Building Students Number Sense with Number Routines

Presented by Jen Barker
Bayridge Elementary
September 24th, 2018

Learning Intentions

- I understand what it means to have Number Sense.

- I understand how using 5 - 10 minute daily Number Routines can develop my students' number sense and computational fluency.

- I understand how using Number Routines helps to build a Mathematical Community and encourages my students to share and communicate their thinking.

- I have one or two Number Routines that I feel comfortable exploring with my class and I understand how to differentiate these to meet the needs of my students.

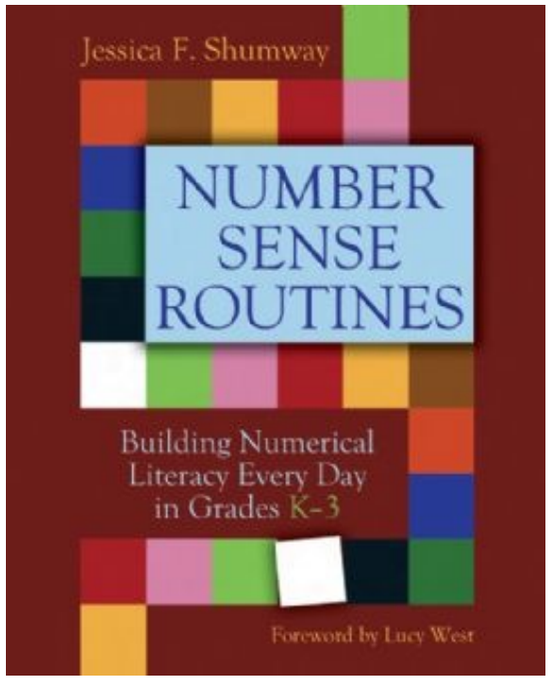
When you think about a student who has Number Sense what comes to mind?

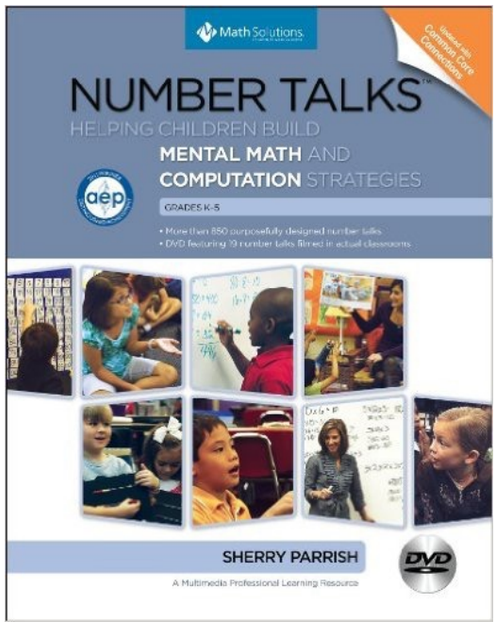
“[They] can think and reason flexibly with numbers, use numbers to solve problems, spot unreasonable answers, understand how numbers can be taken apart and put together in different ways, see connections among operations, figure mentally, and make reasonable estimates.”

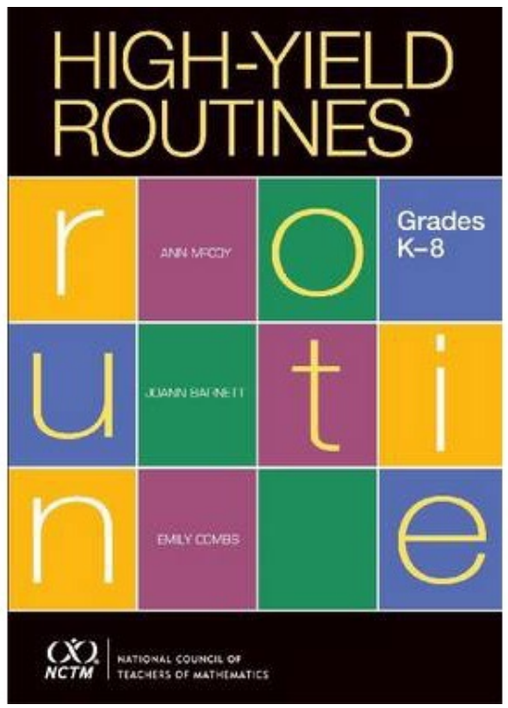
Burns, Marilyn. About Teaching Mathematics: A K-8 Resource. 3rd ed. Sausalito, CA: Math Solutions, 2007. Print.

What are Number Routines?

- Collection of quick, low-prep 5 to 10 minute activities.
- They focus on the big ideas in Mathematics.
- They serve to reteach, reinforce, and enrich.
- Can be used as warm ups, mini lesson, with the whole class or in small groups.







Why use Number Routines?

- Builds a Math community where students feel safe to take risks and can learn from one and other

- Provides daily number sense experiences where students clarify their thinking, consider and test strategies, and build a repertoire of efficient strategies

- Fosters discussion about numbers and their relationships

- Responsive to students' understandings

- Allows for spiralling through concepts and helps students make connections to the big ideas in mathematics

- Emphasizes the core and curricular competencies in relation to mathematical content.

Number Talk Goals

Add strategies to your math toolbox.

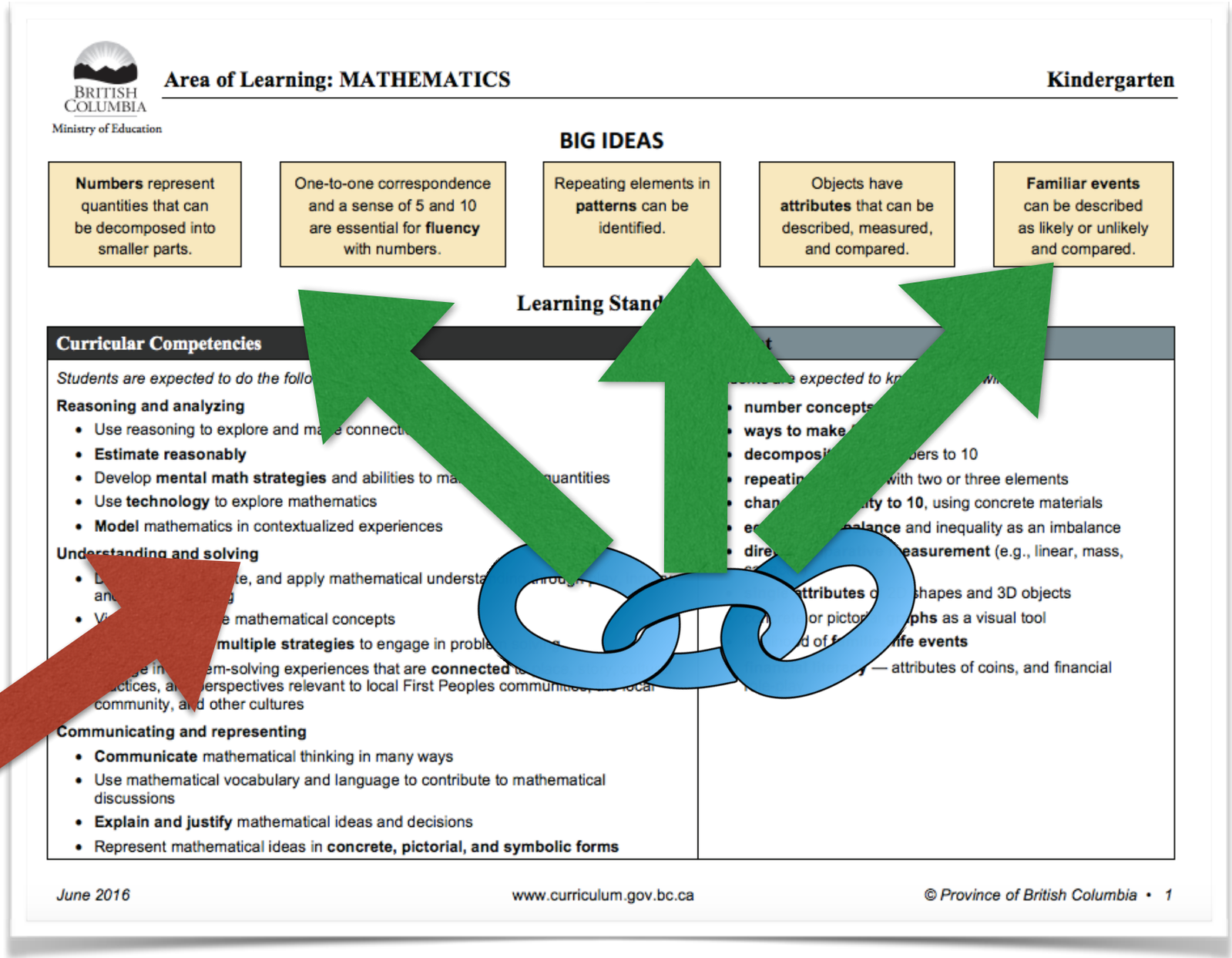
Keep thinking about other strategies.

Be flexible in how you think about problems.

Get ready to explore wrong answers.

How does this relate to the revised Curriculum?

The mathematical discussions embedded in the routines foster the curricular competencies in relation to the content.



BRITISH COLUMBIA
Ministry of Education

Area of Learning: MATHEMATICS — **Kindergarten**

BIG IDEAS

- **Numbers** represent quantities that can be decomposed into smaller parts.
- One-to-one correspondence and a sense of 5 and 10 are essential for **fluency** with numbers.
- Repeating elements in **patterns** can be identified.
- Objects have **attributes** that can be described, measured, and compared.
- **Familiar events** can be described as likely or unlikely and compared.

Learning Stand

Curricular Competencies

Students are expected to do the follo

Reasoning and analyzing

- Use reasoning to explore and ma e connecti
- **Estimate reasonably**
- Develop **mental math strategies** and abilities to ma quantities
- Use **technology** to explore mathematics
- **Model** mathematics in contextualized experiences

Understanding and solving

- e, and apply mathematical understa
- e mathematical concepts
- **multiple strategies** to engage in proble
- em-solving experiences that are **connected** t ctices, a erspectives relevant to local First Peoples communitie community, and other cultures

Communicating and representing

- **Communicate** mathematical thinking in many ways
- Use mathematical vocabulary and language to contribute to mathematical discussions
- **Explain and justify** mathematical ideas and decisions
- Represent mathematical ideas in **concrete, pictorial, and symbolic forms**

expected to kn

- **number concepts**
- **ways to make**
- **decomposi** bers to 10
- **repeatin** with two or three elements
- **chan ty to 10**, using concrete materials
- **e alance** and inequality as an imbalance
- **dire easurement** (e.g., linear, mass,

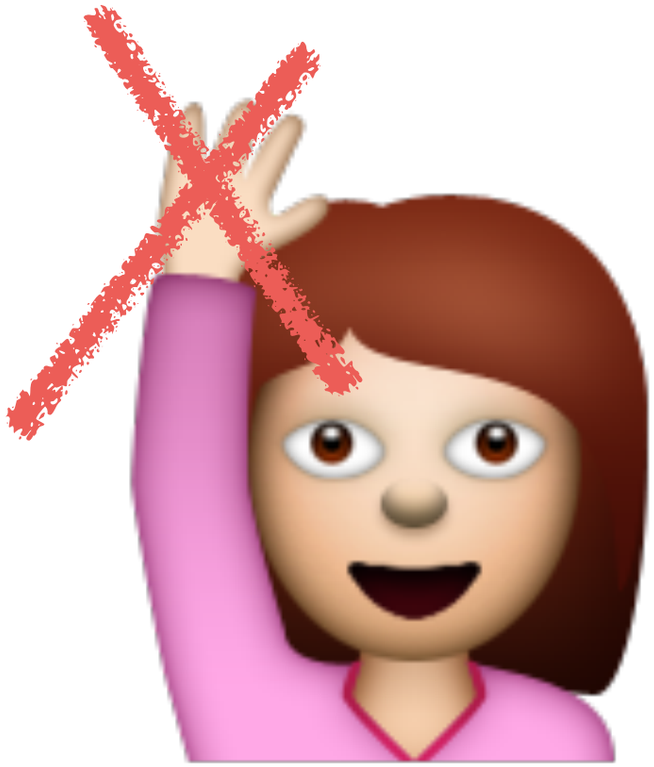
ttributes o shapes and 3D objects
or pictor phs as a visual tool
d of **f ife events**
— attributes of coins, and financial

June 2016 — www.curriculum.gov.bc.ca — *© Province of British Columbia* • *1*

What Curricular Competencies are fostered?

