A Calculated Escape:
Enhancing Reasoning through Team Problem Solving

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National Council of Teachers of Mathematics

Annual Conference 2018, Washington D.C.

Math Progressions through Habits of Mind 2015 – 2018

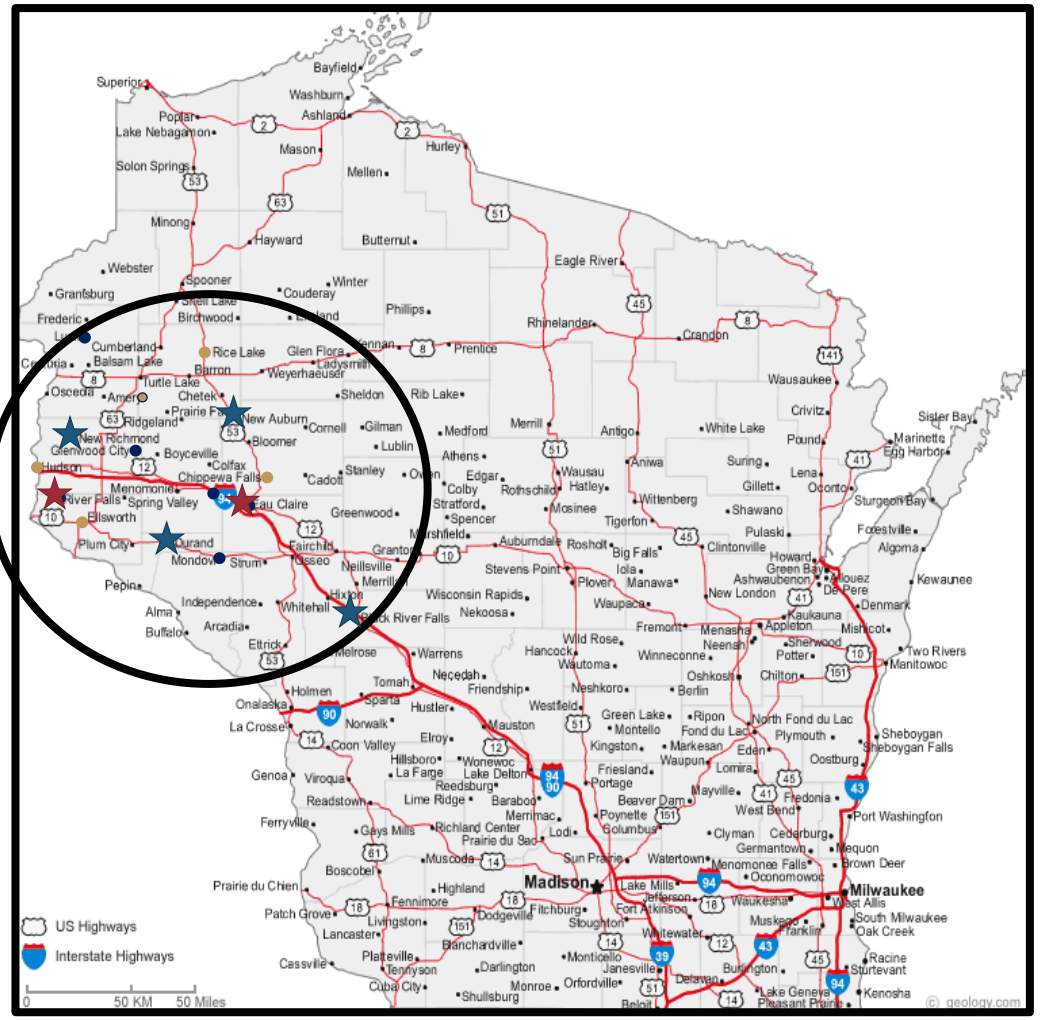
University of Wisconsin – River Falls
University of Wisconsin – Eau Claire
University of Wisconsin – LaCrosse
Mount Mary University

- Barron
- Black River Falls
- Chippewa Falls
- Clayton
- Durand
- Eau Claire
- Elk Mound
- Grantsburg
- Glenwood City
- Hudson
- Lake Holcombe
- Luck
- Menomonie
- Mondovi
- New Auburn
- New Richmond
- River Falls
- Saint Croix Central

88 Participants * 11 Mentor Teachers * 6 Apprentices

Saturday Seminars at UW – Eau Claire and UW – River Falls

Tuesday/Wednesday evening Seminars at Black River Falls, Durand, New Auburn, and New Richmond



Mentor Teachers from Eau Claire, Chippewa Falls, Luck, Mondovi, New Richmond, and River Falls

Apprentices from UW – River Falls

Why Escape Rooms?

- Escape rooms are a fun new trend quickly gaining popularity.
- This activity is a great opportunity to students to demonstrate reasoning skills and collaborate while applying their knowledge of mathematics concepts.
- Rich mathematics tasks prepare students for this type of team challenge.
- Students are given an opportunity to engage with the CCSSM Standards of Mathematical Practice and explore connections between mathematics concepts.

Math Educators Take on the Tactical Escape Challenge

Math Transition into the Common Core Era participants

Standards for Mathematical Practice

Make sense of problems and persevere in solving them.	Reason abstractly and quantitatively.	Construct viable arguments and critique the reasoning of others.	Model with mathematics.
Use appropriate tools strategically.	Attend to precision.	Look for and make use of structure.	Look for and express regularity in repeated reasoning.

