

Authentic CTE Assessment In Common Core

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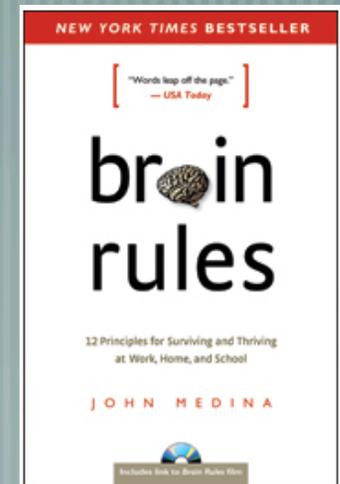
About Us

— [Who are you?

Finish this sentence

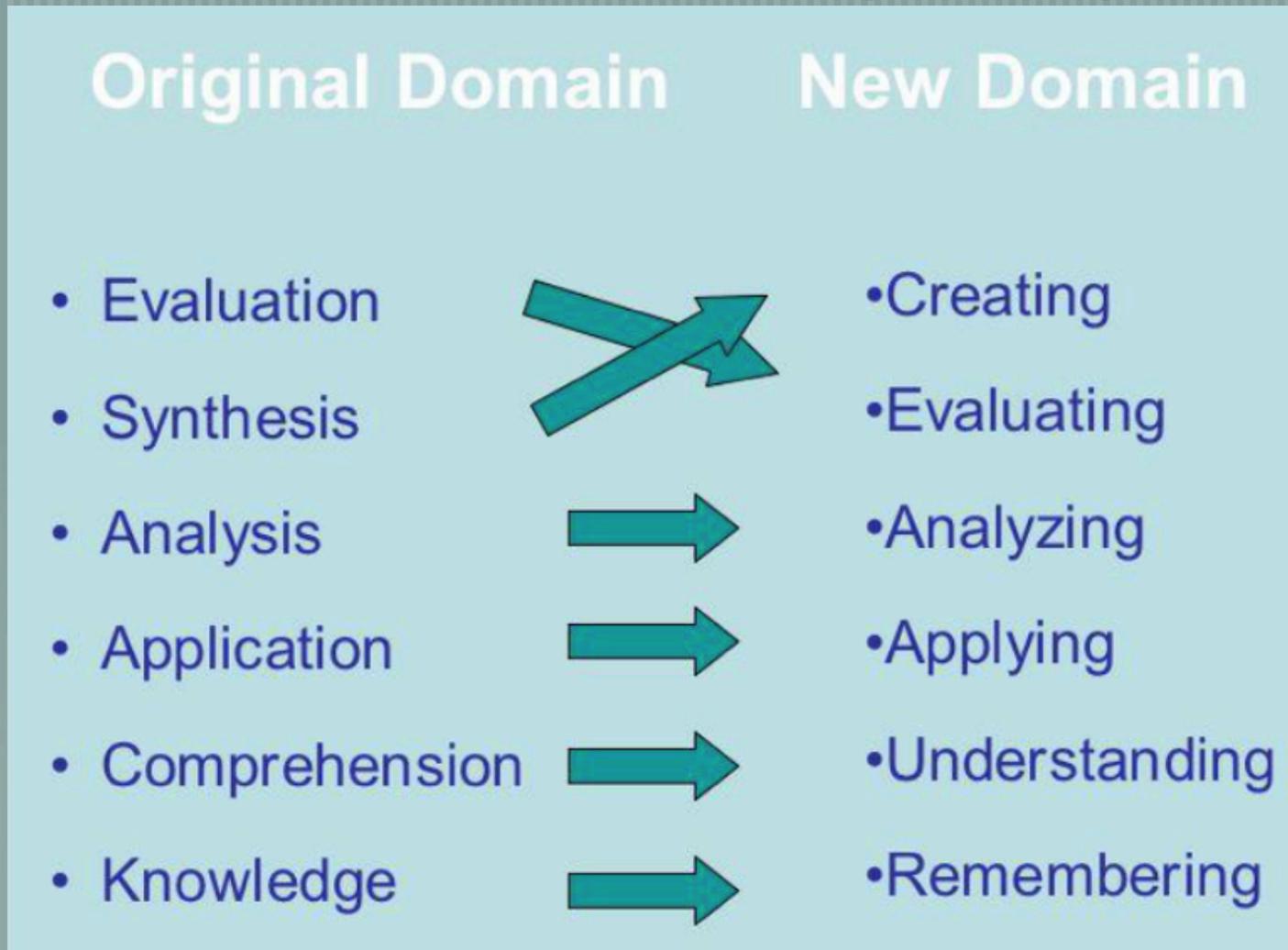
If you wanted to create an education environment that was directly opposed to what the brain was good at doing, you probably would design something like a

