Harmony Elementary School

October 11th, 12th, 13th

by: **Graham Fletcher**
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Broken Squares

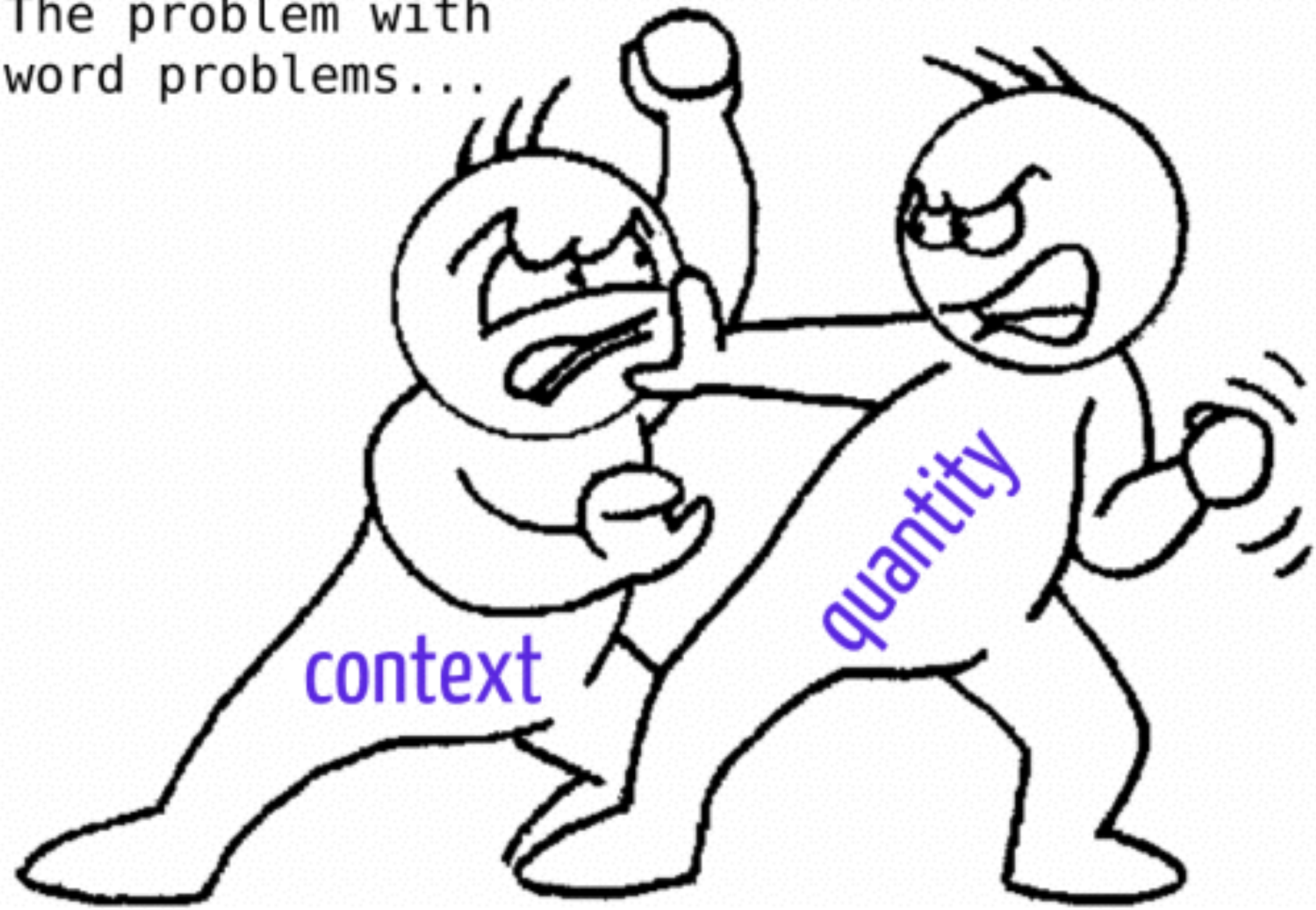
- Designate shape keeper
- Share the shapes as evenly as possible between the group
- All the shapes will make 6 congruent squares with no shapes leftover
- Everyone is encouraged to **OFFER** a shape. No one may **TAKE** or **SNATCH**. You may RECEIVE a shape but only if it's **OFFERED**
- No "community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


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

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

The problem with
word problems...



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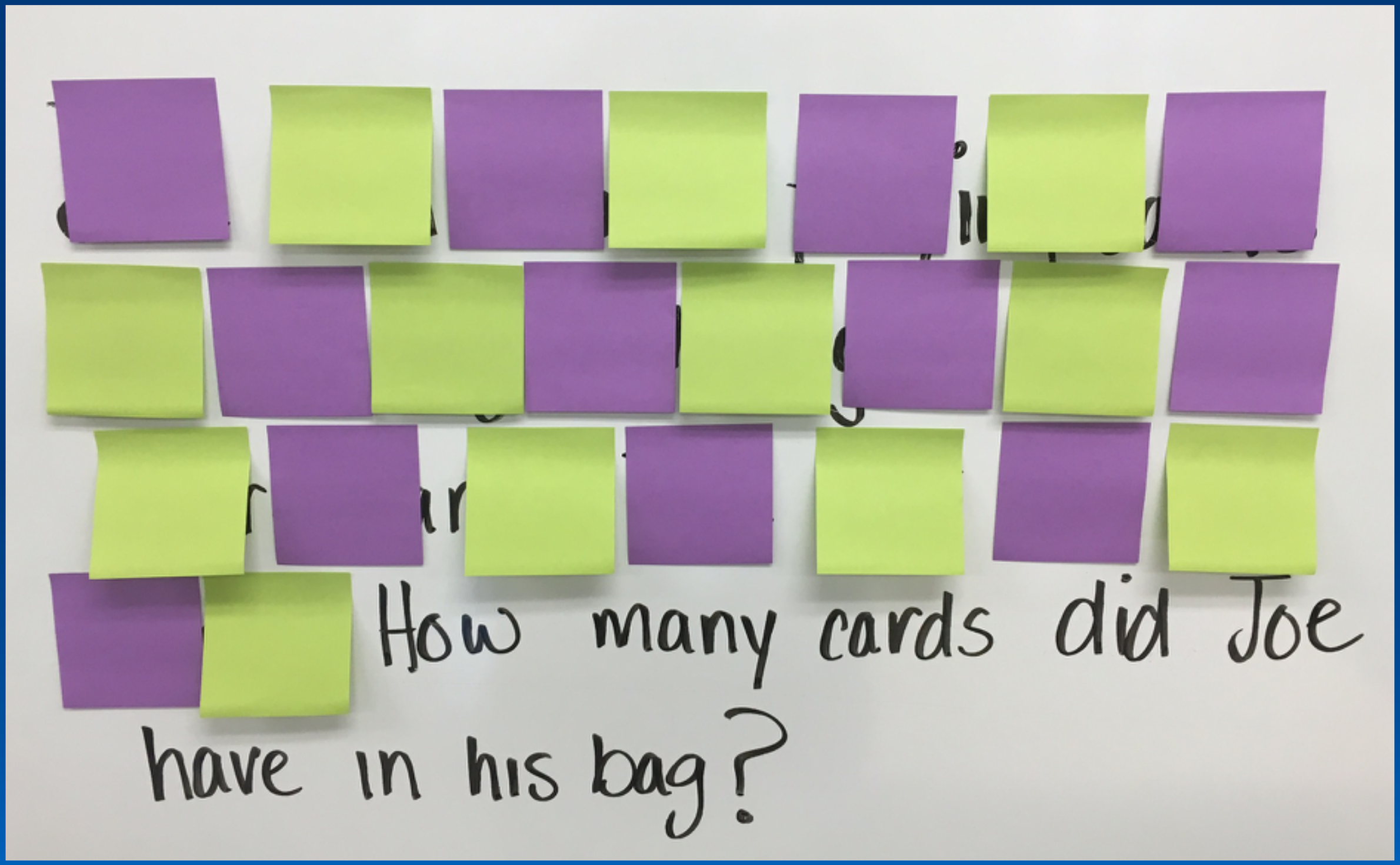

How many cards did Joe
have in his bag?

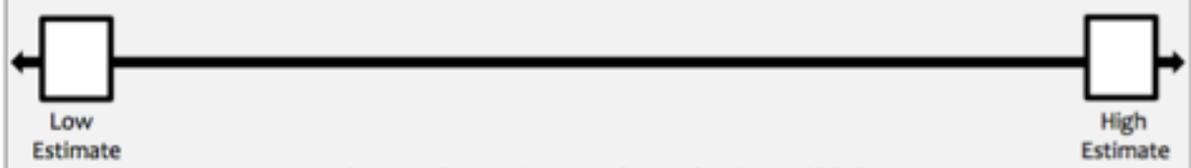
Name: _____ Date: _____

1. What did you notice?

2. What do you wonder?

3. Main Question:

4. Estimate



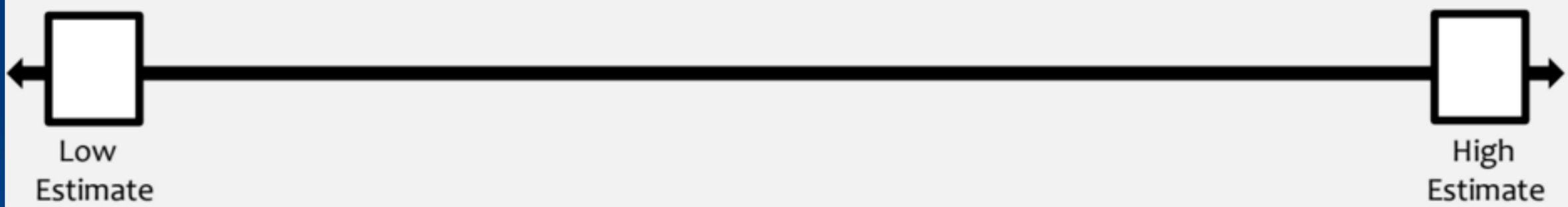
place your best estimate on the number line and label

5. What information would you like to know?

6. Answer


Original
Skittles

4. Estimate



Packages Used


ORIGINAL
Skittles

The answer **IS NOT** 812!

