Number Talks: A Routine Empowering ALL Students

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Why Do Number Talks?

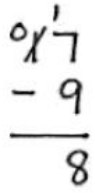
Consider...

$$\begin{array}{r} 17 \\ -\ 9 \\ \hline \end{array}$$

$$\begin{array}{r} {}^{0}\not{1}{}^{1}7 \\ -\ 9 \\ \hline 8 \end{array}$$

Source: *Making Number Talks Matter* by Cathy Humphreys & Ruth Parker

Many who have taught middle school or high school mathematics have bemoaned their students' lack of facility with arithmetic. This is nothing new. Decades of research have shown that the traditional curriculum and instructional methods in the United States have left our students with fragile skills and shallow understanding (Hiebert 1999). And every teacher routinely sees students dependent on rote procedures that they apply mindlessly. Unfortunately, examples like this are common:



The work here isn't wrong; the algorithm is done correctly, and the answer is right. Yet, it is a bit disturbing that this student went immediately to the algorithm without first thinking

“Computational fluency is **strongly related to number sense** and involves so much more than the conventional view of it encompasses.

Developing students’ computational fluency **extends far beyond having students memorize facts** or a series of steps unconnected to understanding”
(Baroody 2006; Griffin 2005)

Source: Principles to Actions: Ensuring Mathematical Success for ALL by NCTM pg. 42

Consider...

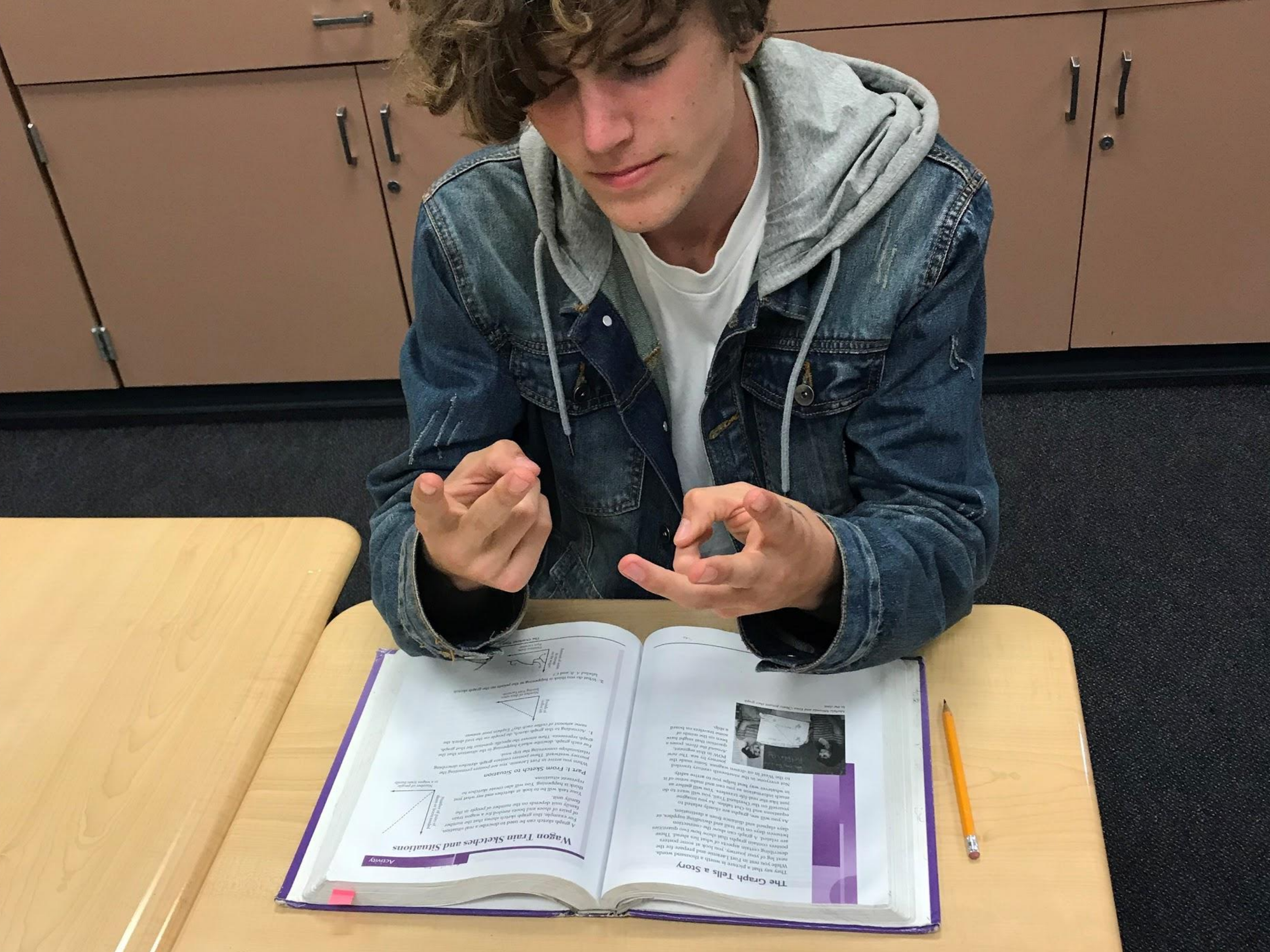
$$276 \div 12 = 23$$

$$(2x^2 + 7x + 6) \div (x + 2) = 2x + 3$$

“Arithmetic algorithms are remarkable tools; they are reliable and efficient and they work with all numbers. The trouble is that their very compactness hides the meaning and complexity of the steps involved” (Hyman Bass 2003, 323)

Source: *Making Number Talks Matter* by Cathy Humphreys & Ruth Parker

Our Story


The Graph Tells a Story
Activity
Wagon Train Sketches and Situations
Part I: From Sketch to Situation

Agenda

- ❑ Our Story
- ❑ Number Talk
- ❑ Challenges
- ❑ Outcomes
- ❑ Action Steps
- ❑ Resources

Problems We Observed

- 80% of our 6th graders lacked basic fact fluency
- Lacking basic operation skills (addition, subtraction, multiplication, division)
- No strategies for calculations
- All known facts based on memory or counting.