- John Medina



Quality, Brain Friendly, Instructional Delivery

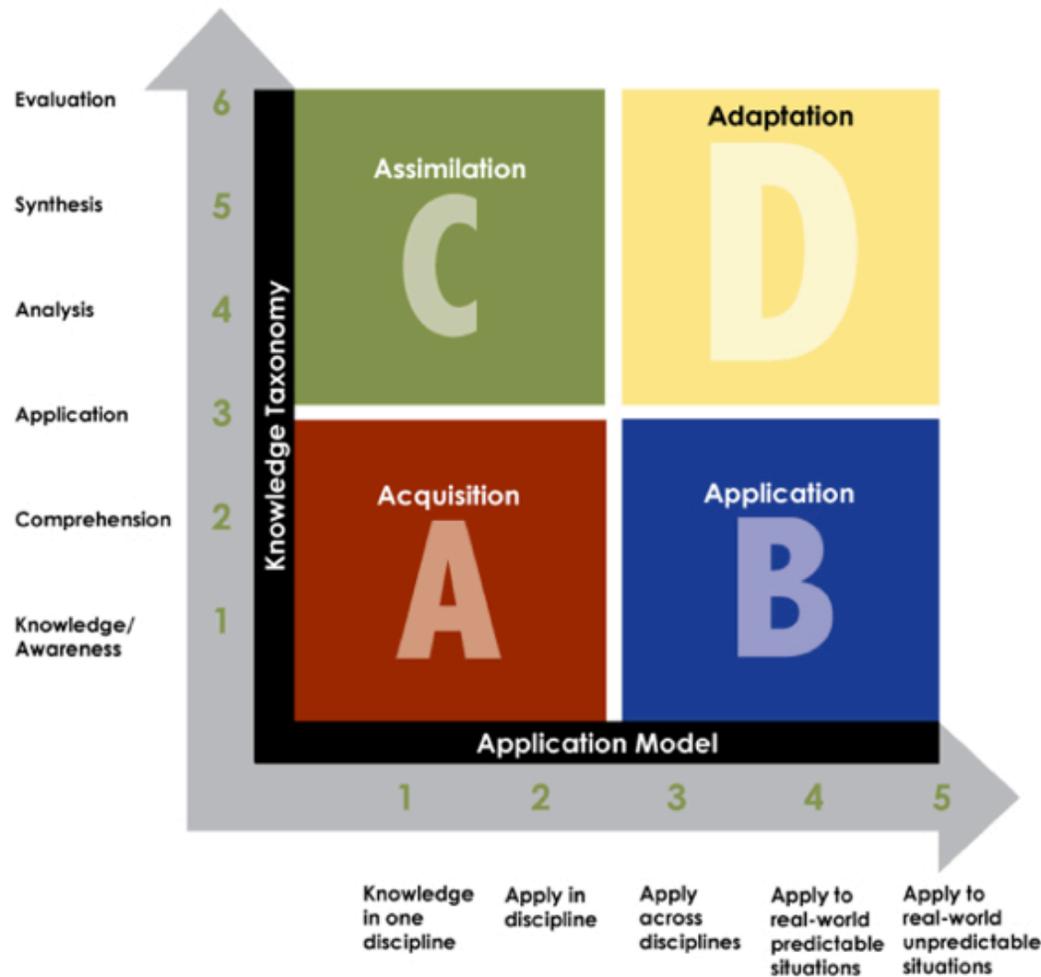
Some Terms We Will Use and Concepts to keep in Mind



Where does our most important test fall on here?

Daggett's Quadrant D is "Creating"

Rigor/Relevance Framework[®]



This begs the question:

**How do our Math
teachers do at creating high
level assessments?**

Apparently, they need some help.

Teacher-Developed Tests

Cognitive Level of Questions

	R	U	<u>Ap</u>	An	<u>Ev</u>	Cr
Elem	83%	0%	7%	10%	0%	0%
JHS	97%	0%	3%	3%	0%	0%
HS	88%	9%	0%	3%	0%	0%

SOURCE: Fleming and Chambers; 8,800 test items analyzed

New Domain

Cr •Creating

Ev •Evaluating

An •Analyzing

Ap •Applying

U •Understanding

R •Remembering

What would industry do with this guy?

Steve is driving his car. He is travelling at 60 feet/second and the speed limit is 40 mph. Is Steve speeding?

He could find out by checking his speedometer.

From the Book: F In Exams by Richard Benson

He might just be the guy they are looking for!