Content Standards

vs

Practice Standards

The 8 Standards for Mathematical Practice

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

Missing the Modeling Mark

- 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.

Model with Mathematics

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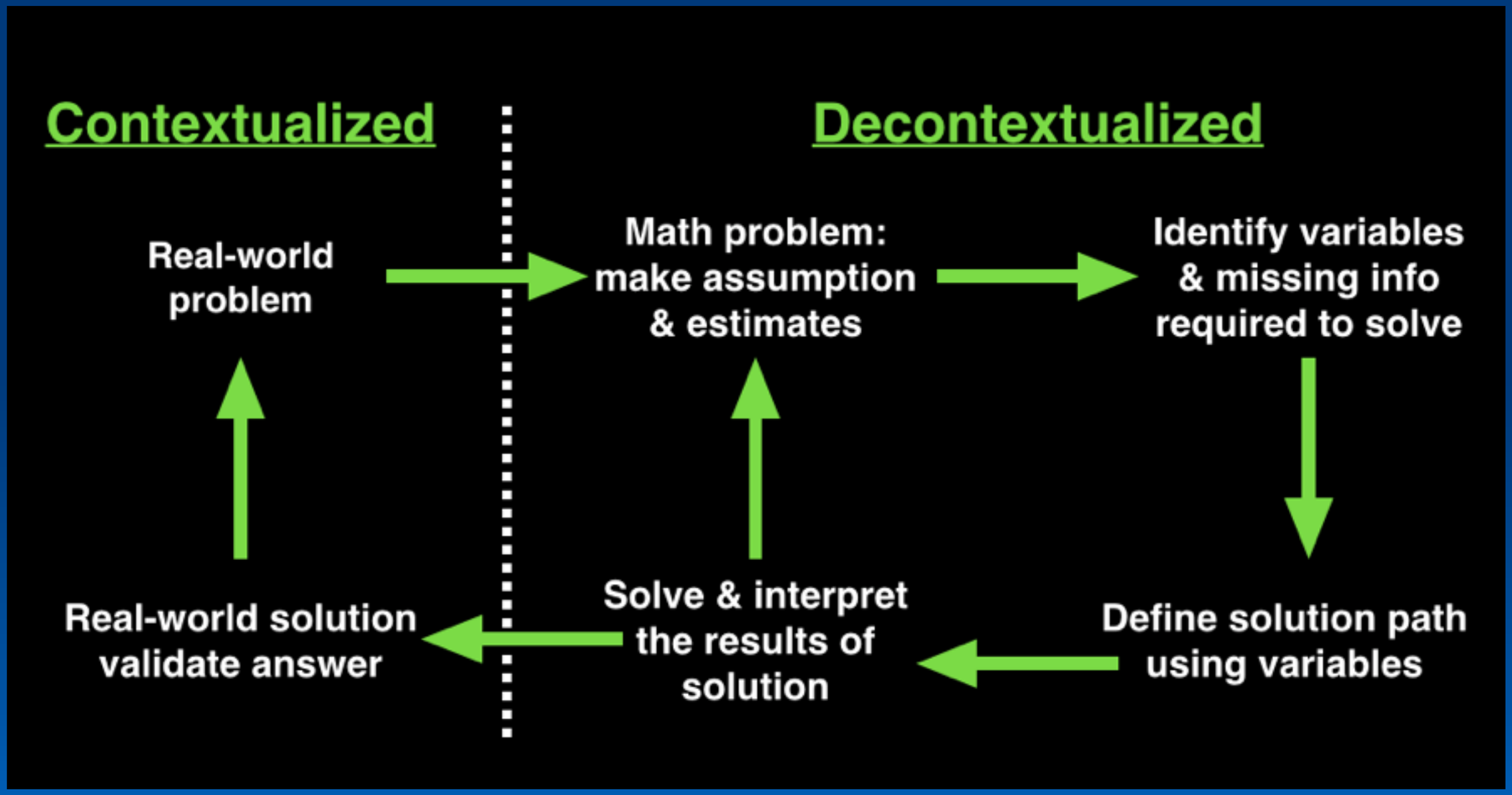
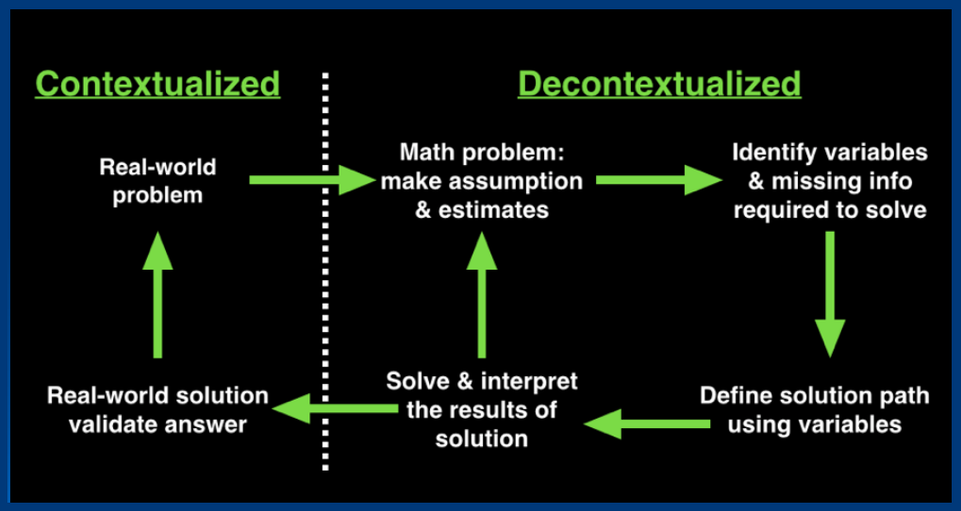
#4 Model with Mathematics in the Elementary Grades



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.

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

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?

The 8 Standards for Mathematical Practice

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5 Practices for Orchestrating Productive Mathematical Discussions

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, pegs@pitt.edu, is an associate professor of mathematics education at the University of Pittsburgh. Over the past decade, she has been developing research-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**, elizabeth.hughes@uni.edu, recently finished her doctorate in mathematics education at the University of Pittsburgh. Her areas of interest include preservice secondary mathematics teacher education and the use of practice-based materials in developing teachers' understanding of what it means to teach and learn mathematics. **Randi A. Engle**, raengle@berkeley.edu, is an assistant professor of mathematics education and the social context of learning at the University of California Berkeley. She is interested in developing practical theories for how mathematics teachers can create discussion-based learning environments that promote strong student engagement, learning, and transfer. **Mary Kay Stein**, mkstein@pitt.edu, is a professor of learning sciences and policy and the director of the Learning Policy Center at the University of Pittsburgh. Her research focuses on instructional practice and the organizational and policy conditions that shape 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 (Hatano and Inagaki 1991; Michaels, O'Connor, and Resnick 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 ideas, and learn to see things from other perspectives (NCTM 2000).

Although discussions about high-level tasks provide important

The **5** practices are:

1. **Anticipating** student responses to challenging mathematical tasks;

Anticipate student solutions for the Whopper Jar task.

Identify and record the types of strategies students will use to solve the task.

Task Planning Document

Task:		
Misconceptions:		
Strategy	**Who and What (highlight)**	**Order**
Anticipate student solutions for the Skittles task. Identify and record the types of strategies students will use to solve the task.		

Anticipating → Monitoring → Selecting → Sequencing → Connecting

The **5** practices are:

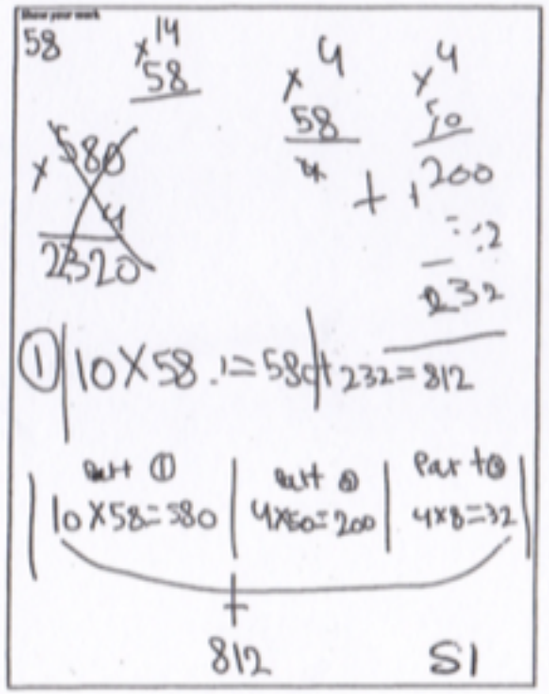
1. **Anticipating** student responses to challenging mathematical tasks;
2. **Monitoring** students' work on and engagement with the tasks;
3. **Selecting** particular students to present their mathematical work;
4. **Sequencing** the student responses that will be displayed in a specific order and;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

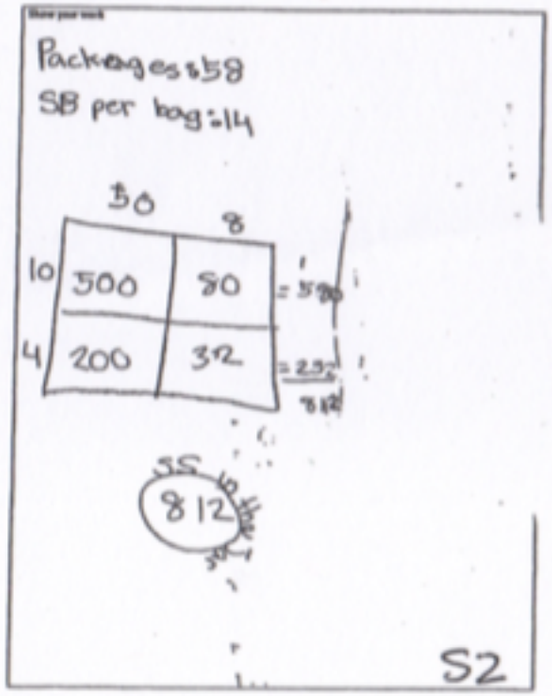
MTMS: Vol. 14, No. 9, May 2009-5 Practices for Orchestrating Productive Mathematics Discussions

