MS Clothesline Math: Building from Student Instincts

tinyurl.com/clothesline2019

NCTM San Diego

Session 481

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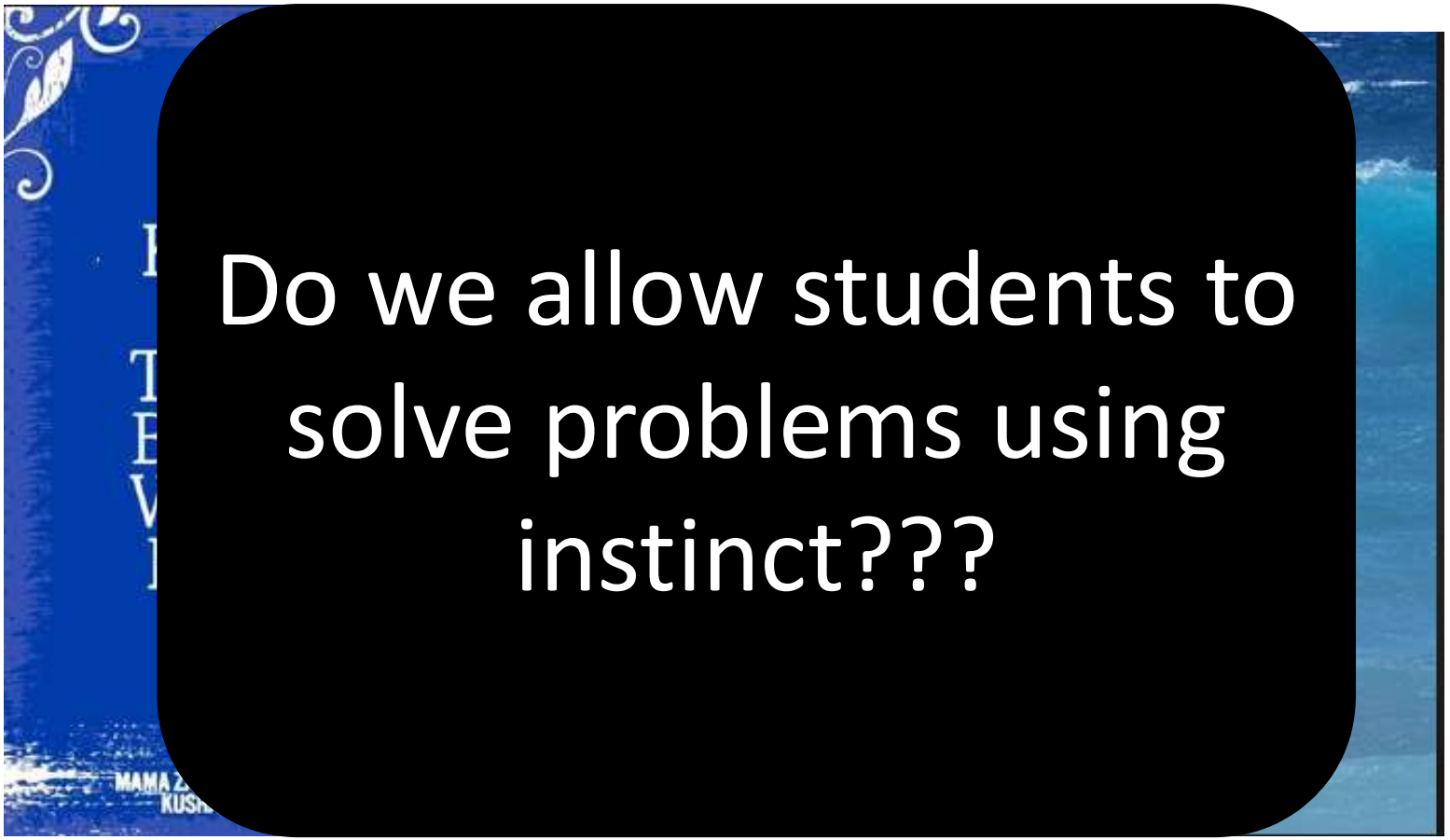
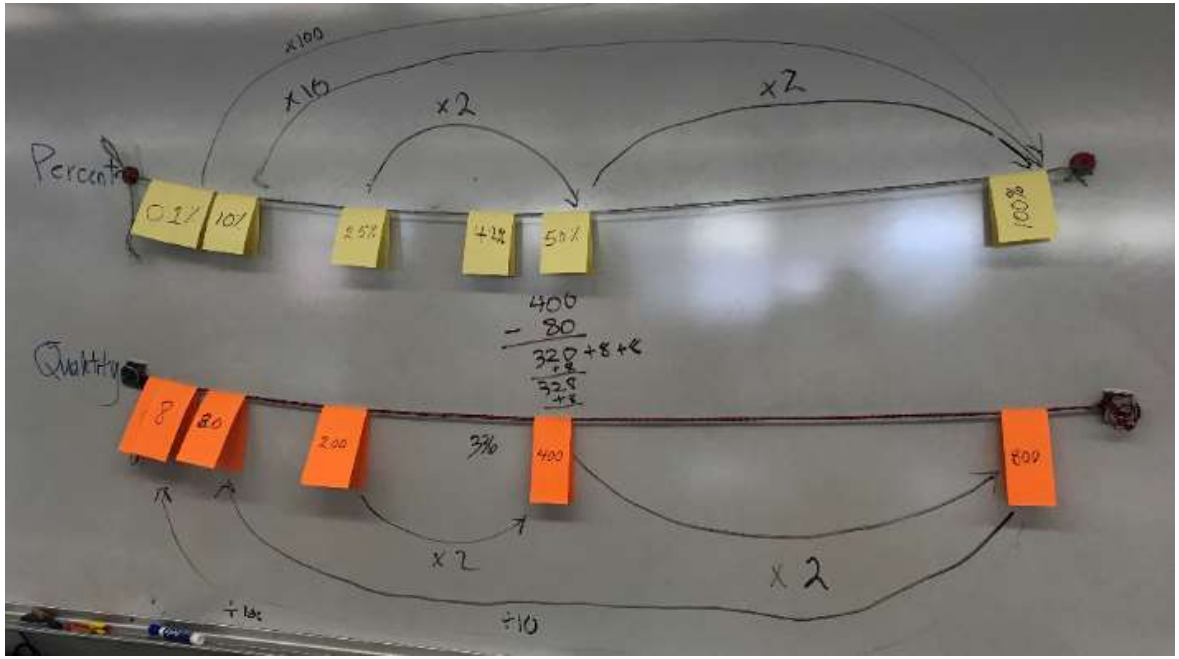
What Do Instincts Have to Do With Math???