Tolerance Check

Out of Range

- Line Temperature
- H₂O Pressure
- Oil Temperature
- Transfer Speed

[Next Group of Gauges >>](#)

Frames Completed: 0

Select the out of range gauges.

Tolerance Limits:

Line Temperature: 25° to 35° H₂O Pressure: 20 PSI to 28 PSI

Oil Temperature: 75° to 100° Transfer Speed: 134.22 to 136.34

ELA CC.11-12.R.ST.7 (Reading in Science and Tech)

Compare the readings for each labeled gauge display. (Line Temperature, H₂O, Oil Temperature, Transfer Speed) to the tolerance limits provided.

Where, if anywhere, do we find this in our schools?

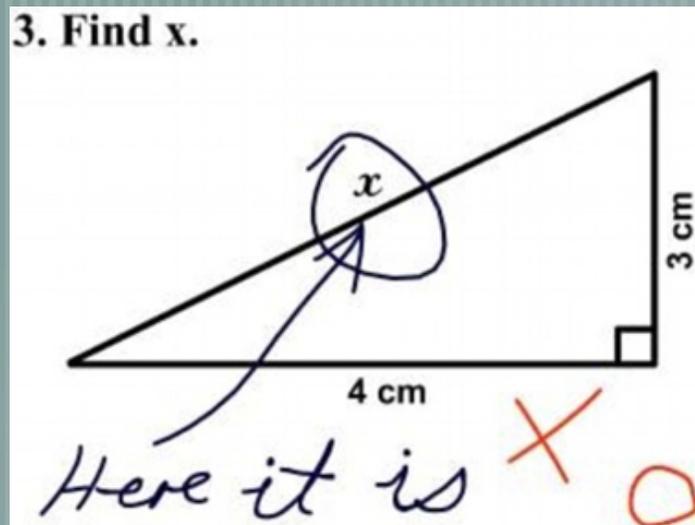
K-12.MP.4 - Model with Math - Usually Associated with things Beyond College Ready

Honestly you would be hard pressed to find a Math "Content" Standard which looks at this

CTE provides authentic assessment

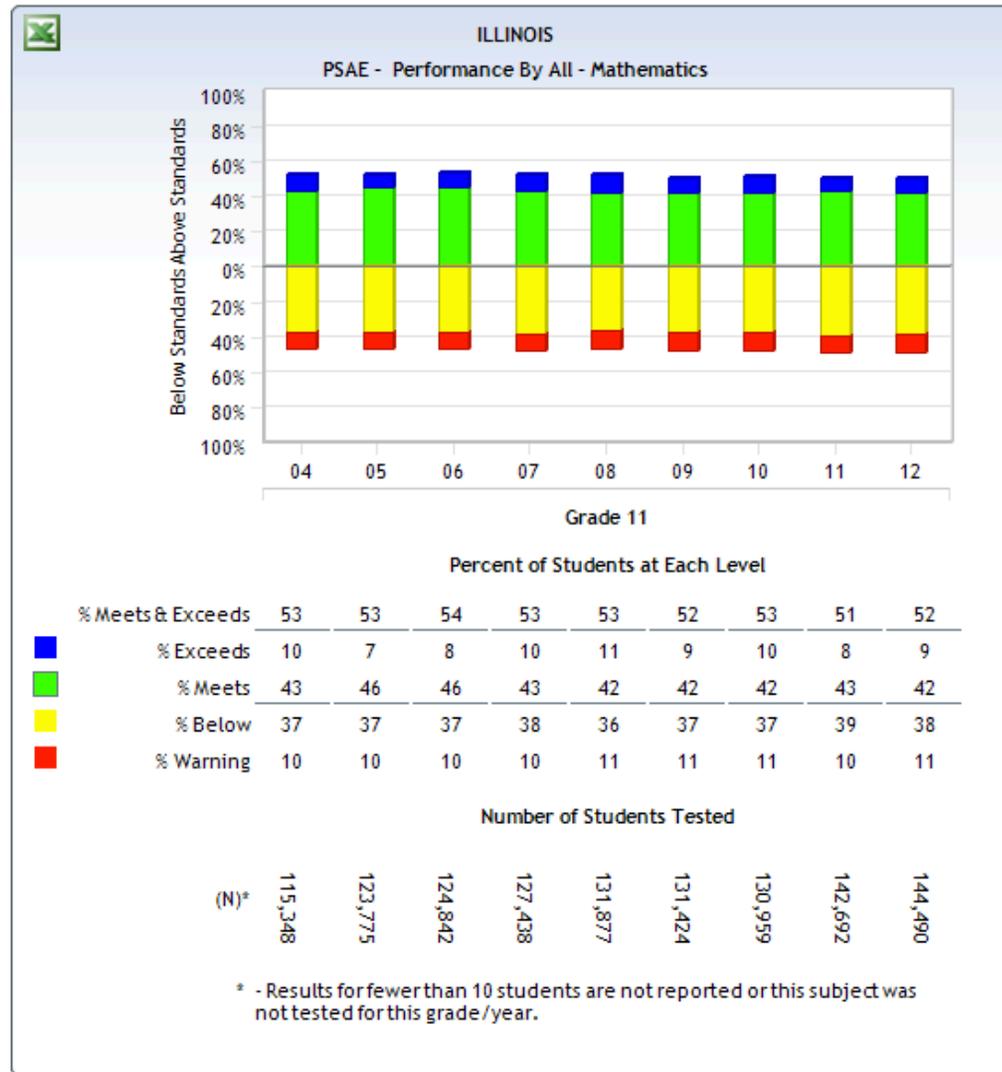
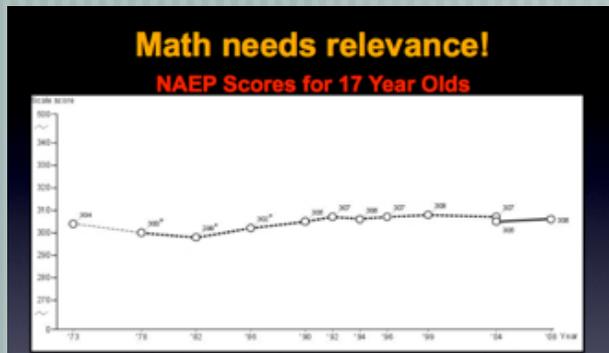
Which is more meaningful?