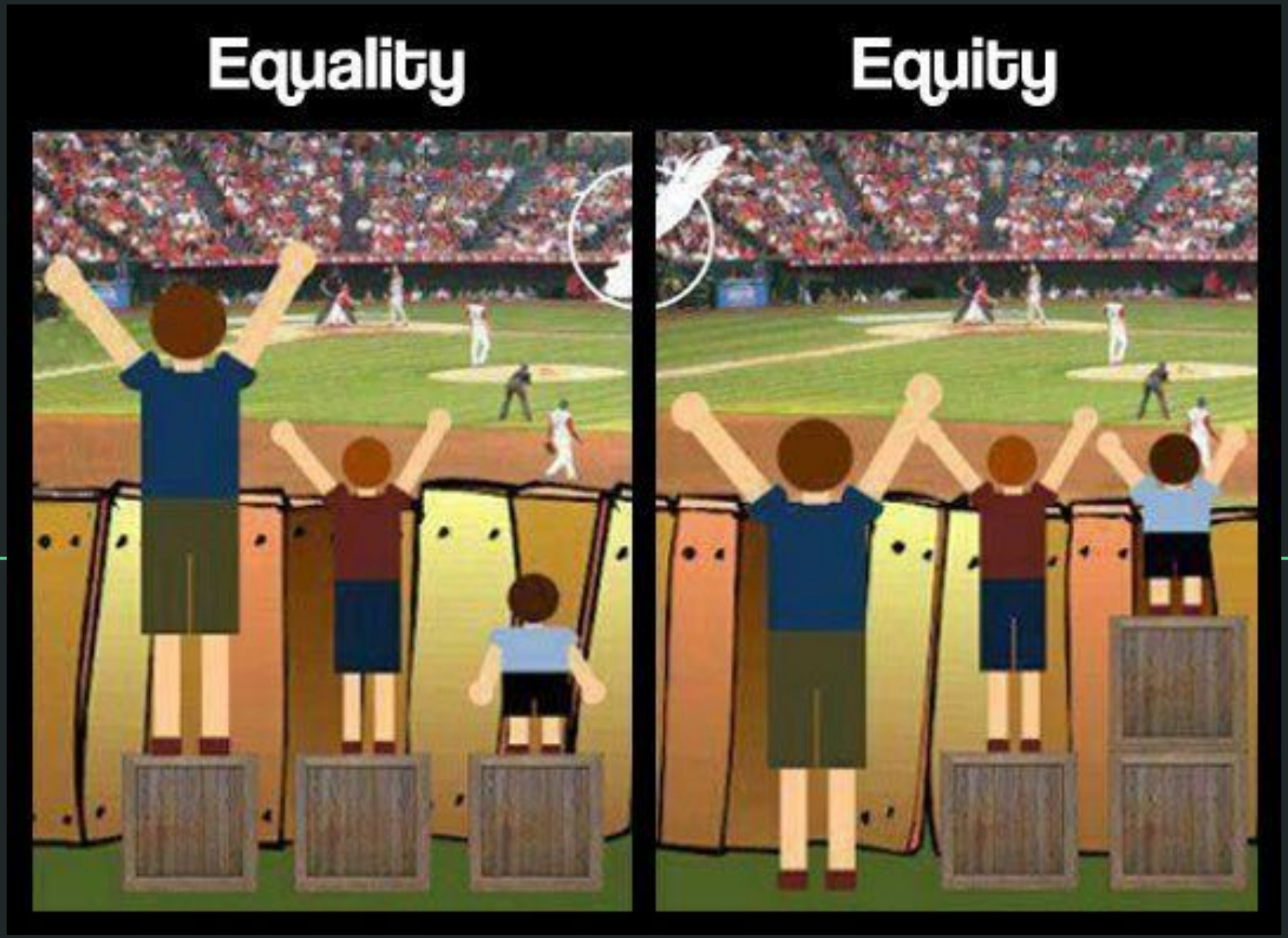
Number Talk Rules

1. No pencils or paper
2. Silent thinking time
3. Place a fist on chest when thinking
4. Use your fingers to show how many strategies you have
5. We will not start until everyone has at least **1** strategy
6. No raising hands until after the first strategy is shared
7. Hold comments until the end of the Number Talk

Number Talk

112(2) 56(4) 28(8) 14(16)

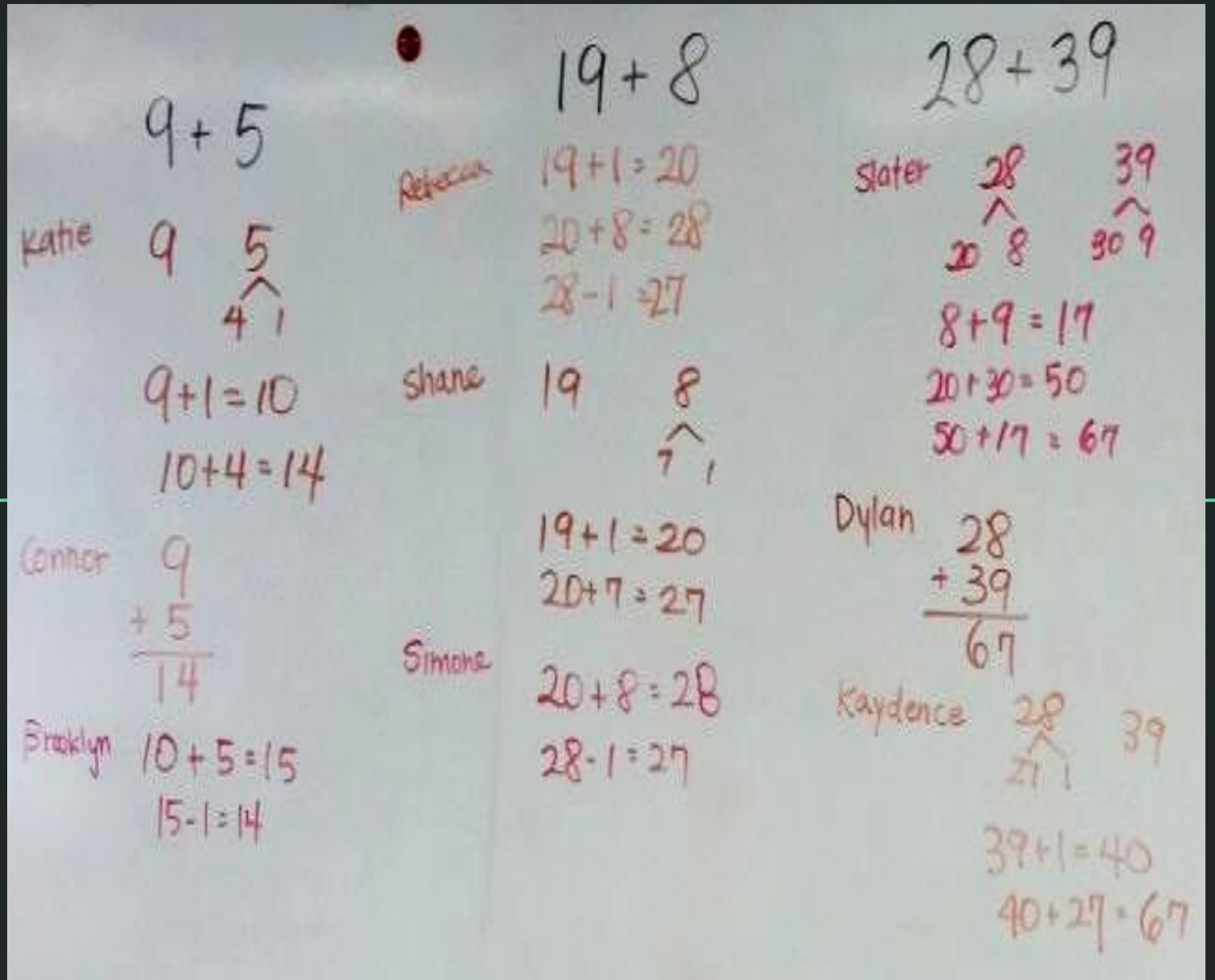
How might this activity give access to all students to participate?