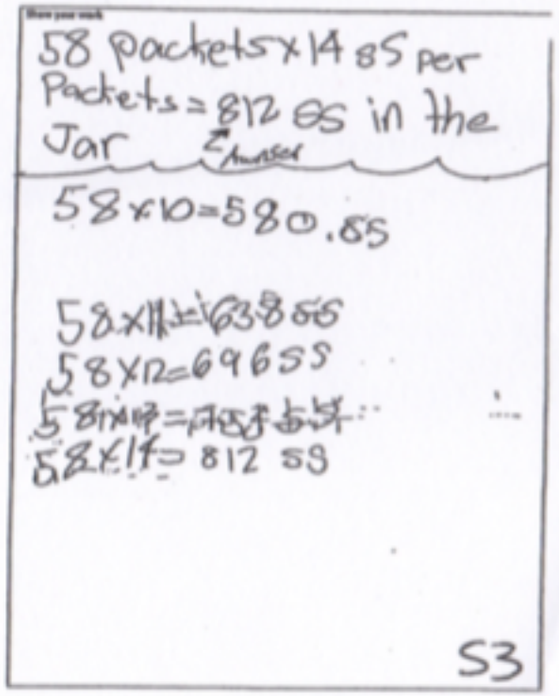
5 Moves Planning

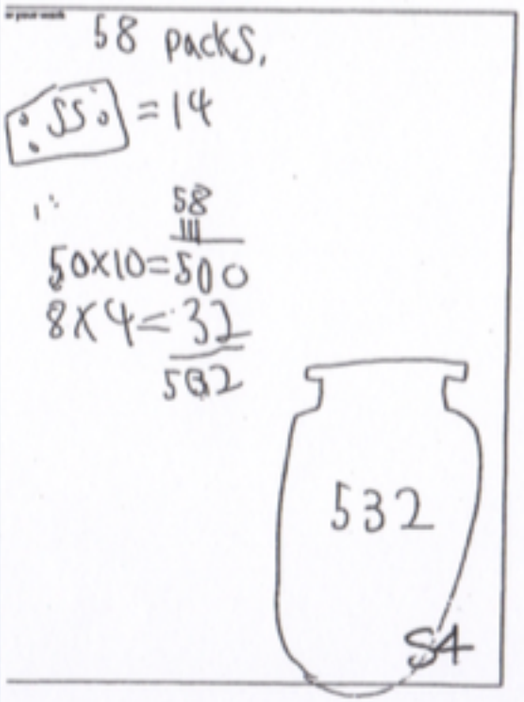
- Look at the student work samples
- Select the solutions you want to highlight in the closing
- Sequence how you'll share them
- Discuss the connection focus you're after

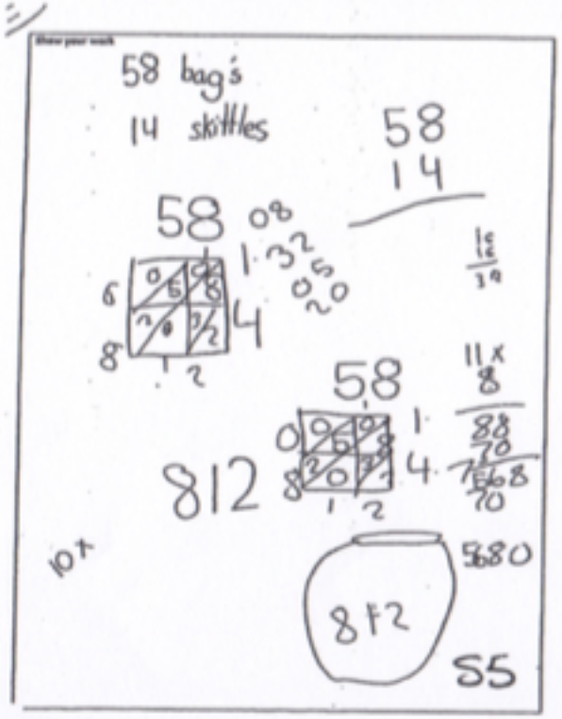
Sequence the following student work samples

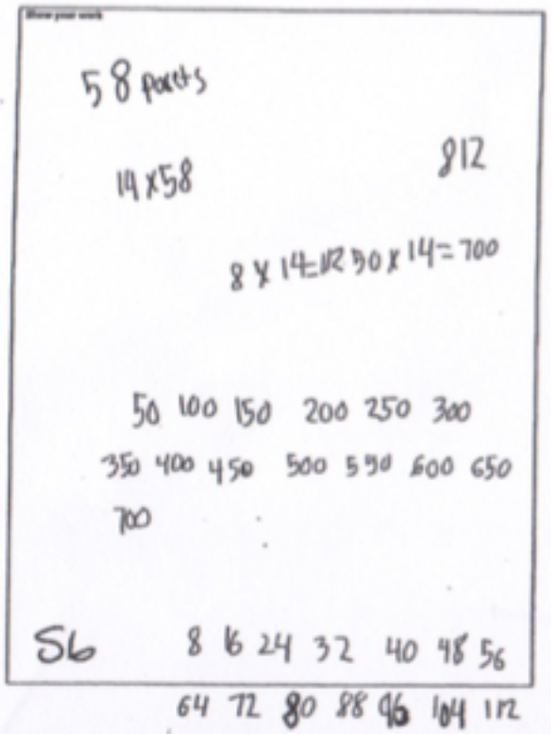


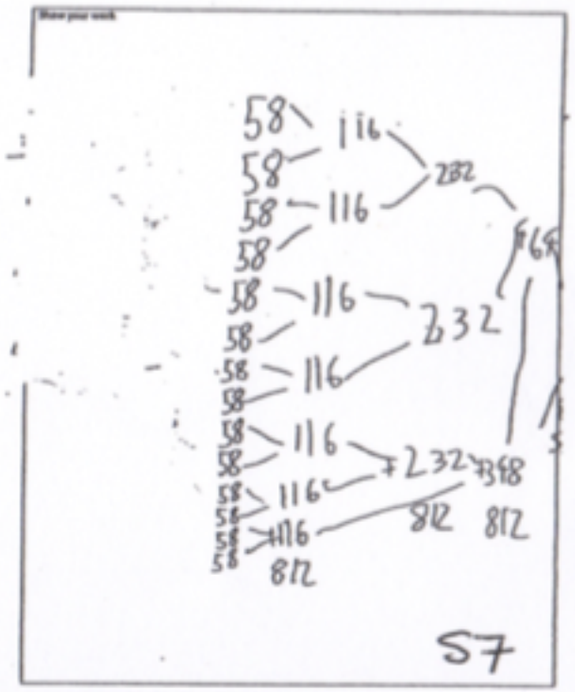












Our next step as the teacher is….?

- Identify student misconceptions
- Identify common strategy
- Are you surprised that a strategy wasn't used?
- Discuss your next moves as a teacher

Making Sense Series

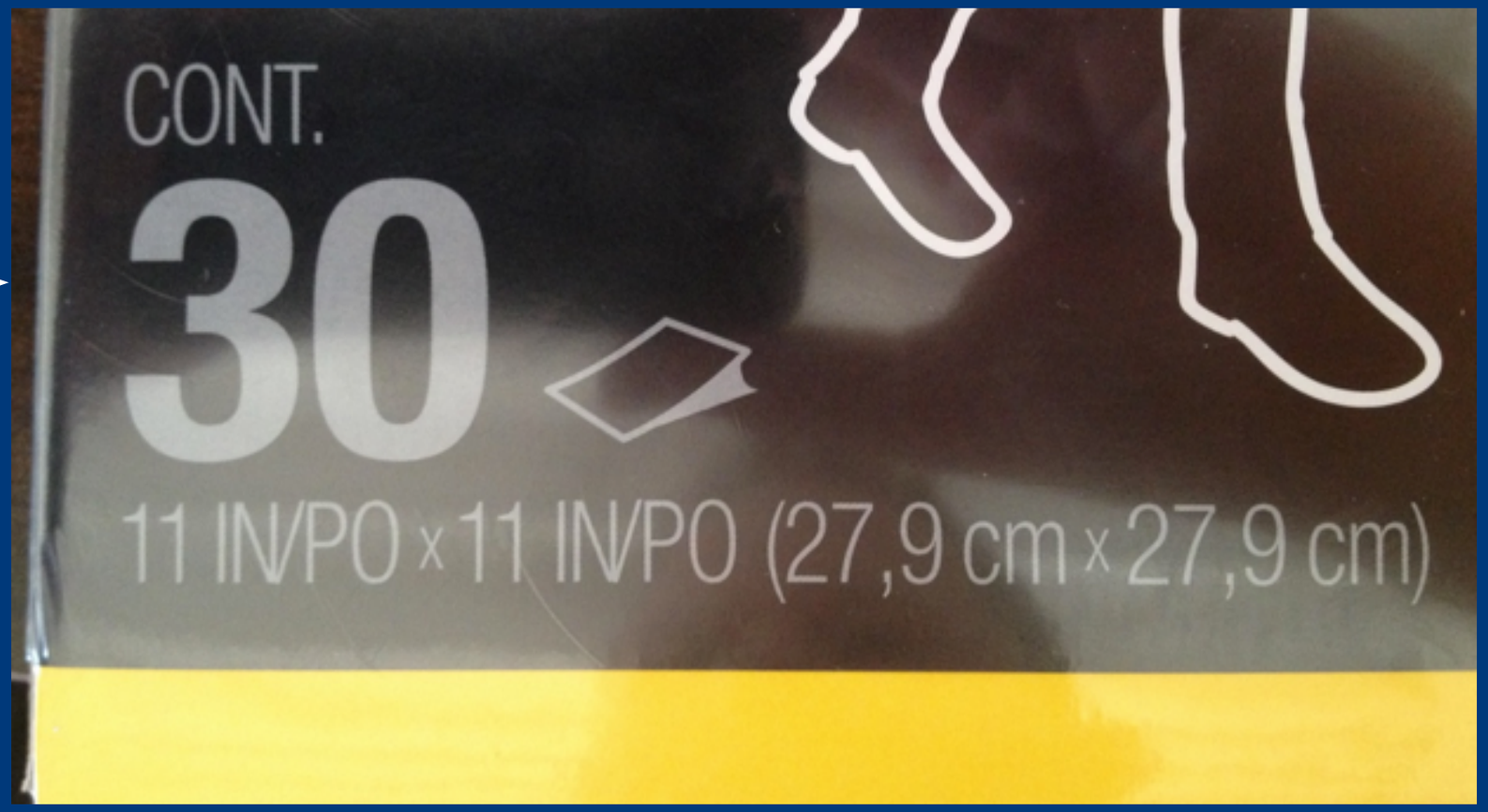
the progression of multiplication
and
the standard traditional algorithm

