21st Century Math Tasks

Linfield, Day 3, 2017-18

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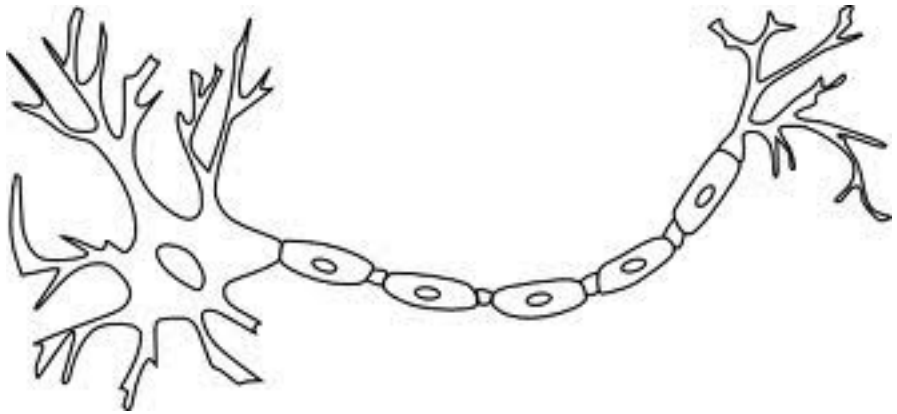
@MathProjects

MPJ

Walkout Song

Neuron Problems

Neuron Problems



Day 3 Objectives

WHY? WHAT? WHO?

The Refresher:
Reflect on how much we have changed.

Group Work, C-P-A Progression & Low-Tech/High Tech Balance:
Commit to one new method.

WHAT? HOW? WHERE?

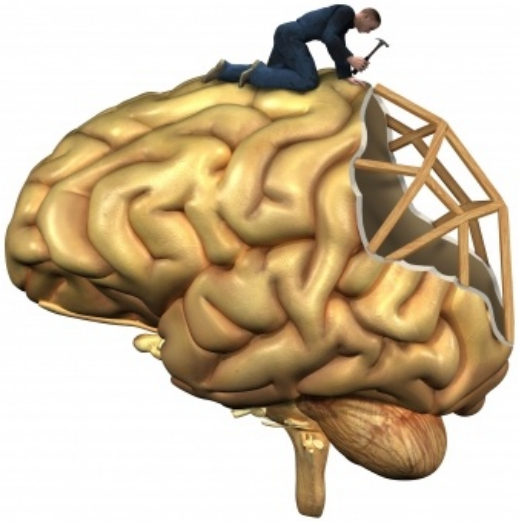
Tasks, Tasks & More Tasks:
Commit to one new task that you will implement.

Reflection

The Refresher

How have you changed from a 20th Century teacher to a 21st Century teacher? Respond specifically to ***why*** you are teaching, ***what*** you are teaching, ***how*** you are teaching, and ***whom*** you are teaching.

The 6 C's



Concepts & Procedures

Critical Thinking

Communicate Reasoning

Constructing Models

Collaboration

Creativity

Most

Group Work
To Group or not to Group?

- Higher-level thinking, Oral Communication, Self-management, and Leadership Skills.
- Student-faculty interaction.
- Retention and Responsibility.
- Diverse perspectives.
- Preparation for real life social and employment situations.

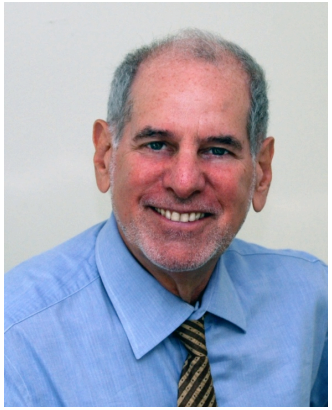
(from Cornell University Center of Teaching Excellence)

Let's not forget the 6 C's

MPJ

Group Work
How to Structure Groups?

Task = Group Worthy

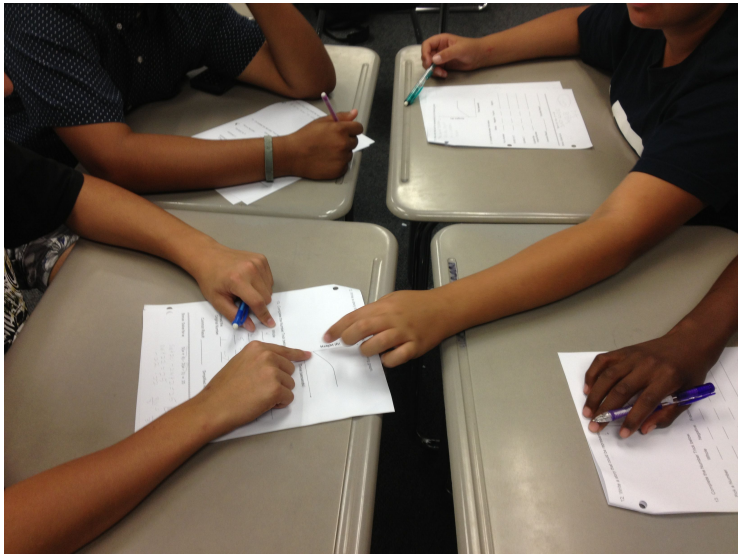


Homogenous

Random

Heterogeneous

Group Work
How to Manage Groups?

