Giving Number Talks a Makeover: Recording for sense-making

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#NCTMSD2019

Learning Goals

1. Why visual representations?
2. Guiding principles for making thinking visual
3. Giving it a makeover

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8 x 45


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3

4

8

x 45

40

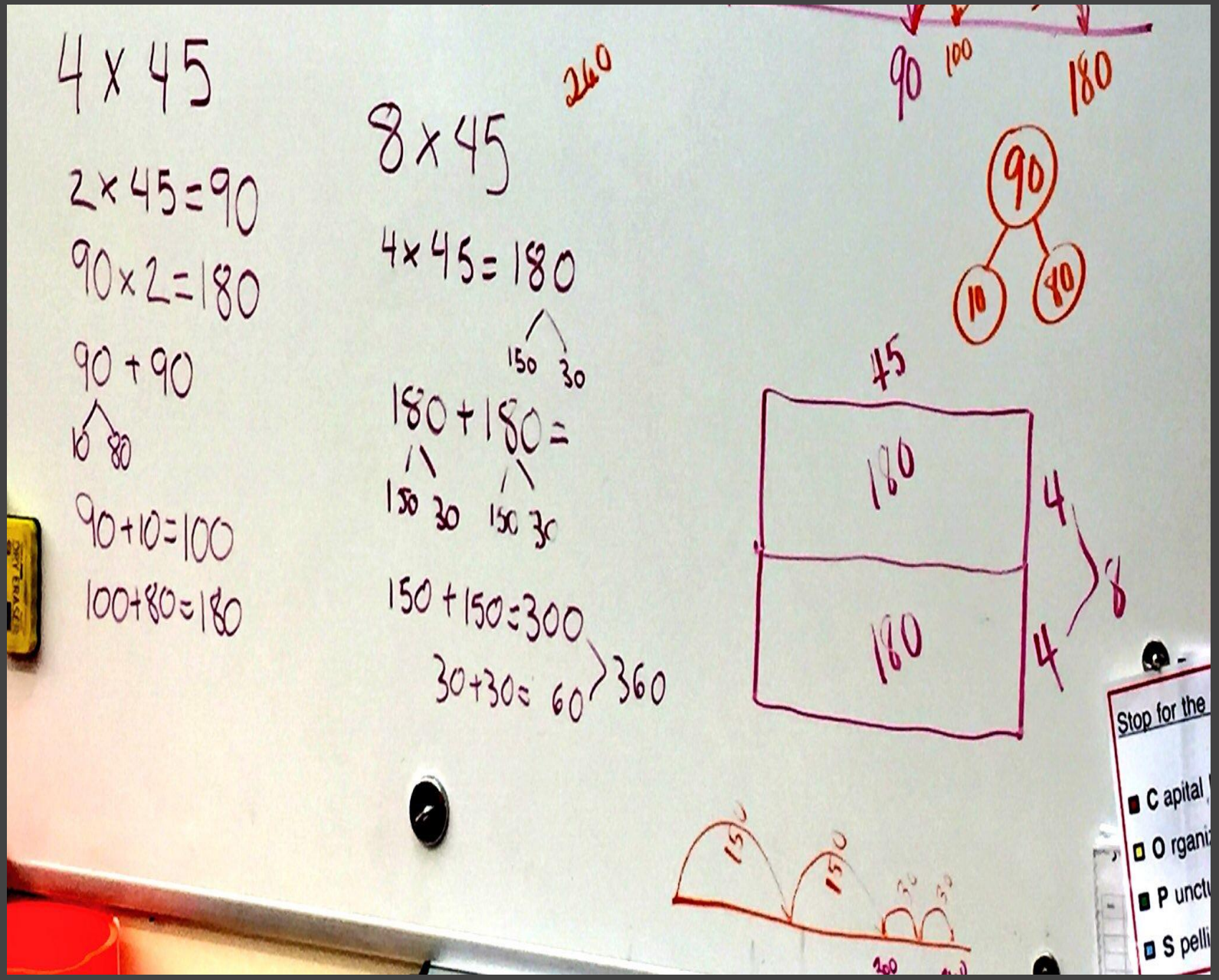
+ 320

360

Distributive Property of Multiplication, c. 1988