created by Graham Fletcher
@gfletchy

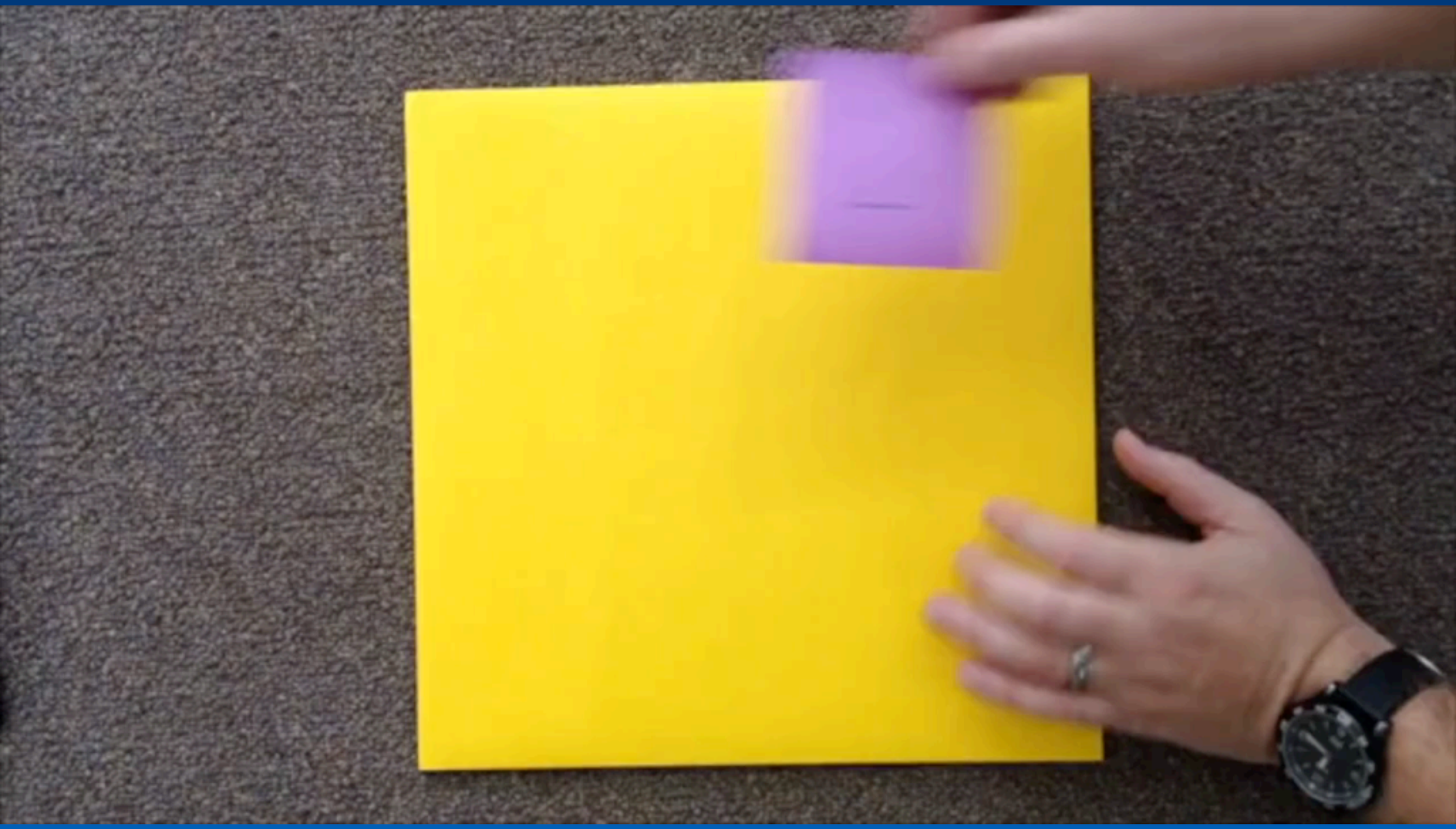
00:06 −05:54

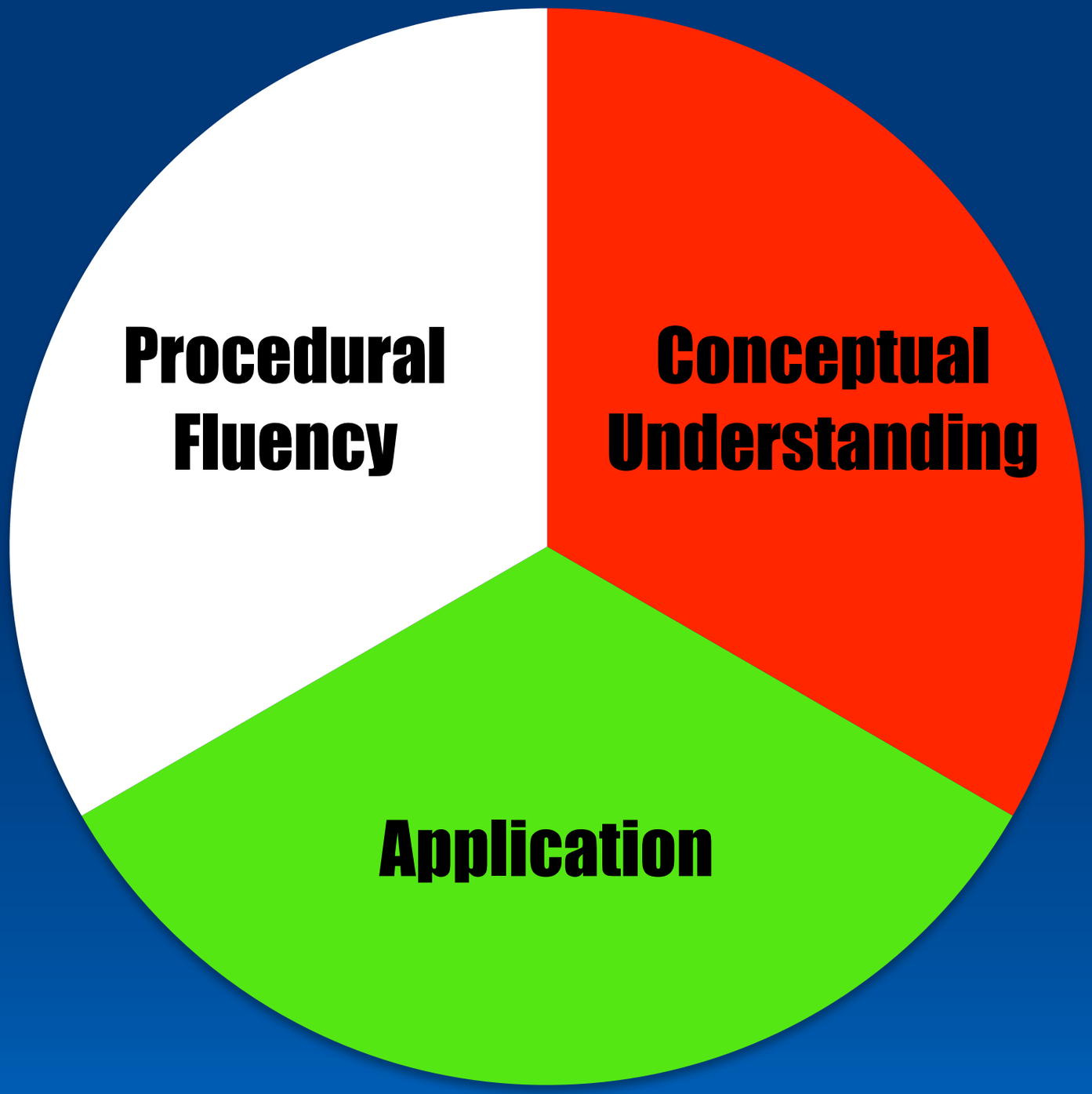

Post-it
BIG PAD
Dream your big idea.
NOTAS GIGANTES
Sueña tu gran idea.
GRAND BLOC
Imaginez de grandes idées.
CONT.