Guidelines for Your Escape

In your small team, make sense of your clues.

Find the value of the letter for your team.

Send a representative forward with your letter and its value.

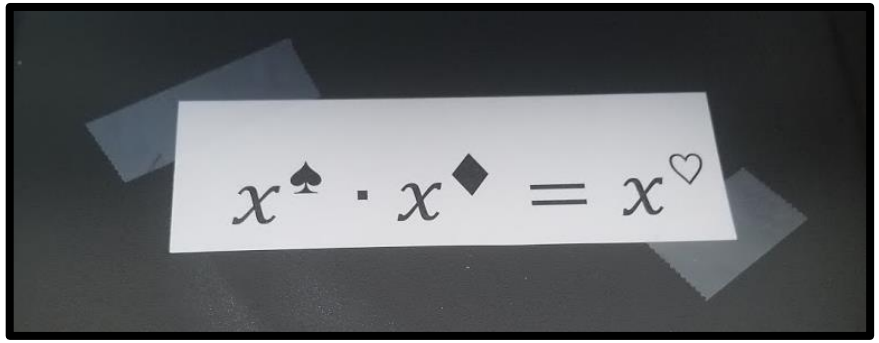
Representatives determine the code word from the letters.

As a large group, input the values for the code to escape the room.

A

PROPERTIES OF EXPONENTS

SYMBOLIC EQUATIONS

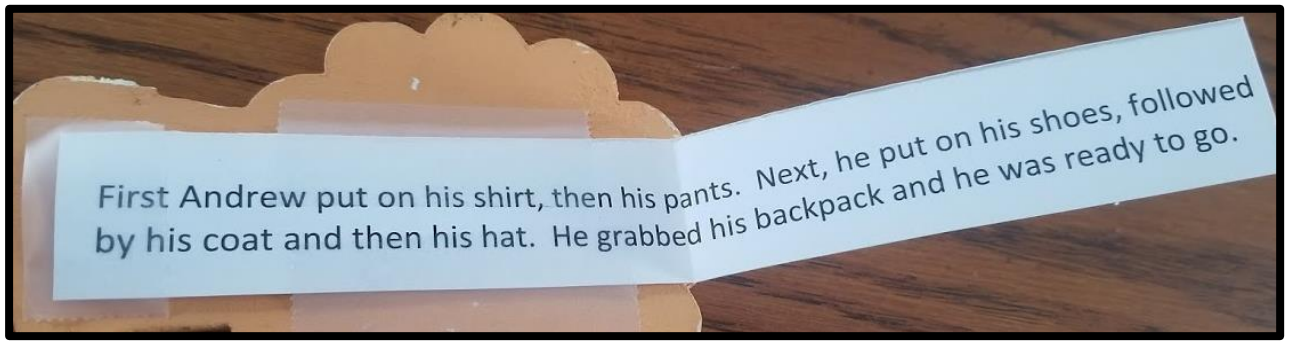


Source: A. LeGear, 2018

R

DIVISION OF POLYNOMIALS

AREA MODELS

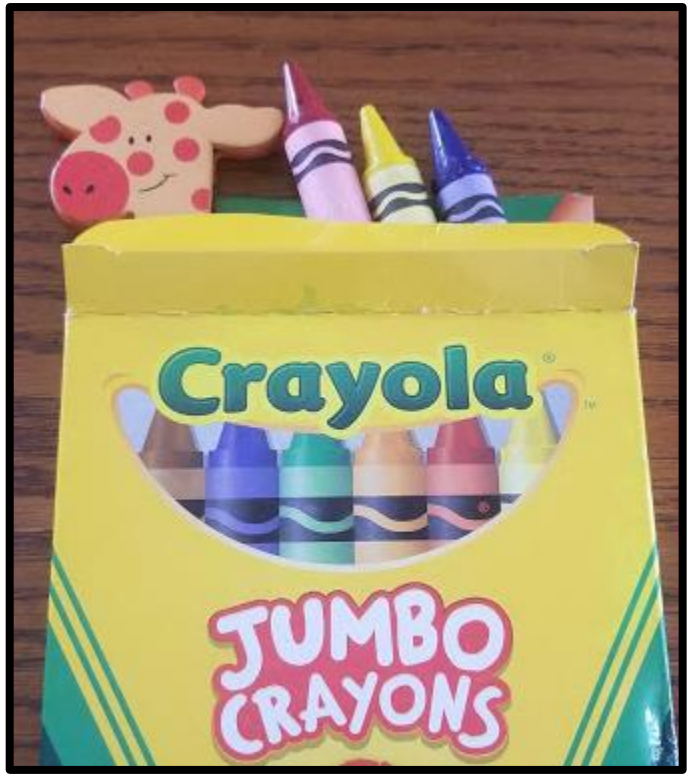


