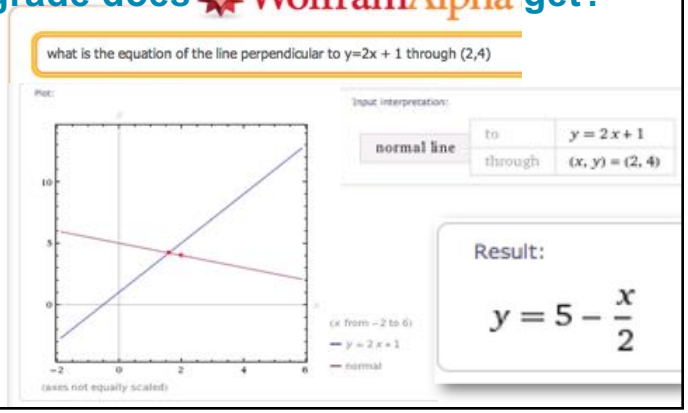
Not if they get excited by PhotoMath

© Photomath

What grade does WolframAlpha get?



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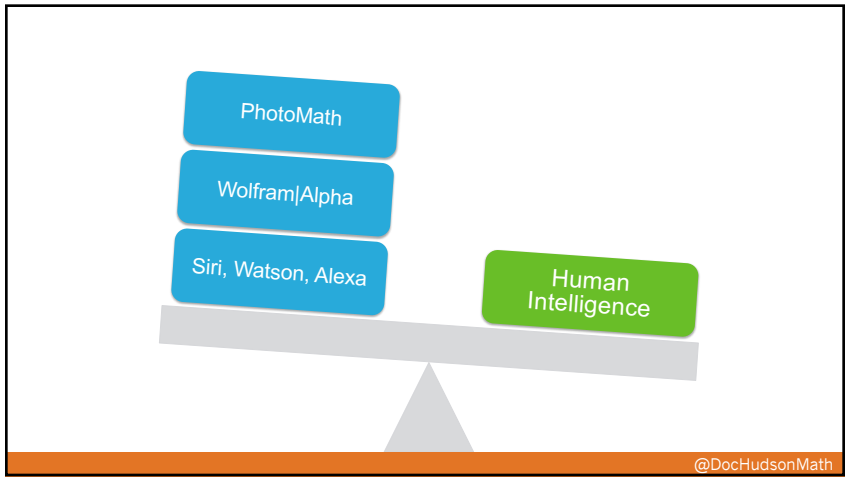
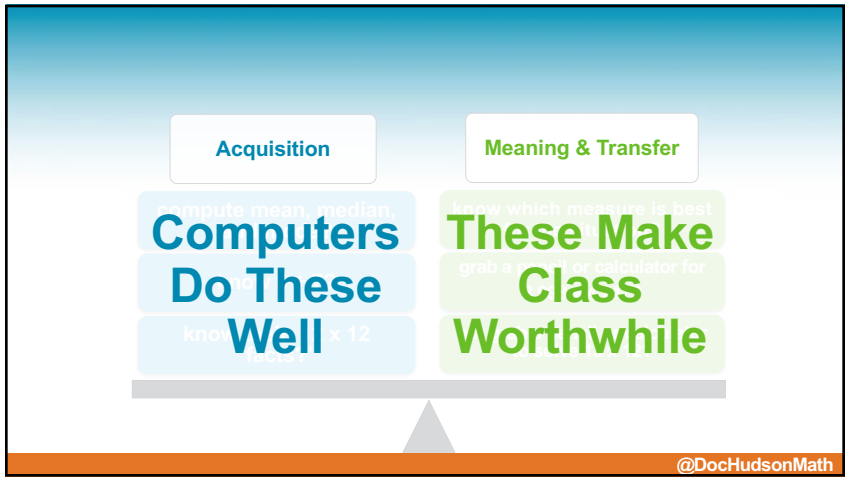
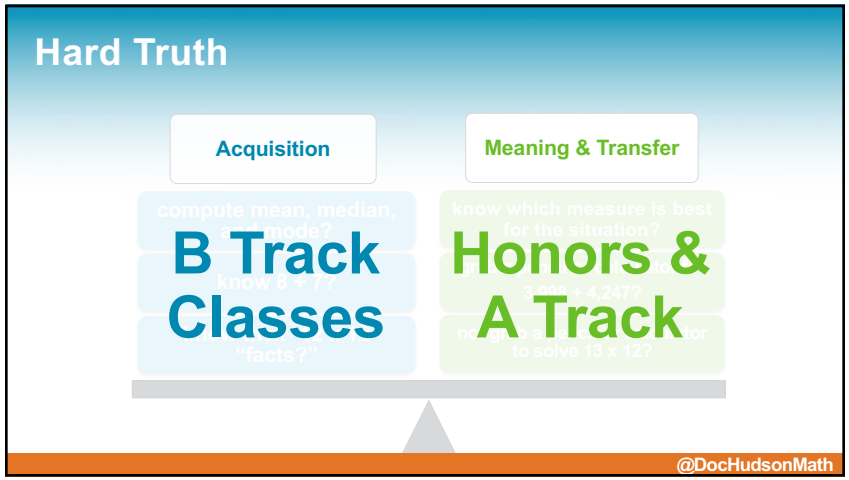
"If a student feels that she or he has learned nothing that cannot be pulled directly from Wolfram|Alpha, then the course really has been a waste of time."