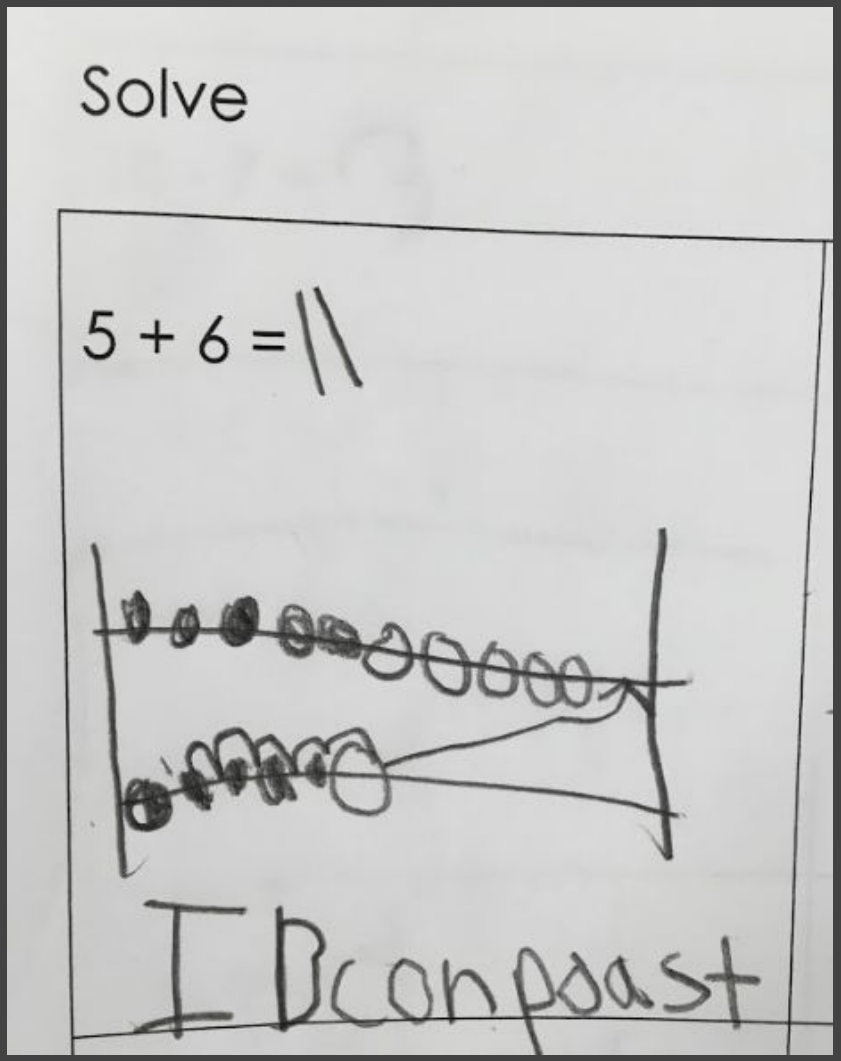
Which of the following shows how the distributive property could be used to solve the problem 8 x 45?

- ➔ 8 x (40 + 5) = 8 x 45
- ➔ (8 x 40) + (8 x 45) = 8 x 45
- ➔ 45 x (10 - 2) = 8 x 45
- ➔ (45 x 10) - (45 x 2) = 8 x 45



"*Visual mathematics* can also inspire students and teachers, to see mathematics differently, to see the creativity and beauty in mathematics and to understand mathematical ideas."

