

Hanover School Division

April 18th-20th, 2017

*****please be sure to complete your name tag*****

by: **Graham Fletcher**

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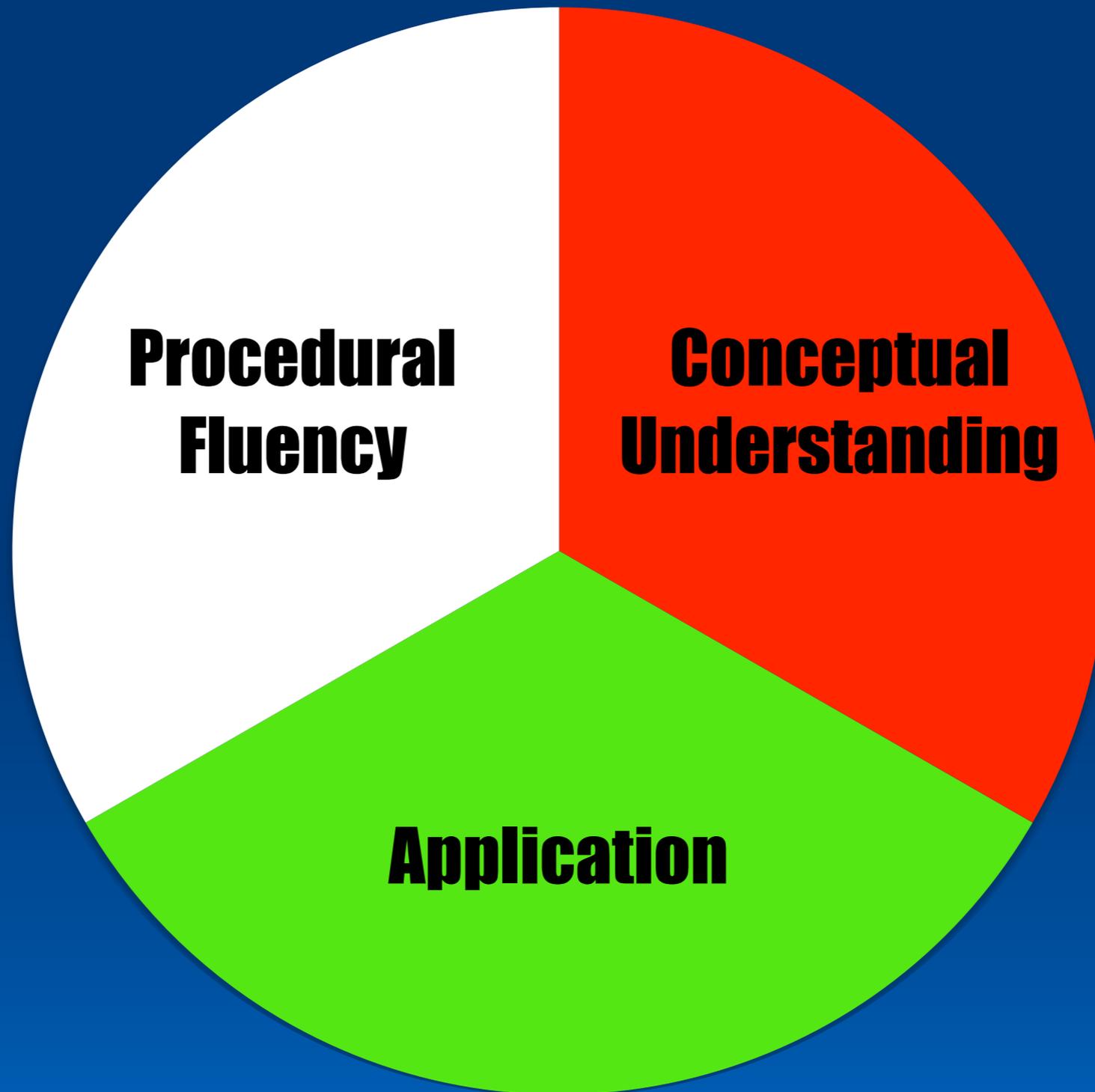
Broken Squares

- Designate shape keeper
- Share the shapes as evenly as possible between the group
- All the shapes will make 6 congruent squares with no shapes leftover
- Everyone is encouraged to **OFFER** a shape. No one may TAKE or SNATCH. You may RECEIVE a shape but only if it's OFFERED
- No “community square”
- NO TALKING



Today's Goals:

- Understand the implementation of a 3-act task and how they can be used as a formative assessment.
- Explore the vertical progression of key mathematical ideas before, during, and after the grade level we teach.
- Value the importance of properly closing a lesson



**Procedural
Fluency**

**Conceptual
Understanding**

Application

**NEXT TIME YOU'RE AFRAID
TO SHARE IDEAS
REMEMBER SOMEONE
ONCE SAID IN A MEETING
LET'S MAKE A FILM WITH A
TORNADO FULL OF SHARKS**

Dan Meyer :

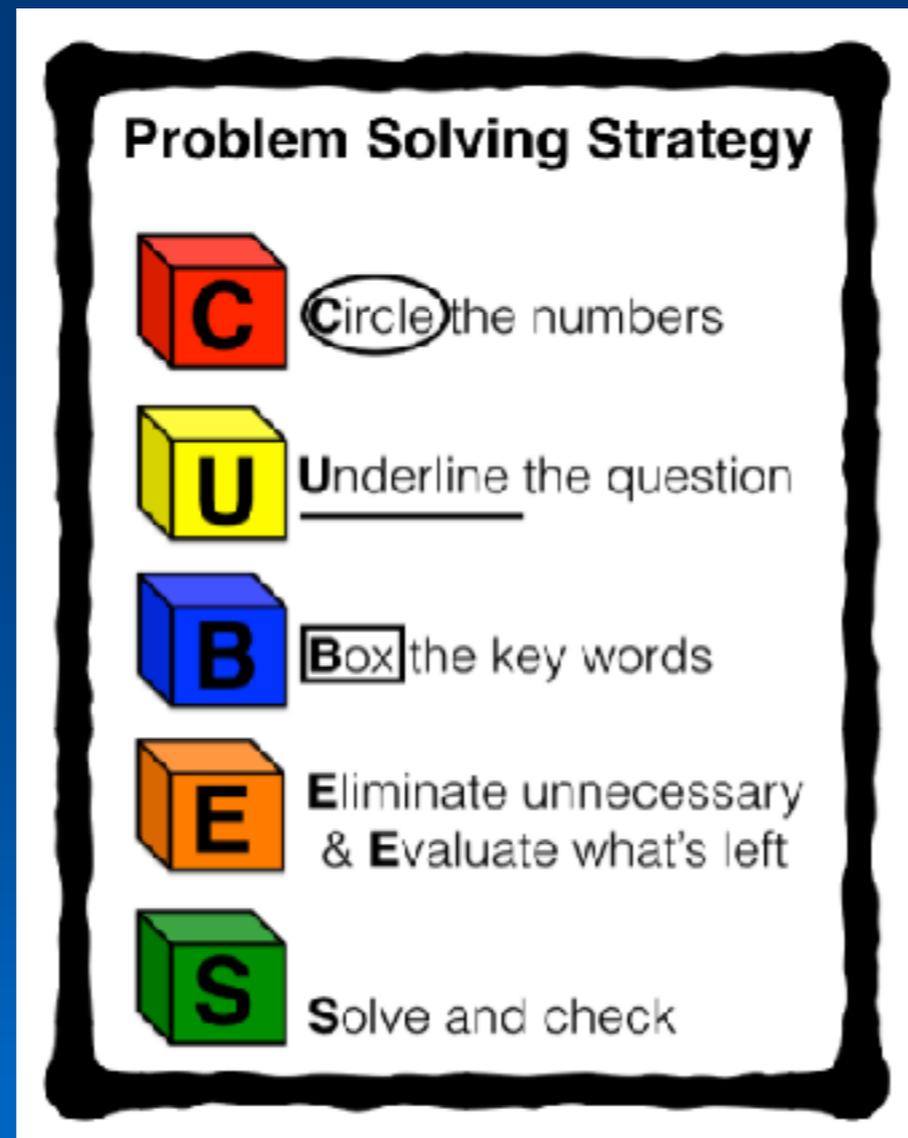
“Be Less Helpful”