Equality
Equity

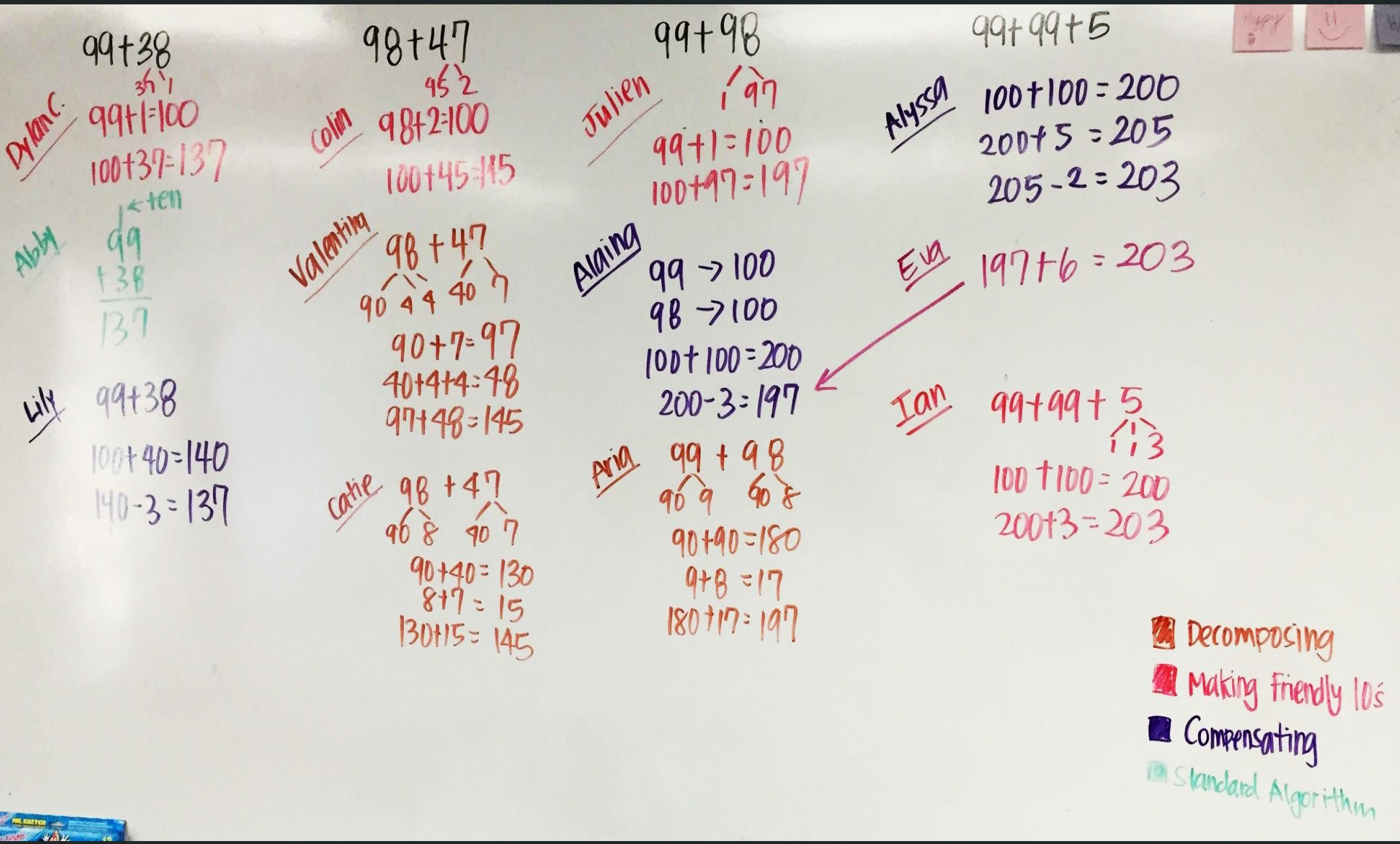
What did we do?

- Began in October
- Started with the addition strategy of Friendly 10's
- 10-15 mins daily (*almost*)