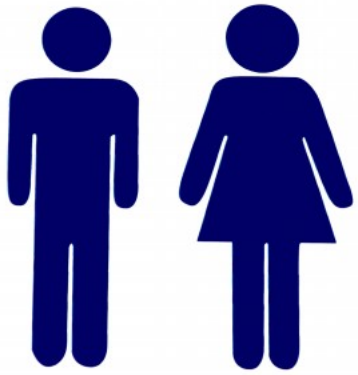


Norms

Vigilance

Accountability

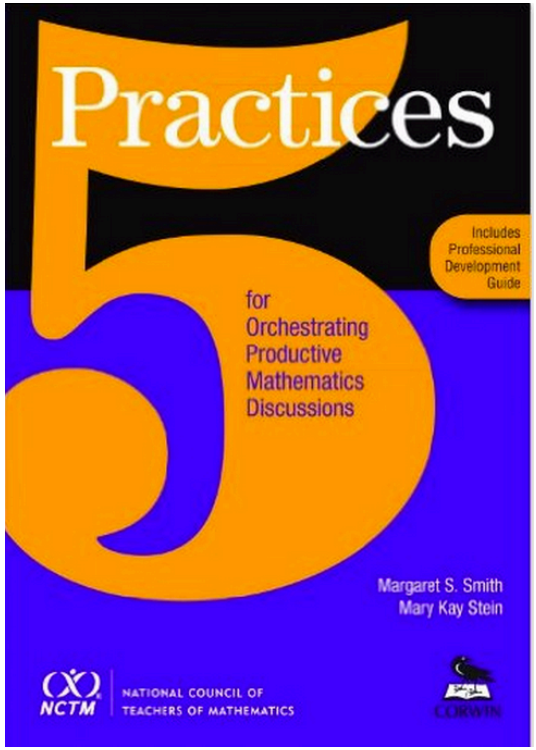
Break



10 minutes until

we farm out the task

Group Work
How to Facilitate Group Learning?



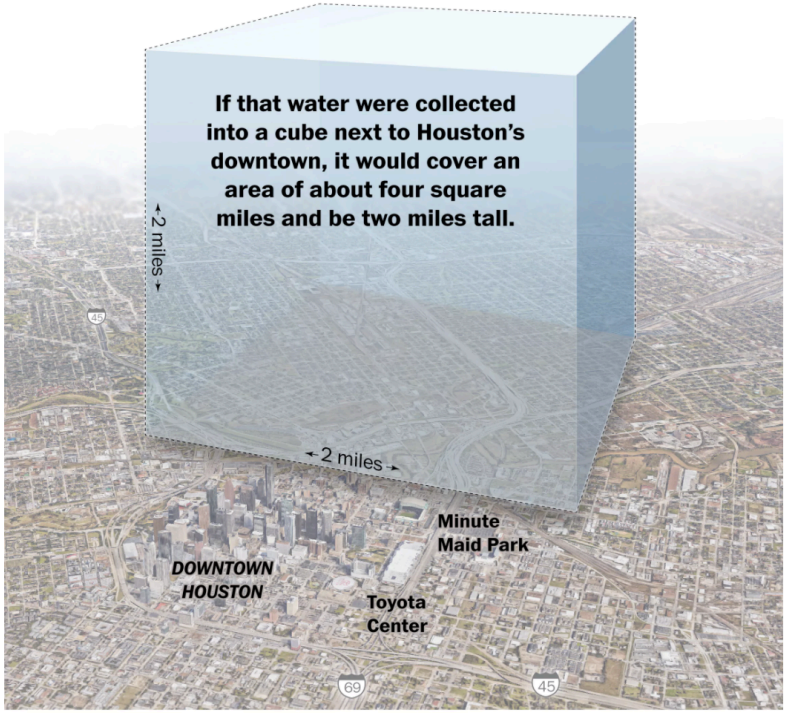
- **Anticipate**
- **Monitor**
- **Select**
- **Sequence**
- **Connect**

Gradual Release = I do, We do, Y'all do, You do
Gradual Reel In = You do, Y'all do, We do, I do

Hurricane Harvey

What would 9 trillion gallons of water look like?

As of noon on Aug. 27, about 9 trillion gallons of rain had already fallen across the greater Houston area and Southeast Texas.



Source: Capital Weather Gang; Google Street View

THE WASHINGTON POST

Tubicopter

Reflection

Group Work & Class Discourse

How will you facilitate more tasks in your class? Commit to at least one method that you learned today regarding the facilitation of group work or class discourse.