Demetrius has 17 Skittles which is 12 fewer than Alicia.

How many Skittles does Alicia have?

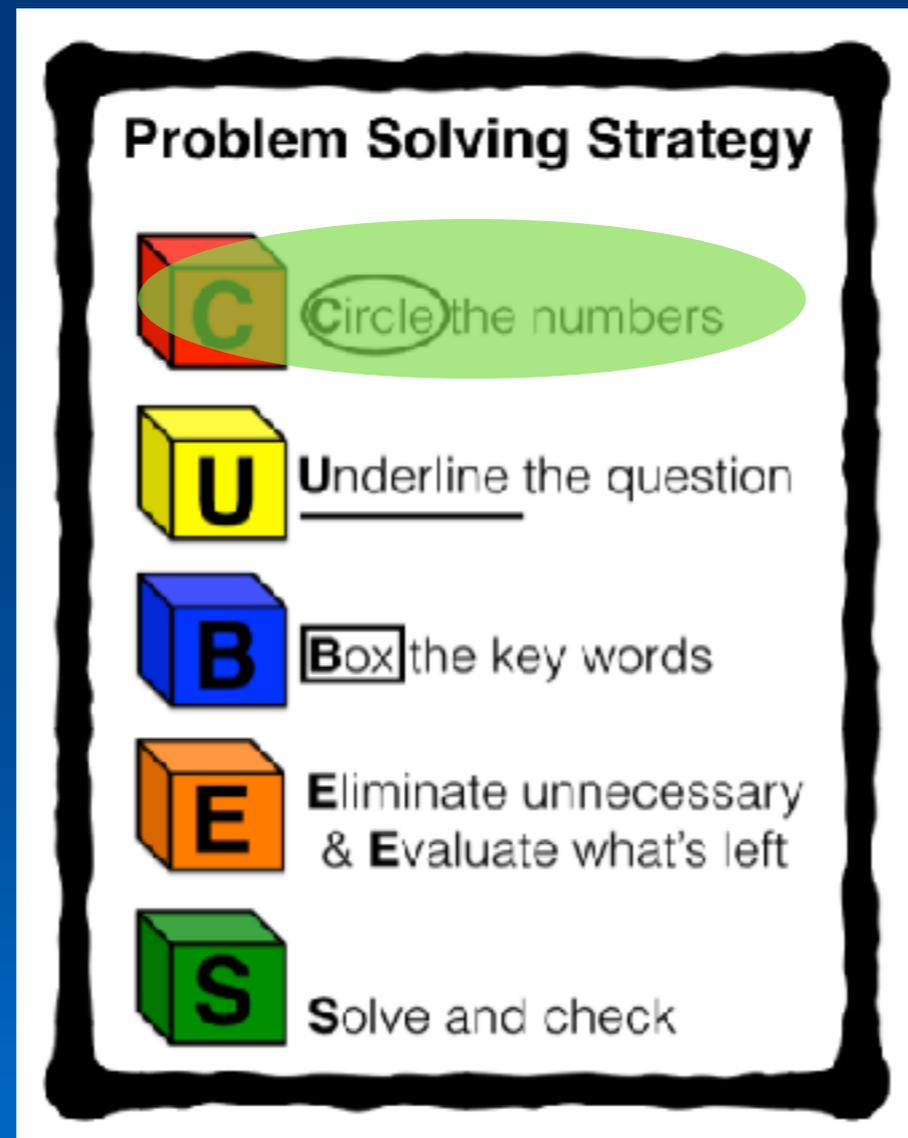
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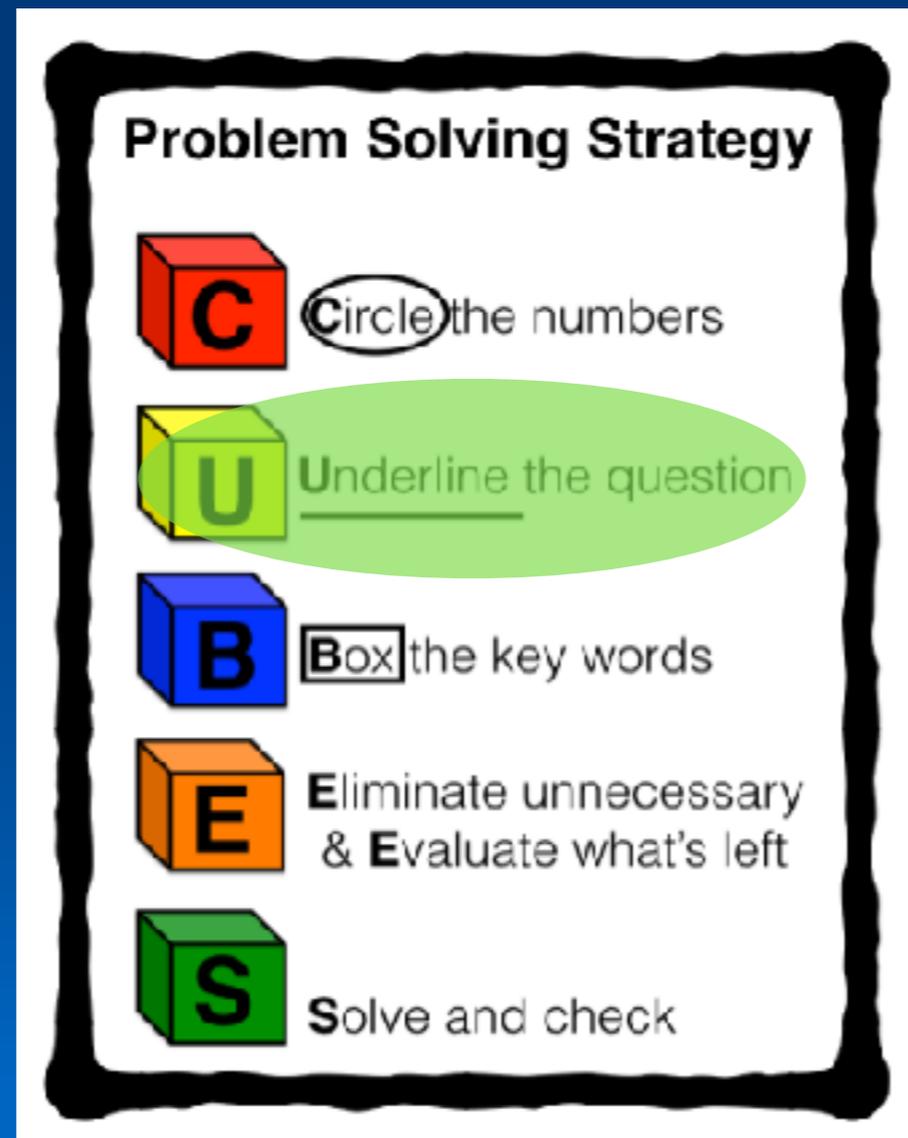
Demetrius has **17** Skittles which is **12** fewer than Alicia.