The photos that you will see are from real situations and will be messy, unorganized, and full of AUTHENTIC LEARNING experiences.

What is Clothesline Math?

The Clothesline is a manipulatable number line that makes the facilitation of class discourse on number sense much more efficient and effective.



What Materials Might I Need?

- Clothesline (Or for us cheap-o's, you can use yarn or rope)
- Magnets to hold up the lines (or blue tape)
- Cards, some pre-made and lots blank
- Clothespins

How Does It Work? Things to Consider…

- First place, then space
- Are you comfortable with that? Why or why not?
- What does that look like?

Where would you place this?

- Be prepared to justify your thinking.
- You may want to take a step back and look at the big picture.
- You may shift the cards as needed.
- If you are uncomfortable you need to voice why.

Let's Debrief

- First place, then space
- Are you comfortable with that? Why or why not?

1. What was the purpose of this string of numbers?
2. Where might students place the cards and why?
3. Where does student intuition come into play?

Where would you place this?

- Be prepared to justify your thinking.
- You may want to take a step back and look at the big picture.
- You may shift the cards as needed.
- If you are uncomfortable you need to voice why.

Let's Debrief

- First place, then space
- Are you comfortable with that? Why or why not?

1. What was the purpose of this string?
2. Why did I make *a* and *b* opposites?
3. What operations did we play with?
4. Where could you take this on day two?

Evaluating Expressions

You will receive a set a cards.

1. Lay out the cards.
2. What order would you have students explore these? Why?
3. Place your cards on your number line in a way that makes sense.