Boaler, 2016



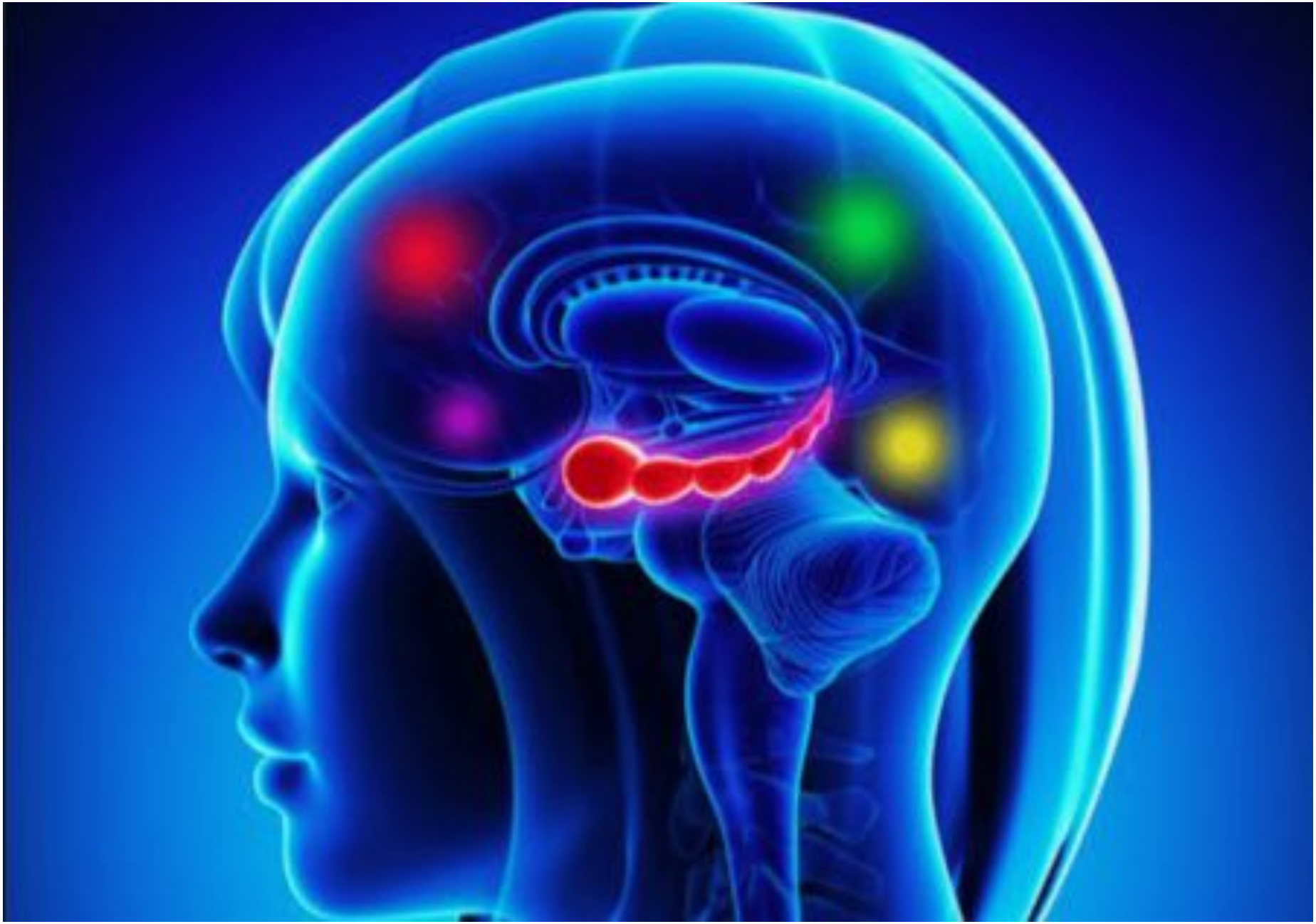
C - R -A


Maryam Mirzakhani
2014 Fields Medal Winner

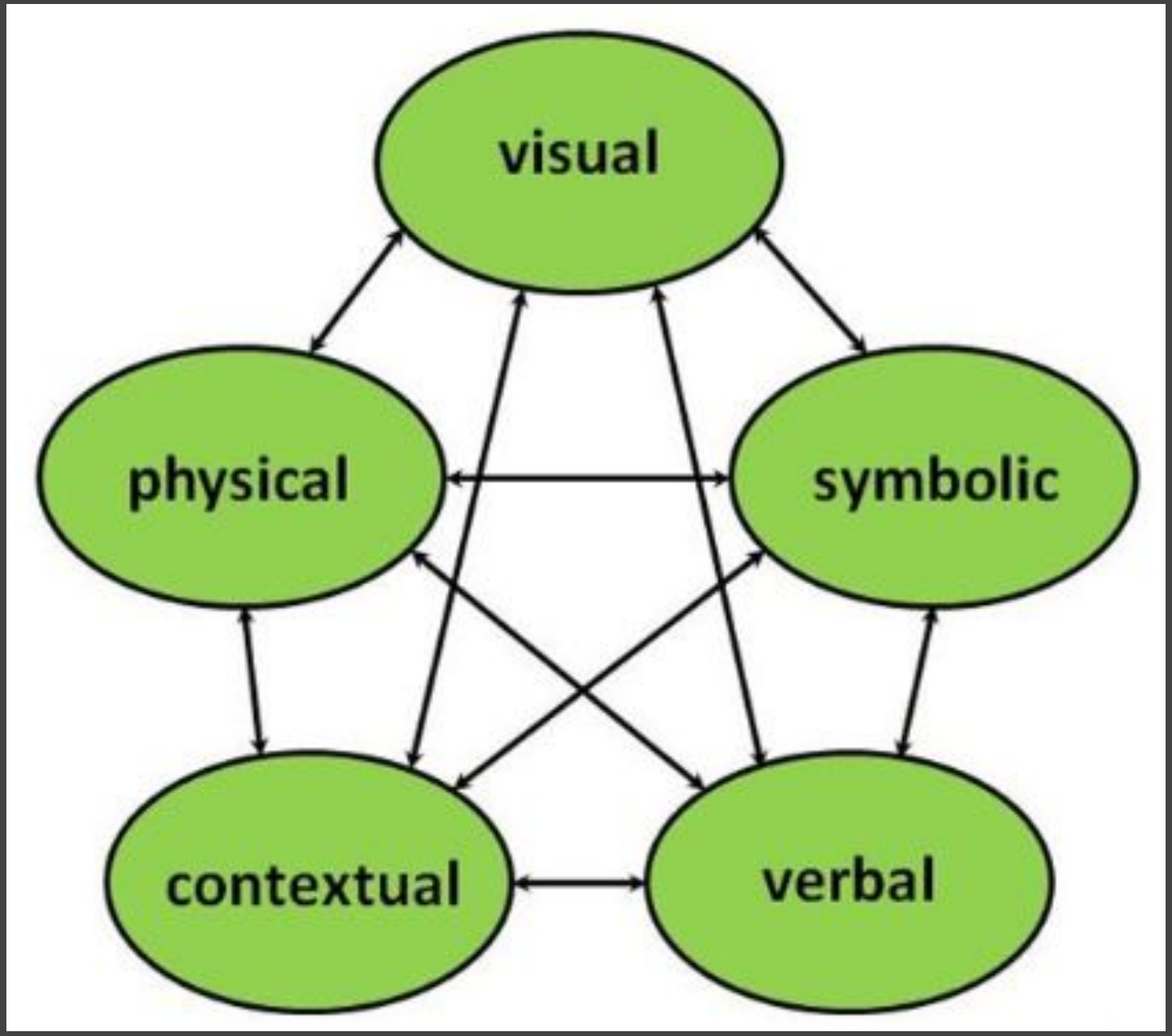
Cultivating Equity

Visual representations help to level the playing field:

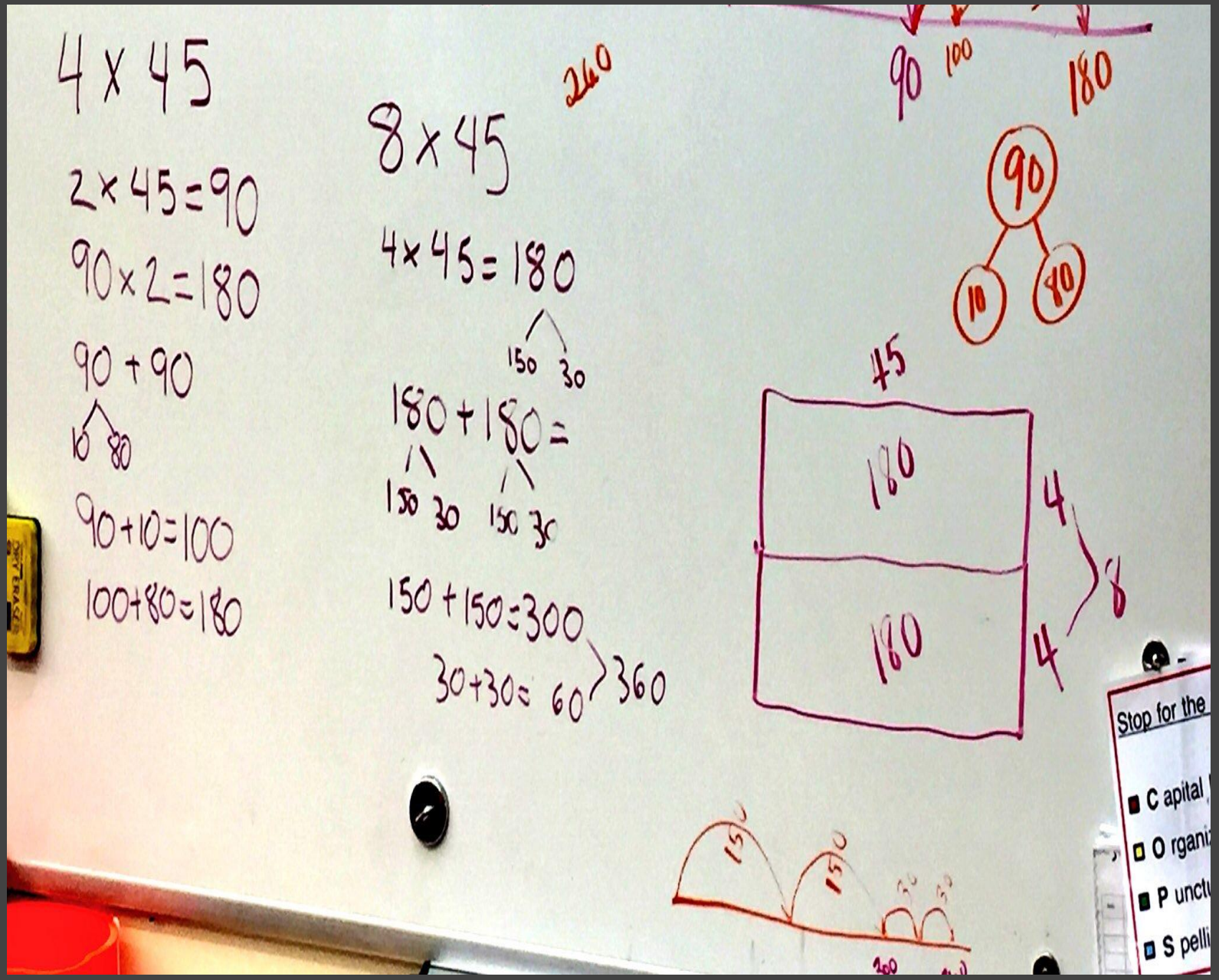
- ➔ Encourages participation from ELLs, those with special needs, struggling learners (Fuson & Murata, 2007)
- ➔ Values students' thinking in different ways
  - ◆ Re-positions students who are traditionally low-status
- ➔ Minimizes status differences
- ➔ Engagement is deeper, uniform