How many Skittles does Alicia have?



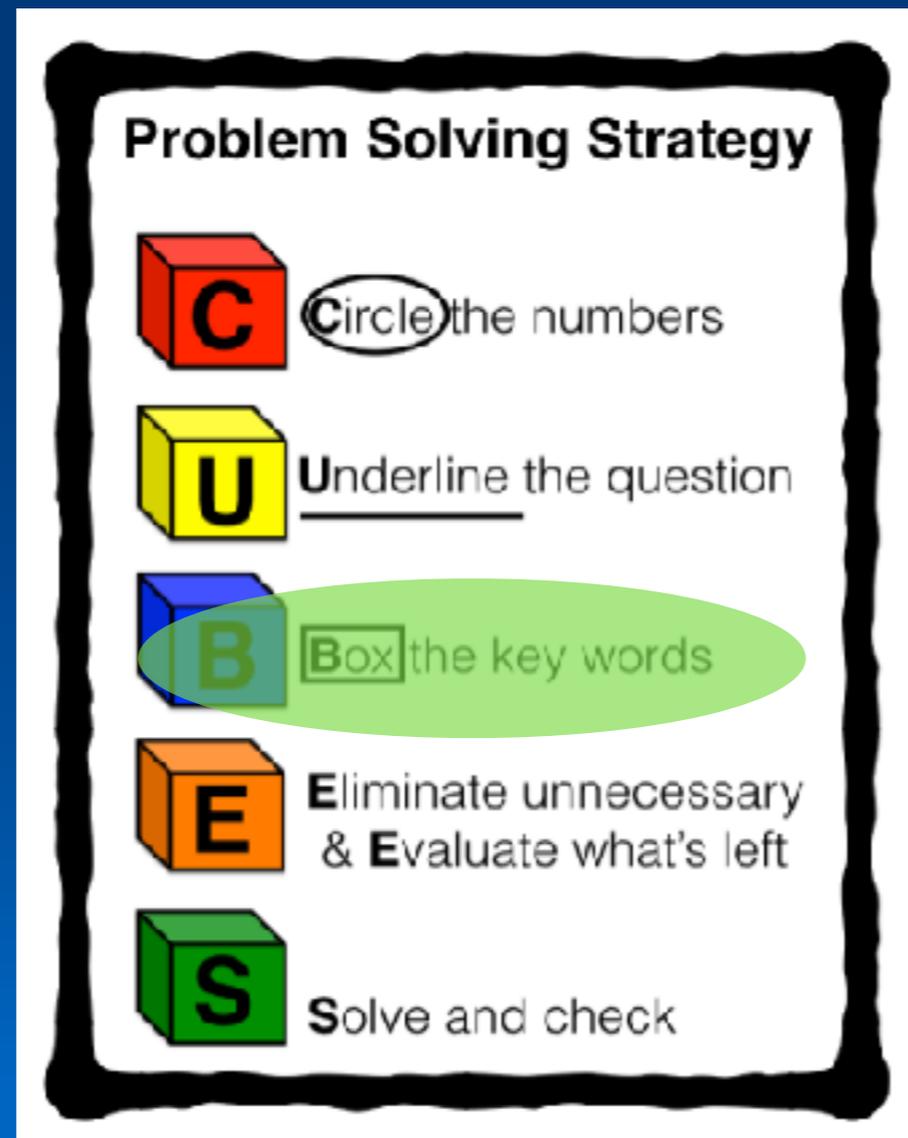
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How many Skittles does Alicia have?



17

12

fewer

How many Skittles does Alicia have?

Problem Solving Strategy

- C** Circle the numbers
- U** Underline the question
- B** Box the key words
- E** Eliminate unnecessary & Evaluate what's left
- S** Solve and check

17

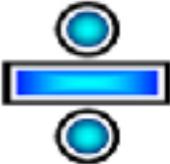
12

fewer

How many Skittles does Alicia have?

Problem Solving Strategy

- C** Circle the numbers
- U** Underline the question
- B** Box the key words
- E** Eliminate unnecessary & Evaluate what's left
- S** Solve and check

The Key Word in Word Problems	
 Add Sum Total All together Plus In all	 Multiply Product Times Twice Total Multiplied by
 Subtract Remain Difference Less than Fewer How many more Minus	 Divide Quotient Goes into Split Equally Each

How many Skittles does Alicia have?

$$17 - 12$$

Tracy Zager:

“How can we break the cycle?”

Joe had some playing cards in his bag. Ashley gave him 13 more cards. Joe now has 21 cards. How many cards did Joe have in his bag?

13

21

You little plucker!