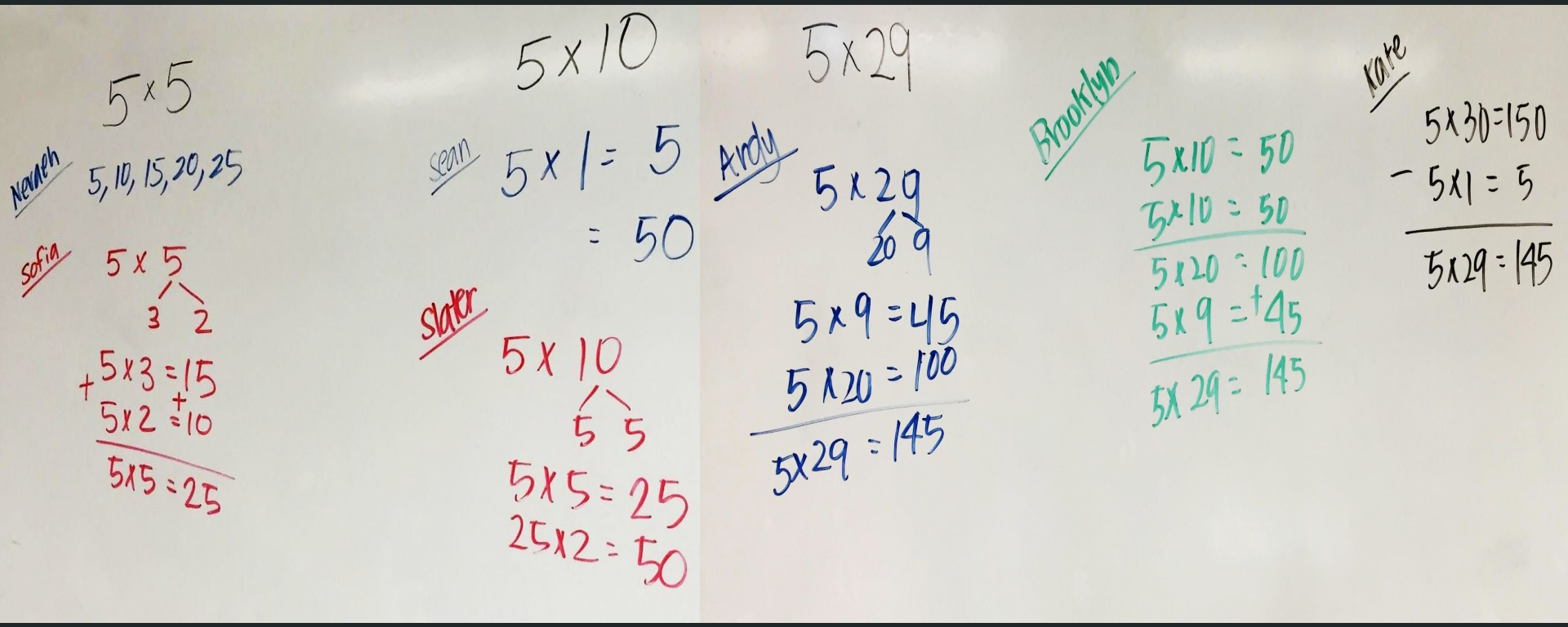
Friendly 10s



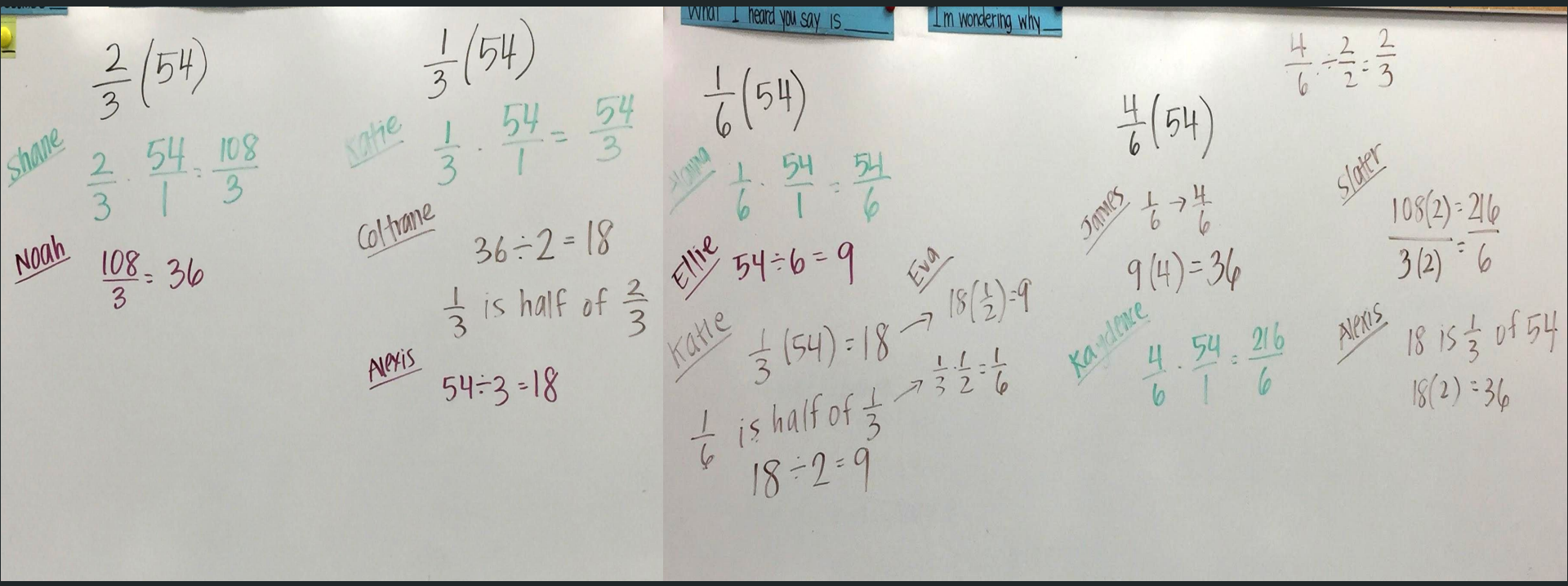
By mid-October...



By February...


5x5
Neveah
5, 10, 15, 20, 25
sofia
5 x 5
3 2
+ 5x3 = 15
5x2 = 10
5x5 = 25
5x10
sean
5x1 = 5
= 50
slater
5x10
5 5
5x5 = 25
25x2 = 50
5x29
Andy
5x29
20 9
5x9 = 45
5x20 = 100
5x29 = 145
Brooklyn
5x10 = 50
5x10 = 50
5x20 = 100
5x9 = +45
5x29 = 145
kare
5x30=150
- 5x1 = 5
5x29 = 145