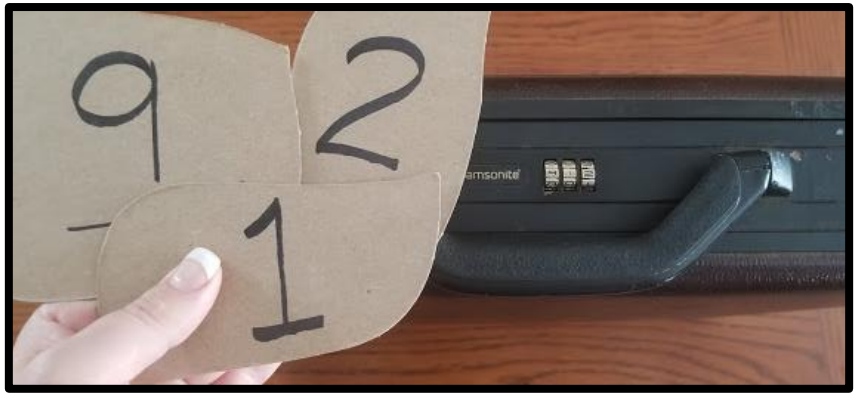
Source: A. LeGear, 2018

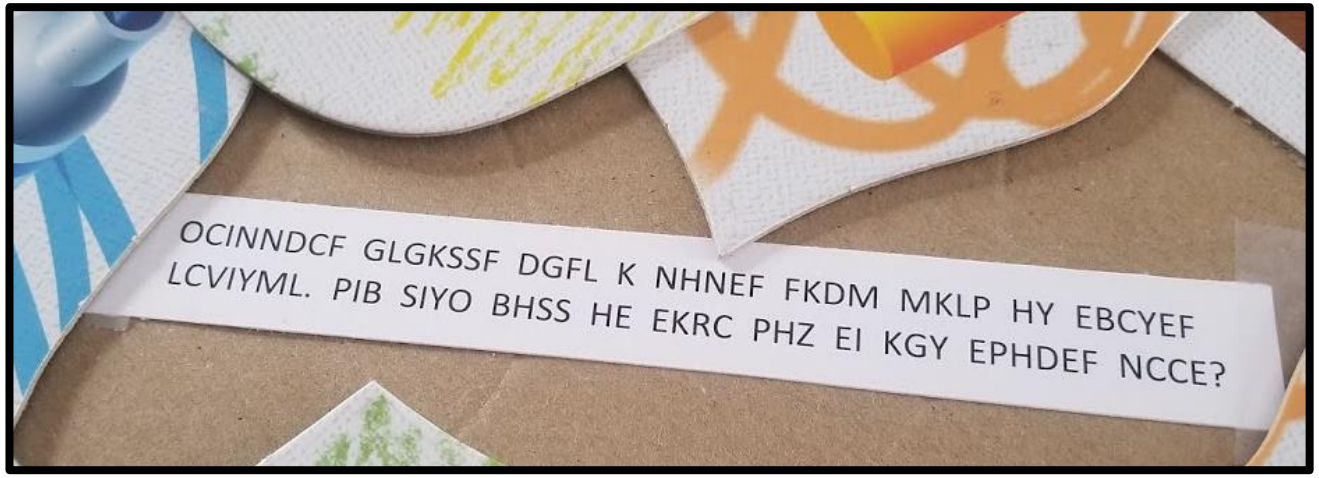
G

PROPORTIONS

CONTEXTUAL SITUATIONS





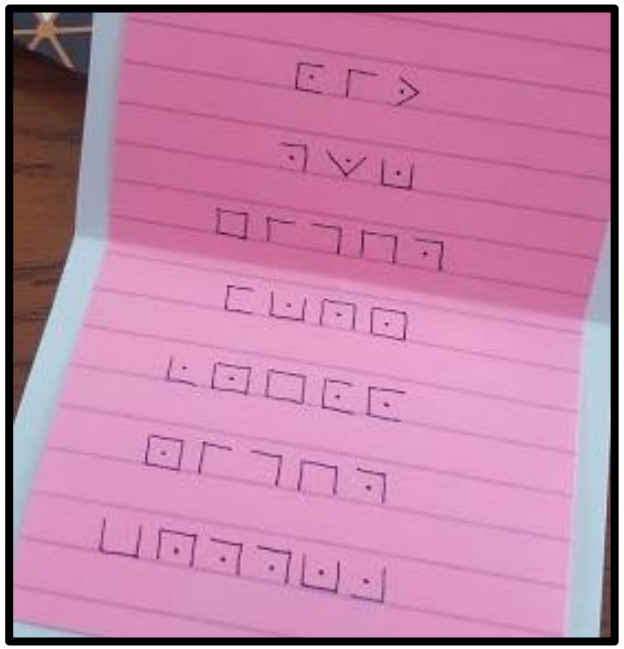


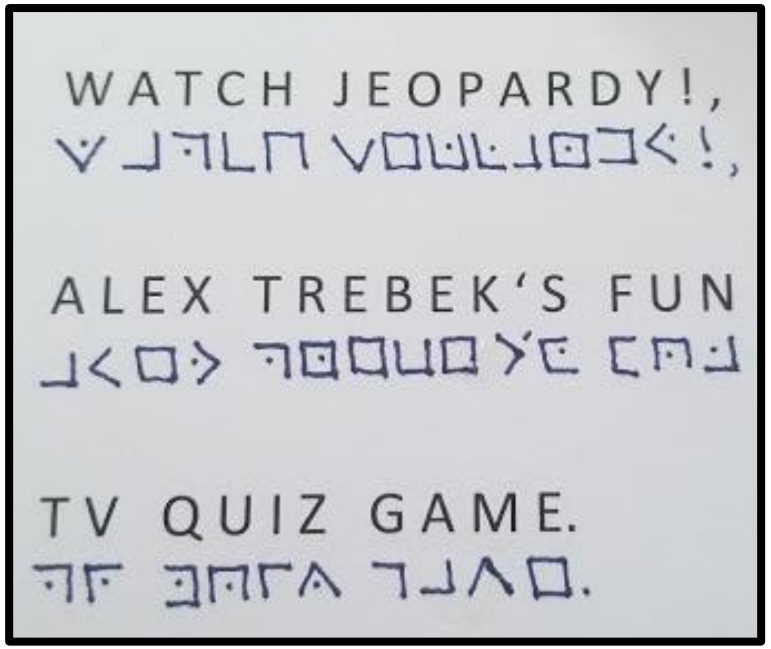
Source: A. LeGear, 2018

U

QUADRATIC FUNCTIONS

SYMBOLIC EQUATIONS & ALGEBRA TILES



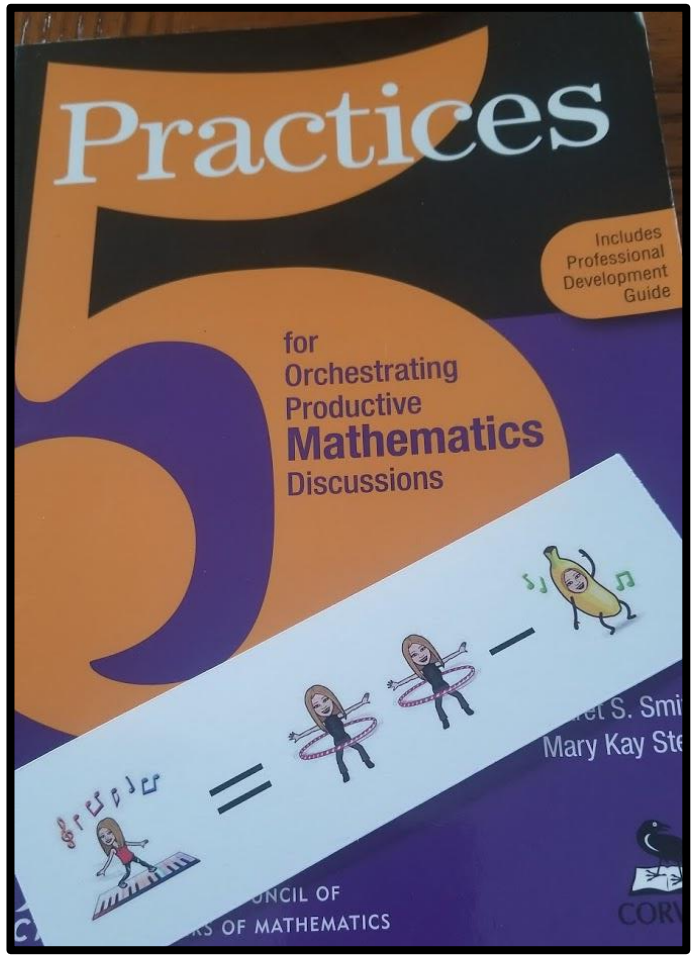


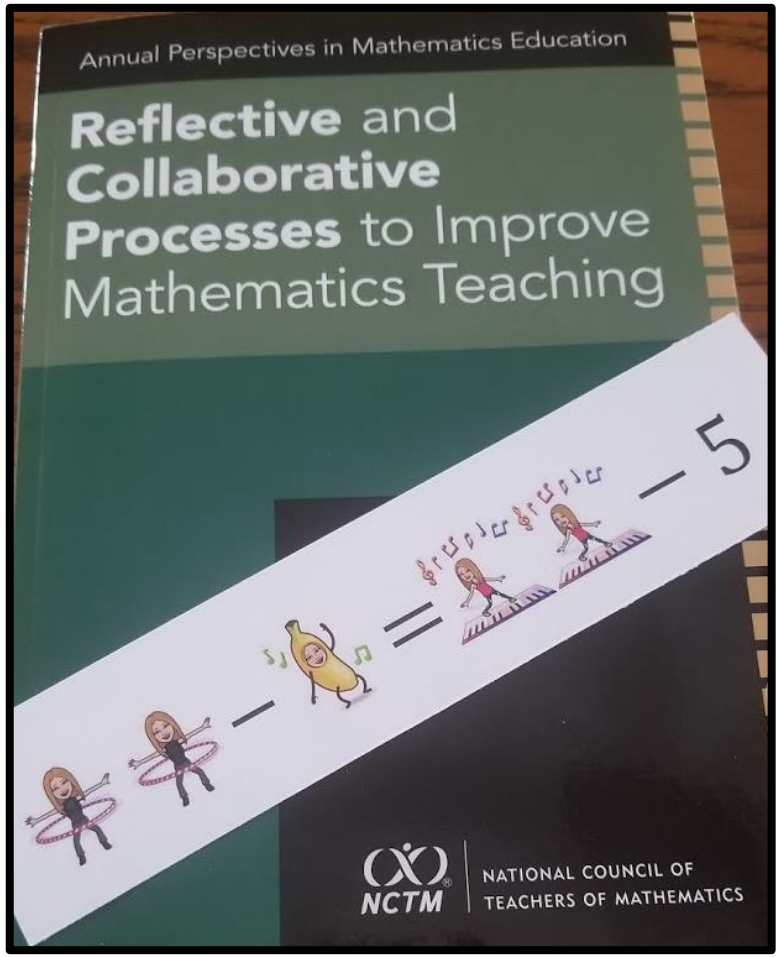
Source: A. LeGear, 2018

M

SYSTEMS OF EQUATIONS

DIAGRAMS



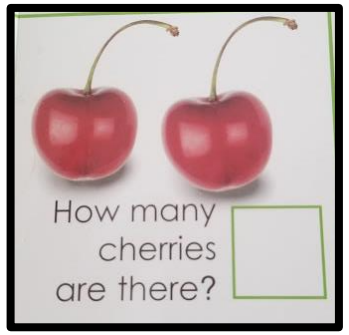