13

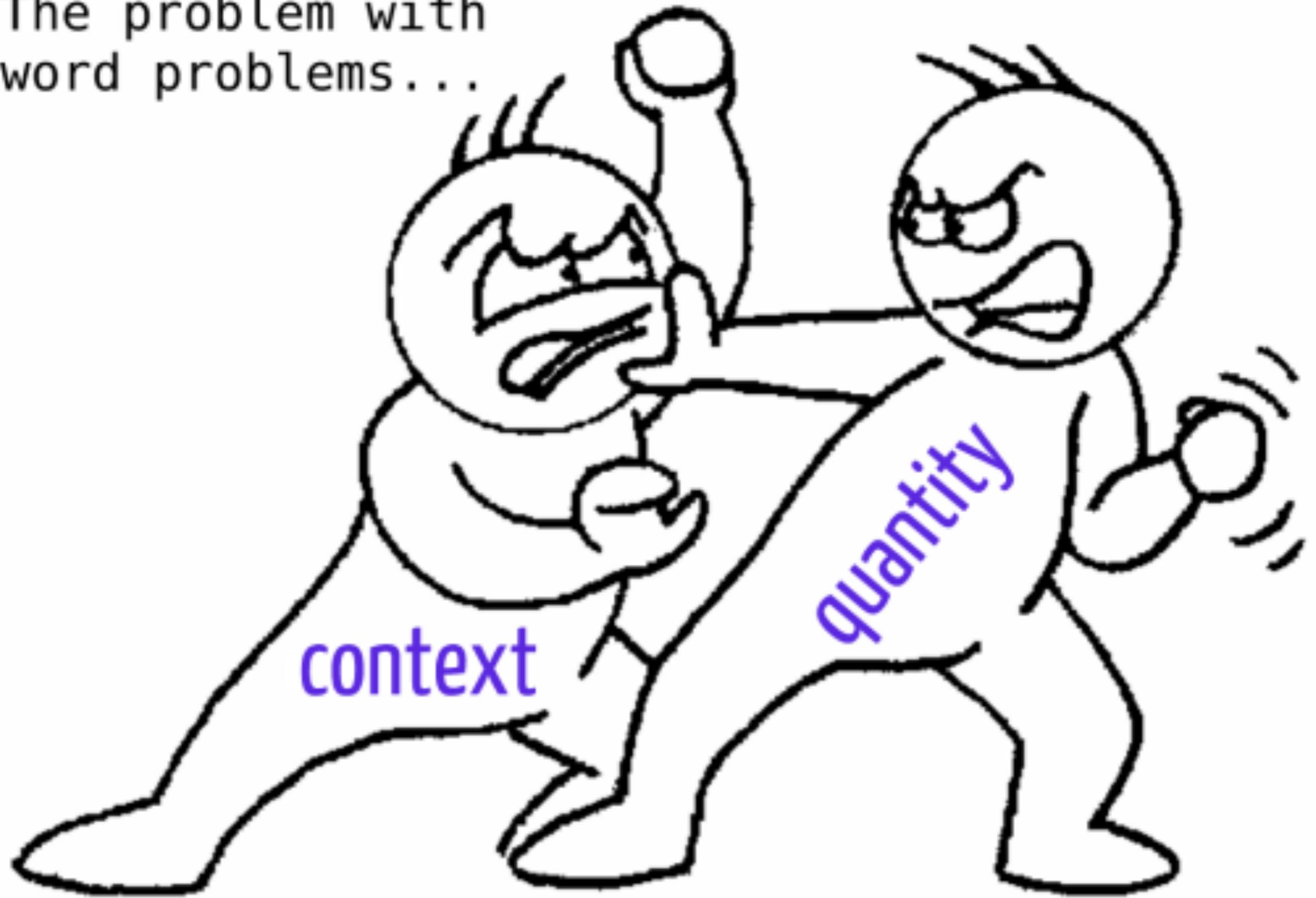
21

number
^

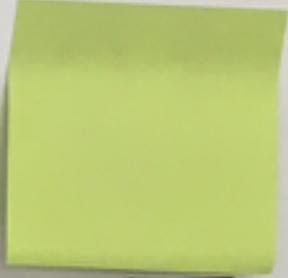
You little plucker!

13
21

The problem with
word problems...



Joe had some playing cards in his bag. Ashley gave him 13 more cards. Joe now has 21 cards. How many cards did Joe have in his bag?

Joe had some playing cards
in his bag. Ashley gave him 
more cards. Joe now has 
cards. How many cards did Joe
have in his bag?



How many cards did Joe
have in his bag?

Name: _____

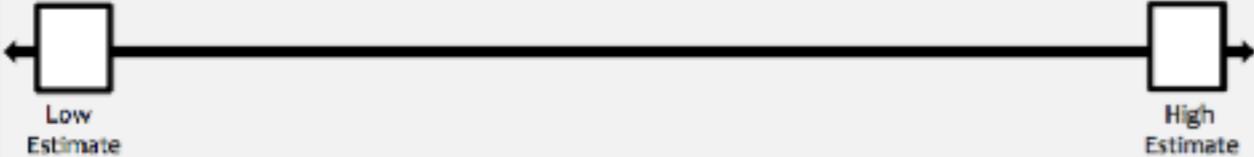
Date: _____

1. What did you notice?

2. What do you wonder?

3. Main Questions:

4. Estimate



Low Estimate

High Estimate

place your best estimate on the number line and label

5. What information would you like to know?

6. Answer

Rope Jumper





5 in 27

10 in 54 times

$127 + 8 = ?$

15 in 81 times

20 in 108 times

25 in 135 times

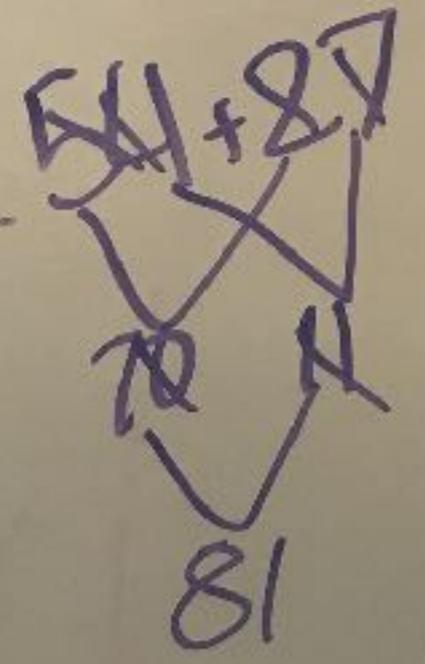
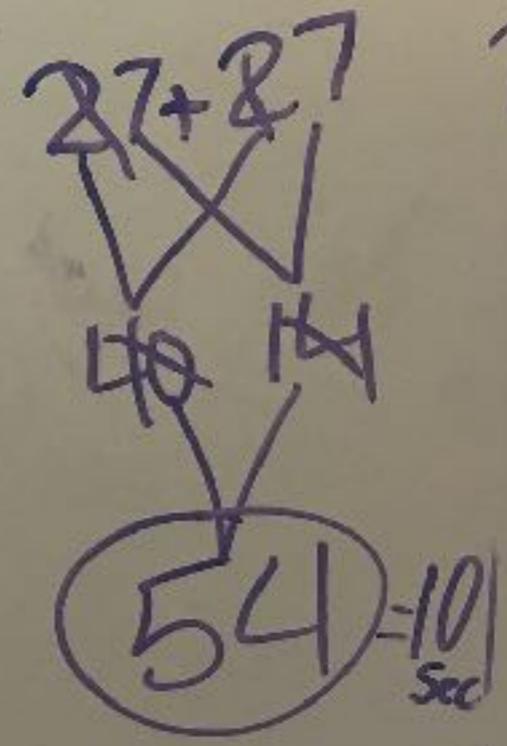
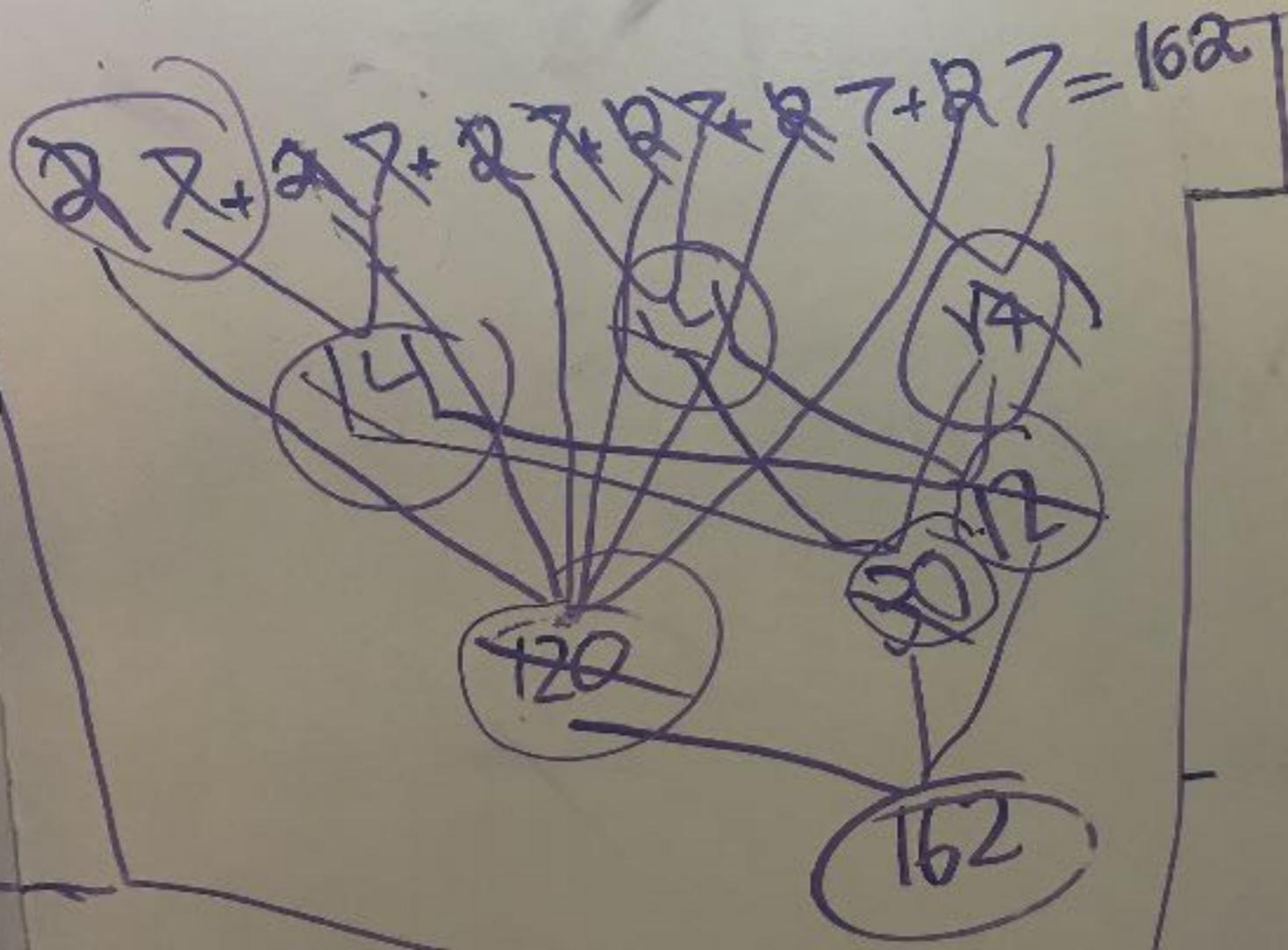
30 in 162 times