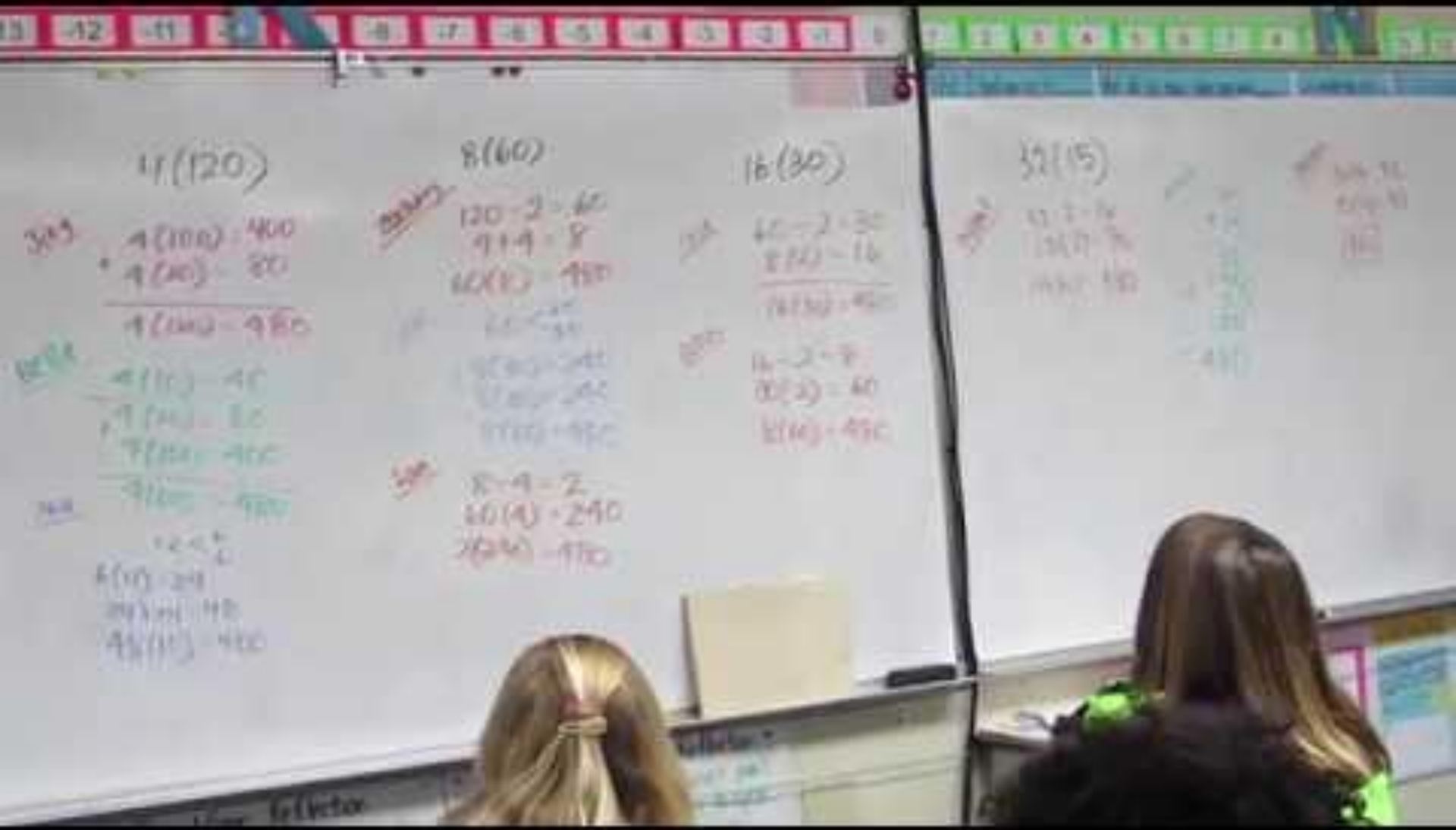
In April, Fractions



Where do **YOU** see gaps?

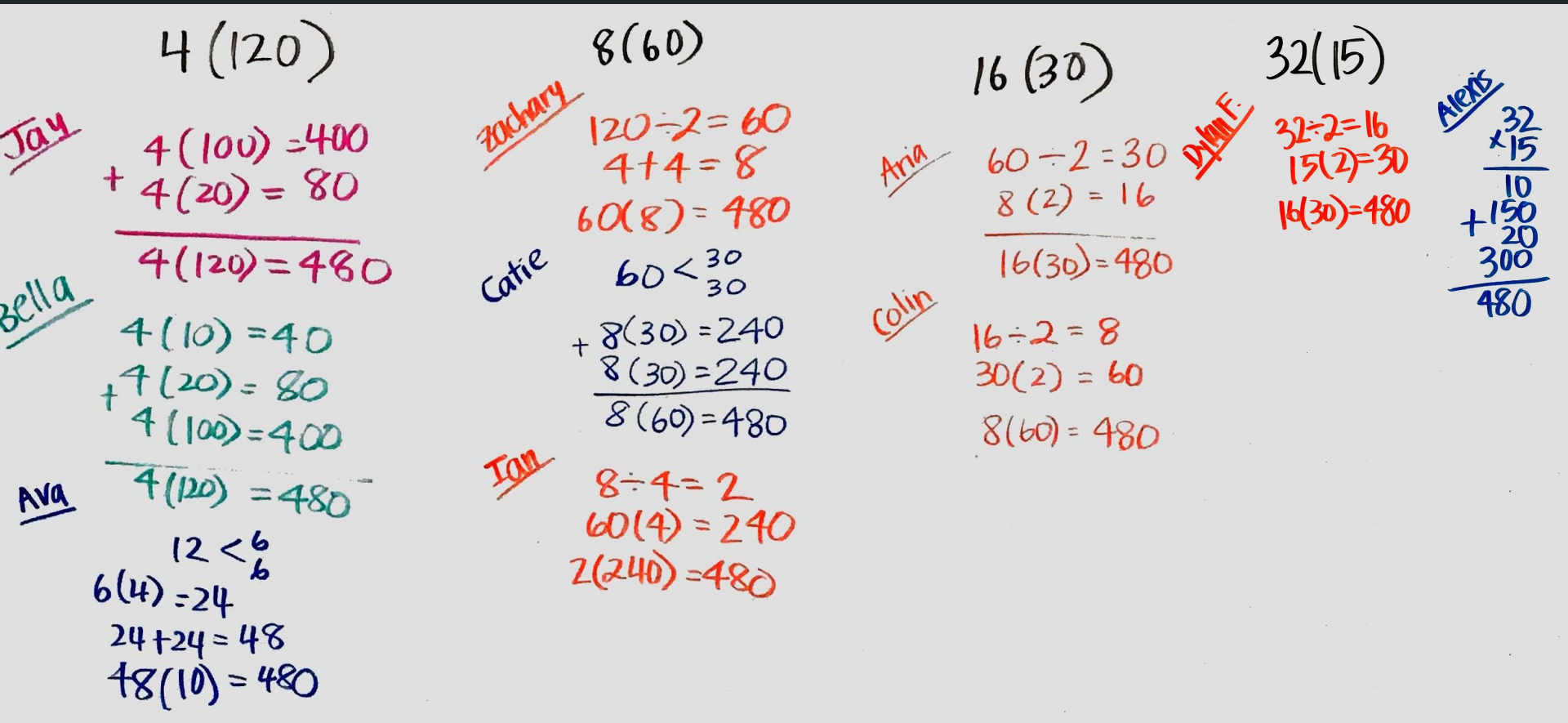
- Addition
- Multiplication
  - Single-digit
  - Multi-digit
- Subtraction
- Division
- Fractions
- Decimals