David Bressoud, www.maa.org/columns







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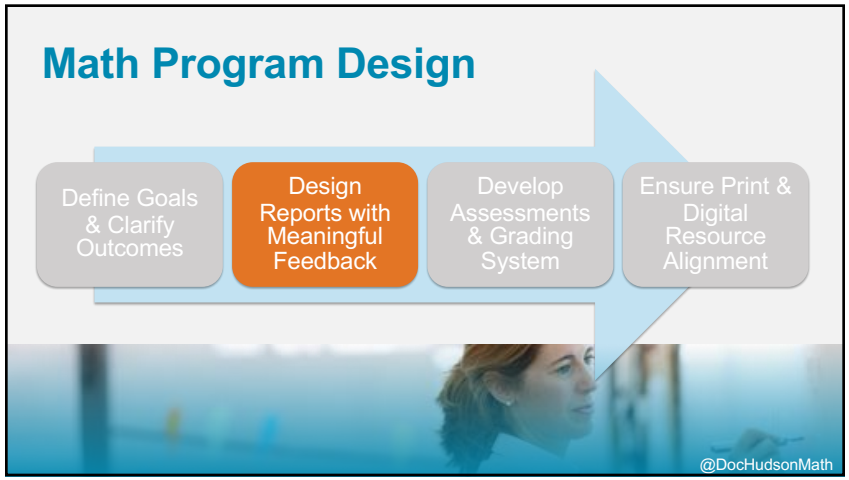