The Big Pad



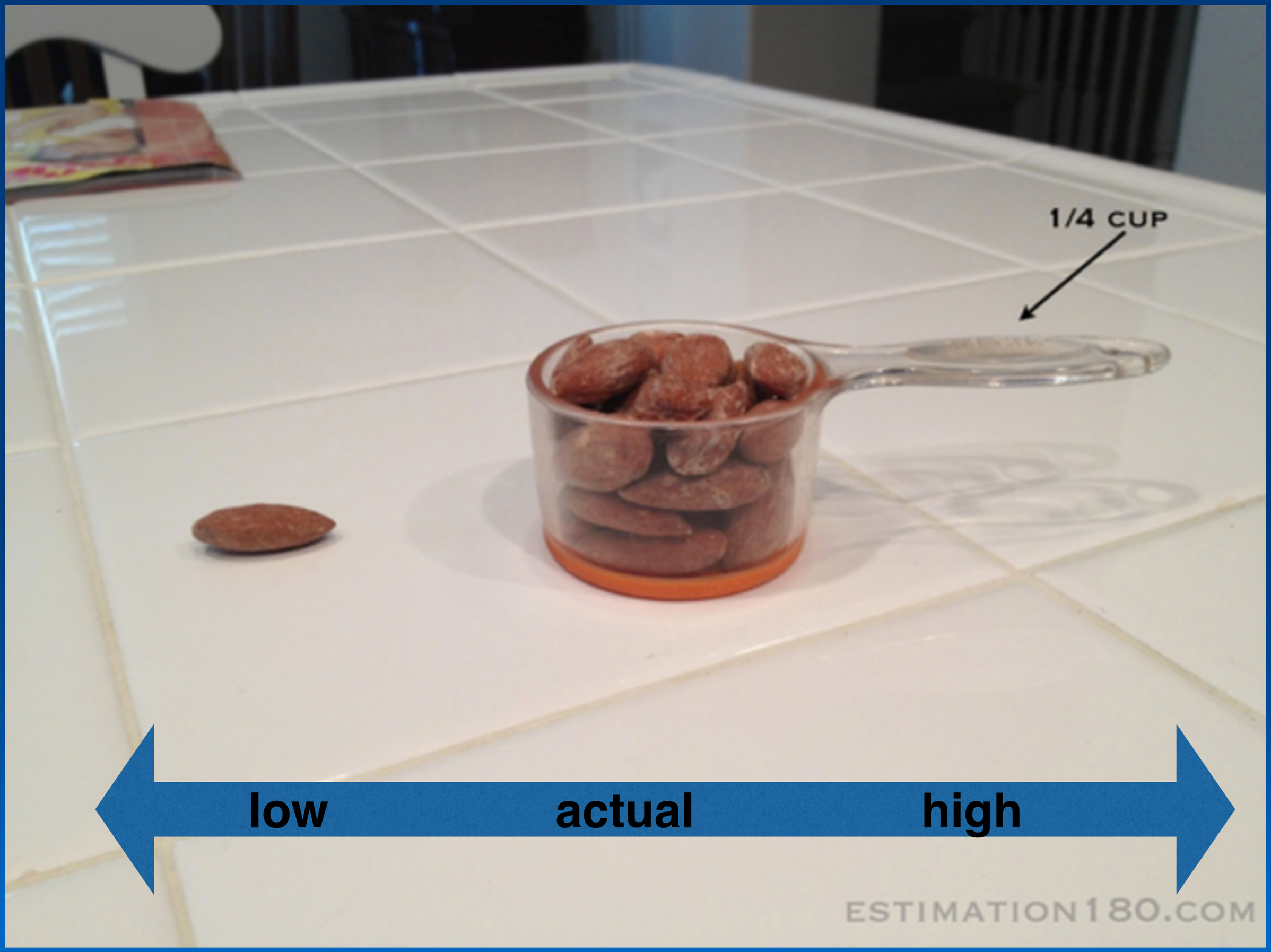
The Post-it




Procedural Fluency
Conceptual Understanding
Application

Becoming a good estimator takes practice

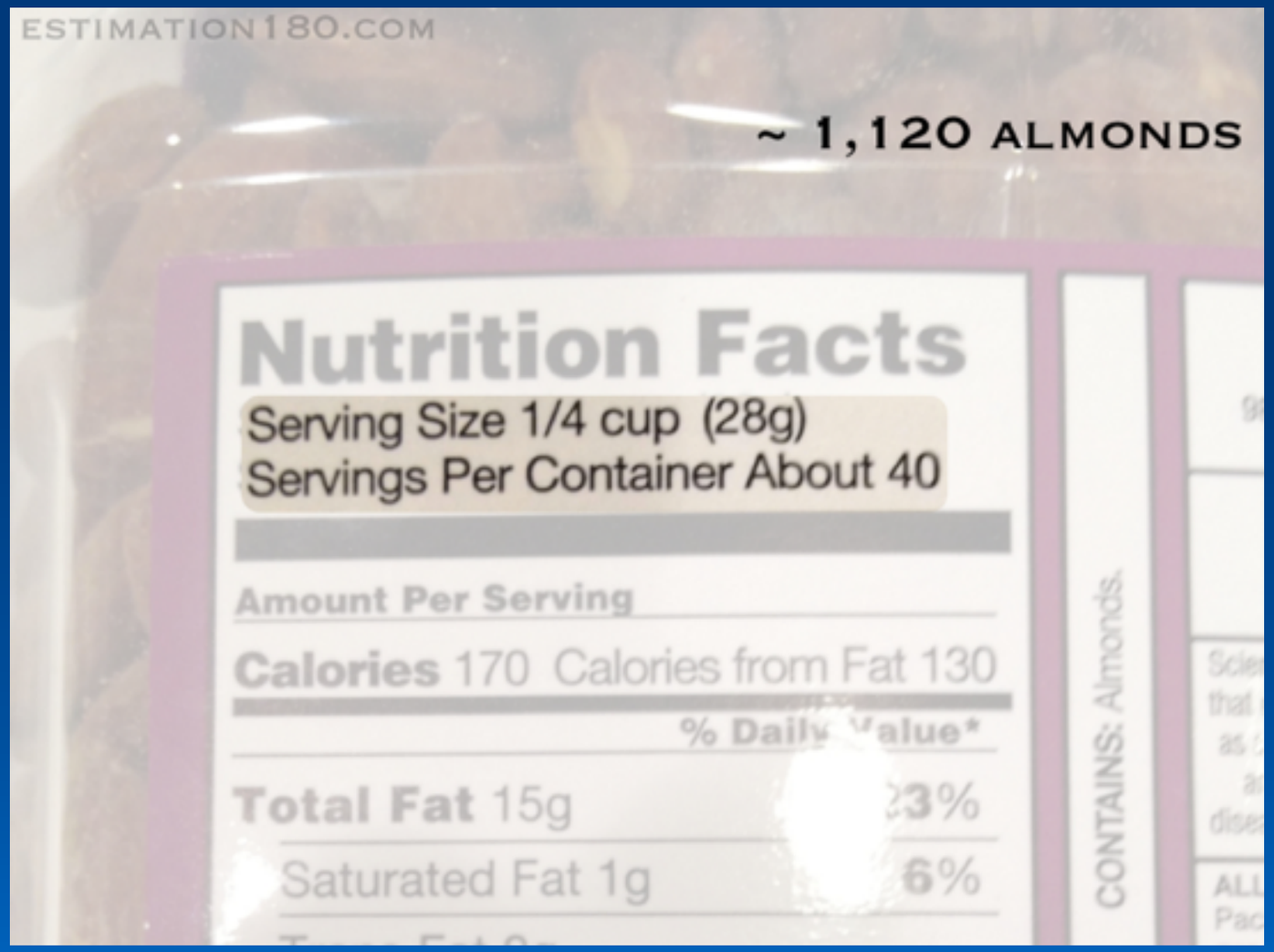
What are you currently doing to promote number sense through estimation in your classroom?


1/4 CUP
low
actual
high
ESTIMATION180.COM


?
28
KIRKLAND
Dry Roasted
ALMONDS
ESTIMATION180.COM

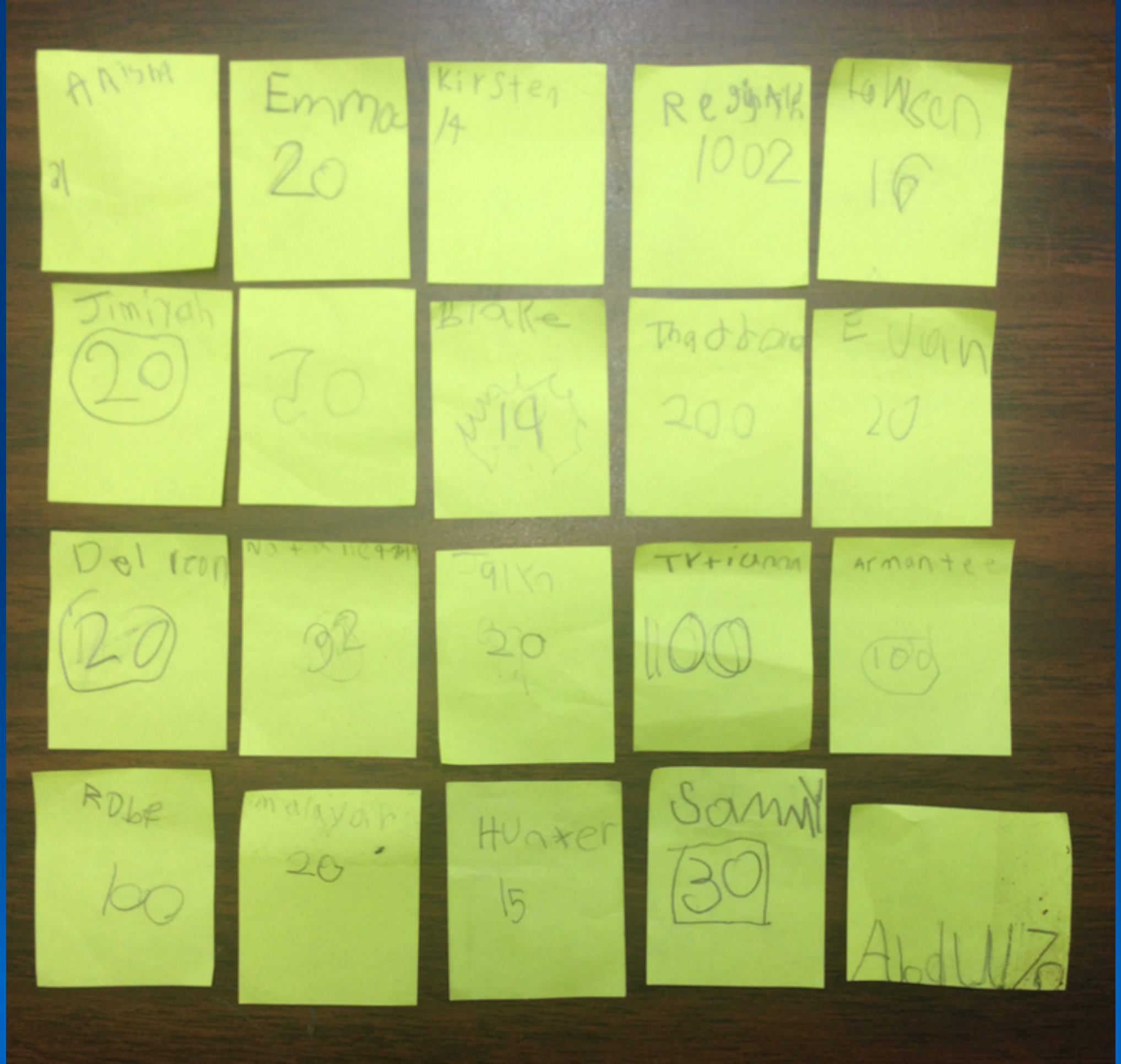
ESTIMATION 180

Building number sense one day at a time.