Jumps

umps

ps

Nelsey + Erica



27 54 81 108 135 162
5 10 15 20 25 30



Modification & Accessibility

Mathematical Modeling



Modeling with Mathematics

What ISN'T mathematical modeling

- The use of manipulatives does not ensure that modeling with mathematics is taking place.
- If the mathematics is not contextualized, modeling with mathematics cannot exist.
- Modeling with mathematics does not mean, “I do, we do, you do.”

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. 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.

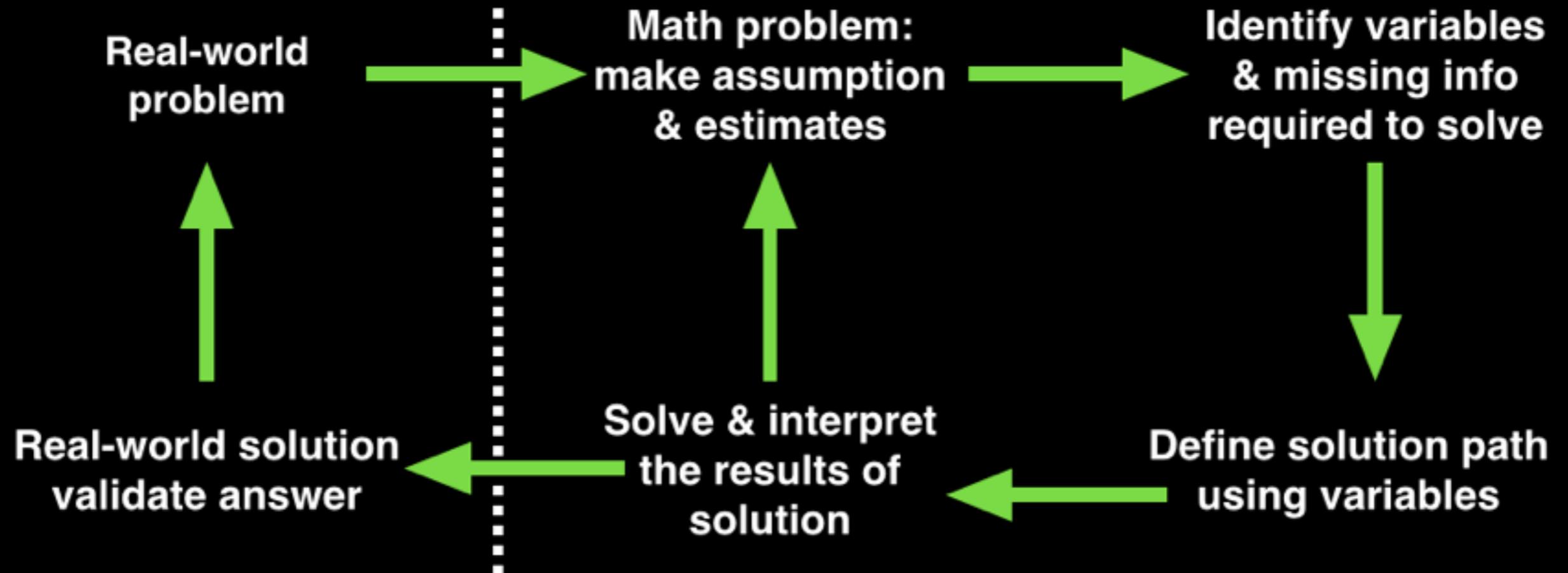
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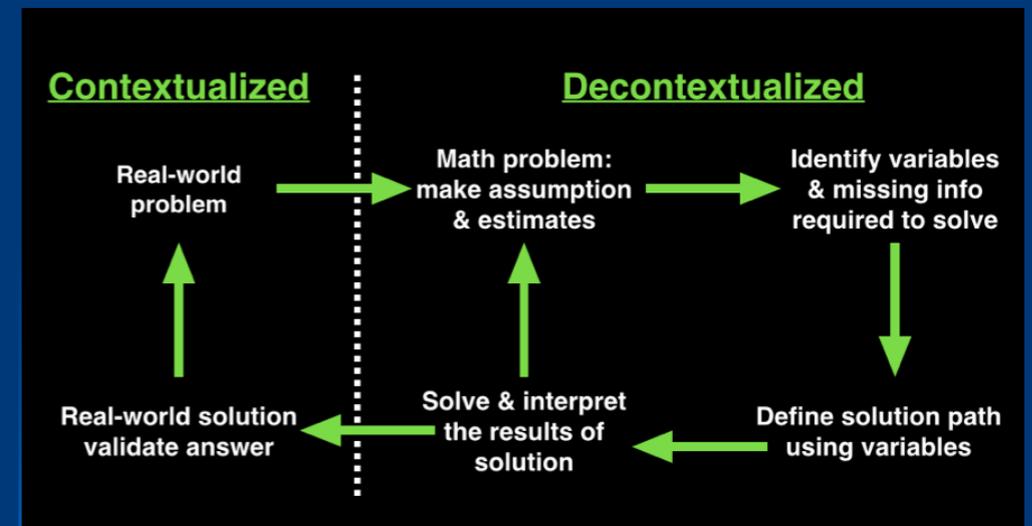
Mathematical Modeling