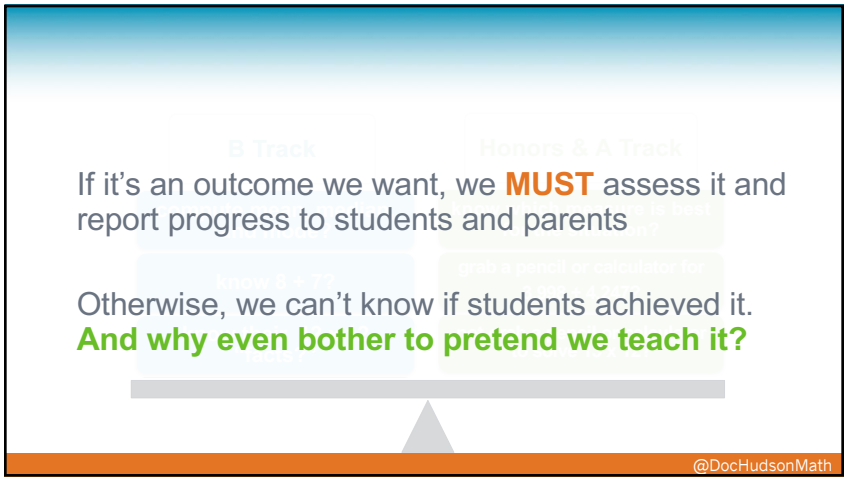

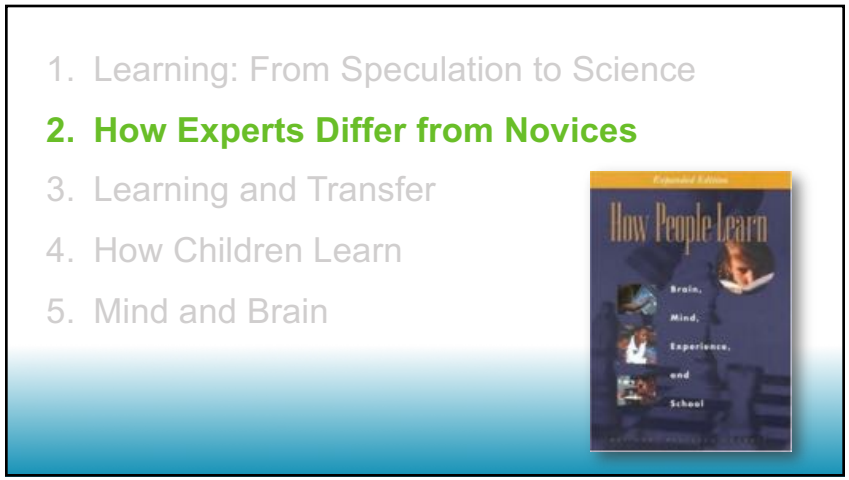

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1. If it matters at all, it is detectable or observable
2. If it is detectable, it can be detected as an amount (or a range of possible amounts)
3. If it can be detected as a range of possible amounts, it is measurable

How to Measure Anything, D.W. Hubbard

For any outcome you want for your students, you can build a Novice-Expert rubric for it

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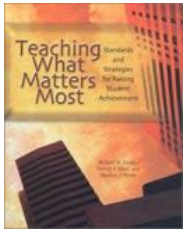
A Rubric for Thought

	Expert	Practitioner	Apprentice	Novice
Inquiry				
Knowledge Acquisition				
Problem Solving				
Communication				
Reflection				



Teaching What Matters Most by Strong, Silver, and Perini, © 2001, p. 58

Problem Solving Rubric

Expert	Practitioner	Developing	Novice
Is constantly looking for and posing relevant questions. Experiments with a variety of solutions and perspectives	Understands there is more than one way to attack a problem Surveys own understanding to determine progress toward solution	Accepts problems on their own terms (e.g., rarely restates them to make them more meaningful); Often generates only one or two obvious solutions	Avoids difficult problems & rarely questions ideas Looks for convenient solutions

Teaching What Matters Most by Strong, Silver, and Perini, © 2001, p. 58

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Transfer: Measures of Central Tendency

Expert	Proficient	Developing	Novice
Apply new and unfamiliar statistical measures (or invent new ones) to make predictions and draw conclusions.	**Justify the most appropriate statistical measures** of center to make predictions and draw conclusions.	**Apply** mean, median, mode, and range to solve problems and make predictions. **(MO State Standard)**	**Compute** mean, median, mode, and range given a data set.