3. Find x .



Bringing it Back to Illinois

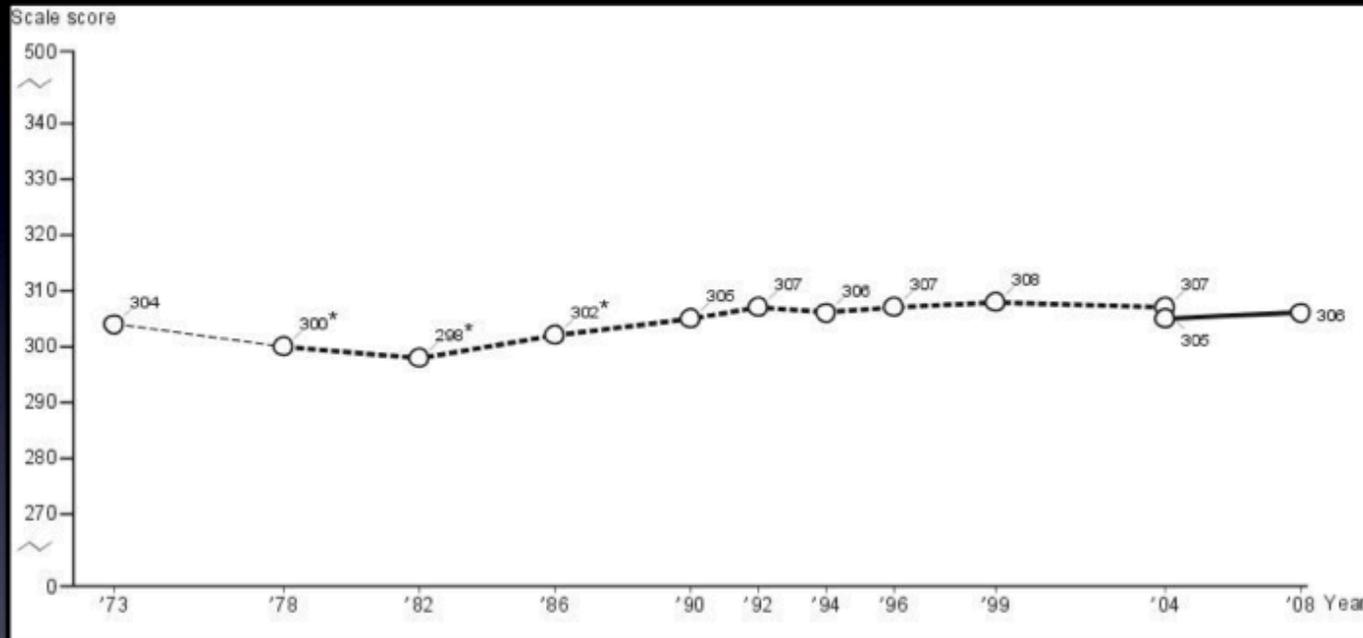
Illinois math scores are as stagnant as the NAEP



National Assessment of Educational Progress

Math needs relevance!