- **Reasoning and Analyzing** through estimating and developing mental math strategies and abilities to make sense of quantities
- **Understanding and Solving** through using multiple strategies
- **Communicating and Representing** their thinking not only orally but through concrete materials, pictorial representations, and symbolically
- **Connecting and Reflecting** through visualizing and describing mathematical concepts, connecting mathematical concepts, and sharing and reflecting upon their thinking

Thinking time is needed



NO HANDS UP

SECRET SIGNALS

Hold up one thumb if you have one way to find the answer.

Hold up another finger if you another way…

Number Talks

Learning Intentions:

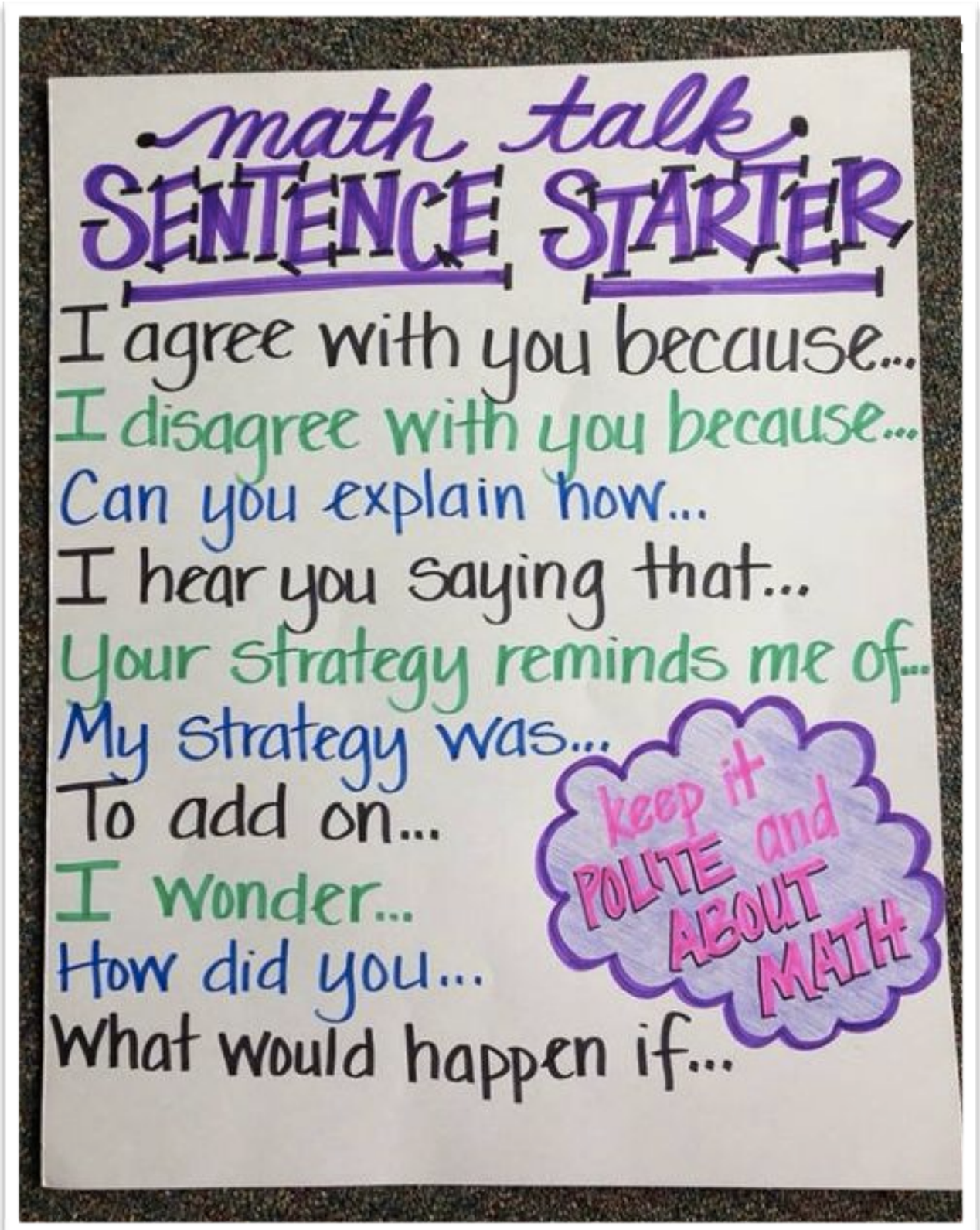
- develop multiple strategies for Decomposing (Mental Math)
- developing flexibility through use of multiple strategies
- Computational Fluency
- Place Value

10 - 15 minutes focussed on one question or a "string" of questions

18 + 7 =

6 x 600
10 x 600
16 x 600
16 x 599

Anchor Charts

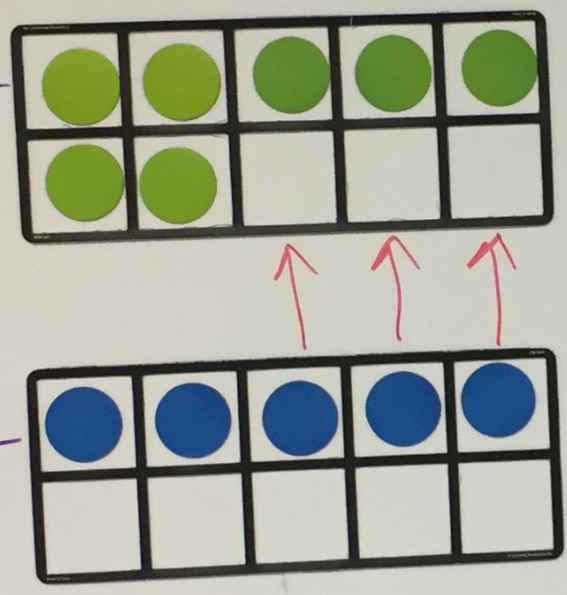


7 + 5 =

3 2

10 + 2 = 12

5:39
from
with
have
what
were



5 + 5)

= 12

10 + 2 = 12

Counted on

9 10 11 12

8

7 +

5 + 7

5 2

10 + 2 = 12

7

8 9 10 11 12

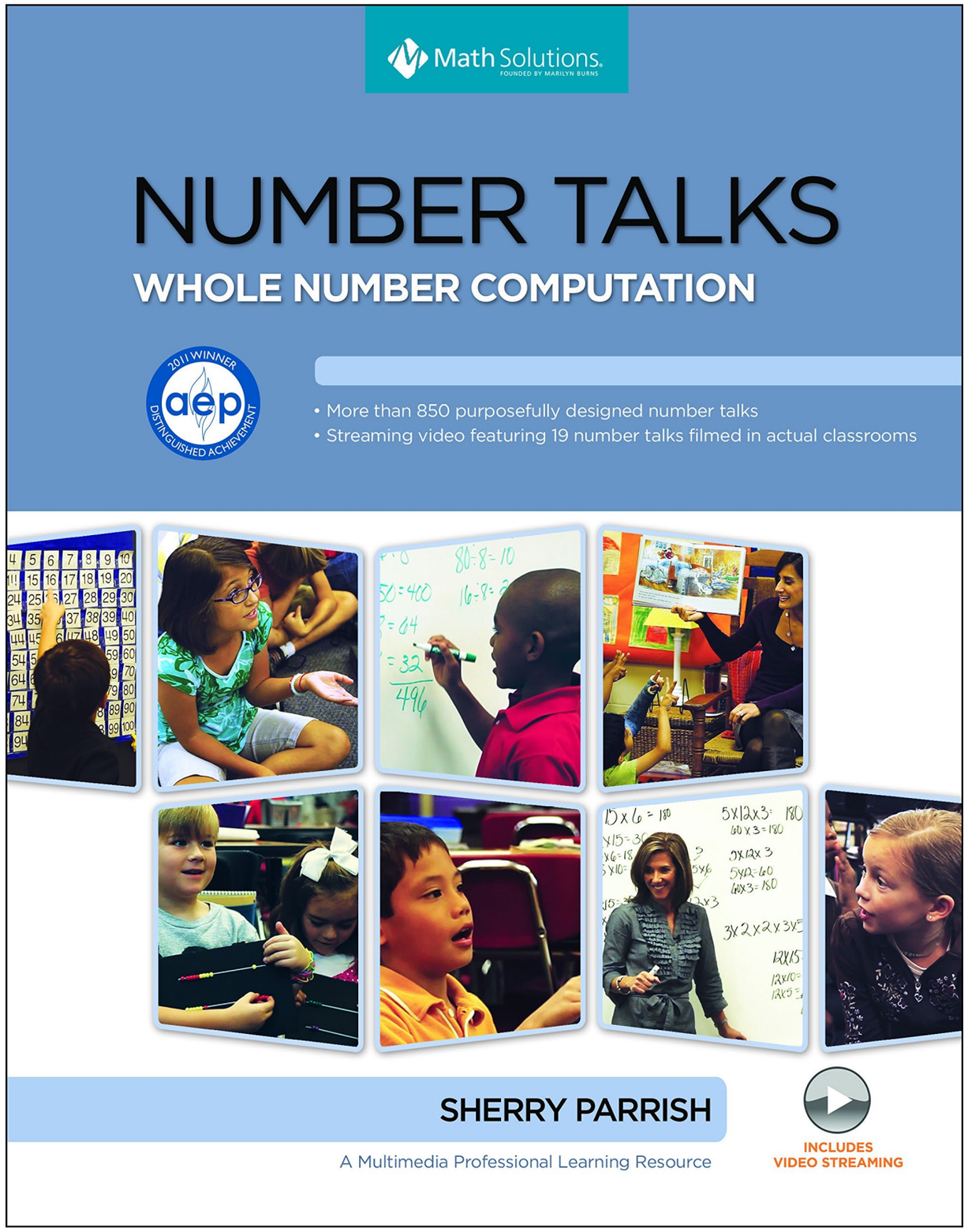
Sample Discussion Prompts

- I agree with _____ because _____.
- I do not understand _____. Can you explain this again?
- I disagree with _____ because _____.
- How did you decide to _____?

BERKSHIRE PARK
ELEMENTARY SCHOOL
15372

Math Solutions.