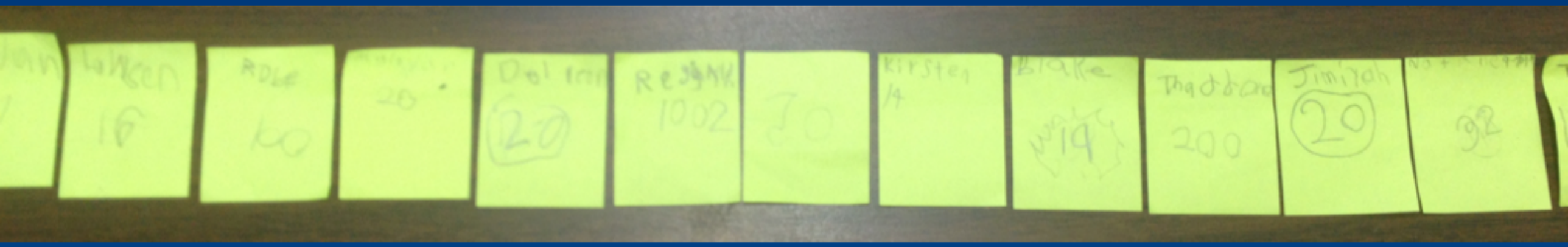


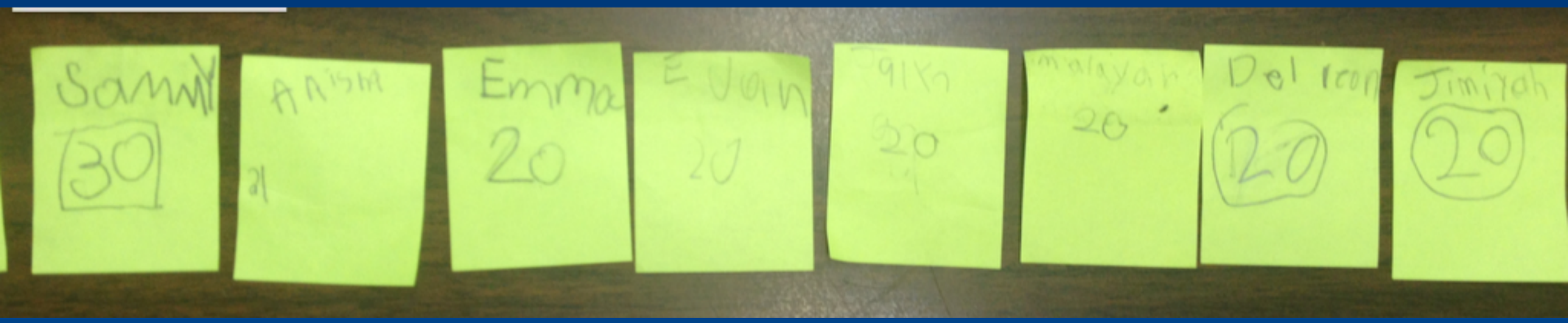
www.estimation.com

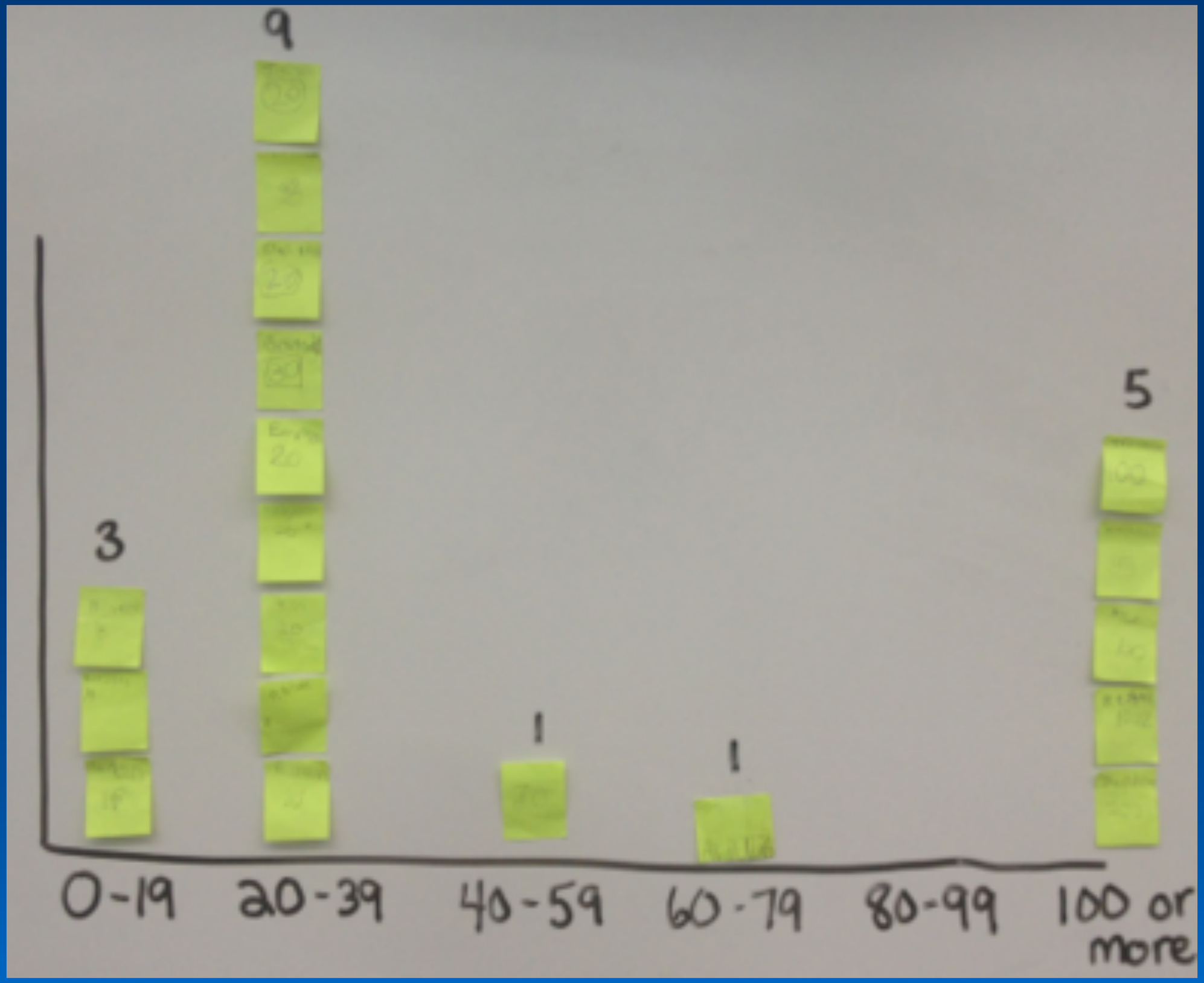
Estimation Station


Emma
20
Kirsten
14
1002
16
Jimiyah
20
Blake
19
200
20
20
92
20
1100
100
Robe
100
20
Hunter
15
Sammy
30
Abdul

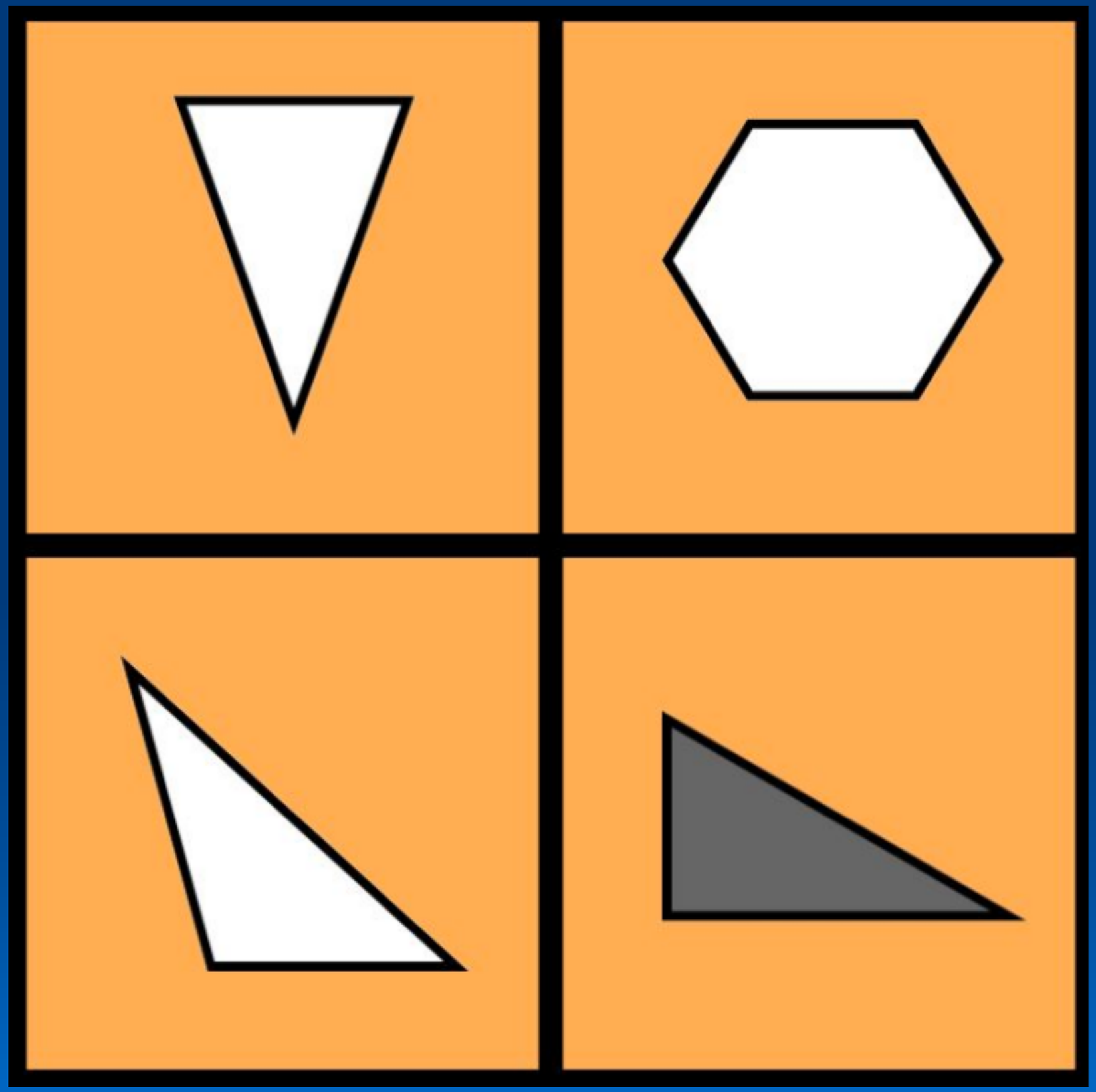

estimation jar


16
100
20
20
1002
50
14
19
200
20
32


Sammy
30
Anisha
21
Emma
20
Evan
20
Zayn
20
Malayah
20
Delicon
20
Jimiyah
20


9
5
3
1
1
0-19
20-39
40-59
60-79
80-99
100 or more

The Spinning Dancer



9	16
25	43

Geometric Subitizing

Ready…

@gfletchy

How many shapes did you see?