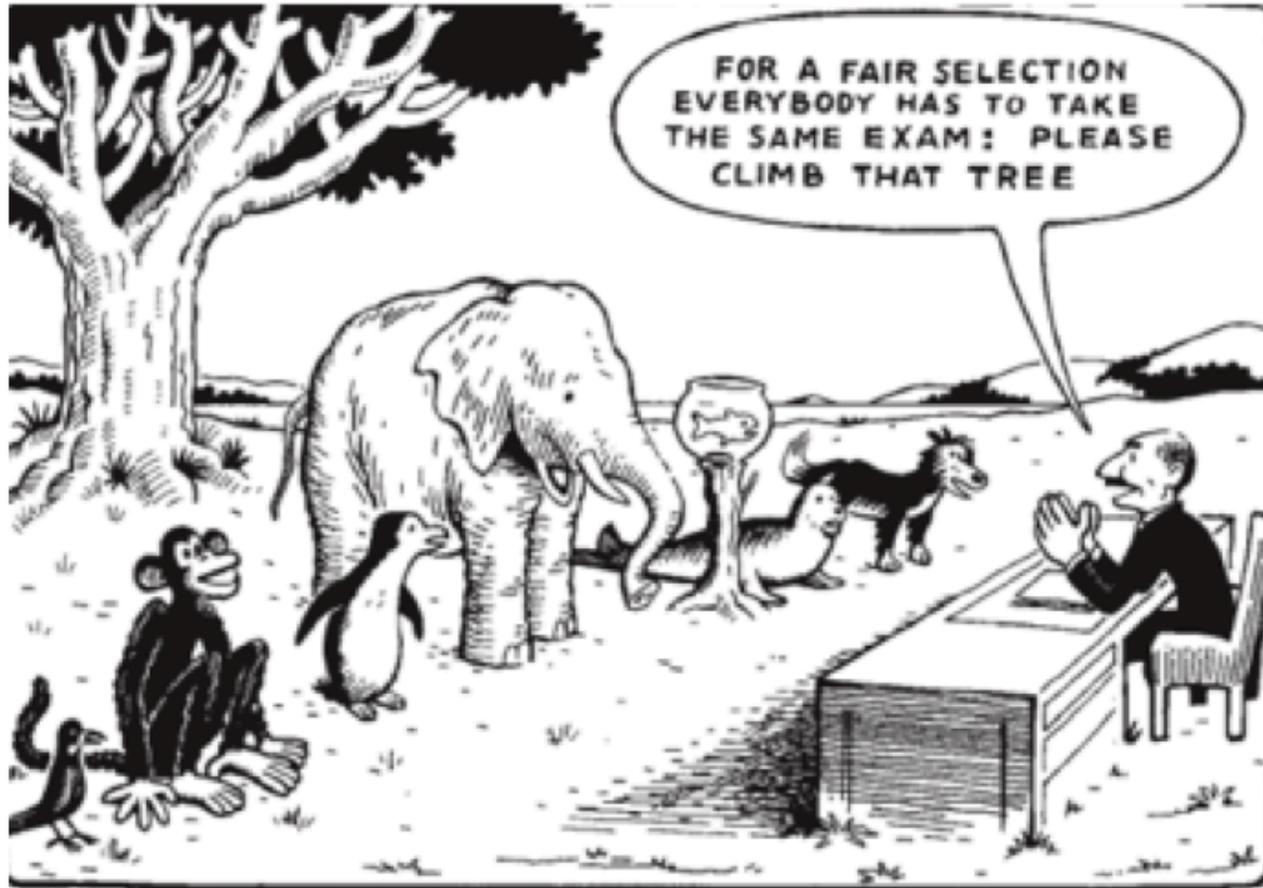
NAEP Scores for 17 Year Olds



“Math should not be delivered as a stand alone subject. It’s like taking an automotive class and only learning about the tools.”

-Jack Gilbert, Engineer and CEO of GDJ Inc.