4. Where do you think we're headed?

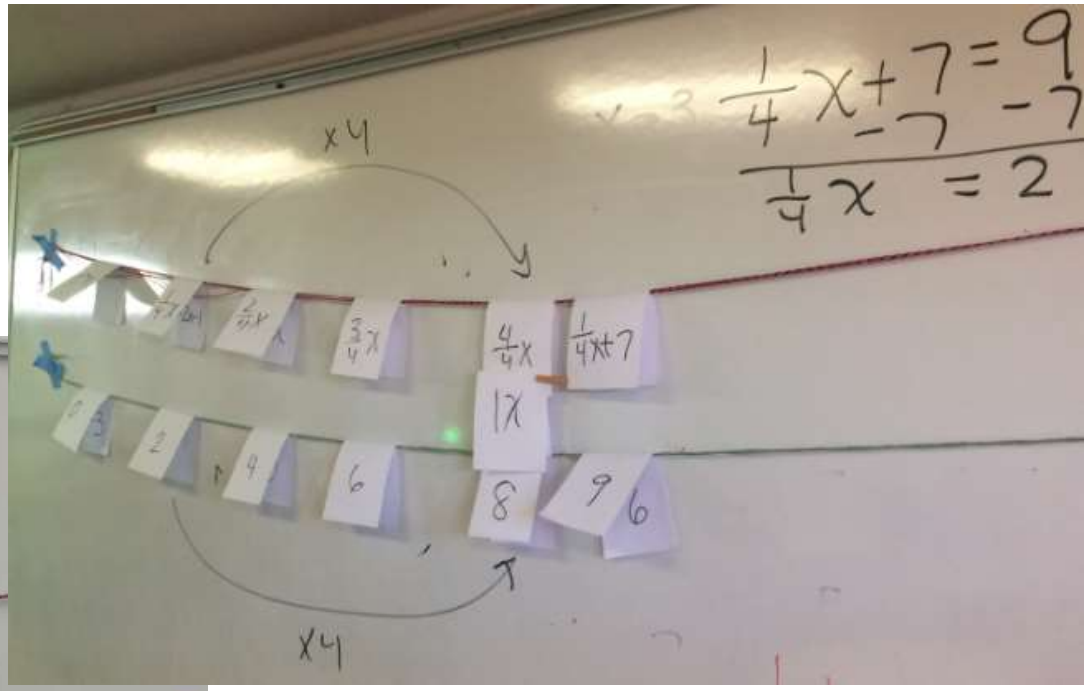
What About Equations?

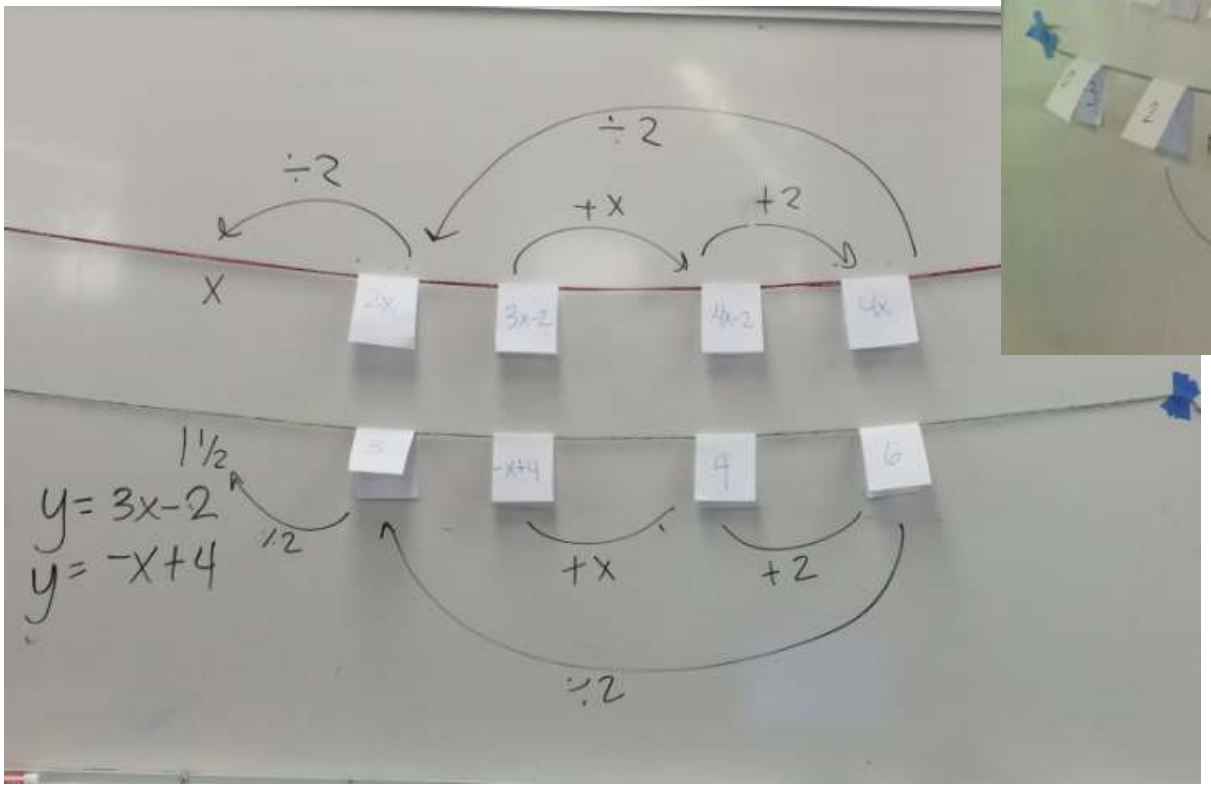
How would I represent and solve equations using the clothesline?