What shapes did you see?

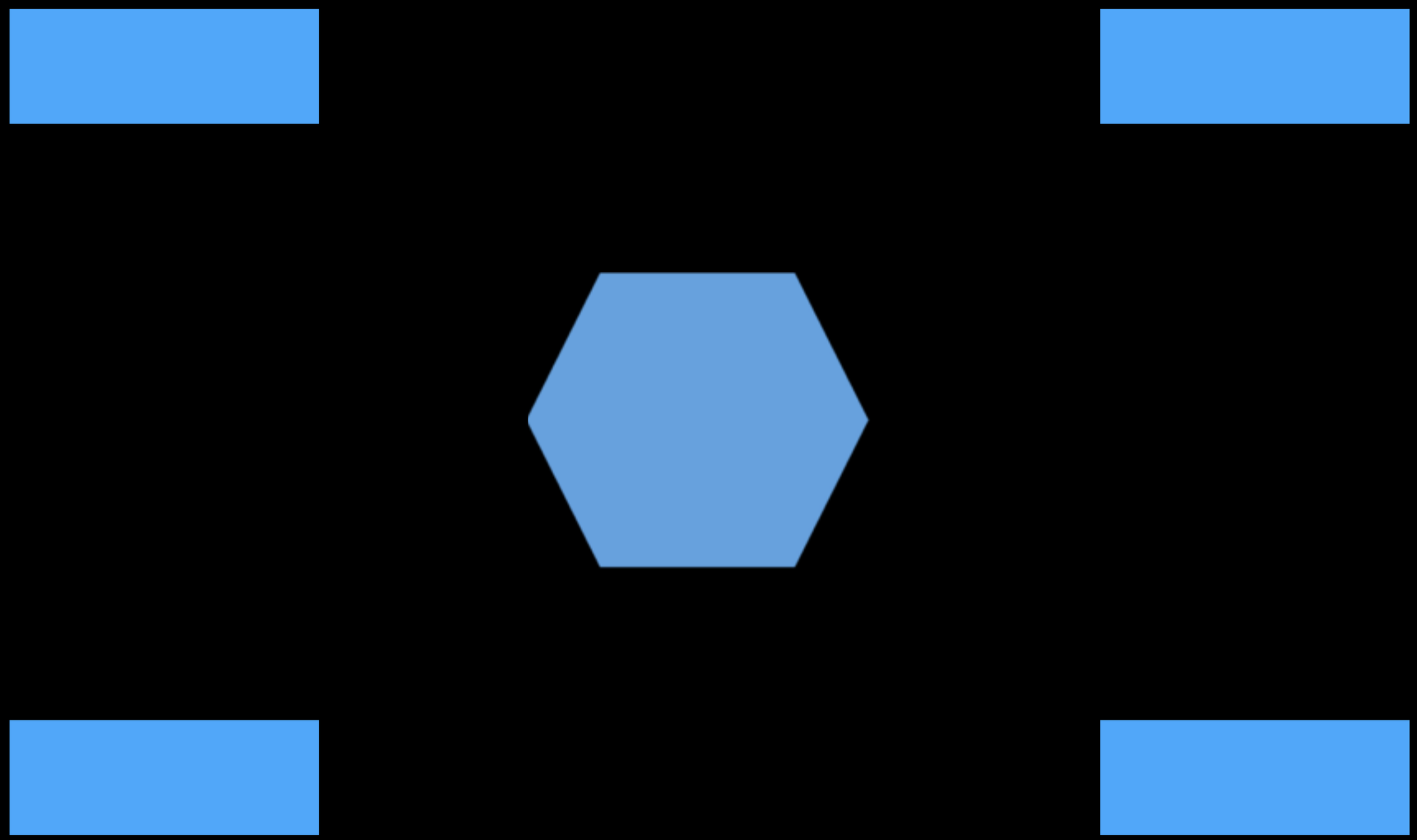
How many sides did you see?

How many shapes did you see? 3 shapes

How many sides did you see? 8 sides

@gfletchy

Ready…

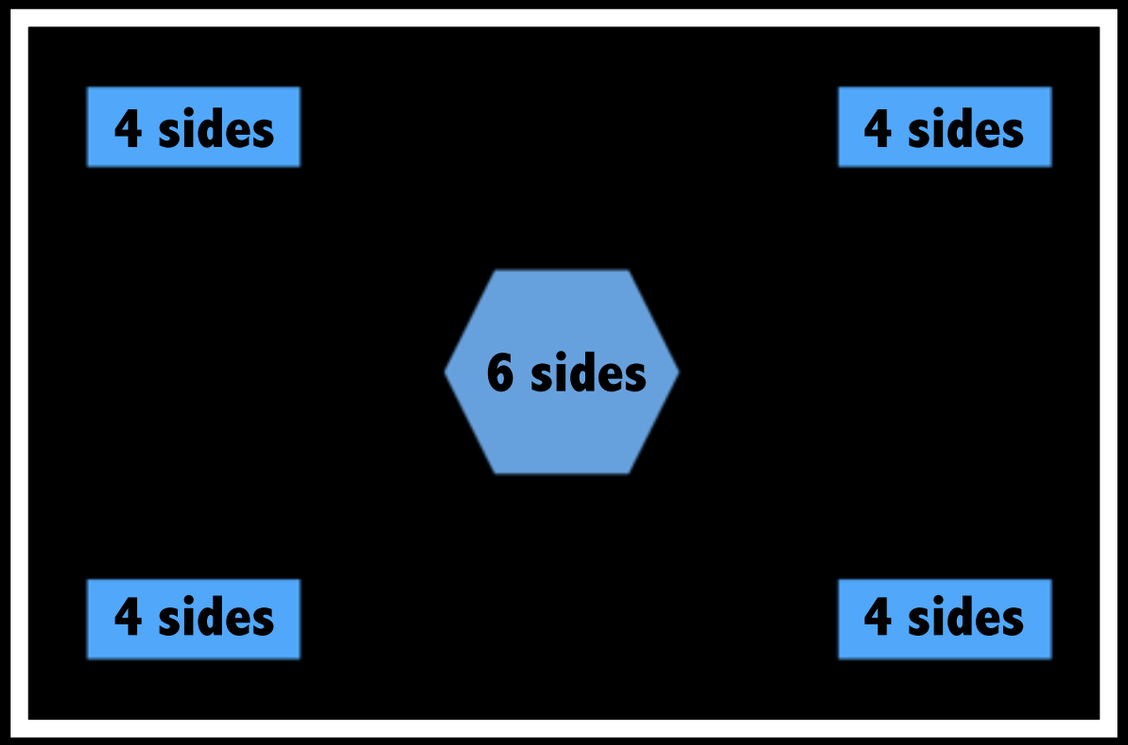


@gfletchy

How many shapes did you see?

What shapes did you see?

How many sides did you see?



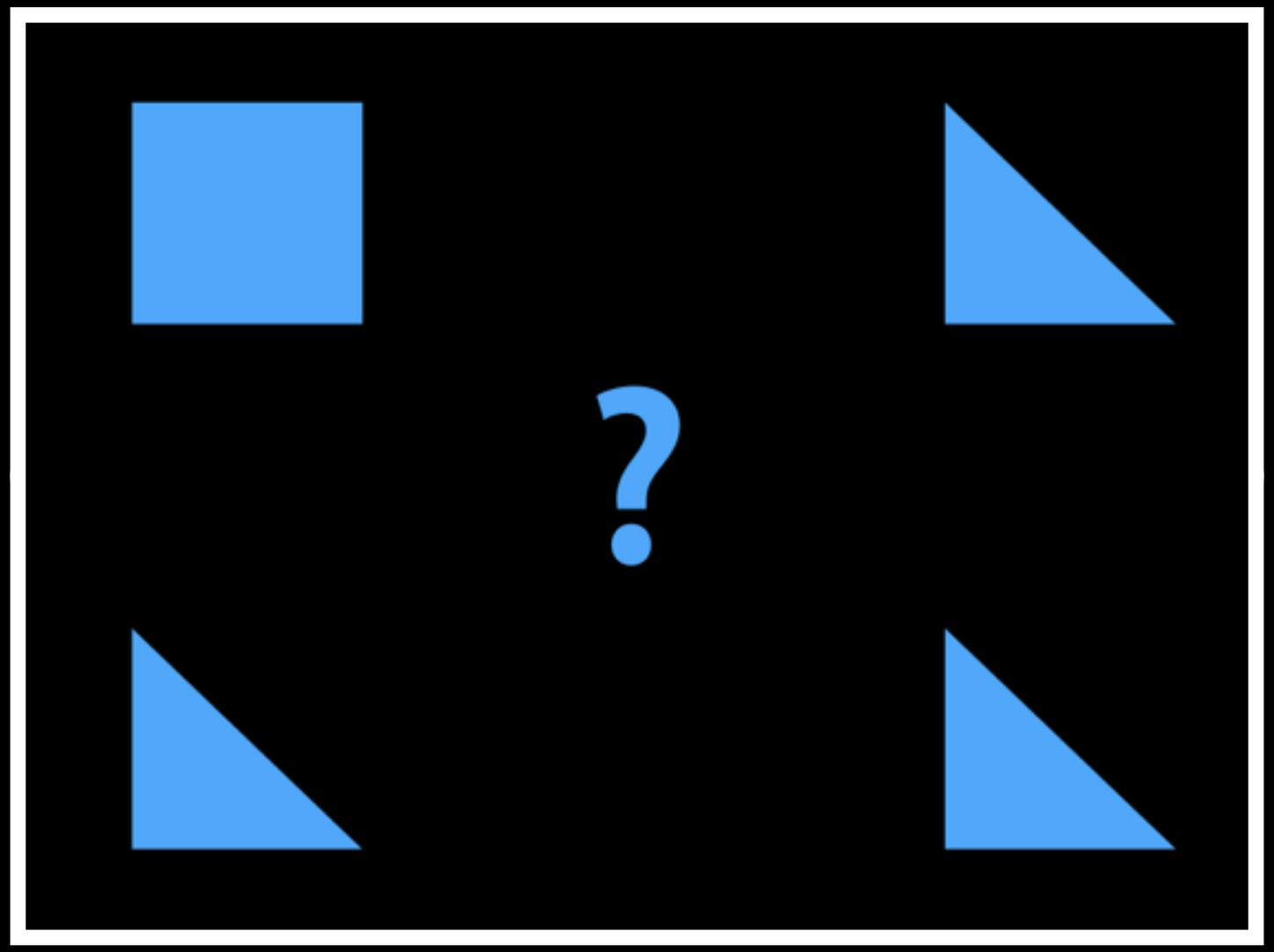
How many shapes did you see? **5 shapes**