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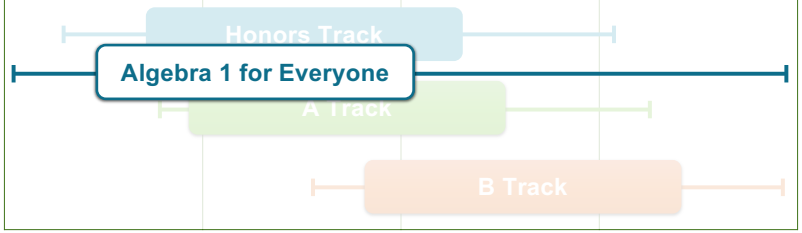
A New Paradigm

Expert	Proficient	Developing	Novice



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Meaning Making: Function Properties

Expert	Proficient	Developing	Novice
Given tables, graphs, or equations of **unfamiliar non-linear functions**, determine and define properties of those functions.	Given a table, graph, or equation, **classify** a function as **linear, quadratic, or exponential** and justify your answer.	Given a table, graph, or equation, **classify** a function as **linear or non-linear** and justify your answer. (**MO State Standard**)	Given a table or graph, classify a relationship as a **function or non-function** and justify your answer.

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Skill: Factoring Polynomials

Expert	Proficient	Developing	Novice
Factor polynomials with **more than three terms, more than one variable, or a degree higher than two**.	**Completely factor** any given **quadratic** expression. **(MO State Standard)**	Factor trinomials with a **leading coefficient of one**.	Factor out a **Greatest Common Factor** (GCF) from any polynomial.

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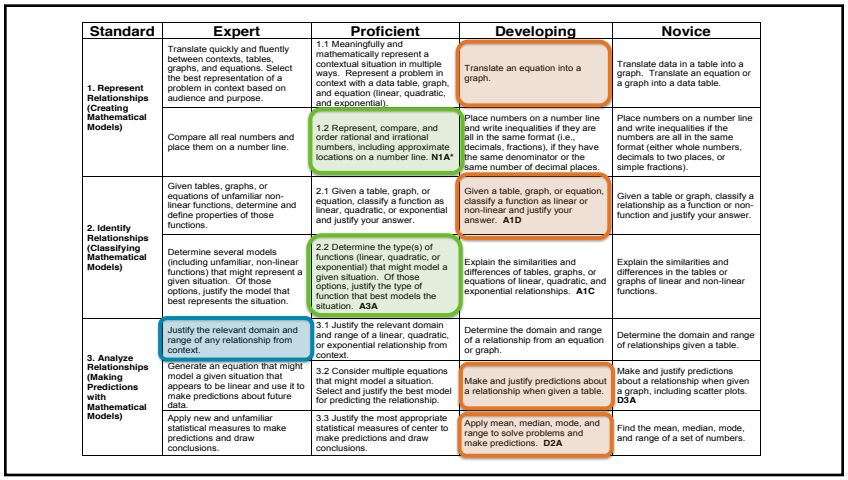
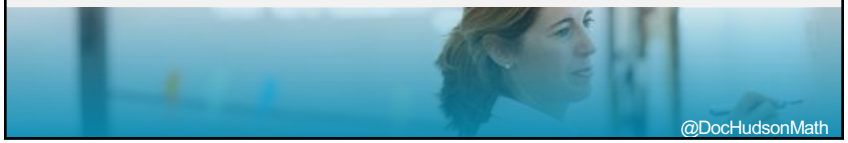