Contextualized

Decontextualized



3-Act Tasks



Act 1:

- Real world problem or scenario presented
- What do you notice? What do you wonder?
- Make estimates

Act 2:

- Identify missing variables and missing variables to solve
- Define solution path using variables

Act 3:

- Solve and interpret results of the solution
- Validate answer

3 Things on the road to modeling...

- Identify the problem, or pose a question.
- Make an estimate.
- Identify the variables needed to solve, and answer the problem or question posed.

Most asked questions:

- How often should we use 3-Act Tasks?
- When should we use 3-Act tasks? How do they fit into the scope of a unit?
- How long does one task usually take?
- What if we don't have the time?
- Any others?

Orchestrating Discussions

Five practices constitute a model for effectively using student responses in whole-class discussions that can potentially make teaching with high-level tasks more manageable for teachers.

Margaret S. Smith, Elizabeth K. Hughes, Randi A. Engle, and Mary Kay Stein



Margaret S. Smith, *coeditor* of this issue, is an associate professor of mathematics education at the University of Pittsburgh. Over the past decade, she has been developing evidence-based materials for use in the professional development of mathematics teachers and studying what teachers learn from the professional development in which they engage. **Elizabeth K. Hughes**, *editorial board member*, recently finished her doctorate in mathematics education at the University of Illinois. Her research interests include preservice secondary mathematics teacher education and the use of algebraic-based materials in developing teachers' understanding of what it means to teach and learn mathematics. **Randi A. Engle**, *coeditor* of this issue, is an assistant professor of mathematics education and the social sciences of learning at the University of California Berkeley. She is interested in developing practical resources for how mathematics teachers can create discussion-based learning environments that promote strong student engagement, learning, and transfer. **Mary Kay Stein**, *coeditor* of this issue, is a professor of learning sciences and policy and the director of the Learning Policy Center at the University of Michigan. Her research focuses on instructional practice and on organizational and policy conditions that impact it.

Discussions that focus on cognitively challenging mathematical tasks, namely, those that promote thinking, reasoning, and problem solving, are a primary mechanism for promoting conceptual understanding of mathematics (Lemov and Lampert 2015; Mizuoka, O'Connor, and Bennett forthcoming). Such discussions give students opportunities to share ideas and clarify understandings, develop convincing arguments regarding why and how things work, develop a language for expressing mathematical claims, and learn to see things from other perspectives (NC 196,000). Although discussions about high-level tasks provide important

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The **5** practices are:

1. **Anticipating** student responses to challenging mathematical tasks;
2. **Monitoring** students' work on and engagement with the tasks;
3. **Selecting** particular students to present their mathematical work;
4. **Sequencing** the student responses that will be displayed in a specific order and;
5. **Connecting** different students' responses and connecting the responses to key mathematical ideas.

Task Planning Document

Task:		
Misconceptions:		
Strategy	Who and What (highlight)	Order

Anticipating → Monitoring → Selecting → Sequencing → Connecting

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$$54 \\ \times 3 \quad 162$$

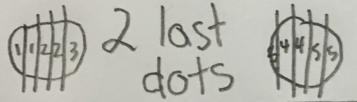
dumps	54 x 3	162
time	10 x 3	30

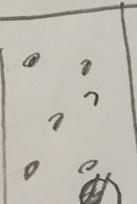
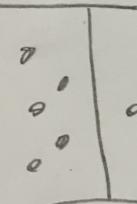
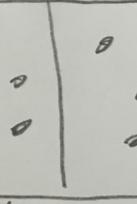
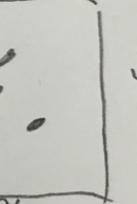
time	Jumps
5	27
10	54
15	81
20	108
25	135
30	162

$$5 \div 30 = 6$$

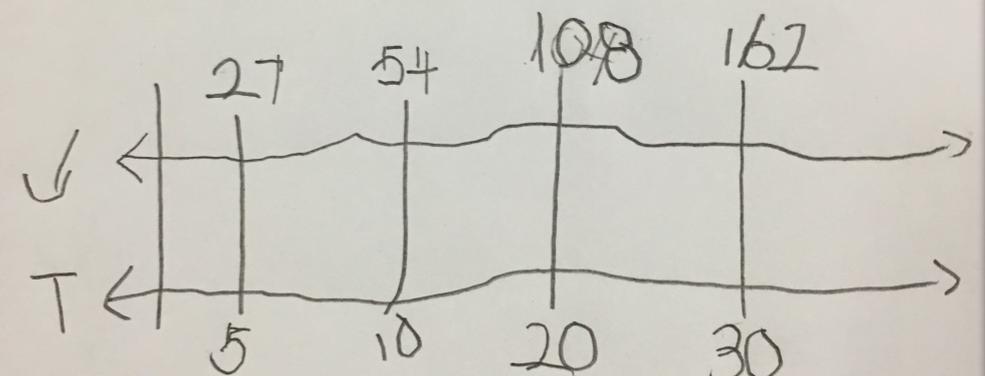
$$27_{\textcircled{1}} + 27_{\textcircled{2}} + 27_{\textcircled{3}} + 27_{\textcircled{4}} + 27_{\textcircled{5}} + 27_{\textcircled{6}} = 162$$