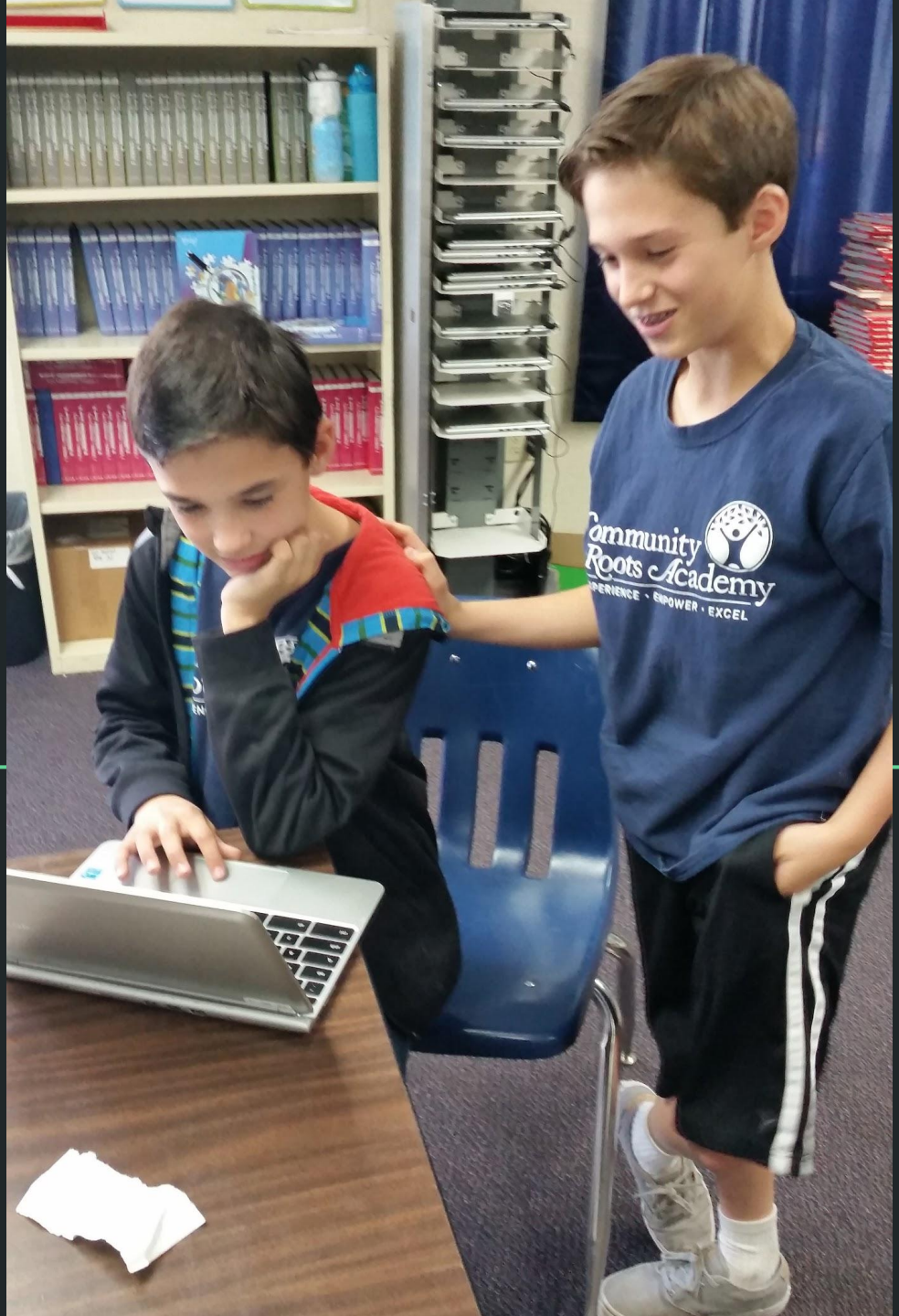
Observations & Outcomes



Link to Video

What was our Number Talk targeting?




Community
Roots Academy
EXPERIENCE • EMPOWER • EXCEL

Outcomes

- Strategies for approaching problems
- Number sense
- Use of academic language
  - Place value
  - Making one vs. canceling out
- Understanding of standard algorithms
- Access to grade level math
- Addresses misconceptions
- Confidence

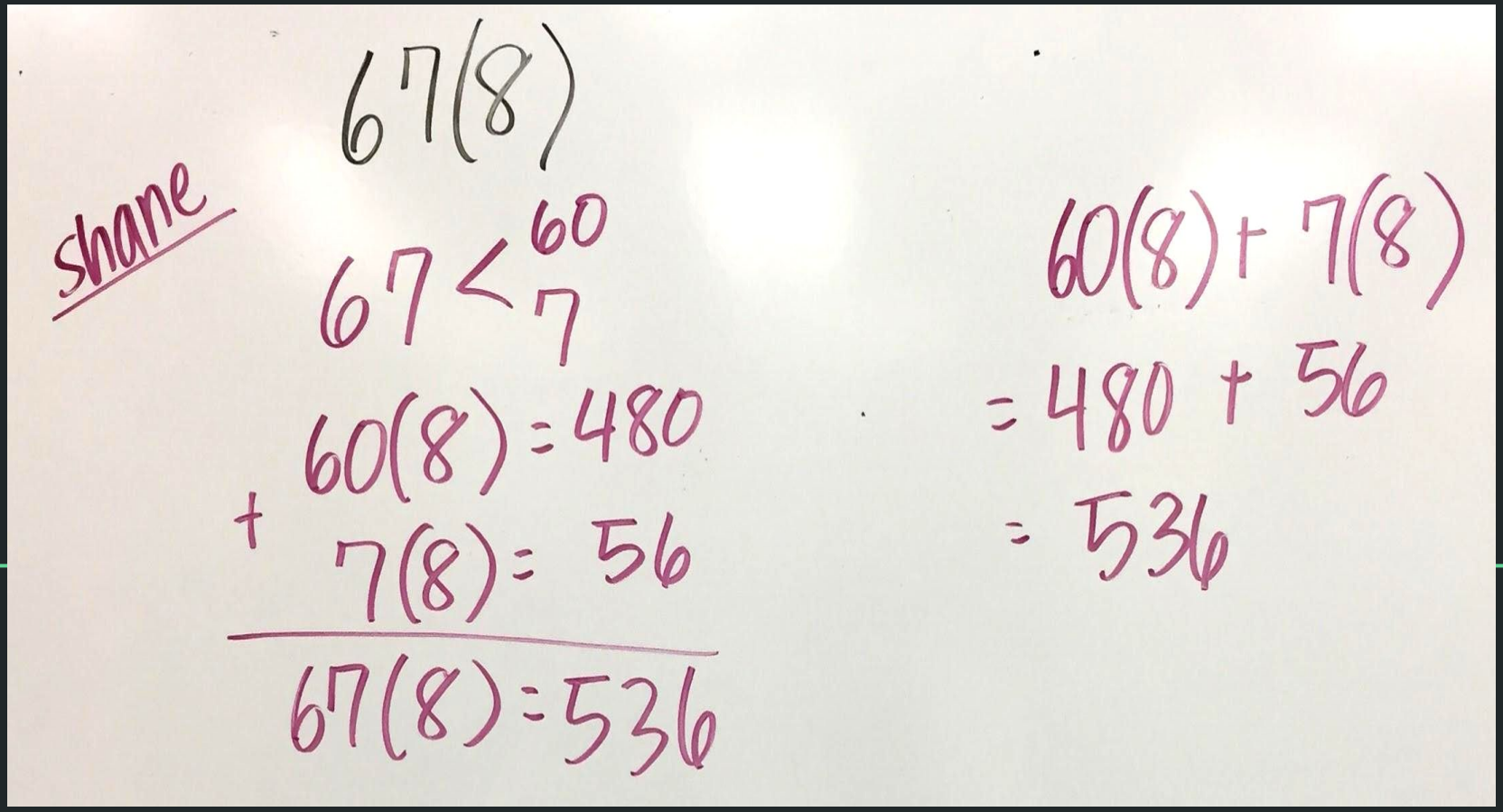
- St ies for approaching
  ms
- er se
- emic language
- vs.
- g of standard
- to gra vel math
- Ad ses misconceptions
- Confidence

75% of our students were FLUENT in their facts by the end of the year!