LRS #171347

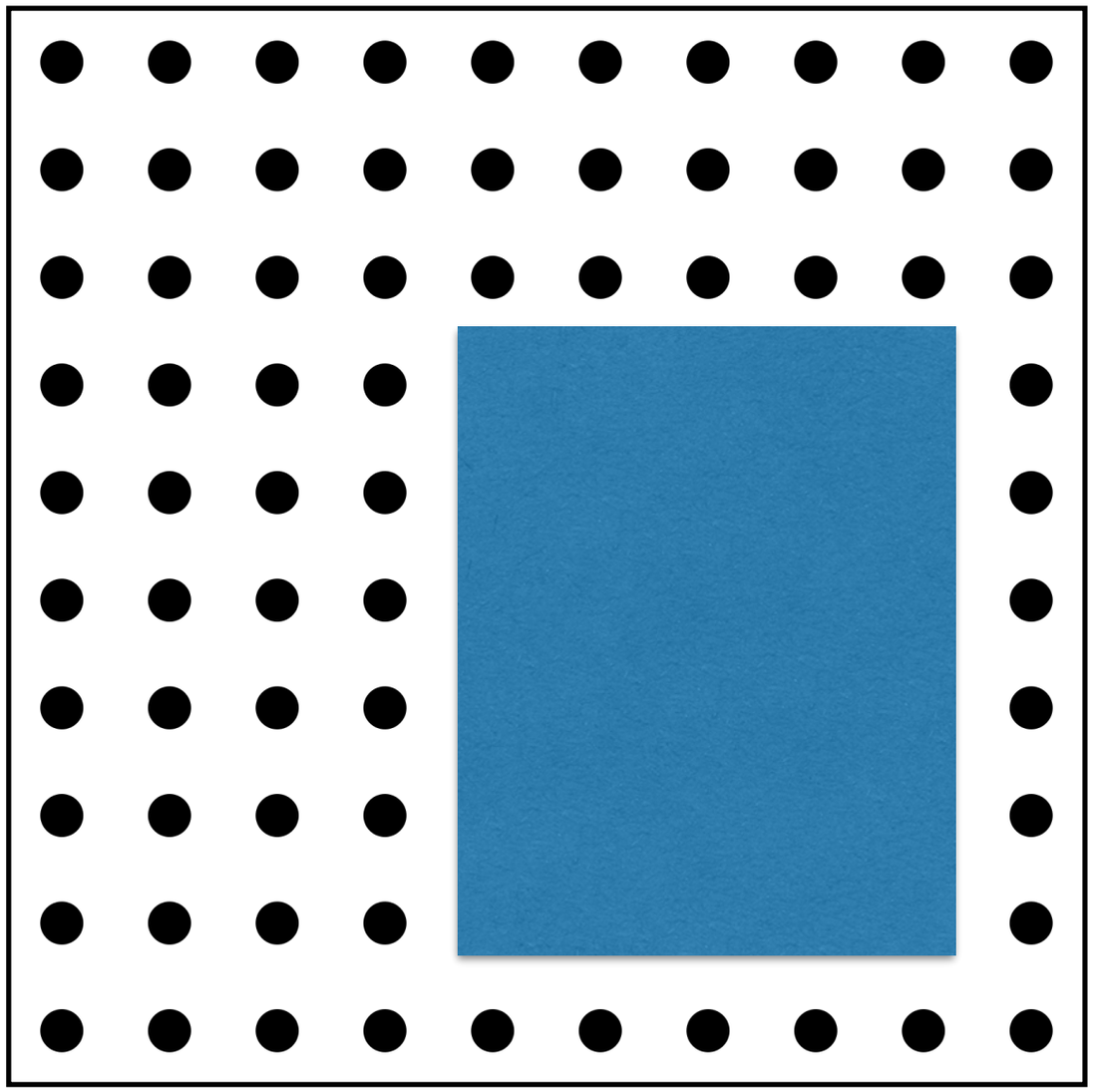

Math Solutions
FOUNDED BY MARILYN BURNS
NUMBER TALKS
WHOLE NUMBER COMPUTATION
2011 WINNER
aep
DISTINGUISHED ACHIEVEMENT
• More than 850 purposefully designed number talks
• Streaming video featuring 19 number talks filmed in actual classrooms
SHERRY PARRISH
A Multimedia Professional Learning Resource
INCLUDES
VIDEO STREAMING

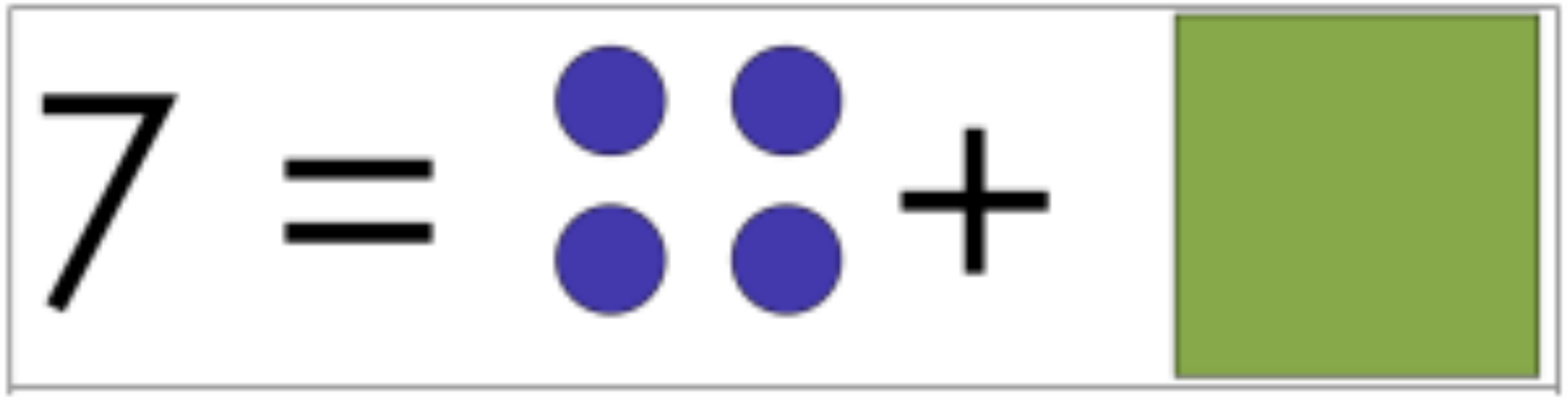
The intent is NOT to “teach” strategies but to provide a platform for Ss to invent, construct, and make sense of important foundations in number.

Missing Part Cards

Learning Intentions:

- Subtilizing
- Decomposing Numbers
- Computational Fluency
- Commutative Property
- Place Value
- Mental Math
- Introduction to Algebraic thinking





- This idea comes from Carole Fullerton and can be downloaded from her website.

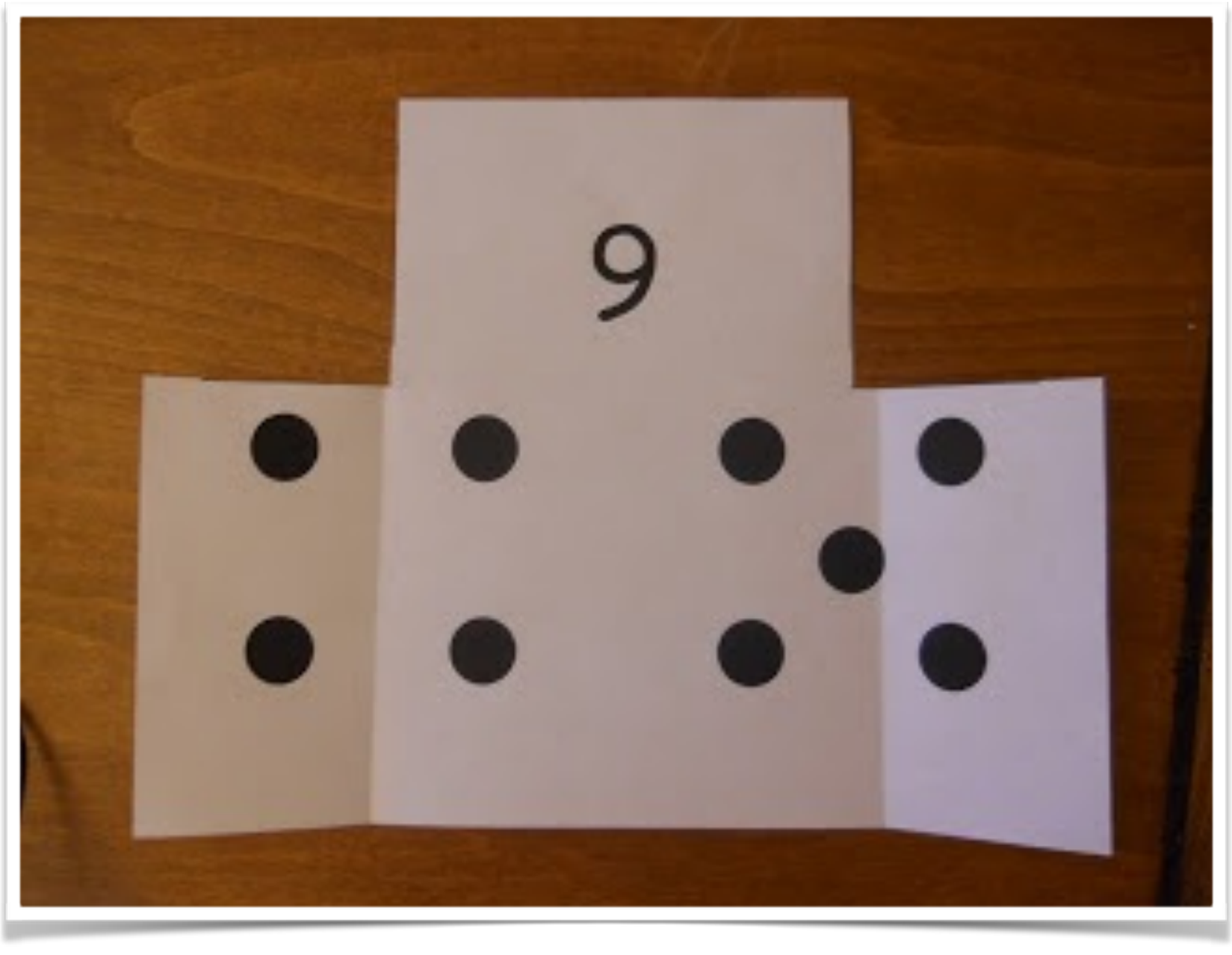
- Show the card and read it aloud with the students

- “Seven is the same as 4 and _____”

- “What do you think is missing?”

- “How do you know?”

Part Part Whole Cards



COUNTING

It is the ability to find out how many!

It is important because students need to develop:

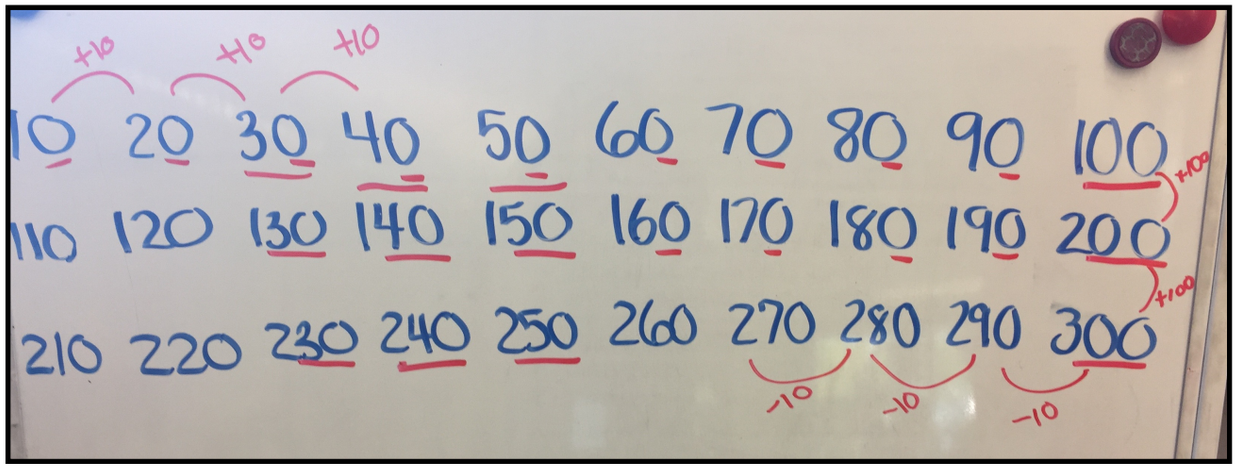
- Correct sequence of number names
- One-to-one correspondence
- Cardinality
- Relative size
- Counting forward and backwards, starting at any point
- Skip counting
- Place Value
- Estimation skills

Choral Counting

Note: The main benefit of this routine is that children can hear and participate in a counting sequence without being put on the spot.