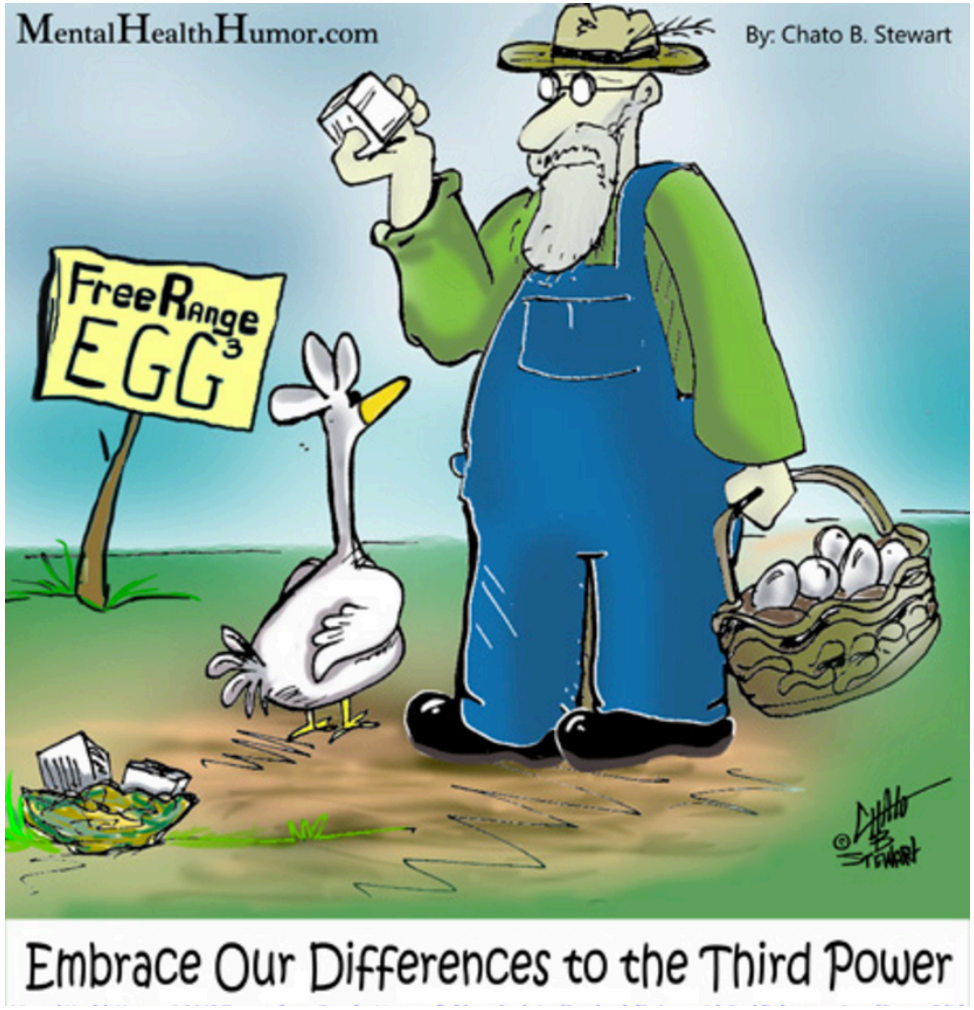
Lunch

Back At 12:15

Up next:

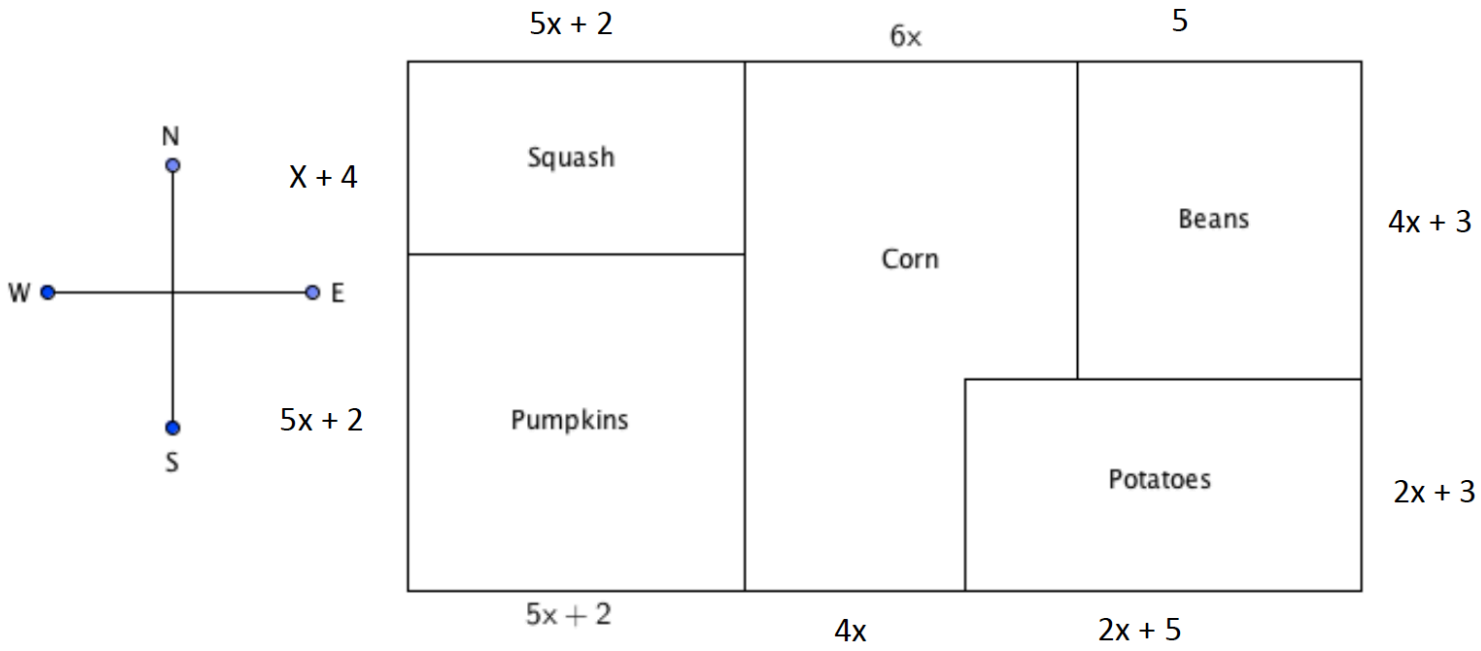
putting our feet to the task

Polynomial Farm



Polynomial Farm

Conceptual ➔ Procedural ➔ Application Practice



Polynomial Farm Day 1… & 2

Conceptual ➔ Procedural ➔ Application Practice

	4in.	5in.
2in.	A	B
3in.	C	D

	2x	3
x	A	B
1	C	D

	Perimeter	Area
A		
B		
C		
D		
Large Rectangle		

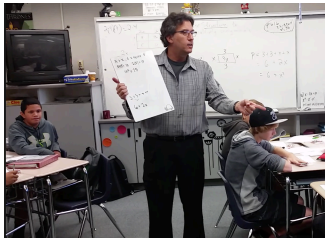
Polynomial Farm

Video Example of

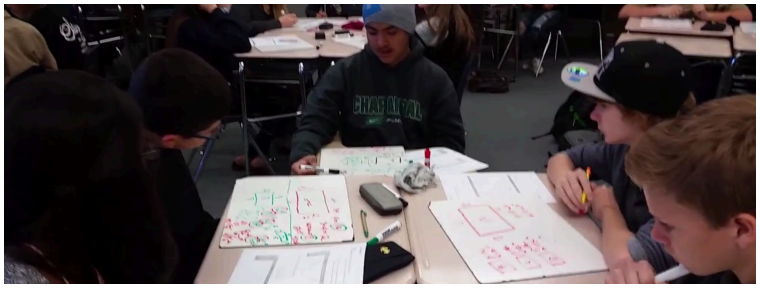
Whole Class Discussion & Small Group Work