(Boaler, 2016)



Principles to Actions, NCTM



Number Talks as a platform for:

- ➔ *Making sense of mathematics*
- ➔ Developing efficient computation strategies
- ➔ Communicating mathematically
- ➔ Reasoning and proving solutions

(Parrish, 2014)

Recording with Purpose

- ➔ “A silent form of honoring and showing respect for student-generated ideas”
- ➔ A visual referent that can be used as a point of analysis, critique
- ➔ Opportunity to make connections between different strategies, representation, concepts over time

"Deciding what to write - *and how* - is both a judgement call and an art, and you will get better over time…"

Making Number Talks Matter
Cathy Humphreys & Ruth Parker

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Five Practices for Orchestrating Productive Discussions: A revised model

Anticipating student responses to a challenging task

Monitoring student work and engagement with the task

Selecting specific students to select their thinking

Sequencing student responses with intention

Connecting student responses but also connecting student responses to other big mathematical ideas

Smith & Stein, 2011

Anticipating student responses to a challenging task

Listening *openly, without prejudice*

Translating *student thinking to a visual representation(s)*

Encouraging *multiple strategies for a single problem*

Connecting student responses but also connecting *multiple and varied representations*

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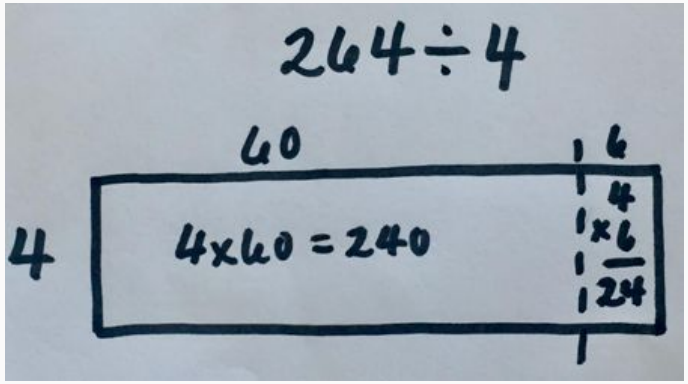
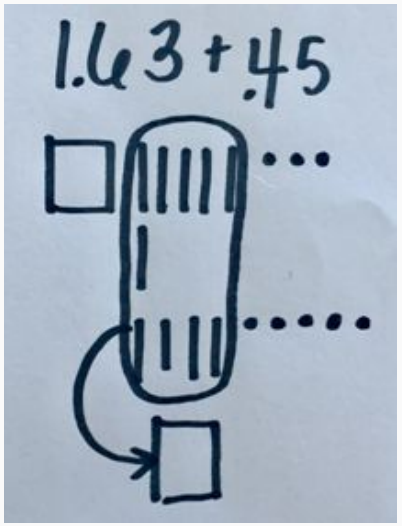
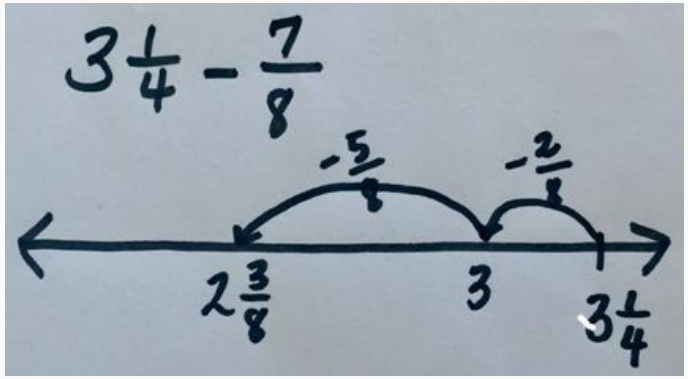
Visual Representation Toolkit