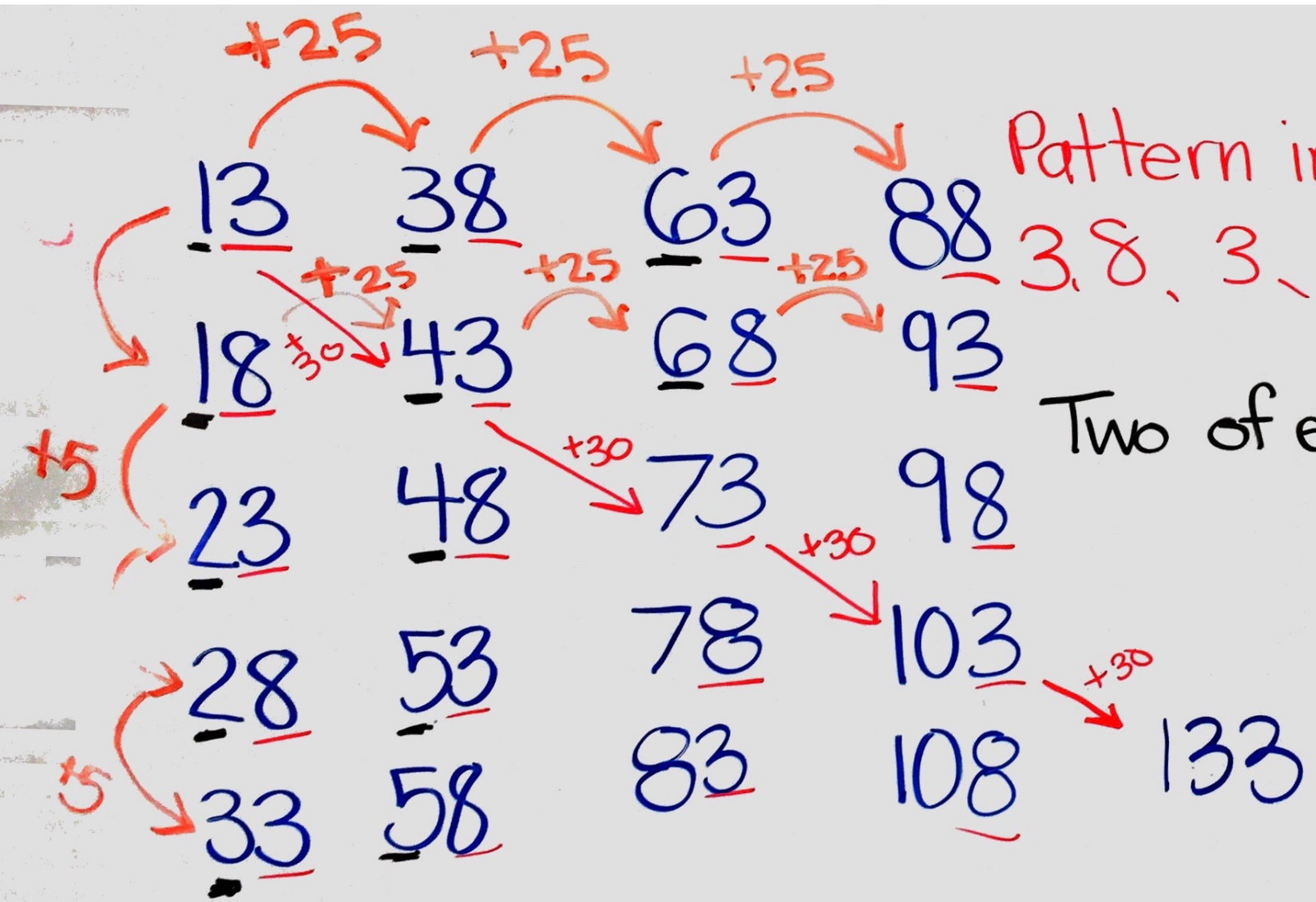
Learning Intentions:

- Counting forwards and backwards
- Skip counting
- Magnitude of numbers
- Make connections between number names, quantitates, and symbols
- one-to-one or one-to-many correspondence
- cardinality



Video from tedd.org

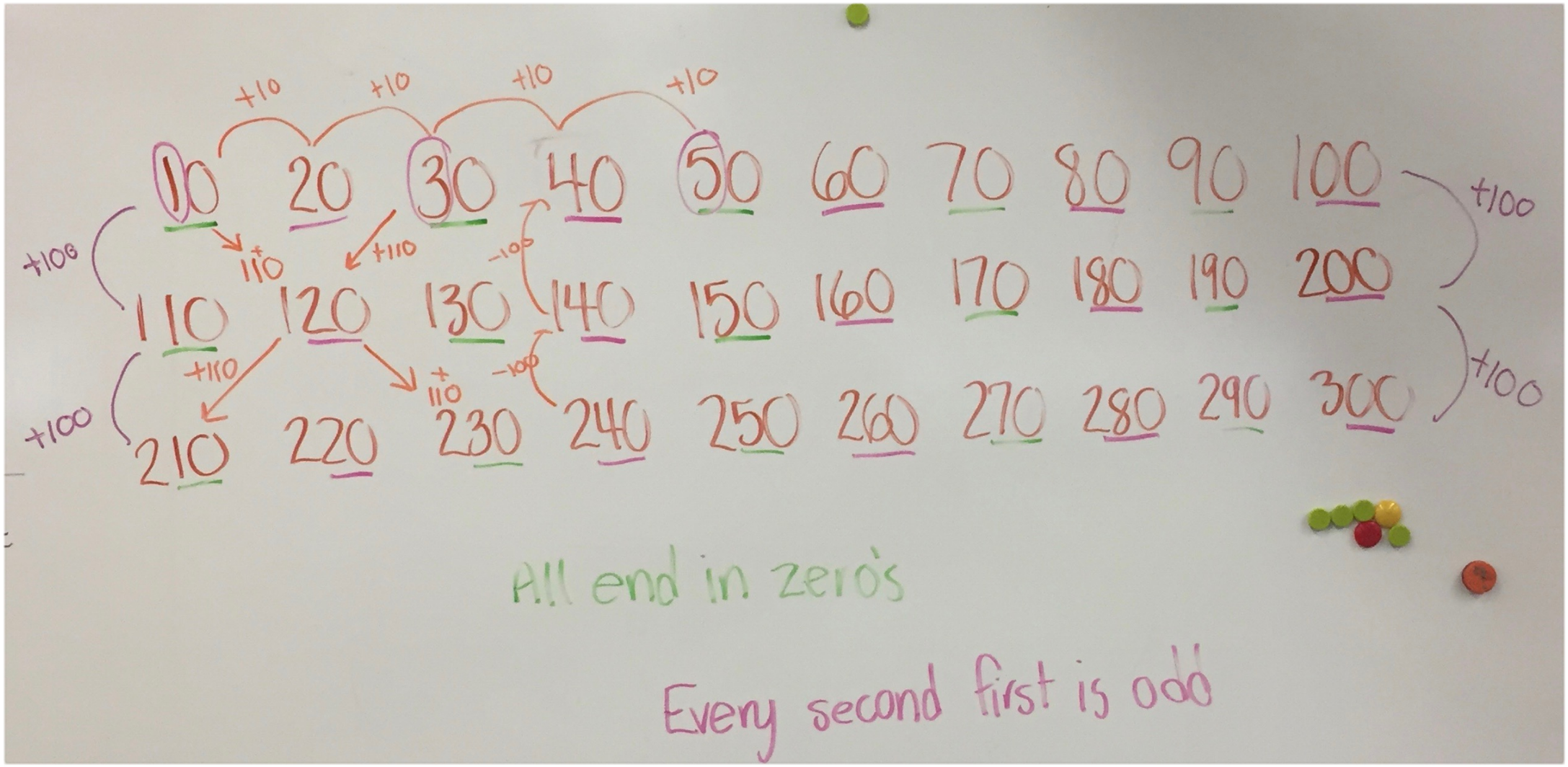
Access this and other videos/key resources at tedd.org



Pattern in the ones

3, 8, 3, 8, 3, 8

Two of each digit in the tens place

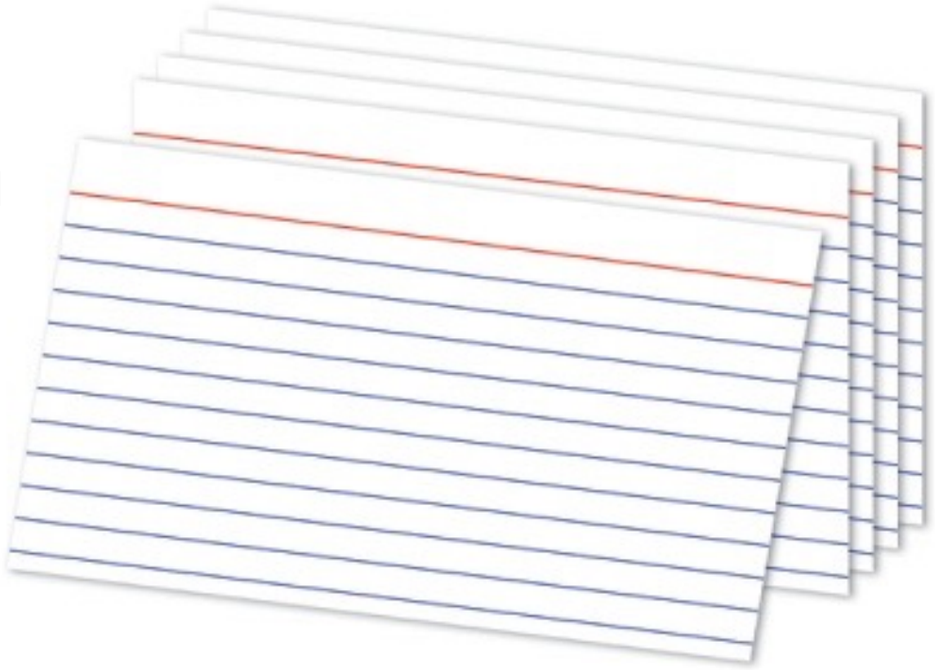

+10
+10
+10
+10
10
20
30
40
50
60
70
80
90
100
+100
+100
110
120
130
140
150
160
170
180
190
200
+110
+110
+110
+110
+100
+100
210
220
230
240
250
260
270
280
290
300
All end in zero's
Every second first is odd

Guiding questions…

- Which three numbers do you think will come next?
- How do you know?
- What patterns are you noticing that help you to predict the next number?
- What number goes here?
- What other patterns are you noticing?
- If we continue, will we say the number _____?
- What number won't we say? Why?

Let's give it a try!

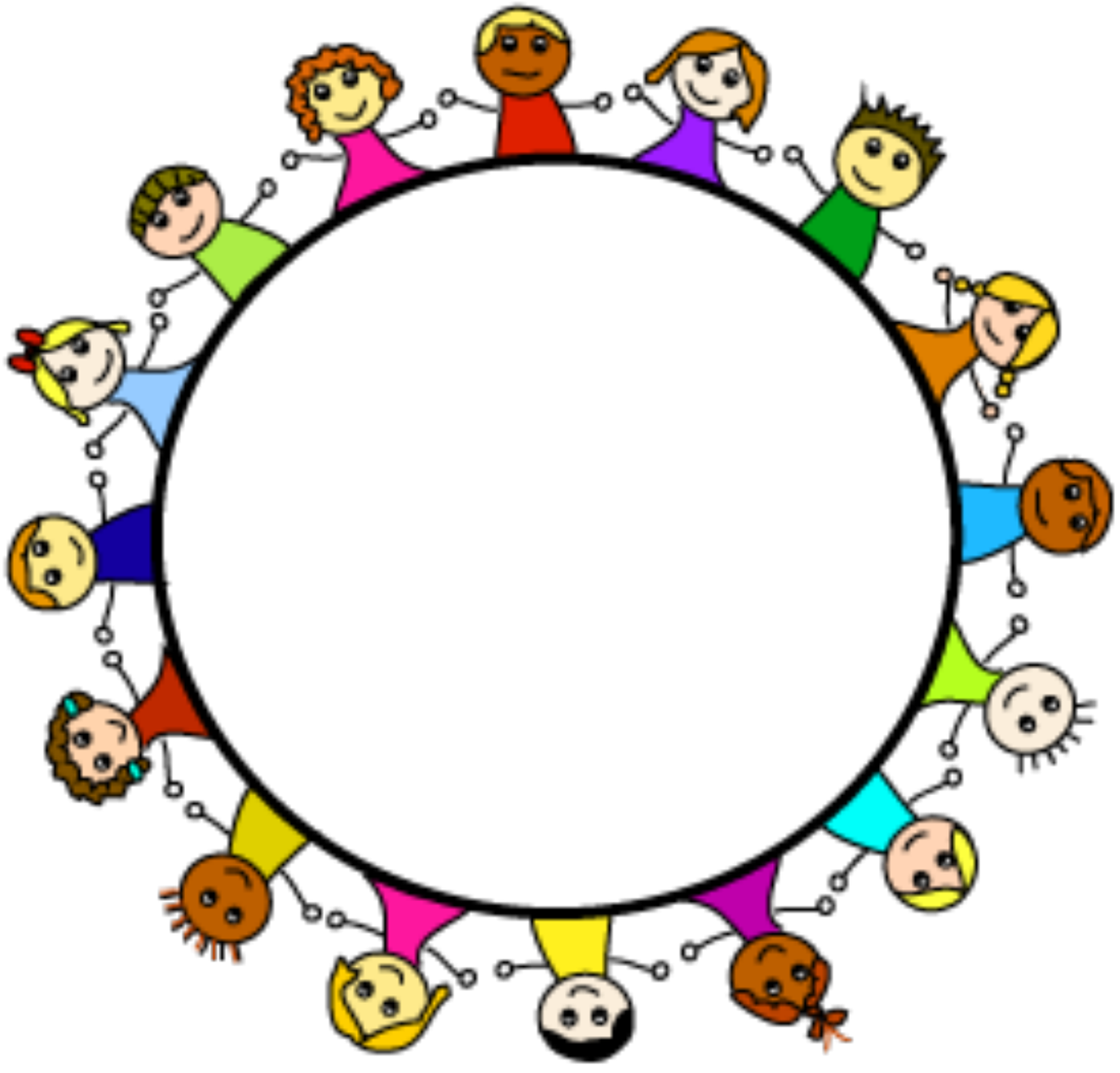
- Which three numbers do you think will come next?
- How do you know?
- What patterns are you noticing that help you to predict the next number?
- What number goes here?
- What other patterns are you noticing?
- If we continue, will we say the number _____?
- What number won't we say? Why?