Standard	Expert	Proficient	Developing	Novice
1. Represent Relationships (Creating Mathematical Models)	Translate quickly and fluently between contexts, tables, graphs, and equations. Select the best representation of a problem in context based on audience and purpose.	1.1 Meaningfully and mathematically represent a contextual situation in multiple ways. Represent a problem in context with a data table, graph, and equation (linear, quadratic, and exponential).	Translate an equation into a graph.	Translate data in a table into a graph. Translate an equation or a graph into a data table.
	Compare all real numbers and place them on a number line.	1.2 Represent, compare, and order rational and irrational numbers, including approximate locations on a number line. **N1A***	Place numbers on a number line and write inequalities if they are all in the same format (i.e., decimals, fractions), if they have the same denominator or the same number of decimal places.	Place numbers on a number line and write inequalities if the numbers are all in the same format (either whole numbers, decimals to two places, or simple fractions).
2. Identify Relationships (Classifying Mathematical Models)	Given tables, graphs, or equations of unfamiliar non-linear functions, determine and define properties of those functions.	2.1 Given a table, graph, or equation, classify a function as linear, quadratic, or exponential and justify your answer.	Given a table, graph, or equation, classify a function as linear or non-linear and justify your answer. **A1D**	Given a table or graph, classify a relationship as a function or non-function and justify your answer.
	Determine several models (including unfamiliar, non-linear functions) that might represent a given situation. Of those options, justify the model that best represents the situation.	2.2 Determine the type(s) of functions (linear, quadratic, or exponential) that might model a given situation. Of those options, justify the type of function that best models the situation. **A3A**	Explain the similarities and differences of tables, graphs, or equations of linear, quadratic, and exponential relationships. **A1C**	Explain the similarities and differences in the tables or graphs of linear and non-linear functions.
3. Analyze Relationships (Making Predictions with Mathematical Models)	Justify the relevant domain and range of any relationship from context.	3.1 Justify the relevant domain and range of a linear, quadratic, or exponential relationship from context.	Determine the domain and range of a relationship from an equation or graph.	Determine the domain and range of relationships given a table.
	Generate an equation that might model a given situation that appears to be linear and use it to make predictions about future data.	3.2 Consider multiple equations that might model a situation. Select and justify the best model for predicting the relationship.	Make and justify predictions about a relationship when given a table. **D3A**	Make and justify predictions about a relationship when given a graph, including scatter plots.
	Apply new and unfamiliar statistical measures to make predictions and draw conclusions.	3.3 Justify the most appropriate statistical measures of center to make predictions and draw conclusions.	Apply mean, median, mode, and range to solve problems and make predictions. **D2A**	Find the mean, median, mode, and range of a set of numbers.

Imagine sharing this level of insight with a parent or receiving this level of detail when a new student transfers into your class.

Key Points for Rubric-Based Reports

1. Avoid negatives: "The student ~~can't~~ **can**…"
2. Give to students & parents at the beginning of the term
3. Expect Novice for Content, but not for Process Standards
4. Don't use to create "ability" groups. Engage rich tasks together.



Math Program Design

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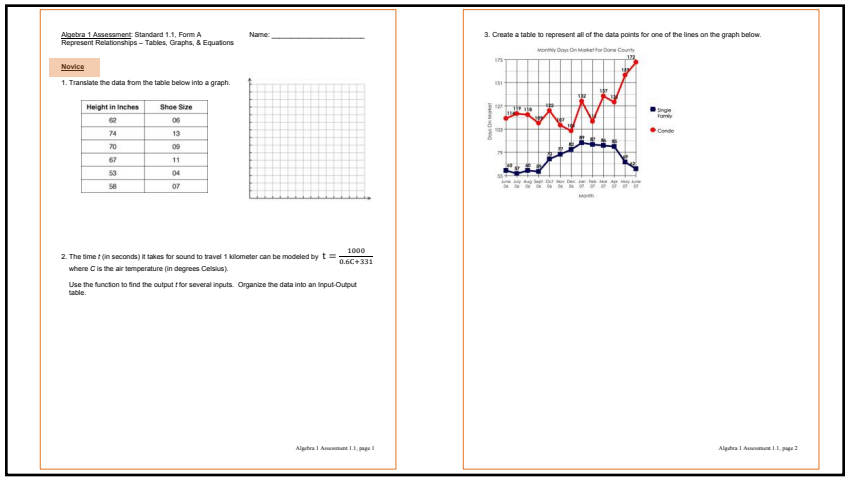
Creating the Tests