Group Expectations

Group Dynamics



Shared Strategy



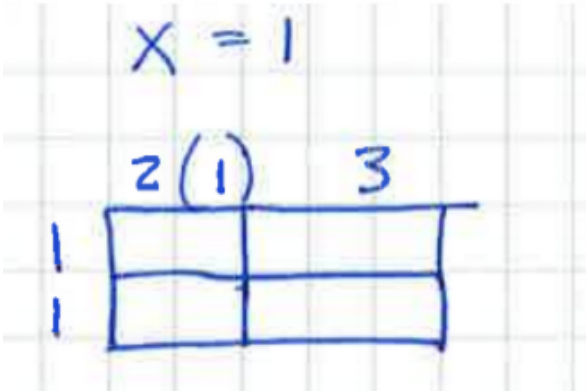
Chunking

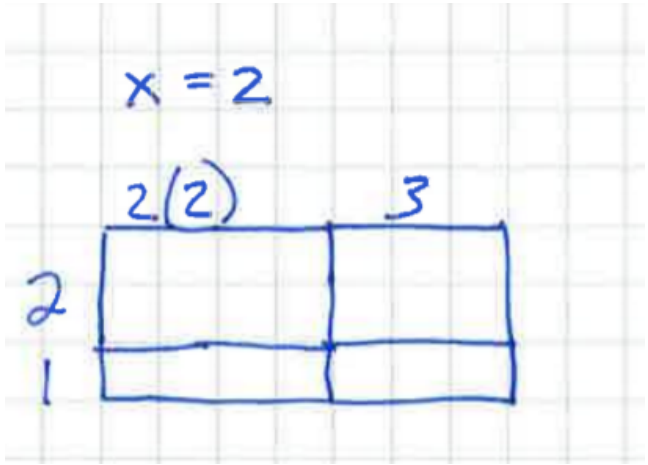
Passionate Argument

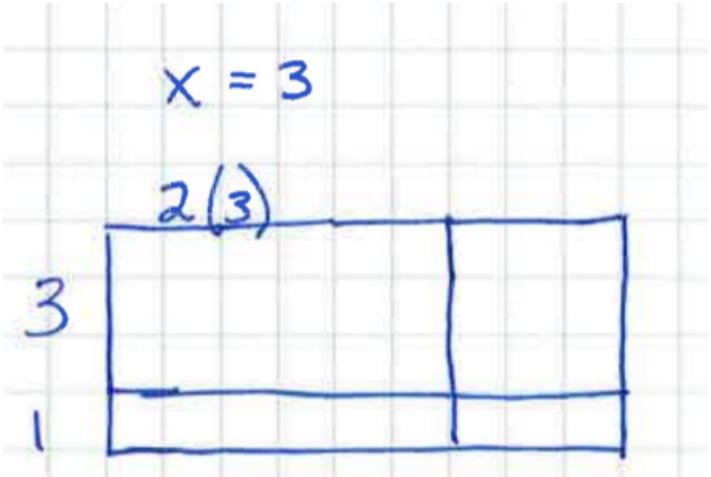
Polynomial Farm Day 3

Conceptual → Procedural → Application

Practice



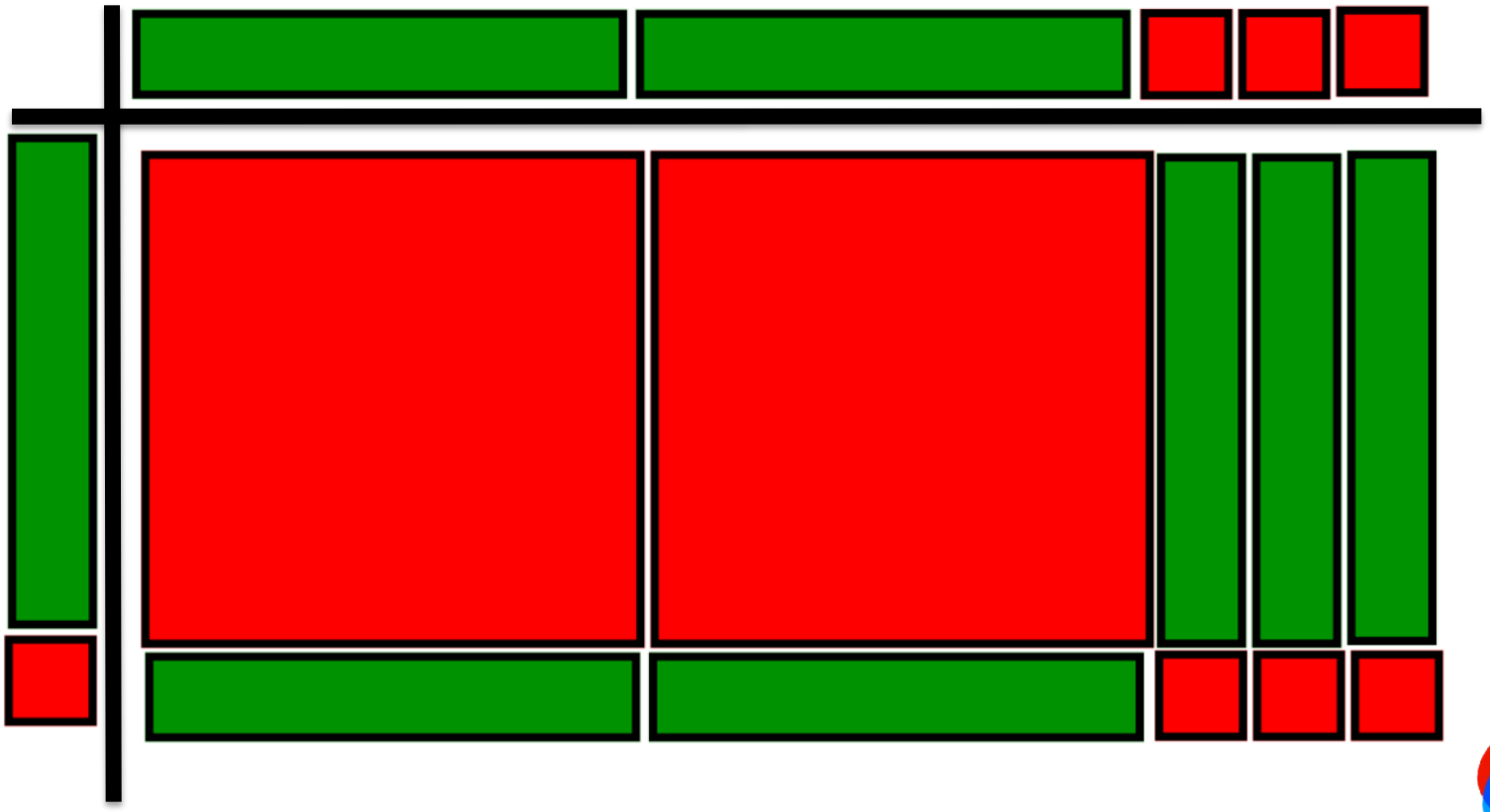




Polynomial Farm Day 4

Conceptual → Procedural → Application

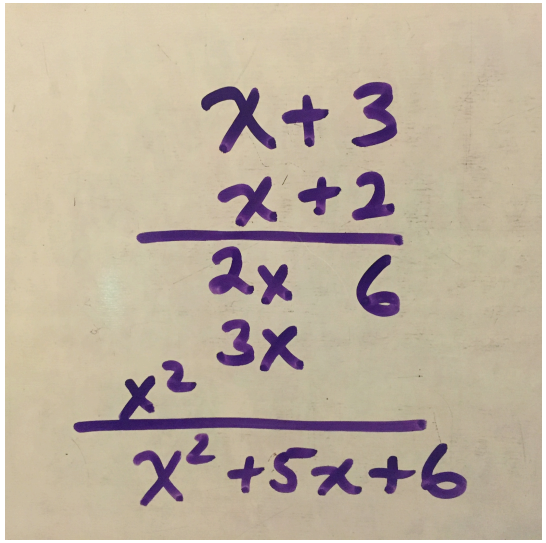
Practice



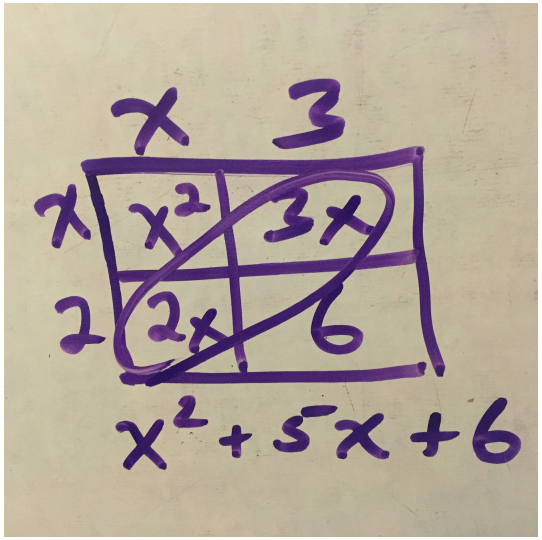
Polynomial Farm, Day 6

Conceptual → Procedural → Application Practice