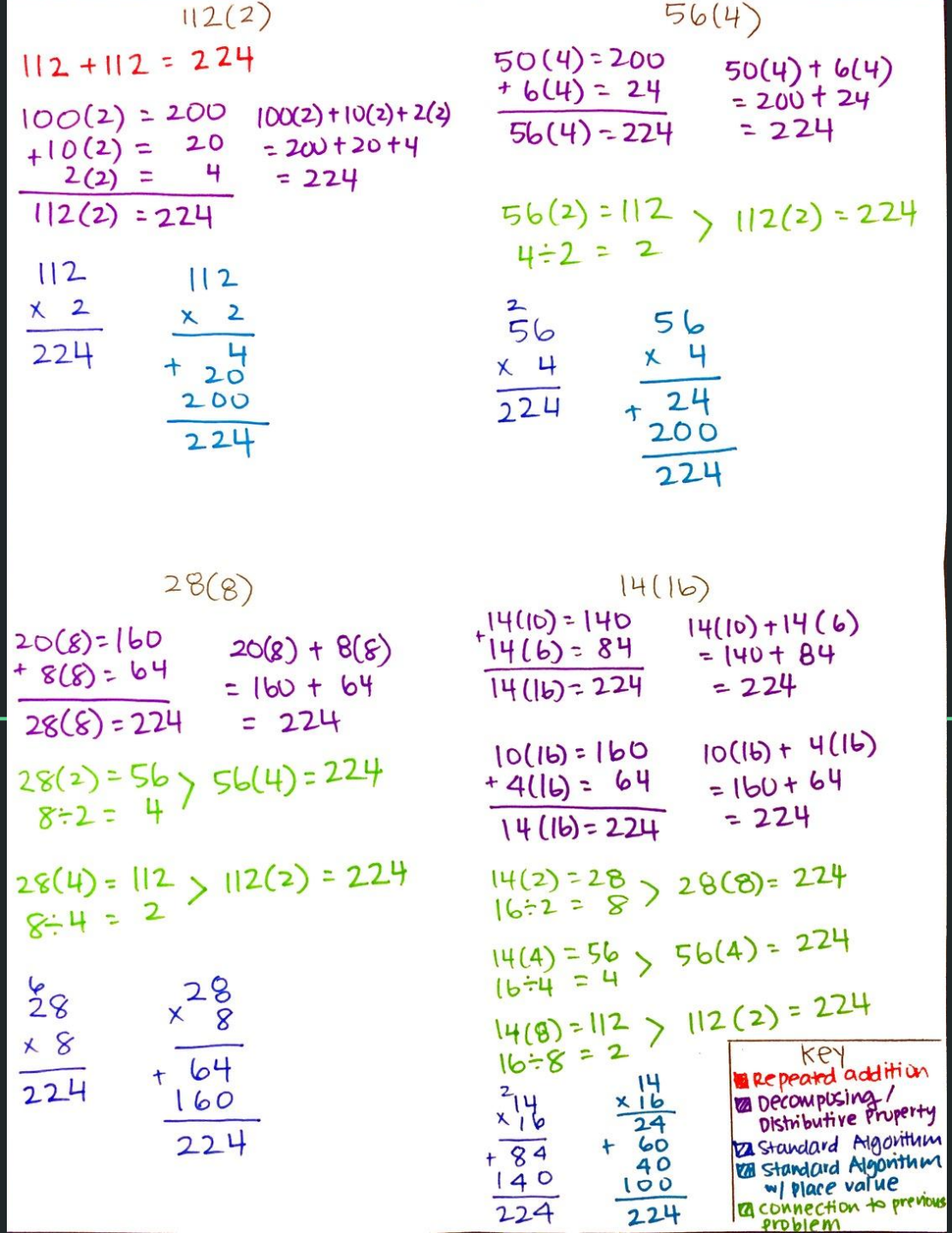
Application

Notating Student Strategies 67(8)

Notating Student Strategies



Sample Pre-Plan



112(2)

112 + 112 = 224

100(2) = 200
+ 10(2) = 20
2(2) = 4
112(2) = 224

100(2) + 10(2) + 2(2)
= 200 + 20 + 4
= 224

112 × 2 = 224

112 × 2 = 4, + 20, 200 = 224

56(4)

50(4) = 200
+ 6(4) = 24
56(4) = 224

50(4) + 6(4)
= 200 + 24
= 224

56(2) = 112 > 112(2) = 224
4 ÷ 2 = 2

56 × 4 = 224

56 × 4 = 24, + 200 = 224

28(8)

20(8) = 160
+ 8(8) = 64
28(8) = 224

20(8) + 8(8)
= 160 + 64
= 224

28(2) = 56 > 56(4) = 224
8 ÷ 2 = 4

28(4) = 112 > 112(2) = 224
8 ÷ 4 = 2

28 × 8 = 224

28 × 8 = 64, + 160 = 224

14(16)

14(10) = 140
+ 14(6) = 84
14(16) = 224

14(10) + 14(6)
= 140 + 84
= 224

10(16) = 160
+ 4(16) = 64
14(16) = 224

10(16) + 4(16)
= 160 + 64
= 224

14(2) = 28 > 28(8) = 224
16 ÷ 2 = 8

14(4) = 56 > 56(4) = 224
16 ÷ 4 = 4

14(8) = 112 > 112(2) = 224
16 ÷ 8 = 2

14 × 16 = 224

14 × 16 = 24, + 60, 40, 100 = 224

key
- Repeated addition
- Decomposing / Distributive Property
- Standard Algorithm
- Standard Algorithm w/ place value
- connection to previous problem