1. Rubrics described the exact types of problems to find or create.
2. Every test has 4 sections with problems for each rubric category
3. Students were required to answer all items in all categories



Algebra 1 Assessment: Standard 1.1, Form A
Represent Relationships – Tables, Graphs, & Equations

Name: _____

Novice

1. Translate the data from the table below into a graph.

Height in Inches	Shoe Size
62	06
74	13
70	09
67	11
53	04
58	07

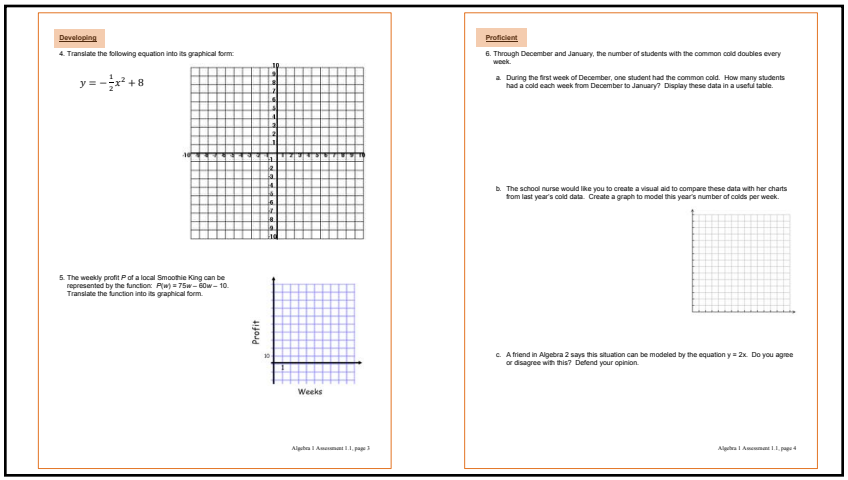
2. The time *t* (in seconds) it takes for sound to travel 1 kilometer can be modeled by $t = \frac{1000}{0.6C + 331}$ where *C* is the air temperature (in degrees Celsius).

Use the function to find the output *t* for several inputs. Organize the data into an Input-Output table.

Algebra 1 Assessment 1.1, page 1

3. Create a table to represent all of the data points for one of the lines on the graph below.

Algebra 1 Assessment 1.1, page 2



Developing

4. Translate the following equation into its graphical form:

$y = -\frac{1}{2}x^2 + 8$

5. The weekly profit *P* of a local Smoothie King can be represented by the function: $P(w) = 75w - 60w - 10$. Translate the function into its graphical form.

Profit

Weeks

Algebra 1 Assessment 1.1, page 3

Proficient

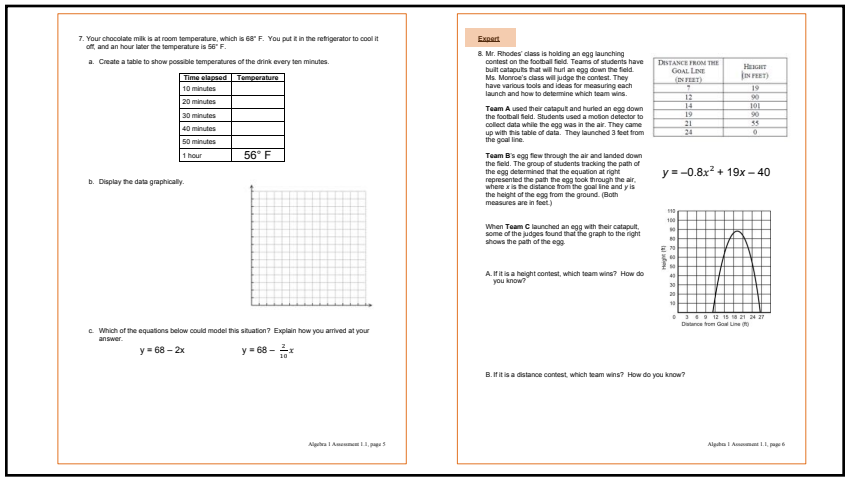
6. Through December and January, the number of students with the common cold doubles every week.

a. During the first week of December, one student had the common cold. How many students had a cold each week from December to January? Display these data in a useful table.

b. The school nurse would like you to create a visual aid to compare these data with her charts from last year's cold data. Create a graph to model this year's number of colds per week.

c. A friend in Algebra 2 says this situation can be modeled by the equation y = 2x. Do you agree or disagree with this? Defend your opinion.