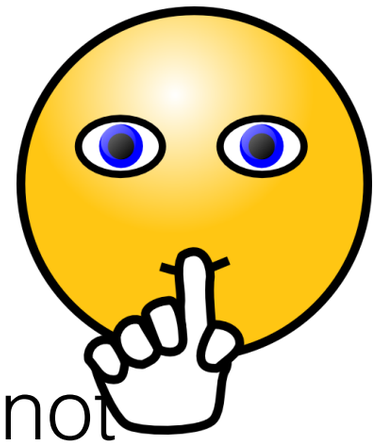
Counting Around The Circle

Learning Intentions:

- Counting forwards and backwards
- Skip counting
- Magnitude of numbers



Reminders:



1. Everyone needs to listen to each person. We cannot be talking to each other. We need quiet to hear each person talking.

2. Give everyone time to think. Calling out the answer turns our friends' brains off.

Recording the numbers on the board while students count aloud so they can make the connection between the number heard and the symbolic number.

And if it is too difficult - move to a choral count aloud.

Differentiation:

- Prior to counting ask some **ESTIMATION** questions

"If we count by one's starting at Megan, and go all the way around the circle, what number do you think Michael will say?"

"Why did you choose ___ as an estimation?"

"Why didn't anyone choose ____ as an estimation?"

Count Around the Circle: Knock-down

Teacher picks a “Knock-Down” number (e.g.10)

Everyone in the circle stand ups. The first student says “1”, next one says “2”, continuing until someone says “10”

The student who says “10” turns to the person beside them and uses pretend fists to “Knock-Down” them down. Play keeps going until only one person is standing!

Start and Stop Counting

- Can be done chorally or in count around the circle
- Students start at a specified number and stop at another determined number
- Use number lines and/or number grids to assist students

Ideas…

- **Starting** at 20 and counting by tens to **Stopping** at 300

- **Starting** at 9.0 and count by tenths using decimals (e.g., 9.0, 9.1, 9.2, 9.3) and **Stopping** at10.5

- **Starting** at 12.25 and count by .25 (or 0.5), and **Stopping** at 13.75

- **Starting** at 12, 992 an d count by ones, **Stopping** at 13, 012

More Ideas for Counting…

- Count forwards or backwards by two's, three's, five's and ten's starting a 3-digit number (e.g., 322, 320, 318, 316)

- Count by halves (e.g. 0, 1/2, 1, 1 and 1/2, 2)

- Count by fourths, eighths, thirds, or sixths starting at zero or at various points.

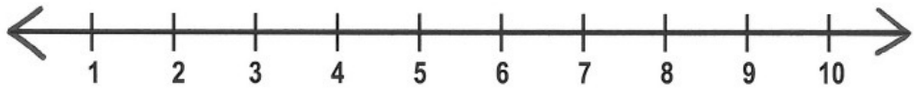
- Count by wholes starting at a fractional number

- Counter by hundreds or thousands or millions starting at zero or various points

Number Lines

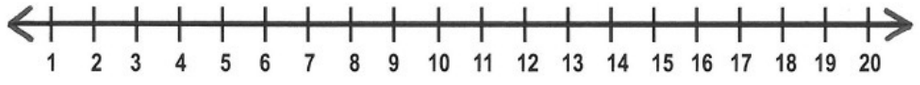
Learning Intentions:

- Visualization
- Spatial Sense of Quantities and Magnitude
- Relationships Among Numbers
- Computational Fluency
- Mental Math Strategies

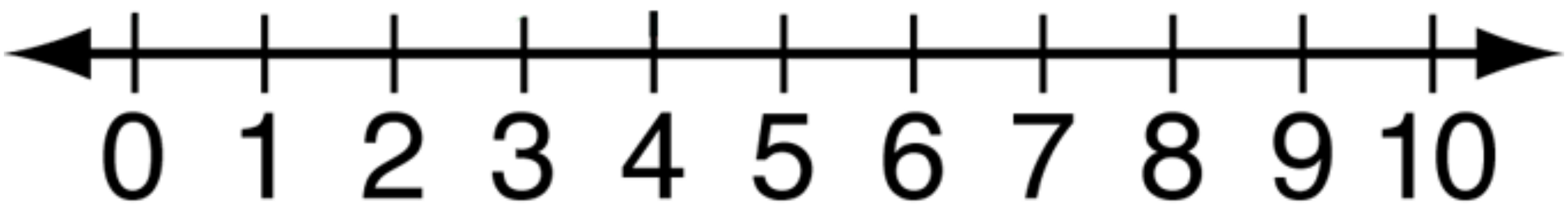


Items you could use:

- White boards
- Class Calendars
- Calendar numbers and Edging at Home Depot

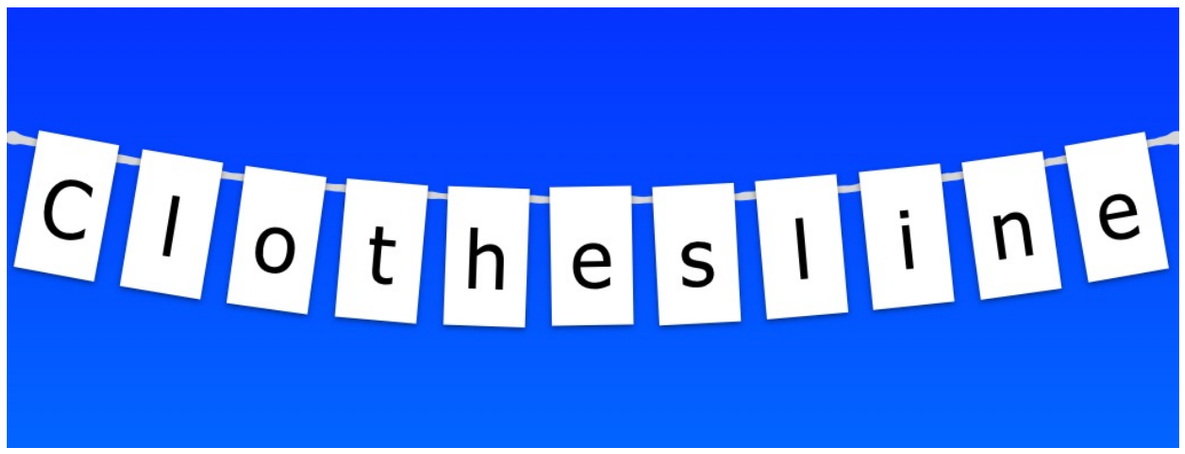


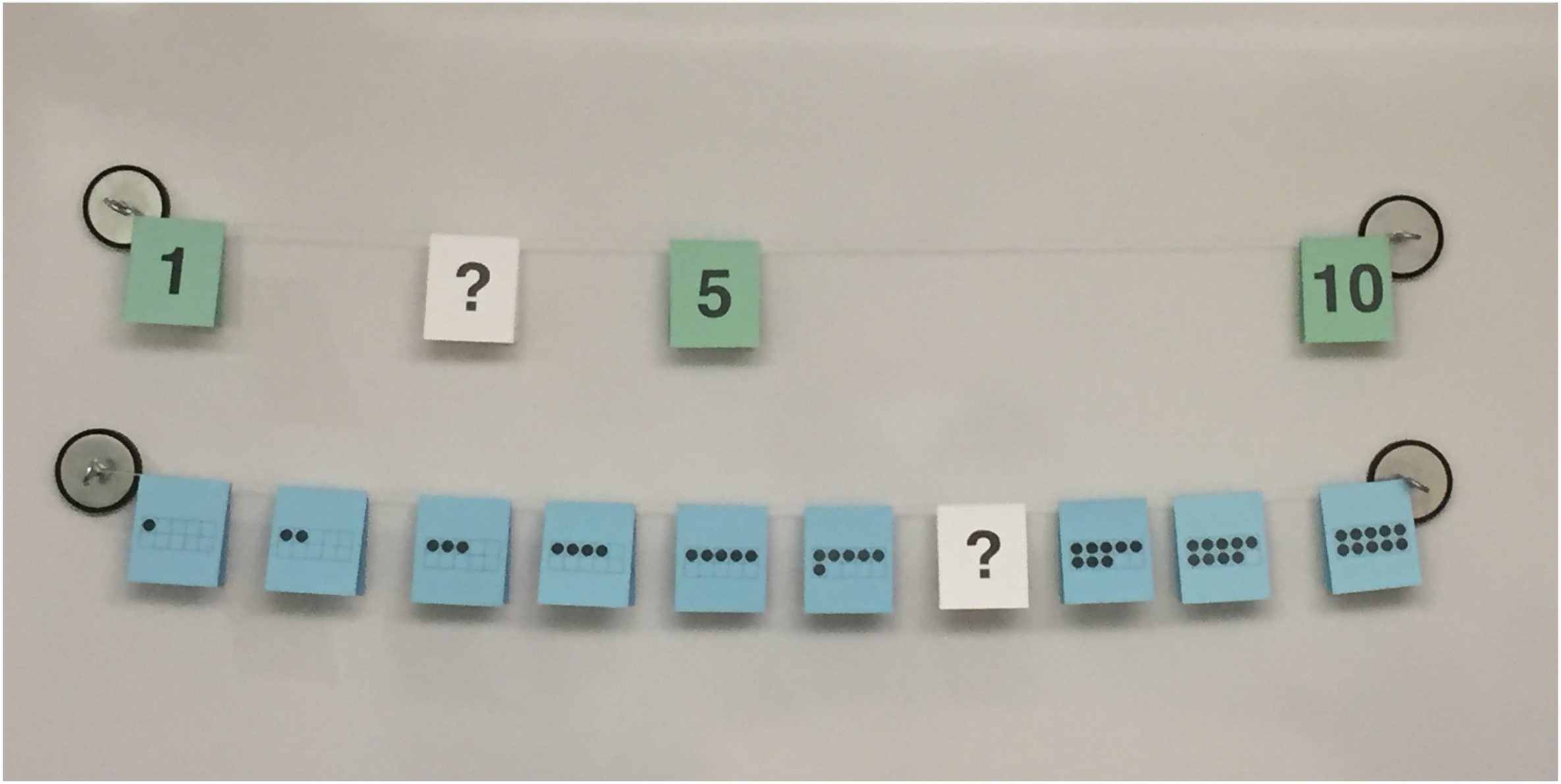
Guess My Number!