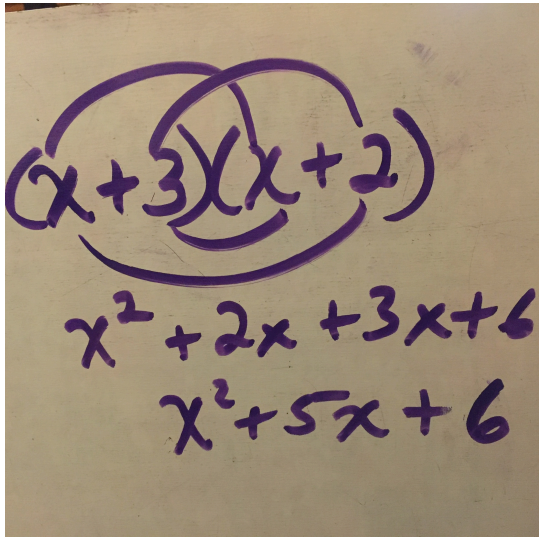
Stacking Method



Area Model
Box Method

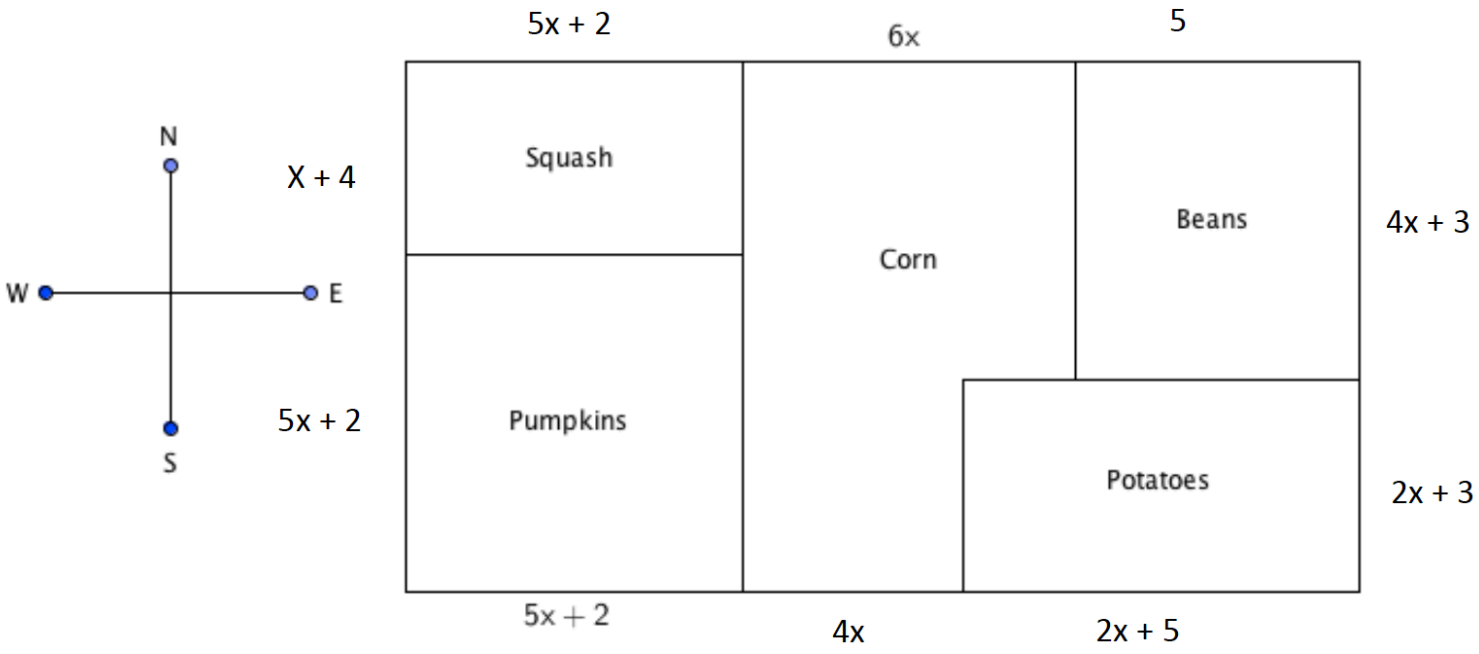


FOIL method



Polynomial Farm, Day 7

Conceptual ➔ Procedural ➔ Application Practice



Polynomial Farm, Day 8 & 9

Conceptual → Procedural → Application

Practice

$$(3x + 5)^2$$

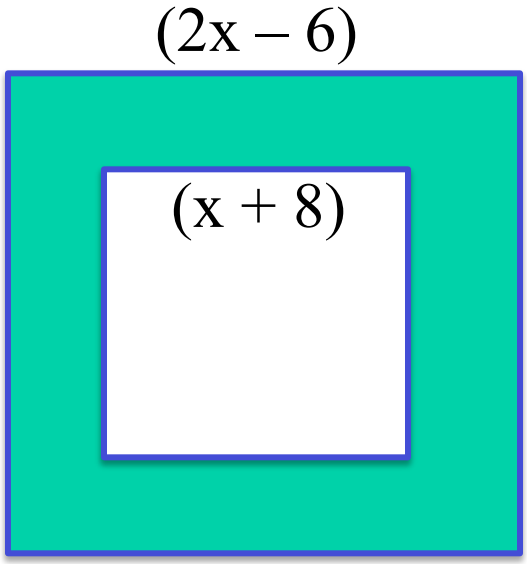
$$(a + b)(a - b)$$

$$(x + 5)(x^2 + 2)$$

$$2x(x + 4) + (x + 5)(3x - 2)$$

Polynomial Unit, Decision Time

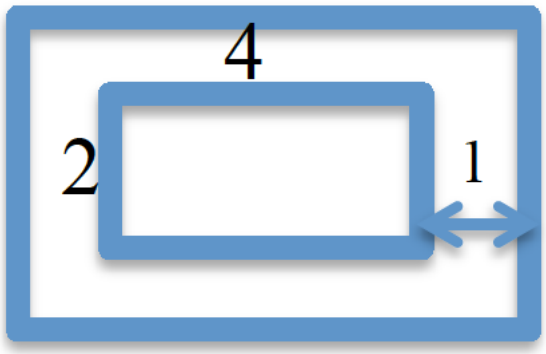