Measuring Success in American Schools



<https://assistivetechologytidbits.wikispaces.com/About+UDL>

Change is coming... **PARCC** - Partnership for Assessment of Readiness for College and Careers

Designed to test in Quadrant D -
Although, Not Everyone Will Think It is Good News

CC HS Assessments

Selected response (objective; a correct answer)

*A student selects a ready-made response to **M-C** items. Best created using a **Table of Specifications** tied to instructional objectives and Bloom's Taxonomy.*

*One answer plus 'distractors'; Able to test lots of content;
Easy to score; Computer-based*

CC HS Assessments

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CC HS Assessments

Constructed response (PBA)

*A student response to a specific prompt or question given in the context of a test; measures **complex** skills. Requires creativity, organization, and logic skills to develop.*

***Open-ended** (short answer); **Rubric** or **Scoring Guide**; more valid inference of understanding than selected; Computer-based format and scoring; EX: NAEP, Felicia's Drive, Cash Box*

Marketing and Profitability Activity: 9-12 A CED 3, K-12 MP.1, 3, 4 (among others)

The MIRN (Math I Really Need) Snack Mix Company assigns you to a team whose goal is to oversee the "launch" of the company's newest snack product.

MIRN's new snack product's **proposed** batch ratios are:

- 1 part Pretzels
- 1 part Cheerios
- ½ part Cocoa Crunch cereal
- 1 part Corn Chex cereal
- 1 part Rice Chex cereal
- ½ part M&Ms



If we were to change the proposed batch ratio, any snack mixture we take to market must contain all of these ingredients. Each ingredient would have a minimum of .5 ounces in the 8 ounce bag while no ingredient could be more than 4 ounces.

1. Taste the product.
2. Brainstorm a name for the new product. _____

Packaging and Product Cost Data:

The product would be sold in 8-ounce packages.

Ingredient costs:

Pretzels	\$3.99/20 oz.
Cheerios	\$6.49/120 oz.
Cocoa Crunch	\$2.99/20 oz.
Corn Chex Cereal	\$1.99/13 oz.
Rice Chex Cereal	\$1.99/13 oz.
M&Ms	\$8.49/42 oz.

3. How would a "real" business save money on product cost?

4. Based on the proposed batch ratio, calculate each ingredient's weight in an 8 ounce batch.

Pretzels	___ oz.
Cheerios	___ oz.
Candy Corn	___ oz.
Corn Chex Cereal	___ oz.
Rice Chex Cereal	___ oz.
M&Ms	___ oz.

Cost Considerations: Cost, Profit Margin, & Selling Price

5. What is the product cost of an 8-ounce package? ___
6. What would MIRN charge for an 8-ounce package if they wanted a 20% profit margin (based on product cost)? ___
7. What other costs (expenses) are factored into the selling price of this snack product for us to accurately determine our profit margin & or set our price?
8. What is the least expensive mixture we could produce if we were to alter the proposed batch ratio?
9. Food for thought - Would the formula we find in question 7 be the most profitable for us to bring to market? Why or why not?

This IS higher level math and could go to even more complex levels if we were to incorporate nutrition labels, profit margins, sales data, etc...

More importantly: It is Relevant and Engaging for students. This is "Quadrant D" learning. It is CAREER READY MATH.

Spreadsheets in your Business Classrooms Can be Meaningful, Relevant, & FUN!



TITLE: 2013 Chicago Blackhawks win the Stanley Cup!

BACKGROUND: The Chicago Blackhawks, a professional ice hockey team based in Chicago, are the defending Stanley Cup Champions having won five Stanley Cup championships since their founding in 1926; winning two in just the last four years.

Below are some 2013 Chicago Blackhawks team statistics.

National Hockey League: Chicago Blackhawks														
2012-2013 Stanley Cup Winners														
Season Playoffs - 4 Rounds/23 games														
#	Pos	Player	GP	Goals	A	P	+/-	PIM	PP	SH	GW	S	5%	
88	R	Patrick Kane	23	9	10	19	7	8	0	0	2	88	10	
29	L	Bryan Bickell	23	9	8	17	11	14	1	0	2	49	18	
81	R	Marian Hossa	22	7	9	16	8	2	3	0	2	70	10	
10	L	Patrick Sharp	23	10	6	16	1	8	2	0	2	91	11	
19	C	Jonathan Toews	23	3	11	14	9	18	1	0	0	70	4.3	
2	D	Duncan Keith	22	2	11	13	10	18	0	0	0	51	3.9	
26	C	Michal Handzus	23	3	8	11	7	6	0	1	0	17	18	
67	R	Michael Frolik	23	3	7	10	1	6	0	1	1	46	6.5	
65	R	Andrew Shaw	23	5	4	9	2	35	1	0	2	36	14	
27	D	Johnny Oduya	23	3	5	8	12	16	0	0	1	30	10	
36	C	Dave Bolland	18	3	3	6	-2	24	0	0	1	29	10	
20	L	Brandon Saad	23	1	5	6	-1	4	0	0	0	50	2	
4	D	Niklas Hjalmarsson	23	0	5	5	10	4	0	0	0	12	0	
16	C	Marcus Kruger	23	3	2	5	-2	2	0	0	1	27	11	
32	D	Michal Rozsival	23	0	4	4	9	16	0	0	0	14	0	
7	D	Brent Seabrook	23	3	1	4	-1	4	0	0	2	39	7.7	
25	R	Viktor Stalberg	19	0	3	3	-1	6	0	0	0	27	0	