Area Model



Base-10 Models



Open Number Line

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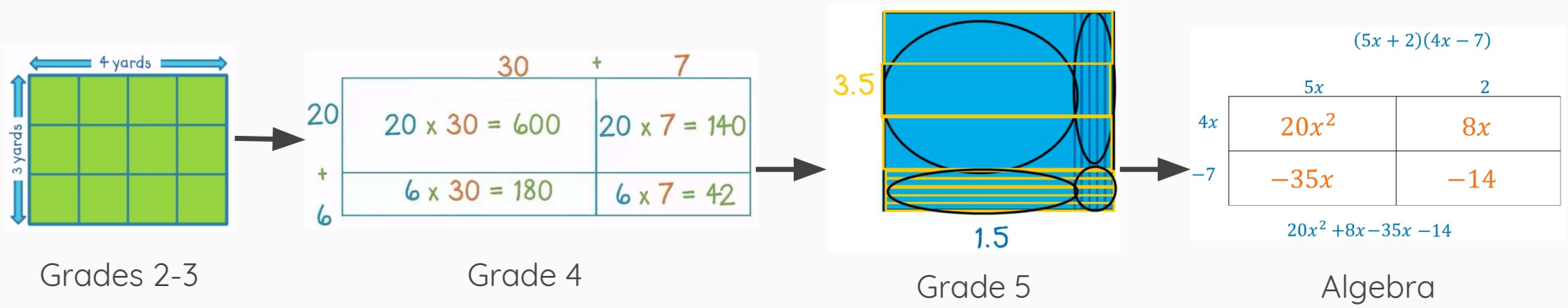
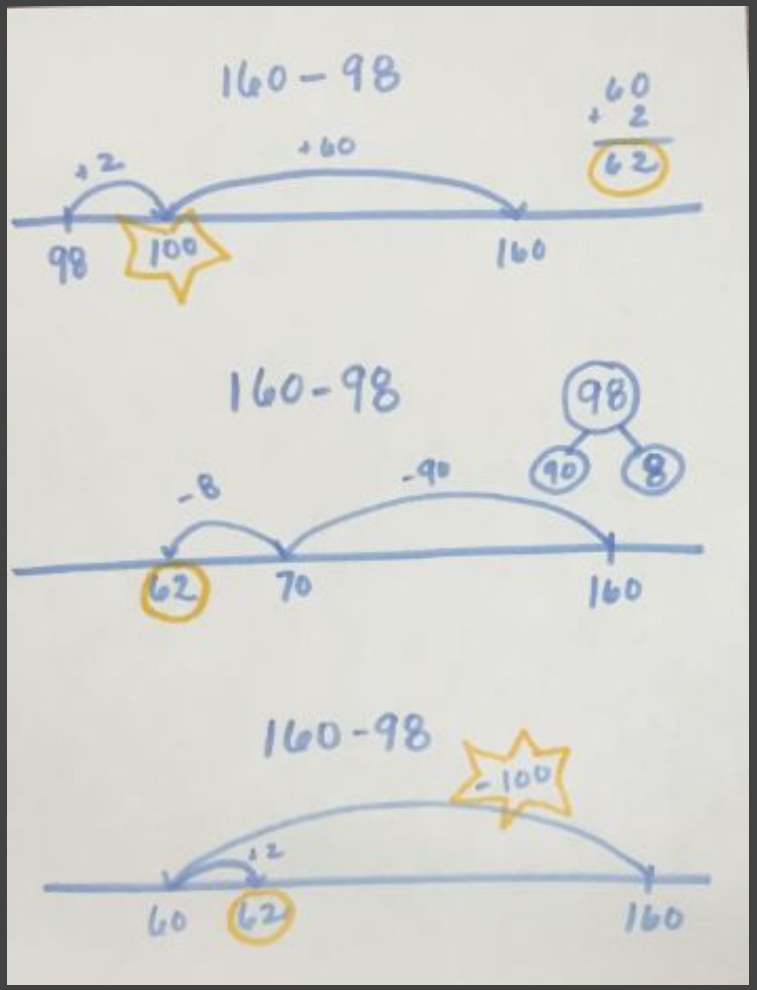
Representations Without a Shelf Life