Audra is framing a square painting with side lengths of (x + 8) inches. The total area of the painting and the frame has a side length of (2x - 6). The material for the frame is $0.10 per square inch.

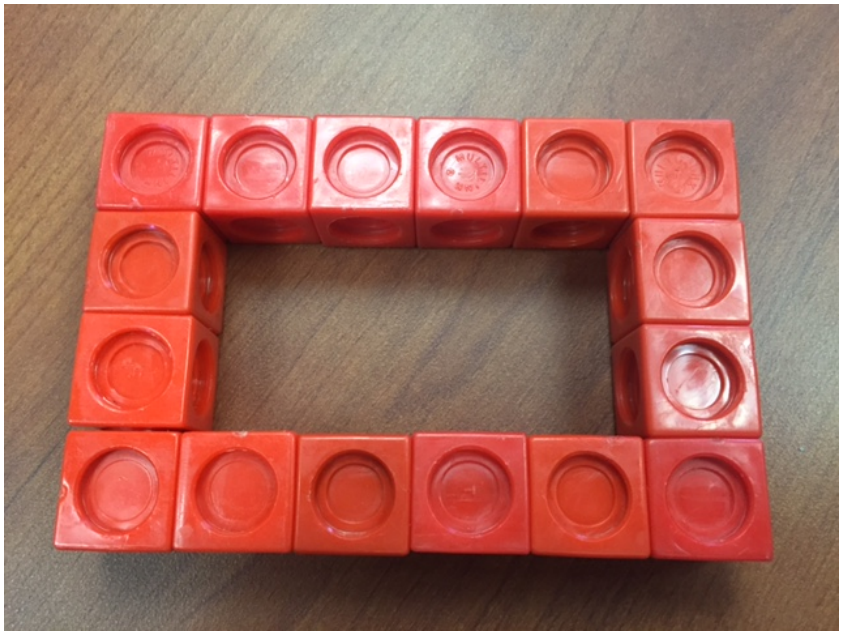


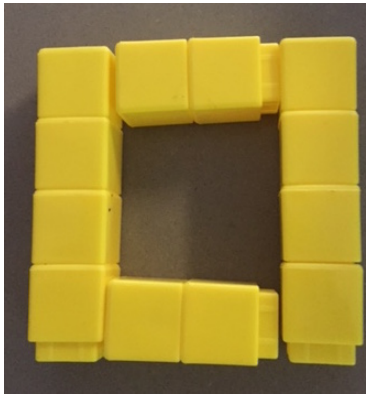
$(2x - 6)^2 - (x + 8)^2$

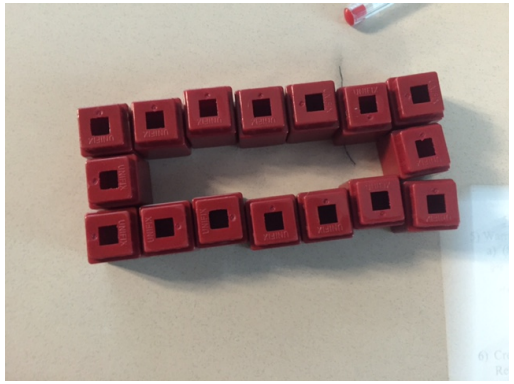
1. Write the expression for the area of the painting.
2. Write the expression for the area of the painting and the frame.
3. Write the expression for the area of the frame.
4. Find the area of the frame if x=16.
5. Find the cost of the material for the frame.