How many sides did you see?

4 x 4 + 6 = 22 sides

@gfletchy

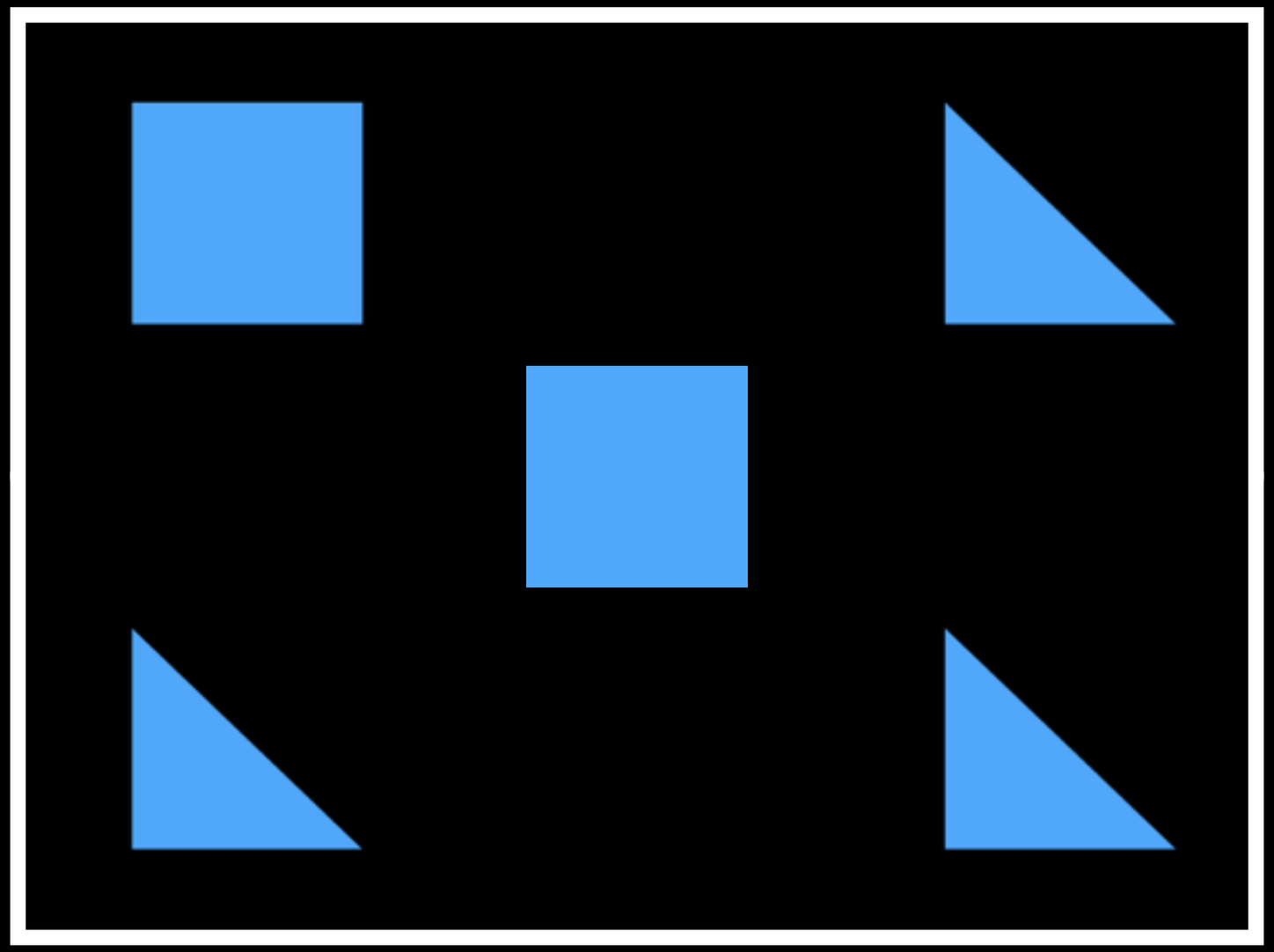
Ready…



There are 17 sides on this card.

What's the mystery shape?

@gfletchy



There are 17 sides on this card.

$$3(3) + 4 + ? = 17$$

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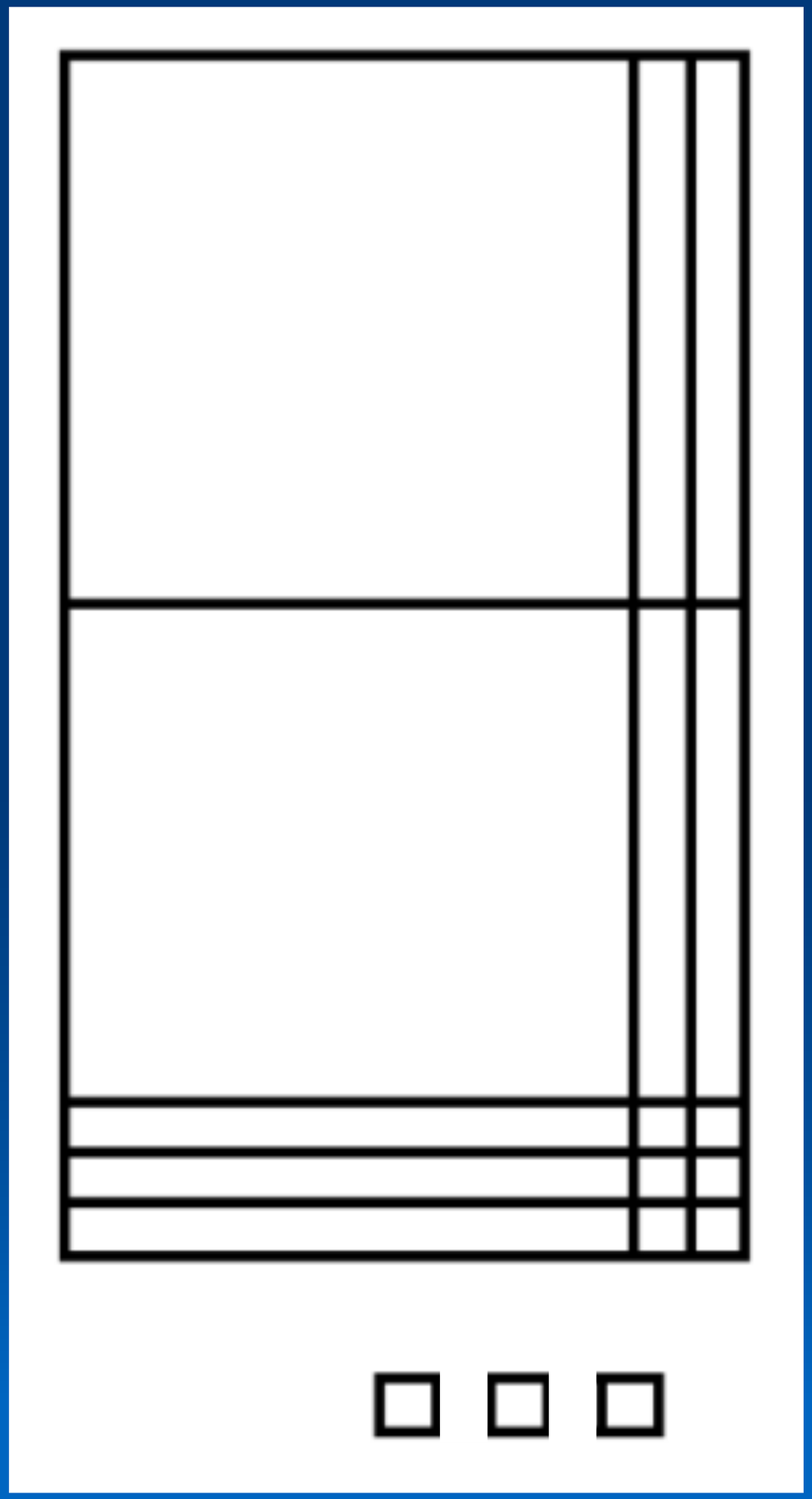
Kindergarten Class #1



Write an expression that matches the model

Mentally solve for the missing numbers.

$$
\begin{array}{r}
\boxed{8}1 \\
47\overline{)\,3\boxed{8}\boxed{1}9} \\
-\underline{3\boxed{7}6} \\
\boxed{5}9 \\
-\underline{\boxed{4}7} \\
12
\end{array}
$$

Strip Model Diagramming for Division