Working with the Clothesline

- Build the line
- What are my mystery numbers?
- Can you fix the line?
- Parallel lines - multiple representations





Multiple representations of quantities

apple quarters rabbit saw turtle umbrella video tape wagon xylophone yo-yo zebras

Pp Qq Rr Ss Tt Uu Vv Ww Xx Yy Zz

Vowel Flashcards Vowel Vowel Aa Ee Vowel Vowel Vowel Ii Oo Uu

Numb 012345

NOVEMBER

29,217

Mrs. Syms & Mrs. Campbe

200 400 600 800

Hanna - I thought about skip counting by 200

Tayanna: I know b/c 300 is inbetween 200 and 400.

Jia & Jennifer: It was easier because I thought about 200 to 800 and what is in the middle

middle

200 ? 400 500 600 800

300 350

Ashton: I think its 300 b/c the distance on either side is equal.

Ahmad: B/C its closer to 400 than 200

Andy: This distance has to be the same as 400 and the middle

Scoop

No Name

David A's Group

I thought of 10 and 20 and in the middle of those is 15.

Ishaan's Group

We divided the space into 5 equal parts.

1000

1000

David's C's Group

I visualized how much space 5000 would be

18,000 is about 3000 more than 15,000 and closer to 20,000

Follow along here:

Twitter: @thelohclass

Website: lohdown.weebly.com

E-mail: loh-c@surreyschools.ca

oneschoolroom.ca + french fun!

Homework:

* SFU Surrey
* $2 winter Day
* Dec 1 Services nSports
* Xmas songs memorized

10 000

11000

?

15 000

17000

18000

20 000

Kenneth's Group:

We knew it was 1000 away and used the space btwn 10,000 and 11,000 to visualize

Where would 130 be located?

Explain your thinking!

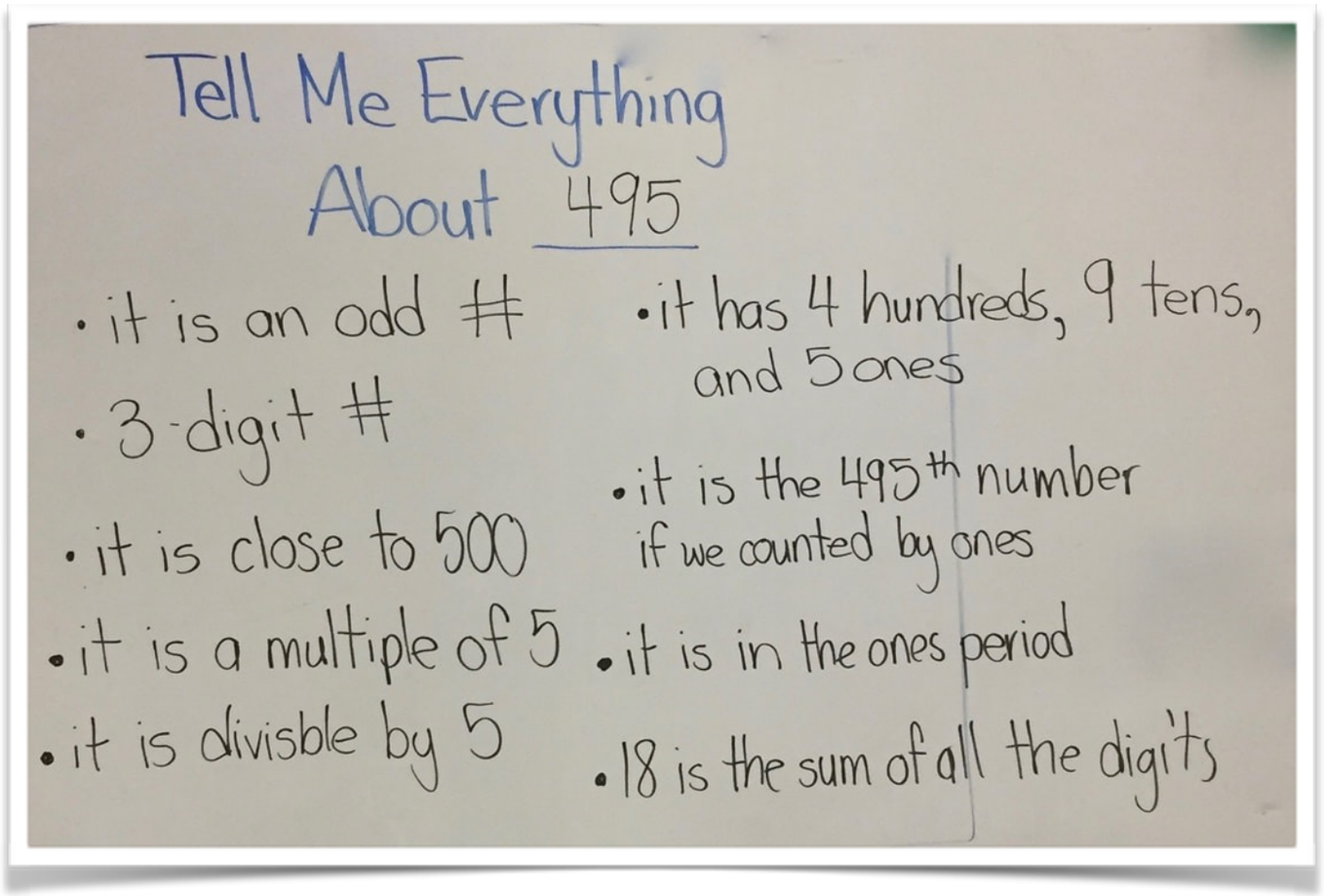
Where would $\frac{1}{10}$ be located?

Explain your thinking!

Tell Me Everything

Learning Intentions:

- Visualization
- Decomposing and Recomposing
- Place Value
- Number Concepts
- Rounding



Tell Me Everything About 1022

- it is close to 1000
- it is even
- it has 4 digits
- no one lives that long
- you could find it in a thousands chart.
- 5 is the sum of all the digits
- it has 1 thousand, 0 hundreds, 2 tens, 2 ones
- it is a multiple of 2
- it is divisble by 2
- that many muffins could feed our school
- it is a multiple of 7 and divisble by 7

True/False Equations

Learning Intentions:

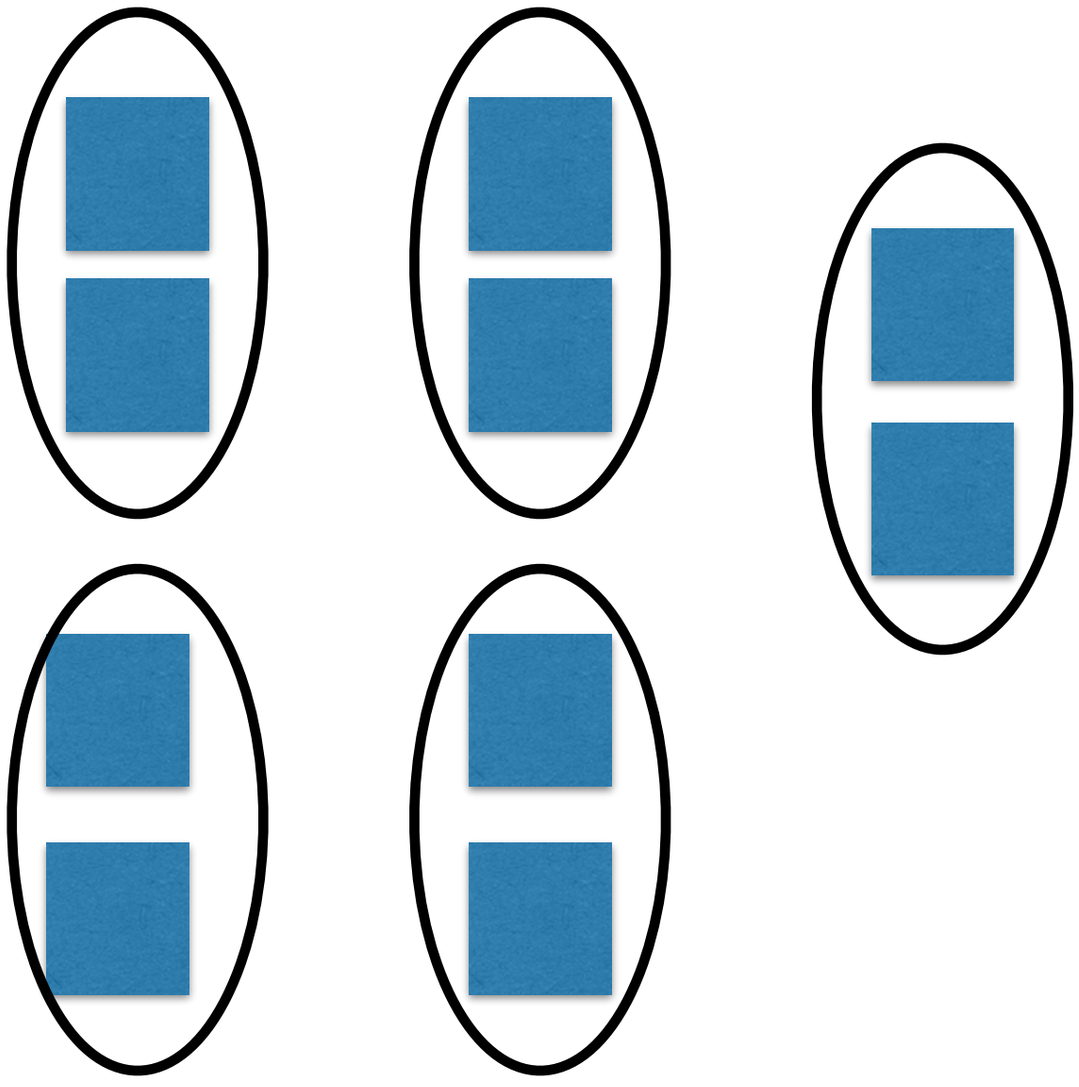
- Subtilizing (Perceptual and Conceptual)
- Visualization
- Decomposing and Recomposing
- Mental Math Strategies

Highlight important math concepts, such as:

- breaking numbers apart into tens and ones
- using patterns
- using the Commutative Property
- using two or more addends
- using repeated groups

2 + 9 + 10 = 1 + 20

TRUE OR FALSE

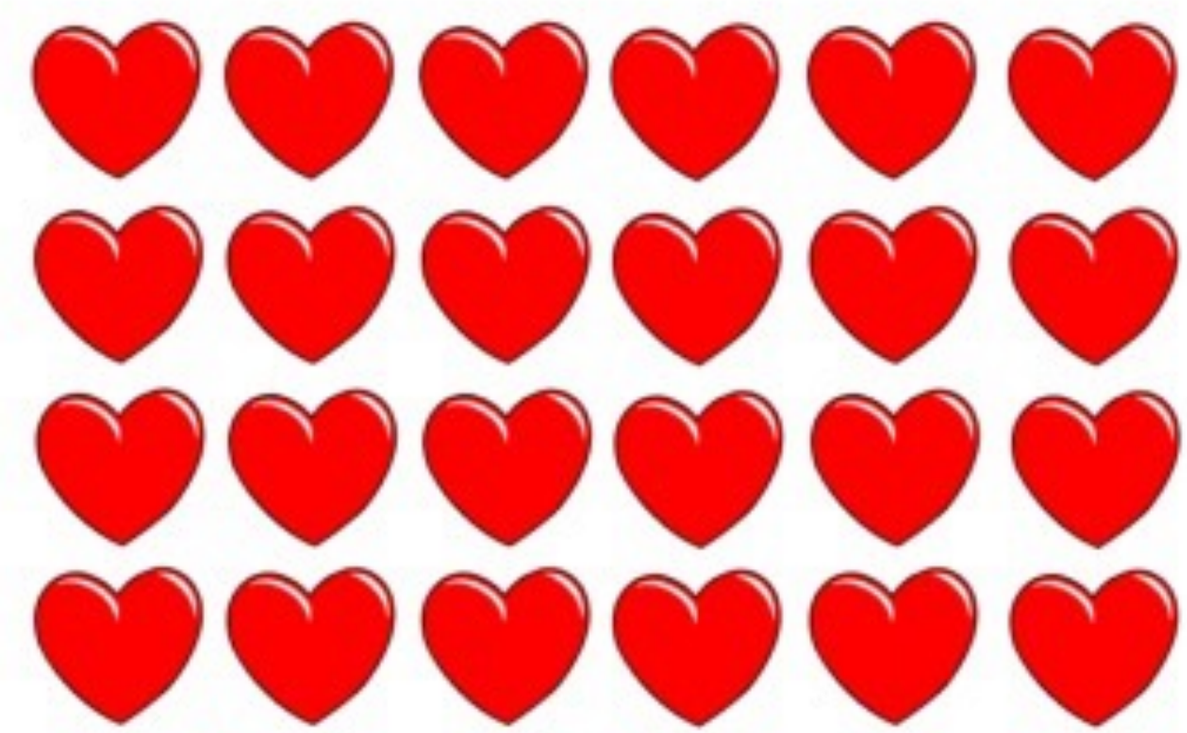


= 5 x 2

TRUE OR FALSE

$$3 + 3 + 3 = 4 \times 3$$

TRUE OR FALSE



= 4 x 5

TRUE OR FALSE

$$2 \times 3 \times 4 = 3 \times 4 \times 2$$

TRUE OR FALSE

$$4 \times 4 = 2 \times 8$$

ESTIMATION

It is the strategy for determining approximate values or quantities, usually using a benchmark or referent.