Polynomial Unit, Day 11

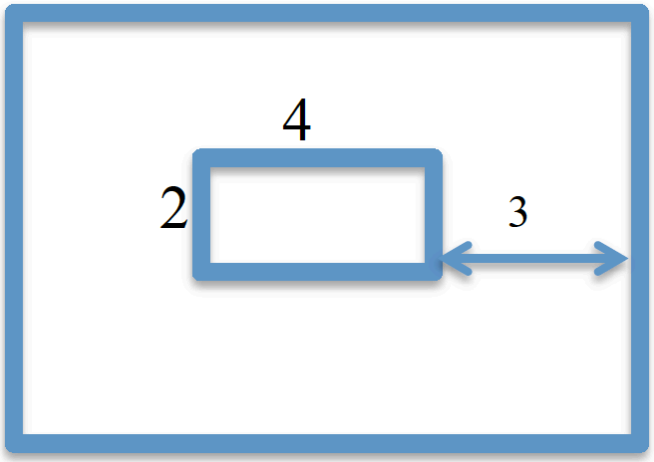


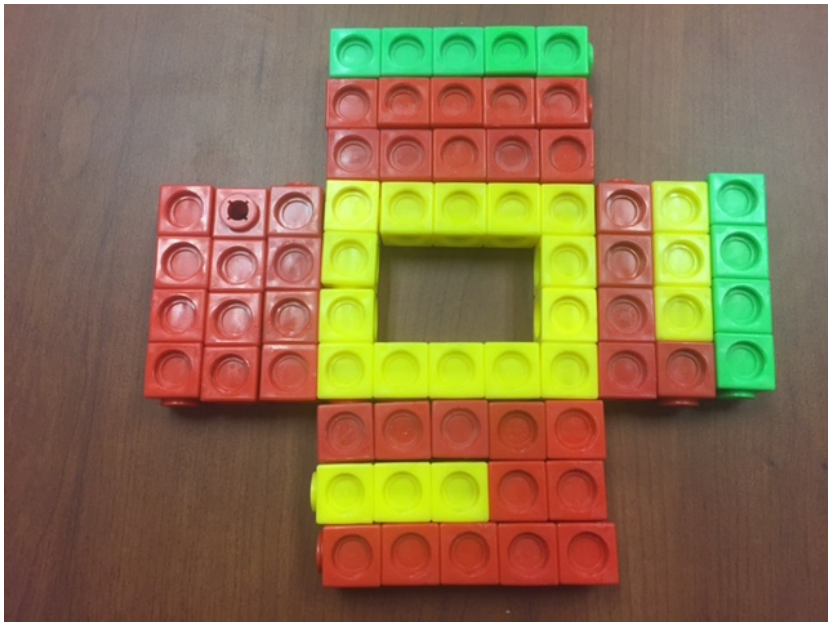


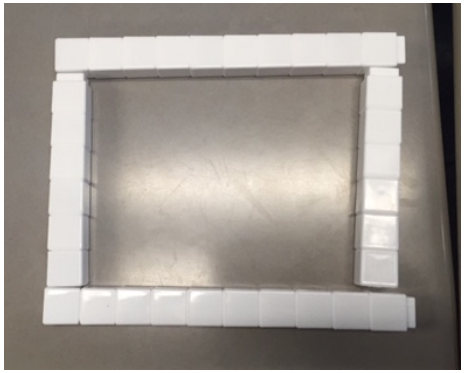


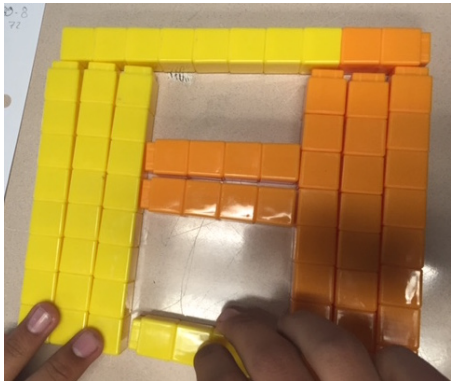


Polynomial Unit, Day 11





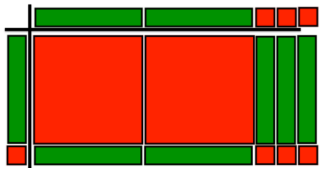


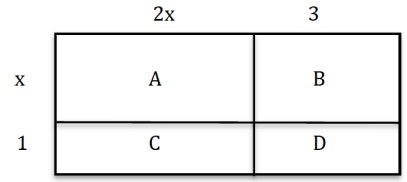


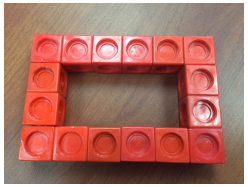
Polynomial Unit

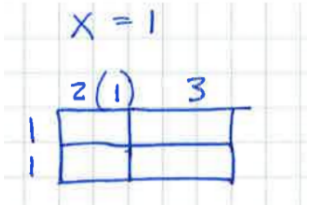
Conceptual → Procedural → Application

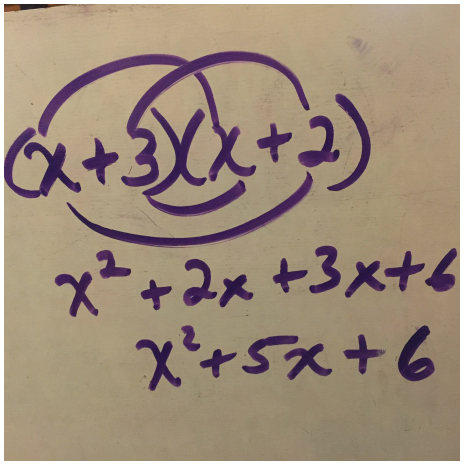
Practice

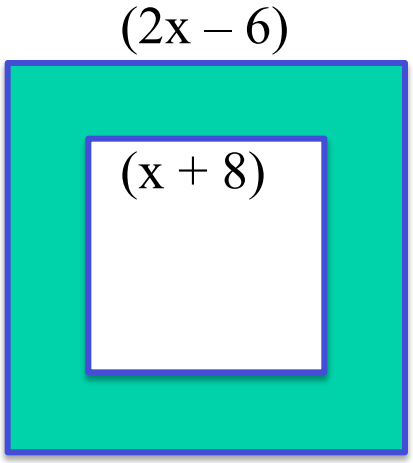












Lowest Grade on District Benchmark for Polynomials = **76%**

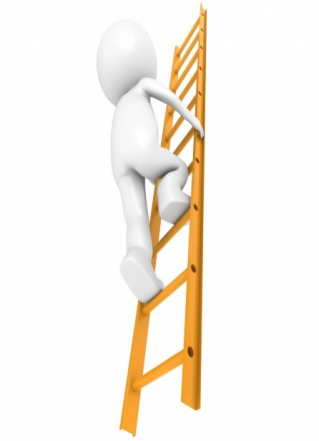
From NCTM

Conceptual → Procedural → Application Practice

FOCUS

"…teachers must focus on the mathematical ideas embedded within the standards. Attention should not be limited to the development of procedural skill. Rather, conceptual understanding along with application of mathematical ideas should play a key role in students' learning."

Lesson Reflection



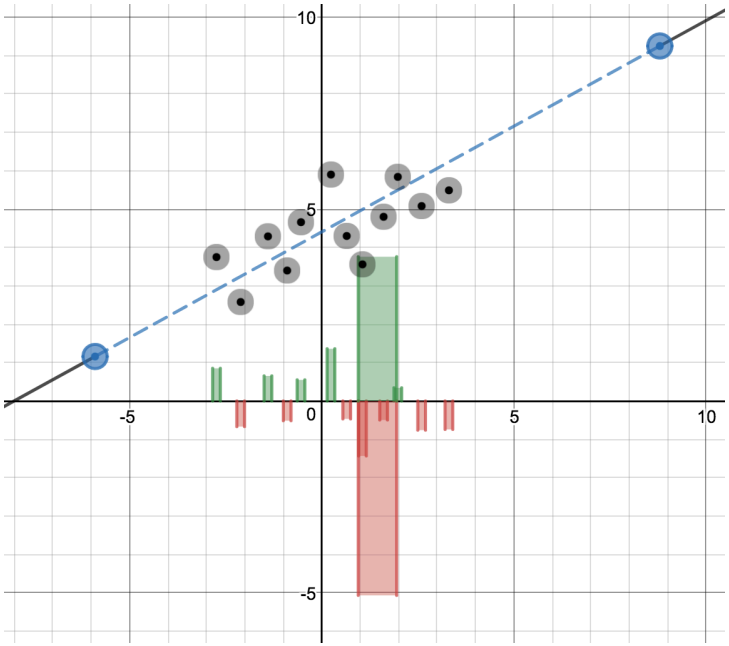
Reflection

The C-P-A Progression

How will you implement a Concept-Procedure-Application progression? Commit to at least one conceptual lesson, and one application task.

Residuals

bit.ly/RegressionButler



Cool Shoes

Reflection

Low-Tech/High Tech Balance

How well did presence of both analog and digital activities enhance these lessons? Commit to at least one lesson in which you think a digital component will compliment the analog experience.

Where to Find Tasks

mathprojects.com

- *Clothesline Math (MPJ)*
- *Desmos/Activity Builder (teacher.desmos.com)*
- *Illustrative Math*
- *Illuminations, NCTM (“diagonals”)*
- *Robert Kaplinsky*
- *Estimation 180*
- *101 Questions (101qs.com “Super Stairs”)*
- *Graphing Stories*
- *Graph of the Week*
- *Which One Doesn’t Belong?*
- *Would You Rather?*
- *Mathalicious*
- *Visual Patterns*