PROBLEM:

- 1) Circle the BEST type of chart you would use to depict the number of goals (bolded on the first page of the table) each member made, as compared to the total goals the team made overall, during the playoff season.
- a. Bar b. Bubble c. Doughnut d. Gantt
- e. Histogram f. Line g. Map h. Pie
- 2) Why is that type of chart the BEST choice to use to “tell your story?” (Use full sentences)

SOLUTION:

- 1) Pie Chart
- 2) While a bar chart could be used to show how many goals each player scored, the pie chart is the most appropriate as the individual players’ goals could be added together to show one total value (100%). Also, since this table offers values in only one data series, a pie chart would be the most appropriate.
-

BLOOM’S COGNITIVE PROCESS: 5.2 (Judging/Critiquing under Evaluating)



Common Core Math, Reading, and CTE is embedded!

CC ALIGNMENT:



CC.9-12.S.ID.1	Summarize, represent, and interpret data on a single count or measurement variable. Represent data with plots on the real number line (dot plots, histograms, and box plots).
CC.9-12.N.Q.1	Reason quantitatively and use units to solve problems. 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.
CC.K-12.MP.4	Model with mathematics. Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

This could easily be adapted towards something other than NHL statistics. Students could choose from a menu of topics to track while learning Excel and reinforcing these standards.

CC.9-10.W.HST.2.a	Text Types and Purposes: Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
CC.9-10.R.ST.7	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
NETS-S	Students use digital media and environments to 2B) Communicate information and ideas effectively to multiple audiences using a variety of media and formats.
ESS01.02.06	Comprehend key elements of oral and written information such as cause/effect, comparisons/contrasts, conclusions, context, purpose, charts/tables/graphs, evaluation/critiques, mood, persuasive text, sequence, summaries, and technical subject matter.
ESS02.09.01	Create tables, charts, and figures to support written and oral communications.

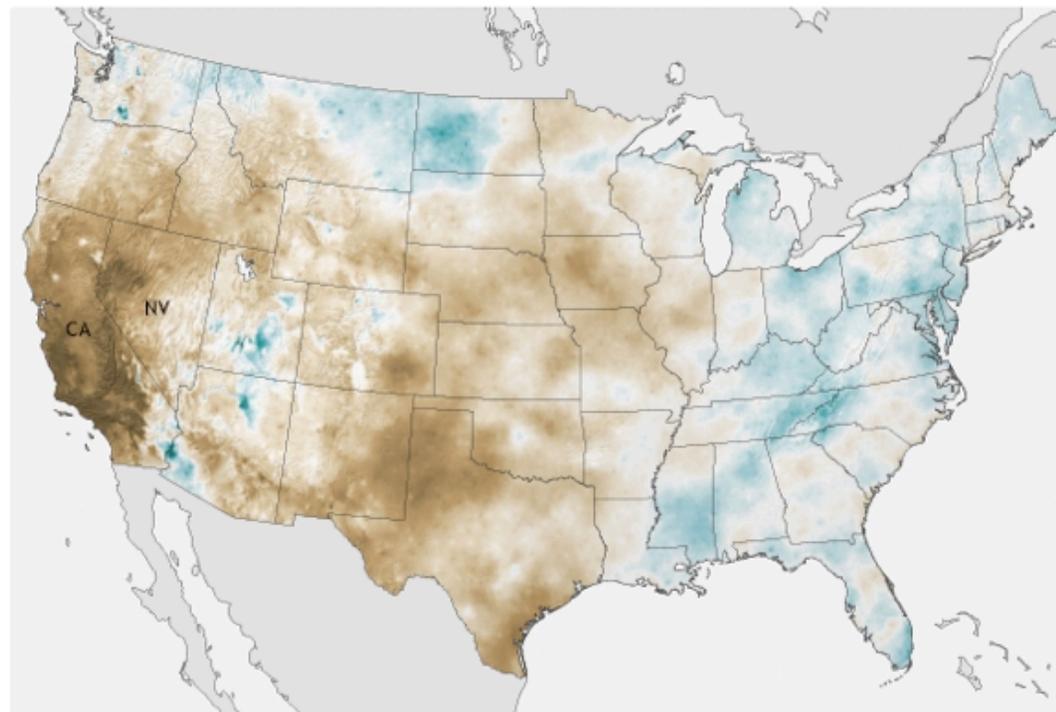


Another Sample

January precipitation deficits keep California drought outlook

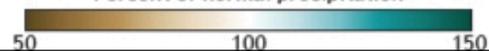
February 7, 2014

In our first post on the drought emergency in California and Nevada, we talked about conditions on a statewide level over the past two and half years. But a statewide average over a relatively long period can hide important variation from place to place, especially in a mountainous state like California, where the high elevations can get several times more average annual precipitation than adjacent valleys do.