It is important because:

- it assists students with rounding with larger numbers
- it provides students a place to return to and consider when do computation. E.g., based on my estimate, does my answer makes sense?
- it is helpful when measuring - time, money, and length, etc.

Estimation Activities

Learning Intentions:

- Estimation
- Visualization
- Spatial Sense of Quantities and Magnitude
- Relationships Among Numbers
- Mental Math Strategies

Items you could use:

- Estimation Jars
- Estimation 180 website

Estimation 180

How many cheese balls do you estimate it will take to fill this tray?

Pause the video part way through -
Would you like to revise your estimate?

How many cheese balls will it take to fill this plate?

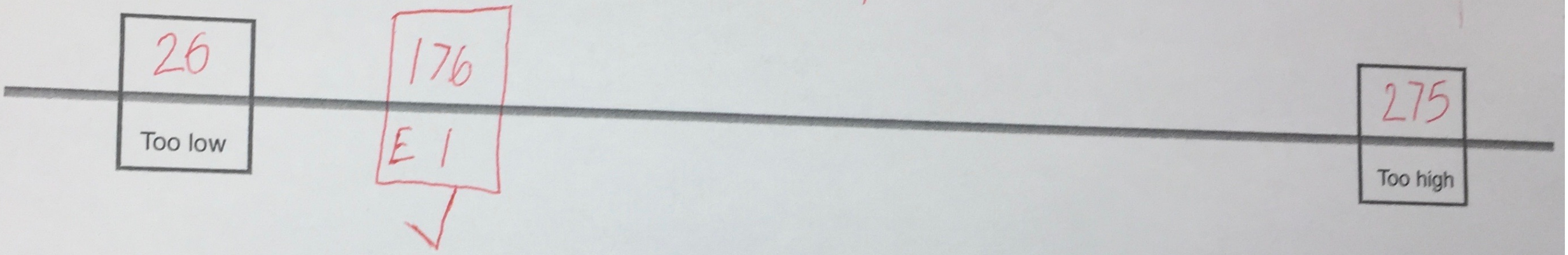
Cheeseballs
1

ESTIMATION 180

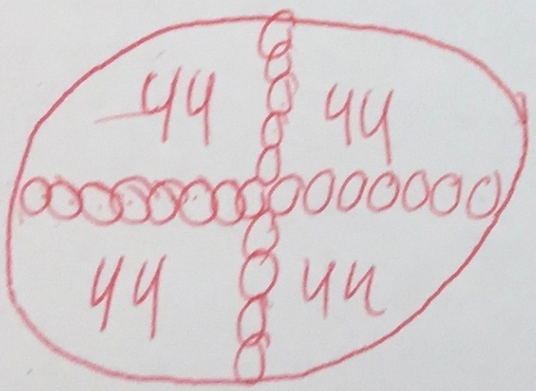
Building number sense one day at a time.

Date Nov 21 2017

Today I am estimating Cheseballs on a plate



My reasoning: becauce I visulised that there is 44 in each quarter I aded them and I got my estamite.



The answer was 156. When I compare my estimate to the answer it is

- my estamite was a little to high
- it needed to take away 20

Andrew Stadel curates this website

ESTIMATION 180

Building number sense one day at a time.

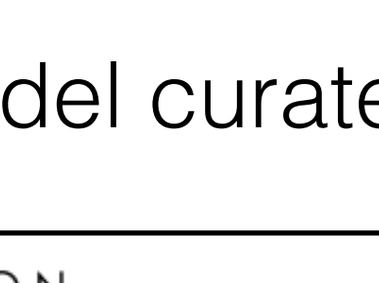
Search

Days | Blog | Lessons | Clothesline Activities | Presentations & Workshops | About

How many folders come in the box?

Day 21

How many envelopes come in the box?



Day 22

How many writing pads in the package?

Day 23

How many sheets of paper in the package?

Day 24

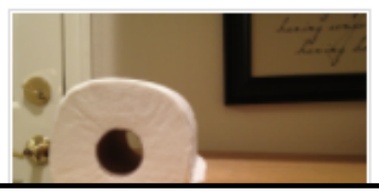
How many pieces of candy corn in the cup?

Day 25

How many candy corn come in the bag?

How many scoops of candy corn fill the jar?

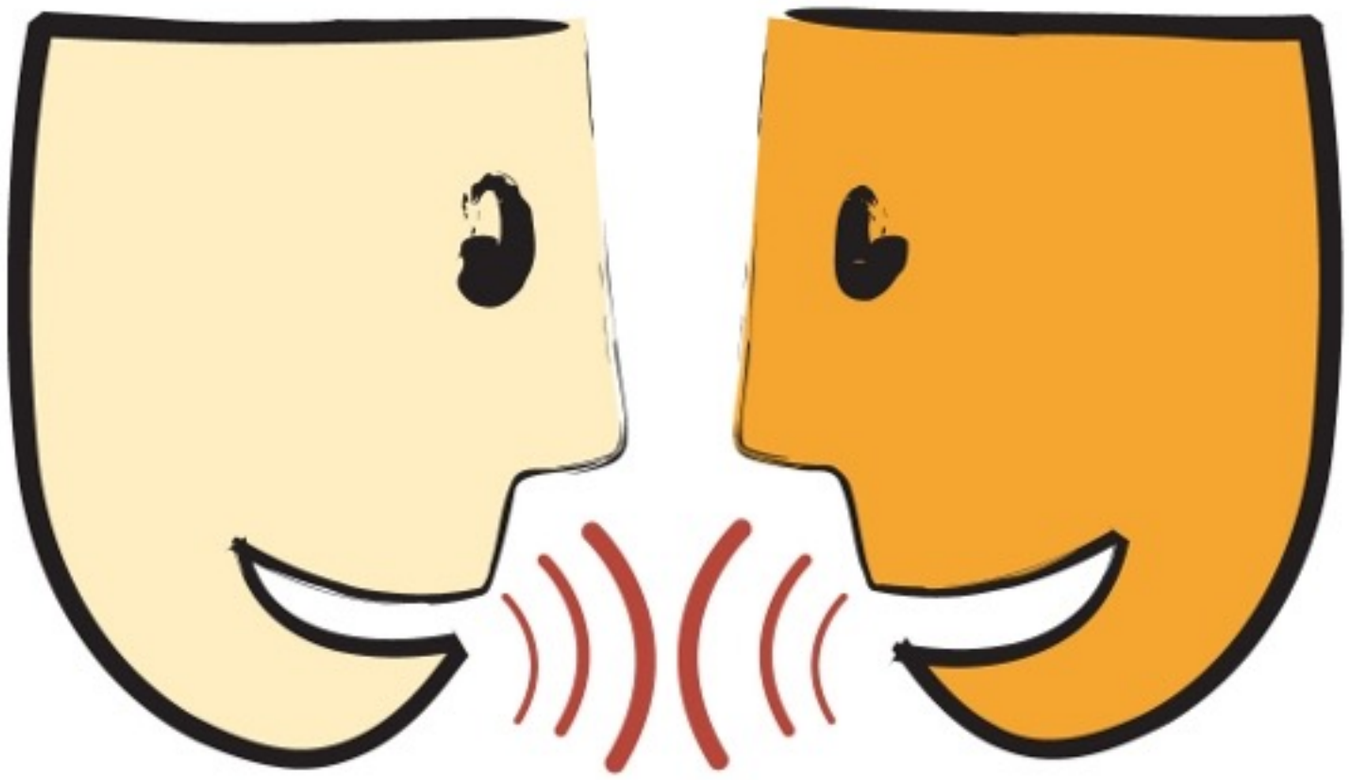
How many sheets on the roll of toilet paper?



How many sheets on the smaller roll?

How long is the entire roll of toilet paper?

Turn and Talk

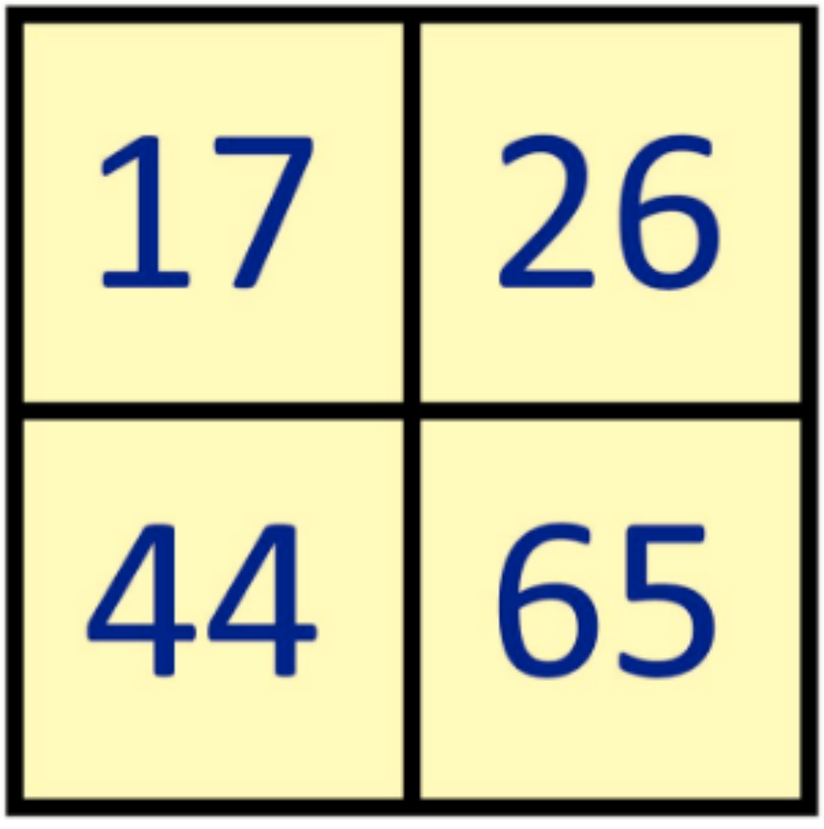


How might you use
this with your students?

Which One Doesn't Belong?