Source: A. LeGear, 2018

E

EXPONENTIAL FUNCTIONS

TABLES

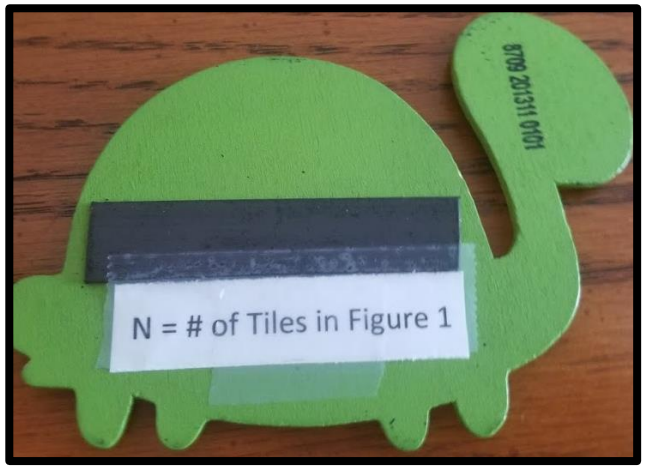


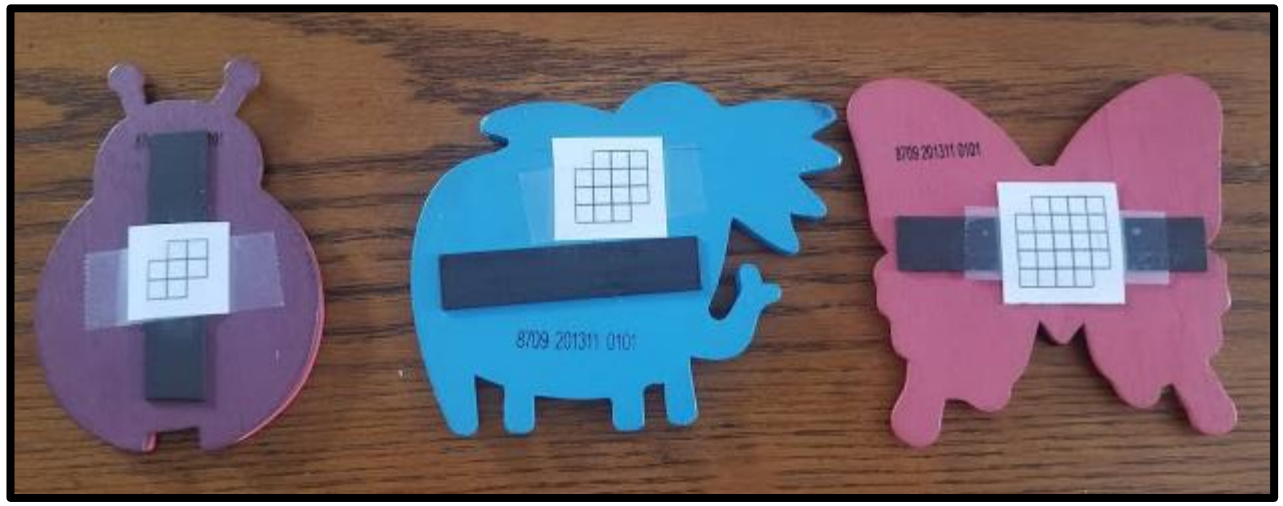
Source: A. LeGear, 2018

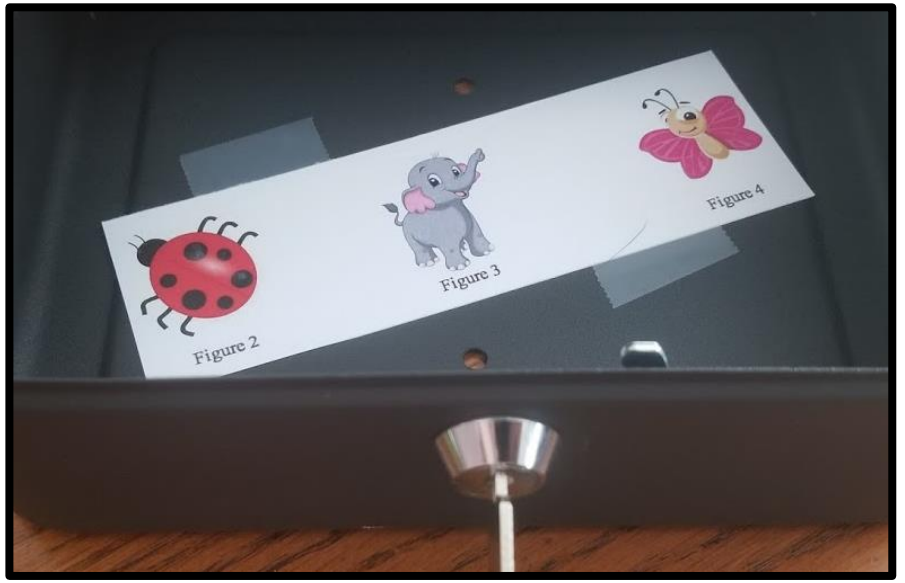
N

QUADRATIC GROWTH

TILE PATTERNS





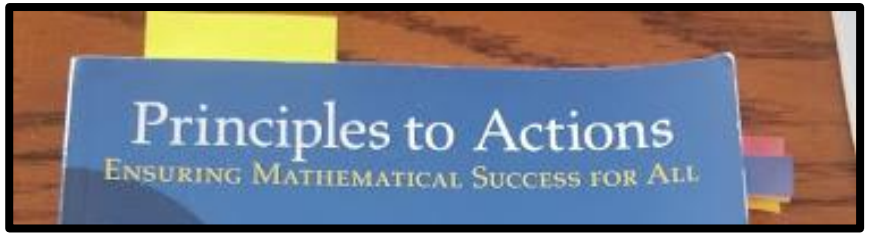


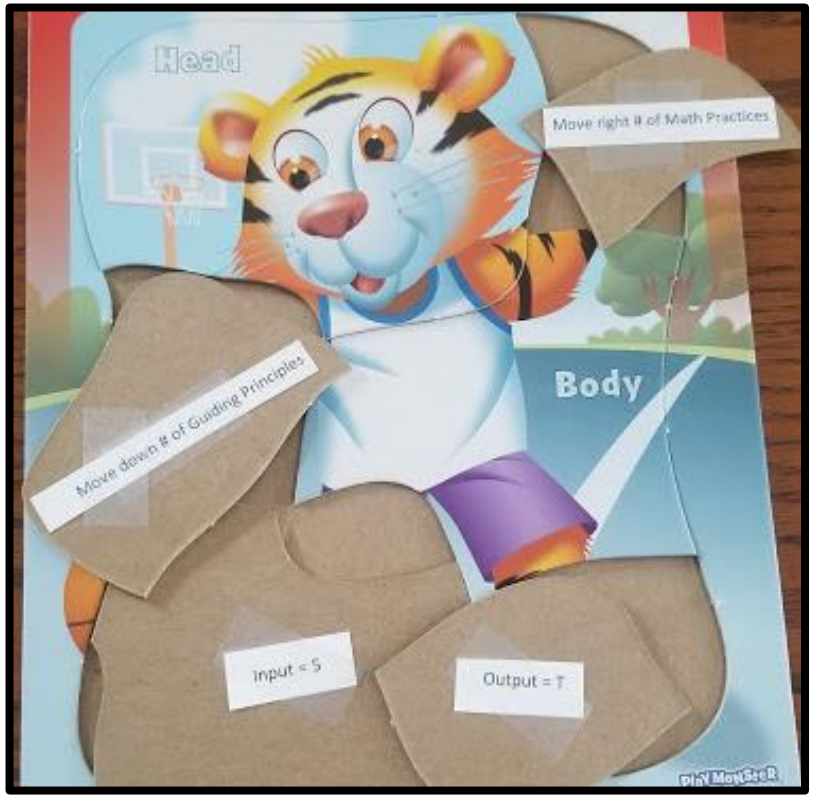
Source: A. LeGear, 2018

T

ABSOLUTE VALUE FUNCTIONS

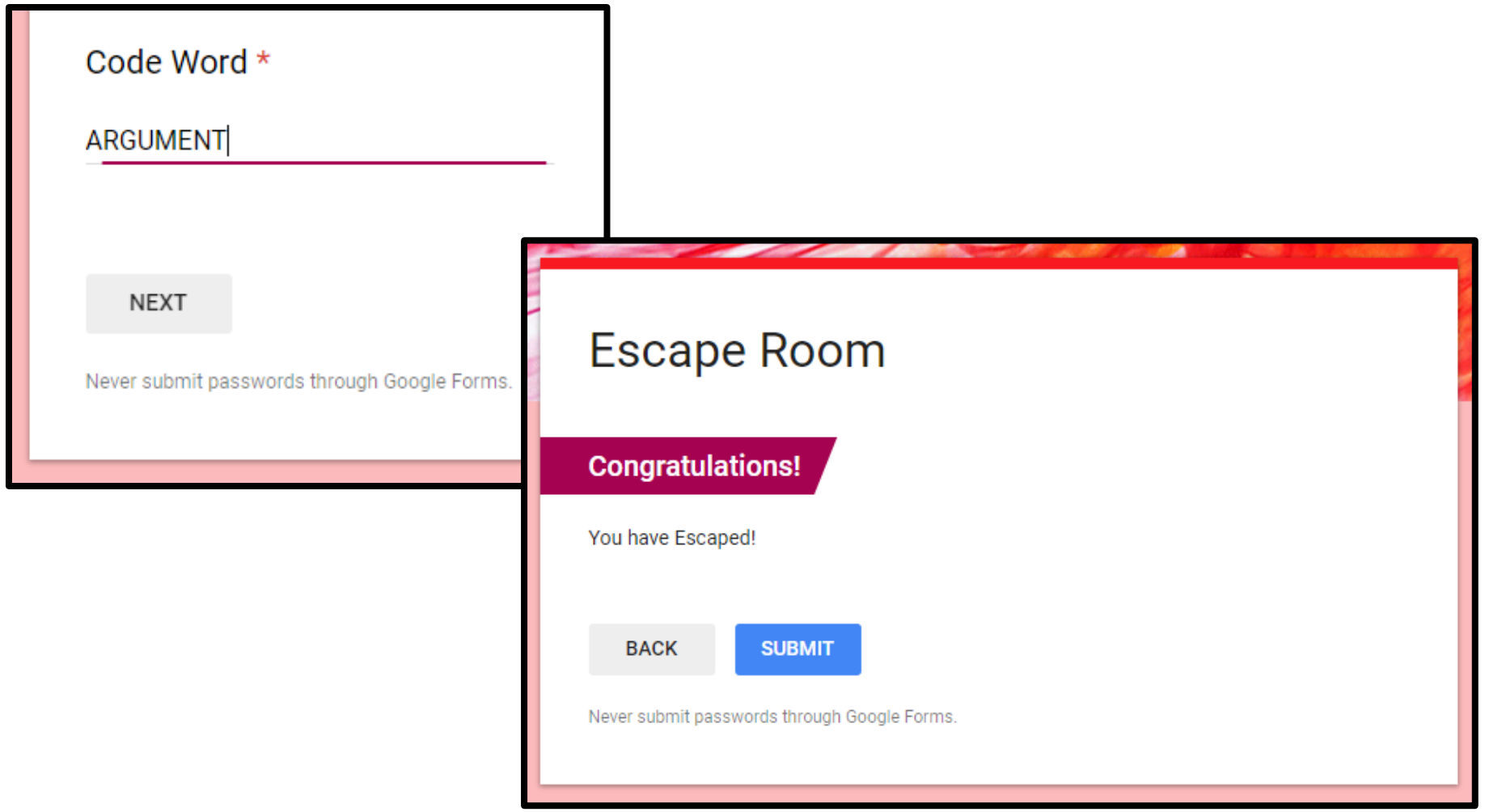
TRANSLATING GRAPHS





Source: A. LeGear, 2018

Entering the Code to Escape



Guidelines for Classroom Escapes