Algebra 1 Assessment 1.1, page 4



7. Your chocolate milk is at room temperature, which is 68° F. You put it in the refrigerator to cool it off, and an hour later the temperature is 56° F.

a. Create a table to show possible temperatures of the drink every ten minutes.

Time elapsed	Temperature
10 minutes	
20 minutes	
30 minutes	
40 minutes	
50 minutes	
1 hour	56° F

b. Display the data graphically.

c. Which of the equations below could model this situation? Explain how you arrived at your answer.

$y = 68 - 2x$ $y = 68 - \frac{2}{10}x$

Algebra 1 Assessment 1.1, page 5

Expert

8. Mr. Rhodes' class is holding an egg launching contest on the football field. Teams of students have built catapults that will hurl an egg down the field. Ms. Monroe's class will judge the contest. They have various tools and ideas for measuring each launch and how to determine which team wins.

Team A used their catapult and hurled an egg down the football field. Students used a motion detector to collect data while the egg was in the air. They came up with this table of data. They launched 3 feet from the goal line.

Distance from the Goal Line (in feet)	Height (in feet)
3	19
12	90
14	101
19	90
21	4.5
24	0

Team B's egg flew through the air and landed down the field. The group of students tracking the path of the egg determined that the equation at right represented the path the egg took through the air, where *x* is the distance from the goal line and *y* is the height of the egg from the ground. (Both measures are in feet.)

$y = -0.8x^2 + 19x - 40$

When **Team C** launched an egg with their catapult, some of the judges found that the graph to the right shows the path of the egg.

Height (ft)

Distance from Goal Line (ft)

A. If it is a height contest, which team wins? How do you know?

B. If it is a distance contest, which team wins? How do you know?

Algebra 1 Assessment 1.1, page 6

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No Percentages. No D's or F's. No Curves.

Ratings	Number of Ratings (out of 11) Determined the Semester Grade			
	A	B	C	Retake 1st Semester
Expert	At least 5	--	--	--
Proficient	--	--	--	--
Developing	0	2 or fewer	4 or fewer	More than 4
Novice	0	0	0	Any

To help understand this assessment system, here are a few examples:

- 3 Expert ratings, 4 Proficient, and 4 Developing - Semester Grade is a C
- 2 Expert rating, 7 Proficient, and 2 Developing - Semester Grade is a B
- 7 Expert ratings, 2 Proficient, and 2 Developing - Semester Grade is a B

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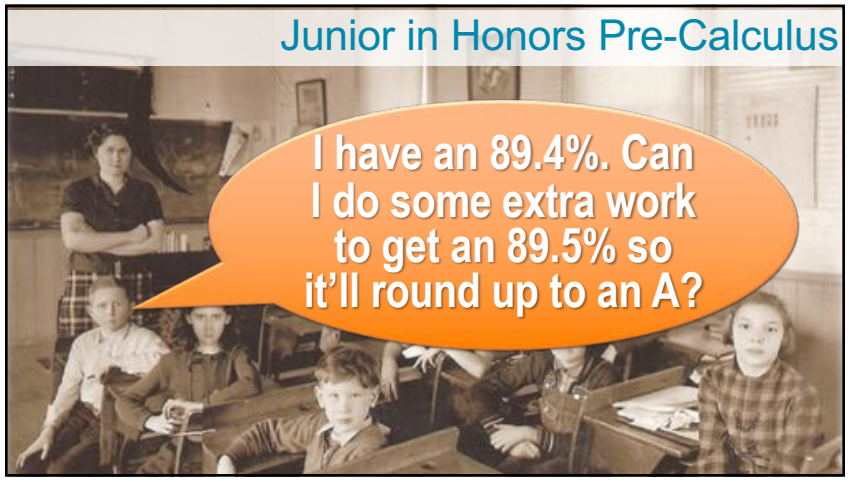
Semester Final Exam