Learning Intentions:

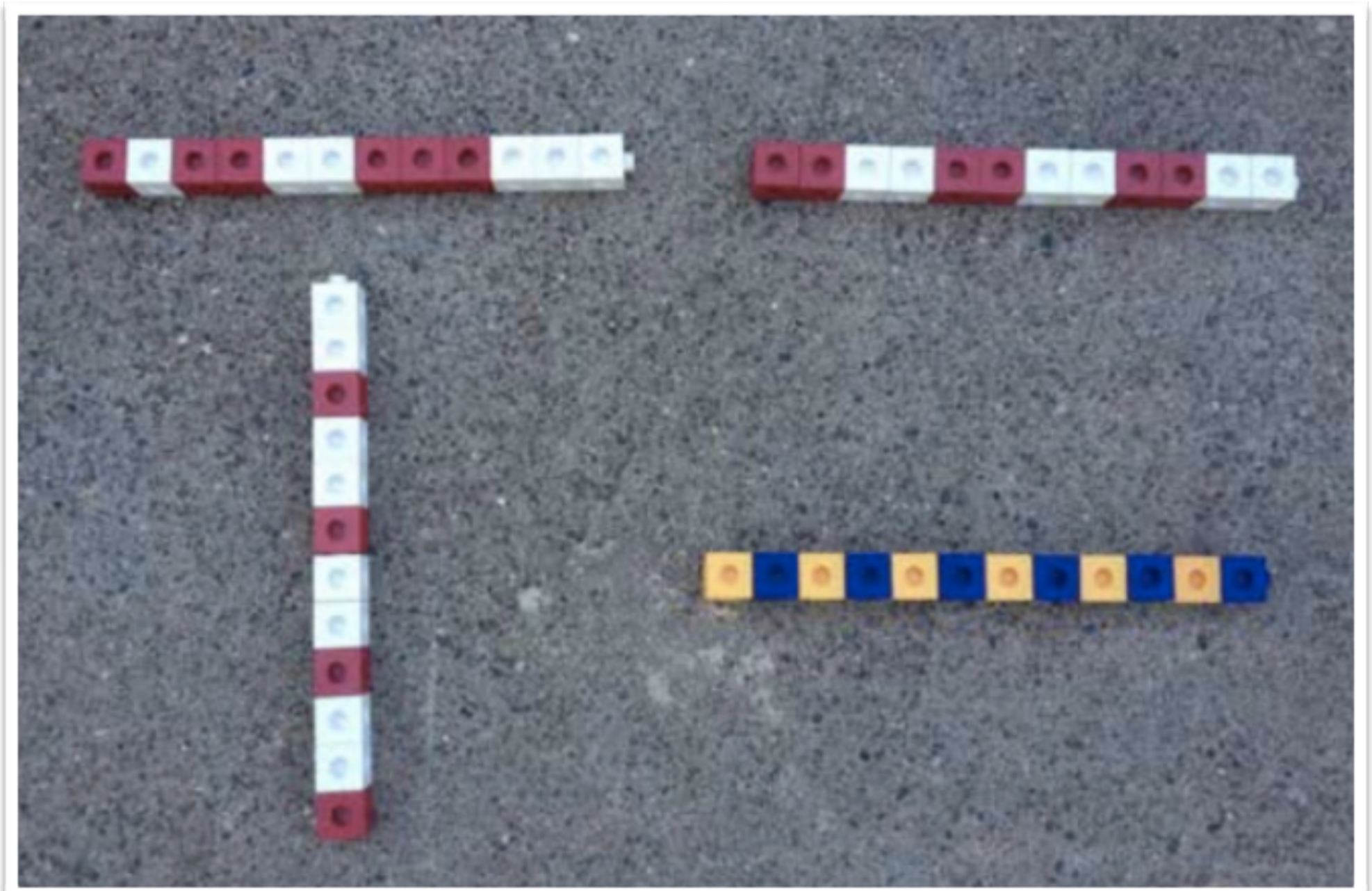
- Understanding attributes
- Encourages Mathematical language
- Spatial Awareness
- Reasoning
- Explain and Justify



Items you could use:

- Letters
- Numbers
- Money
- Graphs

5



$\frac{1}{2}$	$\frac{5}{3}$
$\frac{2}{10}$	$\frac{2}{5}$

1 : 7	2 : 14
3 : 11	7 : 49

Guiding questions…

- What do you notice?
- What makes all the the items alike?
- What makes them different?
- Which one doesn’t belong?
- Can you share your reasoning to justify your answer?

Revisiting our Intentions

- I understand what it means to have Number Sense.

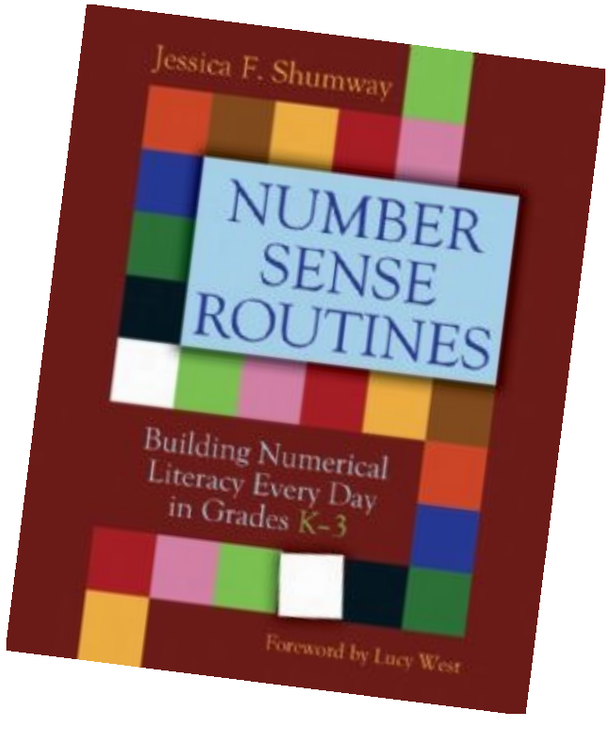
- I understand how using 5 - 10 minute daily Number Routines can develop my students' number sense and computational fluency

- I understand how using Number Routines helps to build a Mathematical Community and encourages my students to share and communicate their thinking

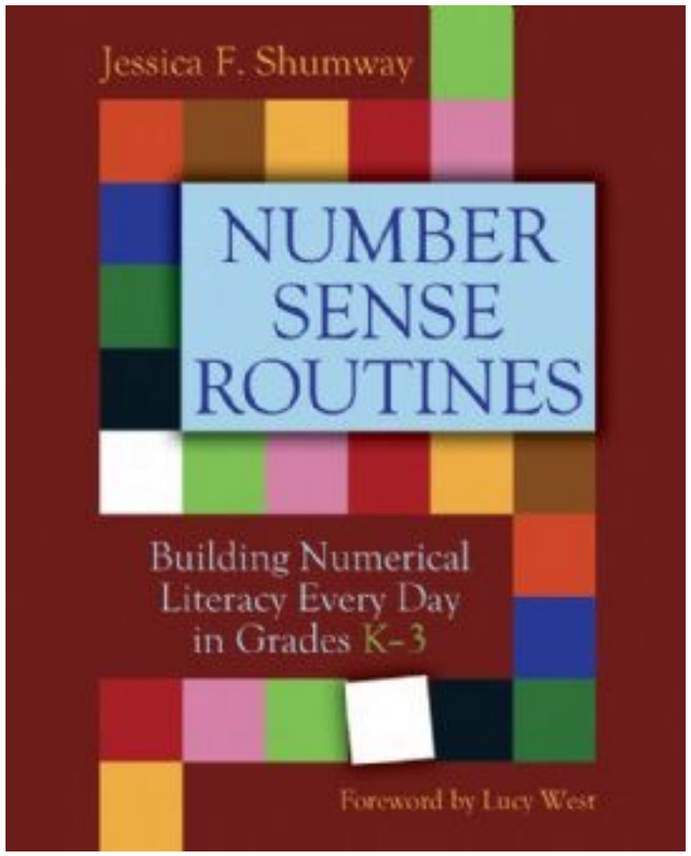
- I have one or two Number Routines that I feel comfortable exploring with my class and I understand how to differentiate these to meet the needs of my students.

"These number sense routines are not 'auto pilot' activities, but opportunities for meaningful practice. You'll learn when to use a particular routine, how to differentiate, and how to use routines as formative assessment tools."

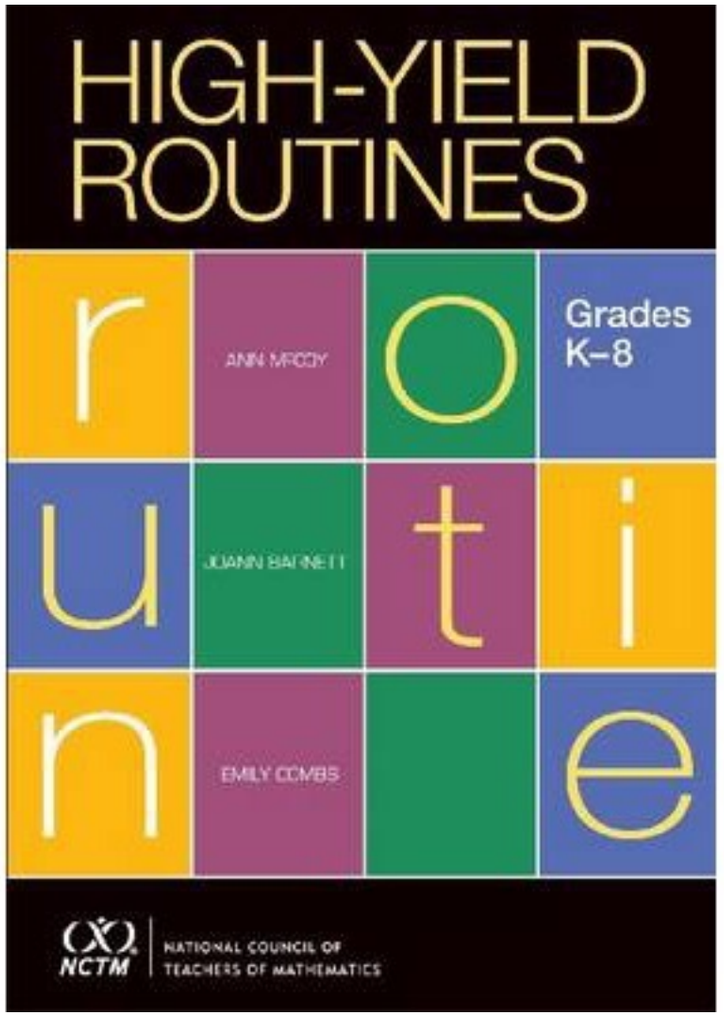
–Jessica Shumway (p.g.14)



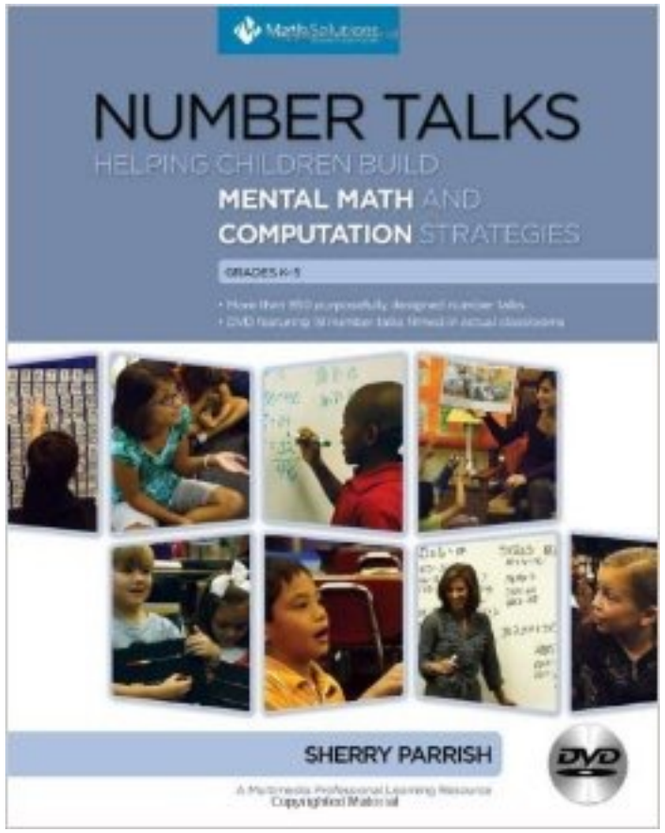
Resources:



Jessica Shumway



Ann McCoy, Joann Barnett
Emily Combs



Sherry Parrish

Christopher Danielson

Thanks so much for sharing your time with me!

MATHEMATICS
is not about
numbers, equations,
computations, or
algorithms:
it is about
UNDERSTANDING.

William Paul Thurston