- You have forty minutes to work as a team to “escape”.
- The code word is marked with a hashtag (#CODE).
- You must solve the clues to find values that you will substitute in for the letters in the code word.
- Do not remove clues from their location. Record them on whiteboards.
- Use the whiteboards to solve problems.
- Anything taped off with a red X is off limits.
- You get up to three hints, but everyone must agree.
- You must dance as a team to earn a hint.
- You have three attempts to solve the puzzle.

Escape Rooms for All

- Escape rooms work well in elementary, middle school, and high school classrooms.
- The clues can be customized to fit content appropriate for the grade level.
- Teachers have commented that they were able to include more advanced content as well because of the team aspect and their role as the facilitator.
- It is important to consider the characteristics of the age group and specific population as part of the escape room design.
- Celebrate unique perspectives. All students have something to contribute.

High School Escape Room

Code Word: MODELS

Source: A. LeGear, 2017

M = Determine the output of an absolute value function.

Find and connect the pieces of information.

O = Find the value in a table for an exponential function.

Find and substitute the input and output values into the table provided.

D = Divide polynomials to find the remainder.

Find directions to unlock the box containing the expression.

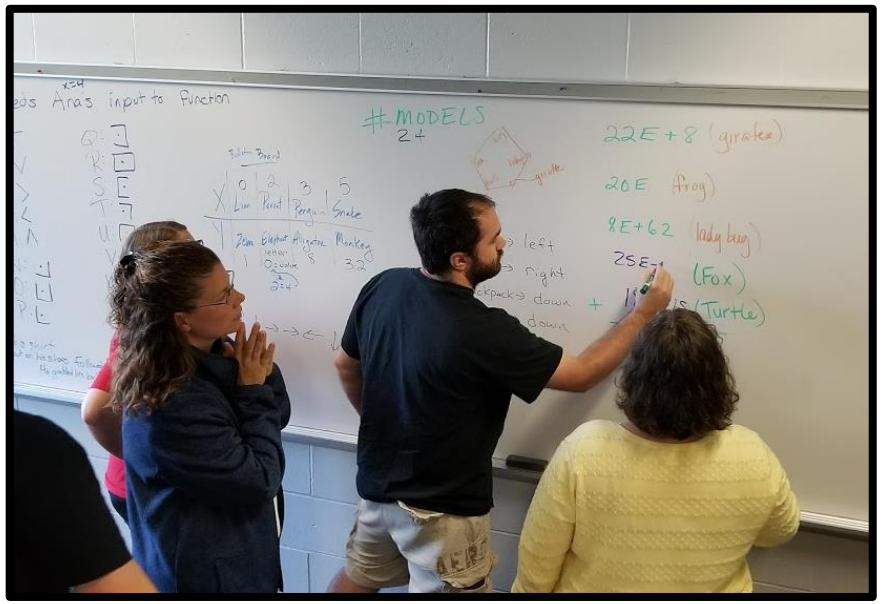
E = Use the sum of the interior angles of an pentagon to solve for a variable.