$$3x + 1 = 13$$
$$3x + 1 = -14$$

Grade 7	Grade 8
$-16 = 2(x - 1)$	$-13 = 2(x - 1) + 5$
$\frac{1}{4}x + 7 = 9$	$\begin{cases} y = 3x - 2 \\ y = -x + 4 \end{cases}$

Sample Work





Expressions and Equations: Quick Debrief

How does clothesline math…

- Allow students to safely make mistakes (and learn from them)?
- Support understanding of signed numbers?
- Support understanding of variables and evaluating them?
- Support solving equations symbolically and the meaning of an equal sign?

What Could This Look Like in My Class?

https://clotheslinemath.com/making-the-clothesline/

What Does This Look Like with Proportional Reasoning?

Janet can sew 35 scarves in 2 hours. At this rate, how many scarves can she sew in 5 hours?

- What are my two quantities? How should I label my clotheslines?
- What information is given?
- What am I solving for?

Brief Summary of Our Lesson Studies

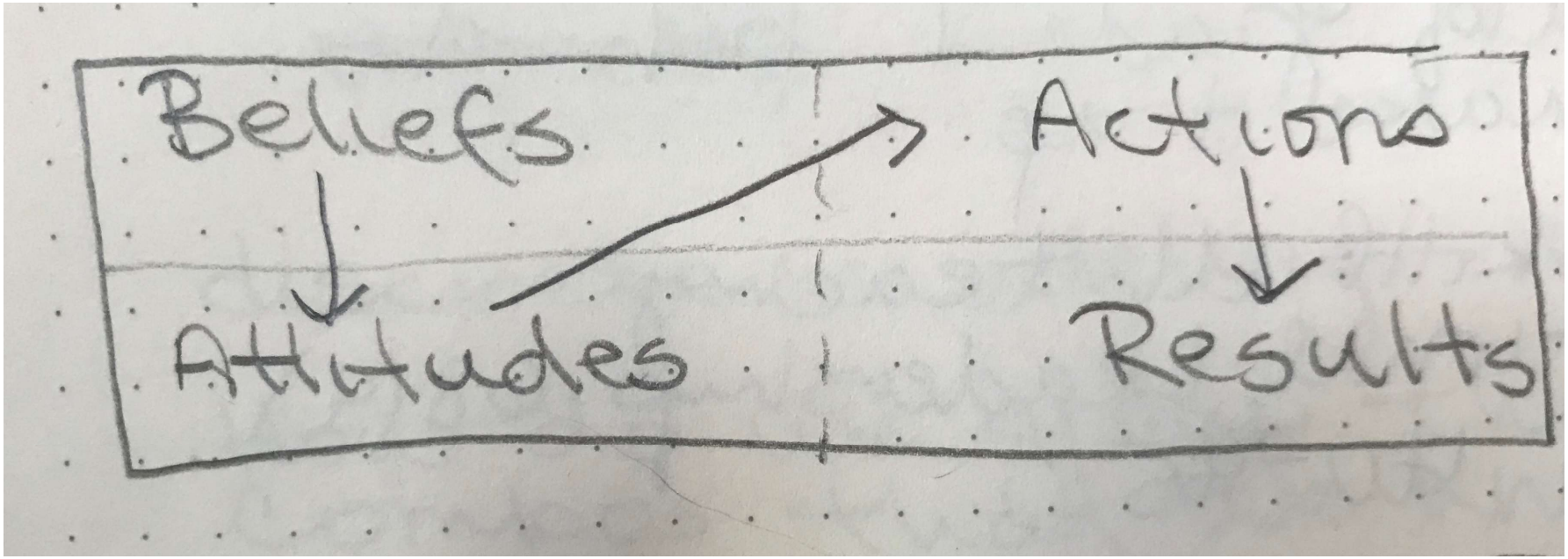
- Grade Specific
- Choose a Strategy or Manipulative to Explore with Students
- 20-30 Min Lesson (Though May Run Over)
- Teach Schedule
  - Plan Lesson
  - Teach Lesson 1
  - Debrief/Edit/Modify
  - Teach Lesson 2
  - Debrief/Summarize/Plan Next Steps

Lesson Study: Proportional Reasoning

Lesson 1: Janet can sew 35 scarves in 2 hours. At this rate, how many scarves can she sew in 5 hours?