Every student is tested on 4 of the 11 standards
- Student chooses 2
- Teacher chooses 2



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When you change the assessment and reporting system, you change the conversation with students, teachers, and parents.

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Alternate Approach: 15-item Test

	Expert	Proficient	Developing	Novice	Total
Items *Completely* Correct					
Total Items	2	3	5	5	15

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First Trimester # Correct Items 30 Total Test Items 4 Expert 6 Proficient 10 Developing 10 Novice		Combined Number of Proficient AND Expert Items Completely Correct (out of 10)					
		10	9	7-8	5-6	3-4	< 3
Combined Number of Novice AND Developing Items Completely Correct (out of 20)	18-20	A	A	B	B	C	N
	16-17	A	B	B	C	C	N
	14-15	B	B	C	C	N	N
	12-13	B	C	C	N	N	N
	10-11	C	C	N	N	N	N
	< 10	N	N	N	N	N	N

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First Trimester # Correct Items 30 Total Test Items 4 Expert 6 Proficient 10 Developing 10 Novice		Combined Number of Proficient AND Expert Items Completely Correct (out of 10)					
		10	9	7-8	5-6	3-4	< 3
Combined Number of Novice AND Developing Items Completely Correct (out of 20)	18-20	28-30	29	25-28	23-26	21-24	N
	16-17	26-27	25-26	23-25	21-23	19-21	N
	14-15	24-25	23-24	21-23	19-21	N	N
	12-13	22-23	21-22	19-21	N	N	N
	10-11	20-21	19-20	N	N	N	N
	< 10	N	N	N	N	N	N

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First Trimester # Correct Items 30 Total Test Items 4 Expert 6 Proficient 10 Developing 10 Novice		Combined Number of Proficient AND Expert Items Completely Correct (out of 10)					
		10	9	7-8	5-6	3-4	< 3
Combined Number of Novice AND Developing Items Completely Correct (out of 20)	18-20	93-100%	90-97%	83-93%	77-87%	70-80%	< 77%
	16-17	87-90%	83-87%	77-83%	70-77%	63-70%	< 67%
	14-15	80-83%	77-83%	70-77%	63-70%	< 63%	< 60%
	12-13	73-77%	70-73%	63-70%	< 63%	< 57%	N
	10-11	67-70%	63-67%	57-63%	< 57%	N	N
	< 10	< 67%	< 63%	< 60%	N	N	N

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Transfer: Curious Learners (Skepticism)

Expert	Proficient	Developing	Novice
When presented with questions, I question the underlying assumptions and perspective of the questioner to find deeper meaning.	When I am presented with a problem or new information, I ask questions to determine its meaning and begin reasoning to assess validity and credibility.	I often trust what I hear or read, but if something sounds really weird, I ask questions to learn more.	I immediately accept what is presented. I want an easy answer or method, so I can mindlessly use it forever.

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Assessing Questions

East High School has been recording the number of 12th graders who drop out of school before earning a diploma. The principal of East High School has asked you to help her reduce the number of students who drop out of school. She gives you this data table:

Dropping Out at East High School in 12th Grade from 2001-2011

School Year	2001-02	02-03	03-04	04-05	05-06	06-07	07-08	08-09	09-10	10-11
Number of Seniors who Dropped Out	21	24	25	48	24	27	25	28	32	30

1. Write two questions you would ask the principal at East High School about these dropout data.

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