Lesson Study Preview

Nov 13

- **Choose Topic**
- **Create/Curate Lesson**
- **Produce Documents**
- **Schedule**

Mar 12

Per 1 **Prep**
Per 2 **Teach It!**
Per 3 **Modify**
Per 4 **Modify**
Per 5 **Re-Teach It!**
Per 6 **Debrief**
Per 7 **Debrief**

Day 3 Objectives

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Commit to one new method.

WHAT? HOW? WHERE?

Tasks, Tasks & More Tasks:
Commit to one new task that you will implement.

But Does Active Learning Really Work?

"Active Learning is the empirically validated teaching practice in regular classrooms,"… In college STEM courses as well as K-12!!

Active learning is defined as "engages students in the process of learning through activities and/or discussion in class, as opposed to passively listening to an expert. It emphasizes higher-order thinking and often involves group work."

--National Academy of Sciences, Scott Freeman, 2013

But Does Active Learning Really Work?

"Failure rates under traditional lecture are 55 percent higher than the rates observed under more active approaches to instruction."

– Mathematics Association of America, 2015

But Does Active Learning Really Work?

"One of the best examples of an active learning technique suitable for use in lectures is 'think-pair-share.'"

– American Mathematics Society, 2013

But Does Active Learning Really Work?

"Some of the findings, such as the benefits of student engagement, are unlikely to be controversial although the magnitude of improvements resulting from active-engagement methods may come as a surprise Other findings challenge traditional assumptions […] For example, students will remember more content if brief activities are introduced to the lecture."

– Journal of Engineering Education, 2004

But Does Active Learning Really Work?

Create YOUR 21st Century Classroom …

…by taking the mound with confidence,

…one active learning task at a time.

www.mathprojects.com