Rope Jumper

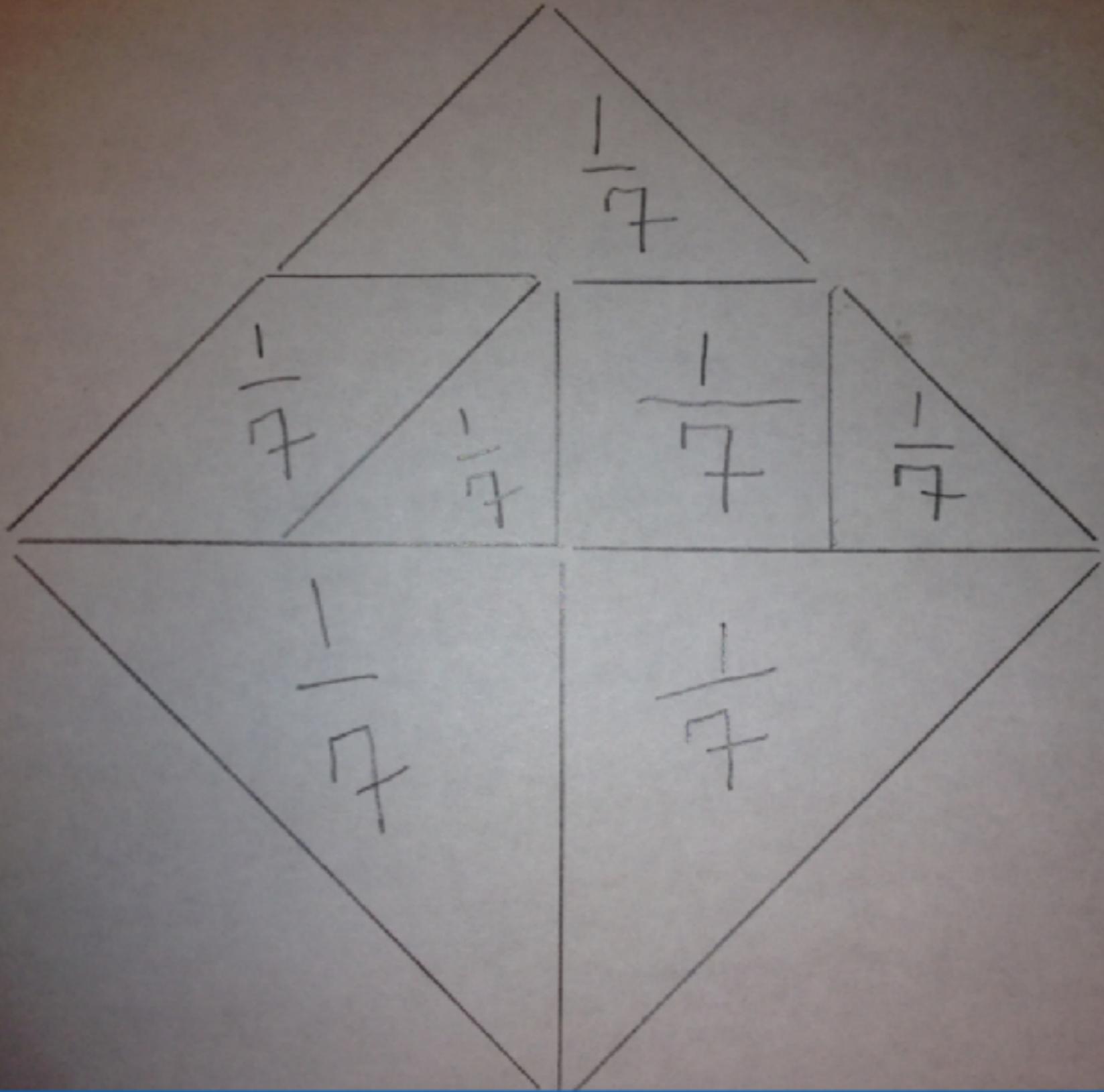
 2 last dots

				
5/5	5/5	5/5	5/5	5/5

$5 \times 30 = 150$ and $\frac{60}{5}$
 $\frac{2}{5} + \frac{2}{5} \dots = \frac{60}{5}$



Unit Fractions



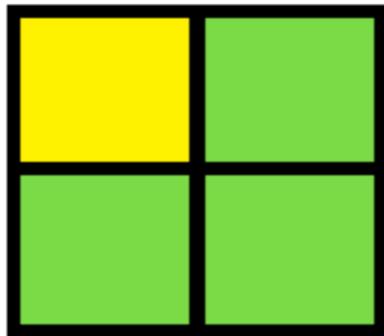
Task Instruction

For each part of the problem, start with a square sheet of paper and make folds to construct a new shape. Then, explain how you know the shape you constructed has the specified area.

1. Construct a square with exactly $\frac{1}{4}$ the area of the original square.
2. Construct a triangle with exactly $\frac{1}{4}$ the area of the original square.
3. Construct another triangle, also with $\frac{1}{4}$ the area, that is not congruent to the first one you constructed.
4. Construct a square with exactly $\frac{1}{2}$ the area of the original square.