Lesson 2 (modified): Janet can sew 30 scarves in 3 hours. At this rate, how many scarves can she sew in 7 hours?

Principles to Action



Teachers' Ah-ha's

- Using just one task and solving for different 'parts' allowed students to see structure and find value in this tool. It also allowed for sense making and using intuition.
- This tool allowed some students to see connections and relationships they may not have seen. Consider using to connect to proportions and teach the "why" we make the moves we do within the algorithm.
- **Just because students have arithmetic gaps doesn't mean that they can't conceptually solve rate problems.**

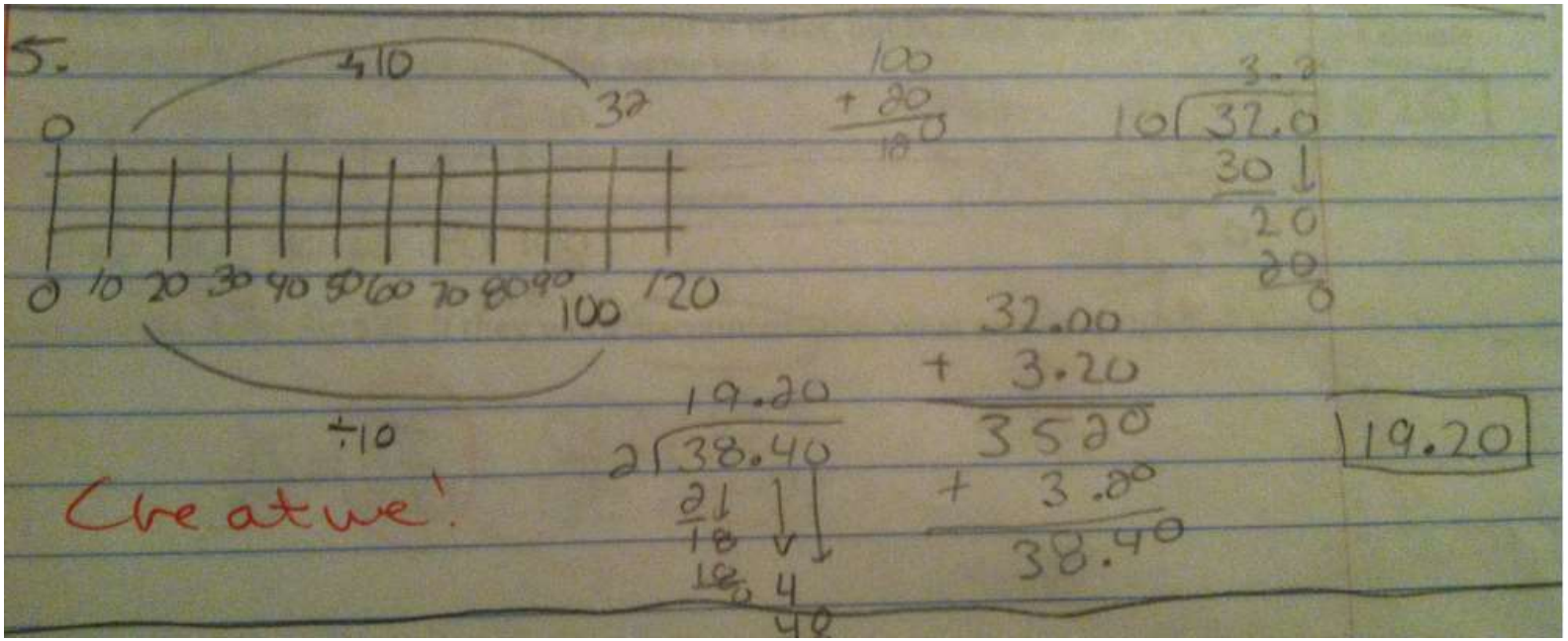
What About Percent Application Situations?

Jen and Crystal go out to lunch and together spend $32. They leave a 20% tip.

How much did each girl pay if they want to split the amount?

- How should I label my clotheslines?
- What information is given? How will I use this info to start my clotheslines?
- What other information do I know that I can add to my clotheslines?
- What am I solving for?

What Was John's Thinking?



Where Can I Find More Info?

NCTM

https://www.nctm.org/Publications/mathematics-teaching-in-middle-school/2001/Vol6/Issue8/Developing-Number-Sense-on-the-Number-Line/

Chris Shore

https://clotheslinemath.com/

Andrew Stadel

http://www.estimation180.com/clothesline.html

Jon Orr

http://mrorr-isageek.com/double-clothesline-solving-equations/

Thank You For Your Time!