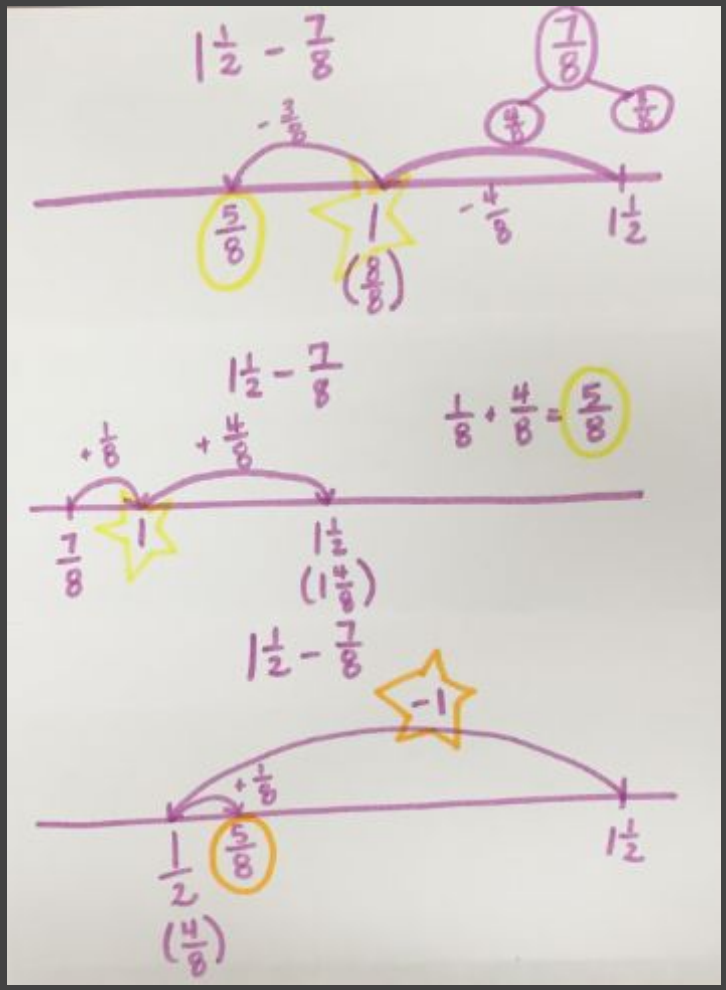


Grades 2-3 | Grade 4 | Grade 5 | Algebra

Image source: LearnZillion

The Power of a Common Thread: Connections within and AMONG content





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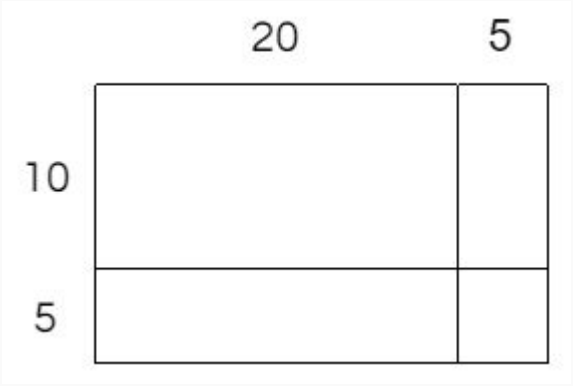
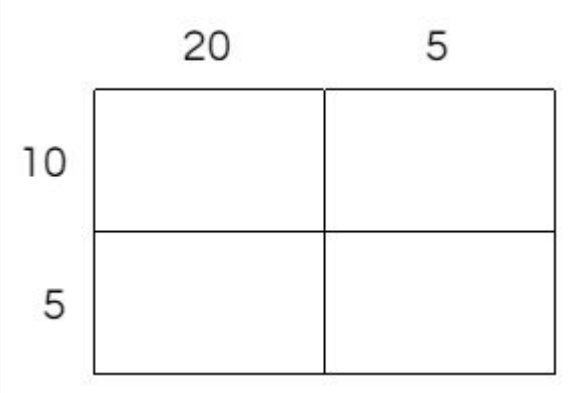
When a visual becomes a tool for getting answers over a model for understanding:

Humphreys & Parker, 156

THIS:



NOT THIS:

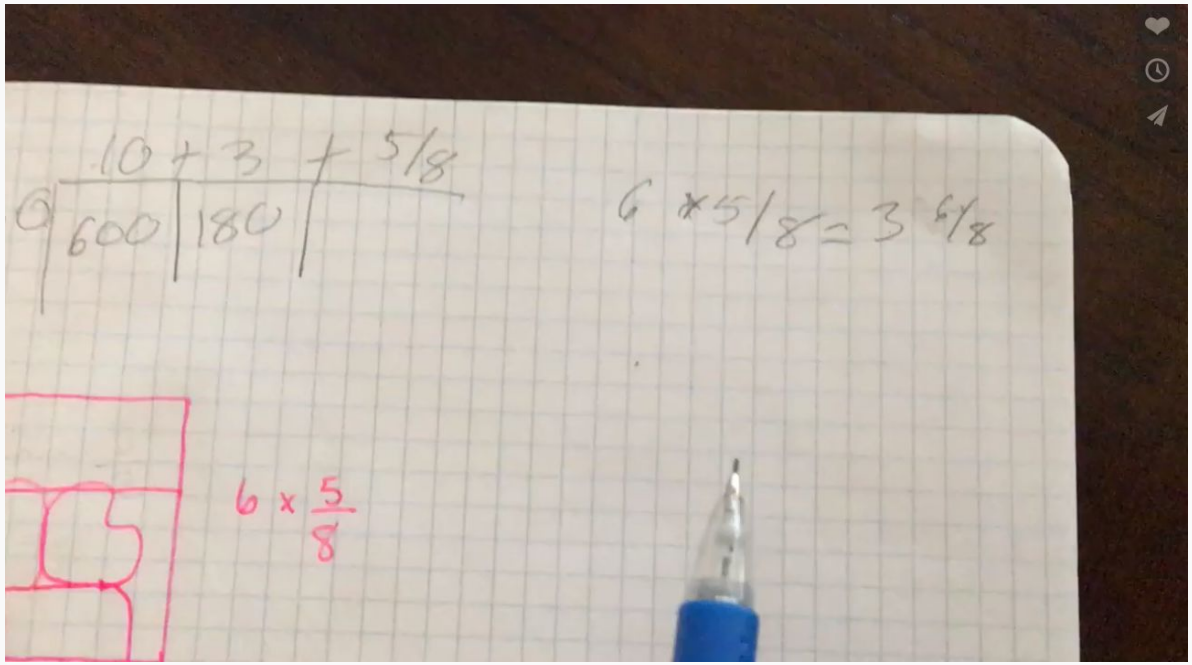


6 x 5/8

What options do we have for giving this Number Talk a makeover?

What visuals would:

- Offer additional points of entry?
- Support sense-making for students?
- Lift important properties?
- Help students make important connections?



Number Talk/String Planning Page

Intended Learning Target What strategy are you hoping will emerge?	**Problem(s)**

Anticipated Thinking

What are different ways that students will approach the problems? What strategies will they use?

Recording Thinking

What visuals will support sense making, clarify student thinking? How might color be helpful? What recording choices will help to highlight the intended learning target?

Consider: Open number line, area/array model, base-10 drawings, number bonds...

Questioning/Connecting

What questions will help students make connections among strategies, representations?

Putting it into practice:

25×16

$1\frac{1}{2} + \frac{7}{8}$

$184 \div 8$

$1\frac{3}{8} - 1\frac{1}{4}$

Refining our craft:

What structures support collaboration, practice-embedded growth?

Learning Labs:

- Live student audience
- Interactive, real-time teacher feedback

Number Talk Rehearsal:

- Live teacher audience
- Collaborative feedback, reflection

What if...

- ➔ I don't understand what my students are saying?
- ➔ I get confused by a student's thinking?
- ➔ I don't know how to record a strategy visually?

A Community of Learners: You are a member

- ➔ Wait before you write.
- ➔ Ask a student to repeat or clarify their thinking.
- ➔ Erase and start again.
- ➔ Revise and re-present the next day.

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Intention Setting

What is 1 thing you will use from this session in the next 2 weeks?

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Giving Number Talks a Makeover:

Recording for sense-making

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Slides:

http://bit.do/NumberTalkMakeoverSlides

Planning Document:

http://bit.do/NumberTalkMakeoverPlanning

Resources

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