Use the diagram and find expressions for each angle to solve.

L and S = Solve a system with a quadratic equation and a linear equation.

Decode a message to unlock the box containing the system.

High School Escape Room



Middle School Escape Room

Code Word: THINKS

T = Translate the graph of an absolute value function and find the new vertical-intercept.
Decode a message to determine the translation.

H and I = Solve a system of linear equations.
Find the code to unlock the box with the system.

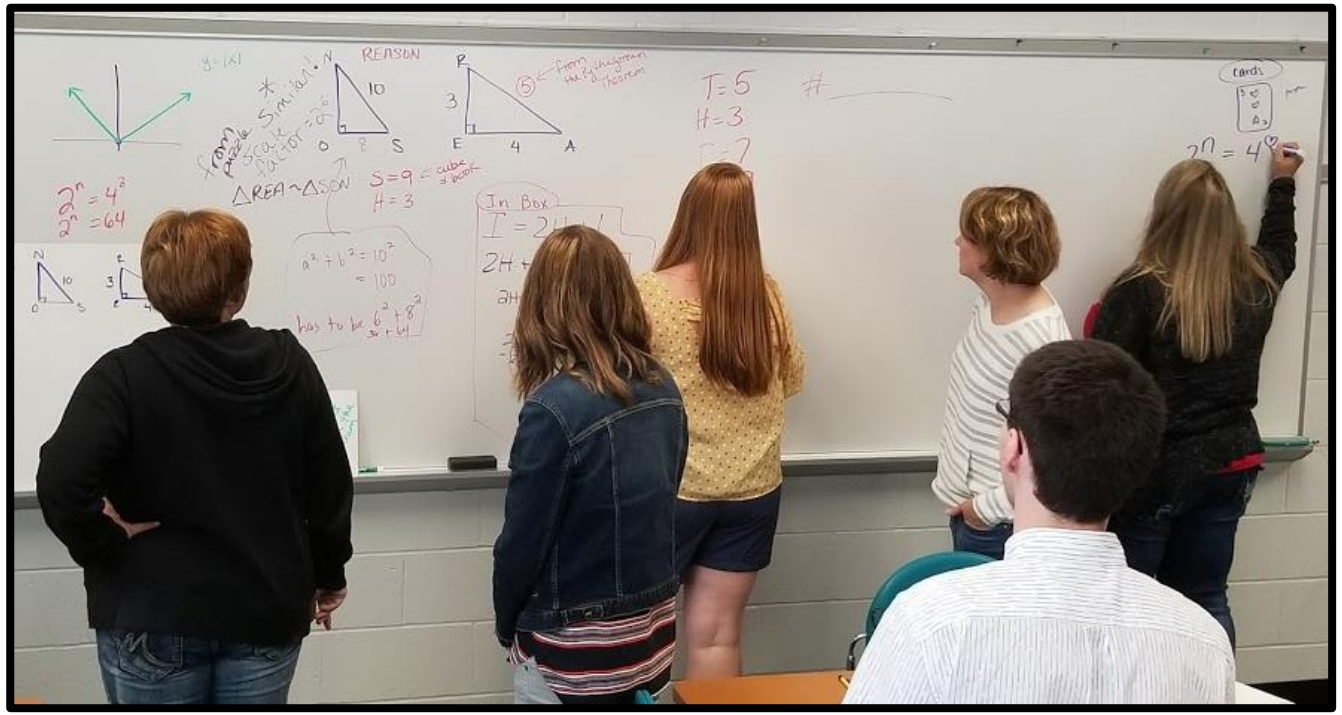
N = Solve an equation using the properties of exponents.
Determine the values of the variables from a deck of cards.

K = Find the scale factor between two right triangles using the Pythagorean Theorem.
Find and connect the pieces of information.

S = Determine the volume of a geometric solid.
Find the top, right, and front views of the solid and use snap cubes to build it.

Source: A. LeGear, 2017

Middle School Escape Room



Elementary Escape Room

Code Word:
NUMBER

Source: A. LeGear, 2017

N = Determine the smallest sum for a magic triangle.
Find the values of the triangle hidden in a puzzle.

U = Simplify an expression using structure.
Find the values to substitute into the expression hidden in a puzzle.

M = Solve a system of four equations.
Find and connect the equations with the Mashup Math visuals.

B = Determine how many hexagons can be built from a set of pattern blocks.
Find the code to unlock the briefcase containing the pattern blocks.

E = Solve a system of linear equations based on a situation.
Find the clues for the situation hidden in a book.

R = Find how many rectangles with a given area can be created with different dimensions.
Find the combination to unlock the box containing the question.

Elementary Escape Room

Making Your Own Escape Room

- Decide on a meaningful code word (which also determines the number of code strings).
- Select the mathematical concepts you want to include.
- Consider different representations you can incorporate to have a balance throughout.
- It is helpful to plan while in your classroom to fully utilize the space.
- Create a key for your escape room so you can find all the clues again.
- Consider extensions or modifications for your students.

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