Number Talks - Tips

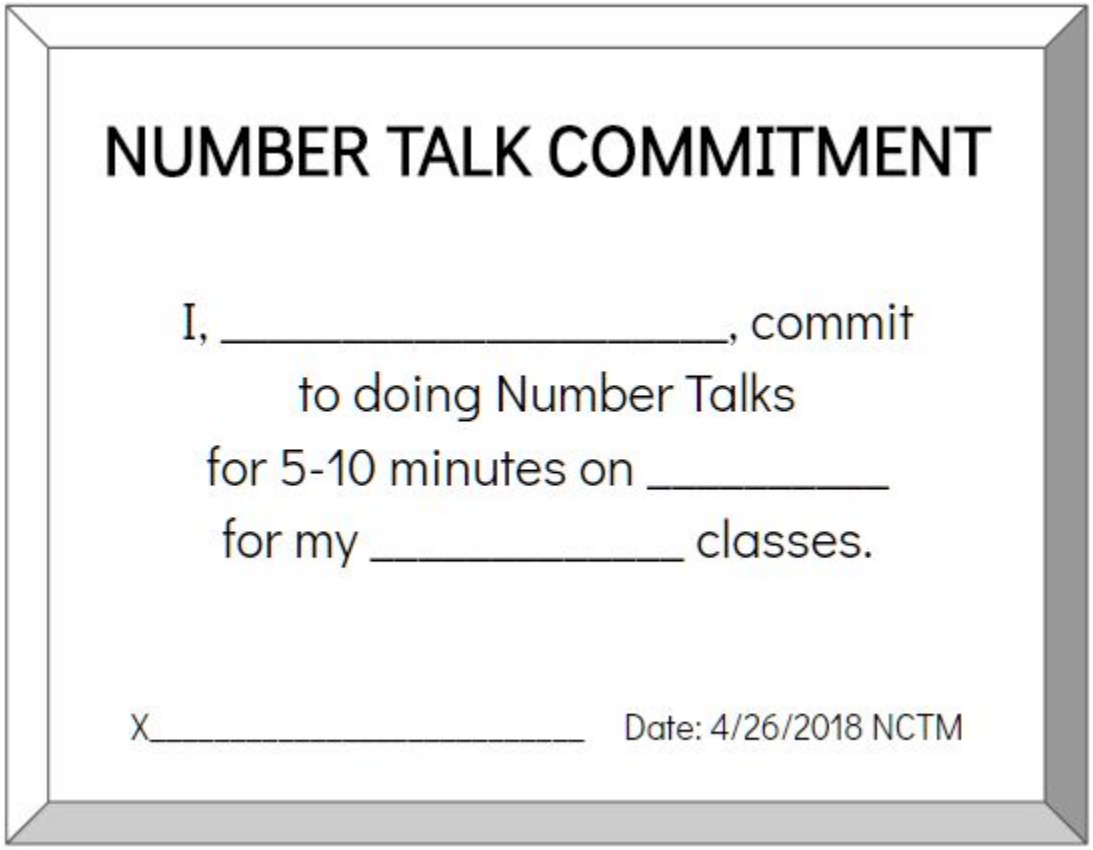
- Commit the time **daily** for at least 2 weeks.
- **Pose** a problem in written form.
- Provide appropriate **wait time** for students to access the problem.
- **Accept**, **respect** and **consider** all answers.
- Encourage student **communication** throughout the talk.

Source: *Number Talks* by Sherry Parrish

How can you start?

1. Look for gaps
    a. Formative assessments
    b. Classwork
    c. “Show your work”
2. Consider which topic or operation to start with
3. Consider what strategies students may come up with
4. Commit 10-15 mins of your class time DAILY!

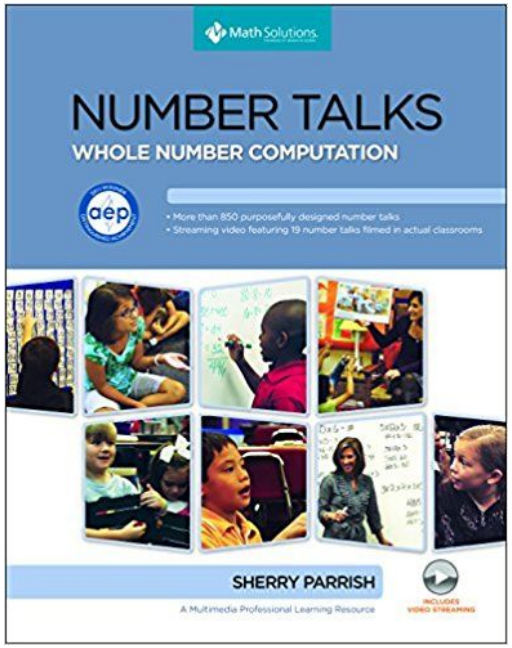
Let’s put it into action NOW!



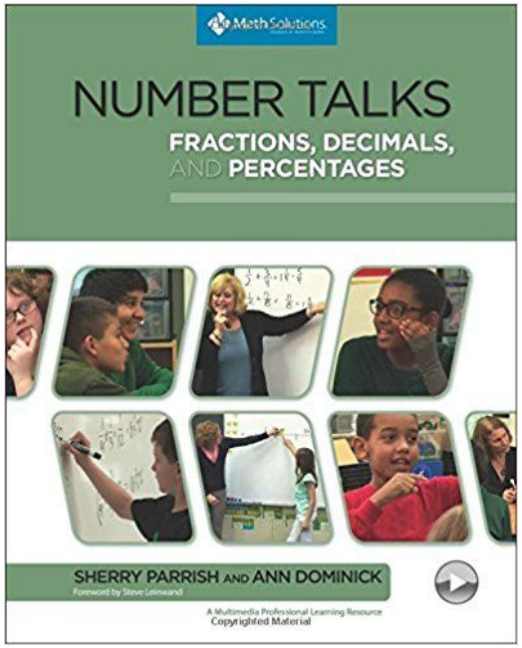
Resources

FactsWise
by Val Henry

factswise.blogspot.com



http://a.co/hrycagv



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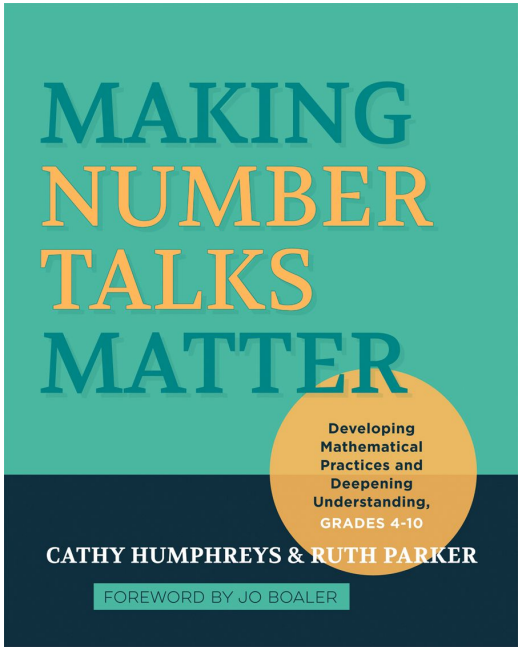

http://a.co/2V5cXSL

Music by our students! Search Mt. Pool on Spotify!

Connection to the Standards

Common Core Math Practice Standards

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

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