July 2011-December 2013

Percent of normal precipitation



Check Your Handouts

- [PARCC Samples

- Popcorn Inventory

- Brett's Race

- Mini-Golf

CC HS Assessments

Extended performance task (vs on-demand)

A student response to the specifications of a project. The task may extend over several hours, several days, several weeks; sustained attention; produces a product.

*From **least realistic** (p & p garden design) to **most realistic** (repair an engine); Computer-based; EX: Short Extended = Impact of WWII on Economy vs Architecture–Pre-Design*

Extended Response



This task was developed by high school and postsecondary mathematics and health sciences educators, and validated by content experts in the Common Core State Standards in mathematics and the National Career Clusters Knowledge & Skills Statements. It was developed with the purpose of demonstrating how the Common Core and CTE Knowledge & Skills Statements can be integrated into classroom learning – and to provide classroom teachers with a truly authentic task for either mathematics or CTE courses.

TASK: BMI CALCULATIONS

TARGET COMMON CORE STATE STANDARD(S) IN MATHEMATICS:

S-ID.1 Represent data with plots on the real number (dot plots, histograms, and box plots).

S-ID.2 Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.

S-ID.3 Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).

6.EE.2c Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole- number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations).

6.RP.3d Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.

TARGET STANDARDS FOR MATHEMATICAL PRACTICES:

MP 1. Make sense of problems and persevere in solving them.

MP.3 Construct viable arguments and critique the reasoning of others.

MP 4. Model with mathematics.

MP 5. Use appropriate tools strategically.

The Trail Mix Problem Revisited

— [How would we take this question from a “long constructed” to an extended response?

Assessment Methods

Target	Selected Response	Constructed Response	Extended Performance	Communication
Knowledge Mastery	Good match for assessing mastery of knowledge (remembering, recalling).	Good match when looking for an understanding of relationships among elements of knowledge.	Not a good match and too time-consuming.	Can be used if assessor asks questions, evaluates answers, and infers mastery—time consuming.
Reasoning Proficiency	Good match only for assessing understanding of some patterns of reasoning out of context.	Written descriptions of complex problem solutions can provide some evidence of reasoning proficiency.	Assessor can watch students solve some problems and infer their reasoning proficiency. (e.g., assessor must be proficient with content)	Assessor must ask student to “think aloud” or assessor asks follow-up questions to probe reasoning. (e.g., tedious)
Skills	Not a good match. Best use is student knowledge to perform the skill. M-C questions do not measure the skill.	Not a good match. Best use is student knowledge to perform the skill. Cannot measure the skill.	Good match. Assessor can observe and evaluate skills as they are being performed. (e.g., workplace and content standards, rubrics, etc.)	Strong match when skill is oral communication proficiency.
Create Products	Not a good match. Assesses only mastery of the knowledge needed to create quality products.	Strong match only when the product is written .	Good match. Can assess a 3D product. (e.g., created a product)	Not a good match.

Another Resource

NRCCTE.ORG

Math-in-CTE Curriculum Map: Information Technology

CTE Course/Unit	CTE Concepts	Math Concepts	Middle School Common Core Math Standards	High School Common Core Math Standards
Excel	Payroll; Sales; Property Tax; Stats; Charting; Graphing	Percent; Multiply; Add and subtract; Ratios; Average; Sampling/survey; Conversion decimals to fractions; Mean, median, mode; Variance, standard	6.NS.2; 6.NS.3; 7.NS.1; 7.EE.3; 6.RP.1; 6.RP.2; 6.RP.3; 7.RP.1; 7.RP.2; 7.RP.3; 6.RP.2; 6.RP.3; 7.EE.2; 6.NS.1;	A.APR.1; A.APR.7; N.RN.3; N.Q.1; G.MG.3; S.ID.1; S.ID.2; S.ID.4; S.IC.6

Questions?

— [Please complete and return evaluation

— [Mary Waters - mary@watersedgeconsulting.net

— [Brian Gordon - brian.gordon@jjc.edu

— [Please explore - cteintrees.wix.com/trees

— This presentation (within a day or two) and a host of other helpful resources can be found there