Representation of a Fraction

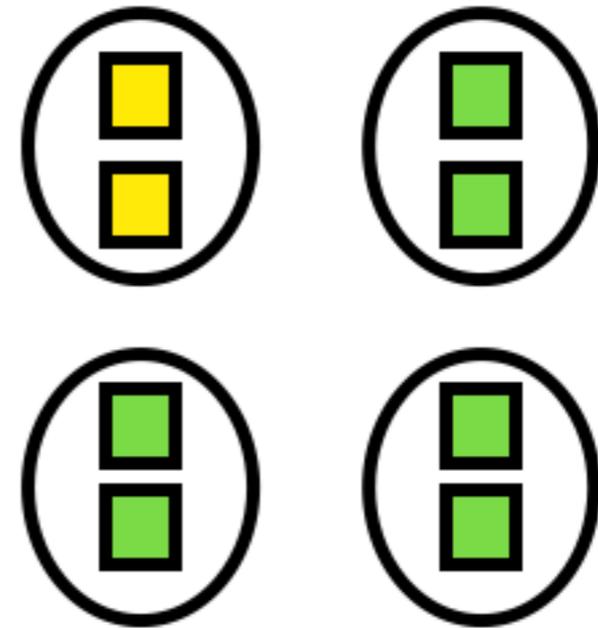
Area



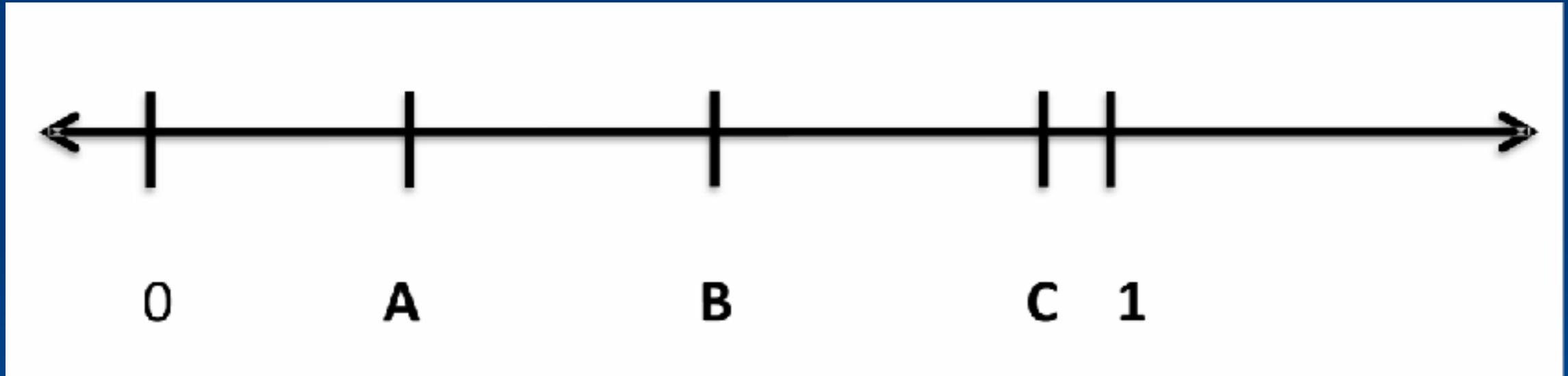
Length



Set



unit fraction $\frac{1}{a}$



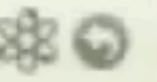


We Will Rock You
Queen — Greatest Hits I

0:21



We Will Rock You
Queen — Greatest Hits I



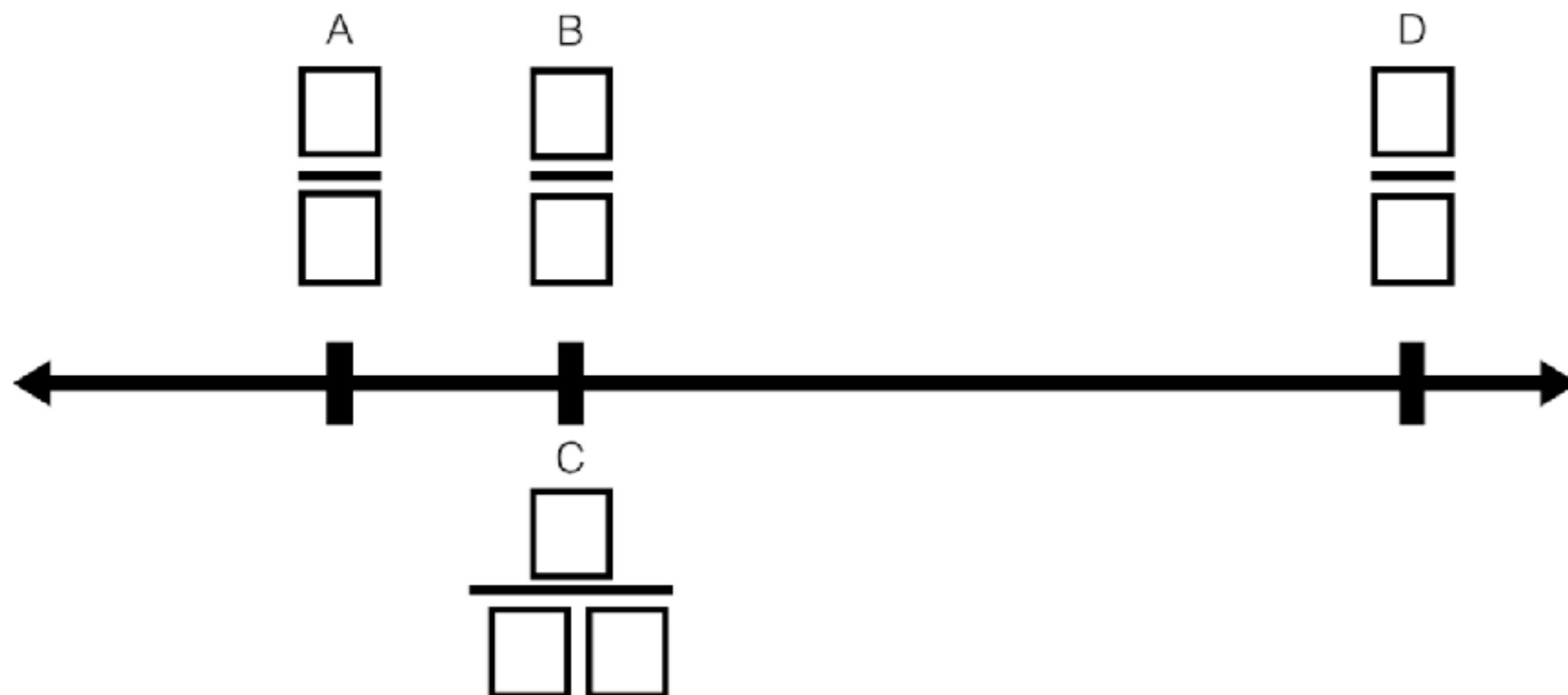
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ESTIMATION180.COM

COMPARING AND IDENTIFYING FRACTIONS ON A NUMBER LINE

Directions: Using the whole numbers 1-9 once each, create and place 4 fractions on the number line in the correct order. (fractions B & C are equal)

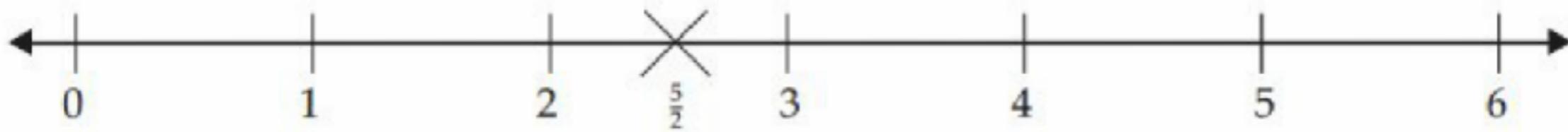


Open Middle

Challenging math problems worth solving

Dotty Pairs Game

The students play in pairs. One student takes dots, the other takes crosses. Place the cards (cards 1–6, two lots, see Material Master 4-1) face down in a pile. The players take turns turning over two cards. The numbers are used to form a fraction, e.g., 2 and 5 are turned over, so $\frac{5}{2}$ or $\frac{2}{5}$ can be made. One fraction is chosen, made with the fraction pieces, if necessary, and marked on a 0–6 number line with the player's identifying mark (dot or cross).



Players take turns. The aim of the game is to get three of their marks uninterrupted by their opponent's marks on the number line. If a player chooses a fraction that is equivalent to a mark that is already there, they miss that turn.

NB: A fraction such as $\frac{4}{1}$ can be made using the cards. Students may not be familiar with fractions in this form and the meaning of the numerator and denominator will need to be explored with the fraction circles.

<https://www.random.org/integers/>

4-in-a-Row Equivalence

Materials:

- A game board, three 6-sided dice, two color counters

Directions:

- Roll three dice at the same time and select two dice to create an equivalent fraction to a fraction on the game board.
- Represent the 2 selected dice as a fraction. (Discard #3 die)
- Use a color marker to cover an equivalent fraction on the game board.
- The winner is the first player to cover 4 squares in a row.



$\frac{2}{12}$	$\frac{8}{10}$	$\frac{2}{4}$	$\frac{1}{1}$	$\frac{2}{3}$	$\frac{2}{8}$
$\frac{4}{2}$	$\frac{1}{2}$	$\frac{8}{12}$	$\frac{12}{4}$	$\frac{2}{10}$	$\frac{10}{5}$
$\frac{4}{8}$	$\frac{10}{12}$	$\frac{4}{6}$	$\frac{2}{1}$	$\frac{6}{12}$	$\frac{5}{10}$
$\frac{6}{10}$	$\frac{6}{3}$	$\frac{3}{12}$	$\frac{1}{3}$	$\frac{8}{4}$	$\frac{4}{8}$
$\frac{3}{9}$	$\frac{3}{1}$	$\frac{4}{10}$	$\frac{3}{6}$	$\frac{8}{2}$	$\frac{3}{12}$
$\frac{9}{12}$	$\frac{4}{12}$	$\frac{1}{4}$	$\frac{6}{8}$	$\frac{6}{9}$	$\frac{2}{2}$

Making Sense Series

The Progression of Fractions
Meaning, Equivalence, & Comparison

created by Graham Fletcher

 @gfletchy

www.gfletchy.com