MATH co//aborative

Notes to Nerds

April 2, 2021

Index

Announcements

- ***Operation Super Solver Camp*** *- We are excited! More information to come! Fifth-grade teachers, be on the lookout!*
- **Sign up! Thinking Classroom** book study to start the week of April 11th. Join us! It will disrupt your current thinking about teaching and give you a new lens for viewing your classroom (and, of course, new ideas!). Interested? Contact Peter Anderson
- **Calling CSU Teacher Candidates (and Faculty)** - The Math Collaborative has a slate of FREE workshops on Tuesdays, Wednesdays, and Thursdays -- elementary, middle, and high school. **Year-end sessions begin April 12th!** Registration Link
- ***Parent Resource Page*** has some pretty cool MATH stuff! Check it out! (Link to cool Parent stuff) *TEACHERS might like it TWO… too!*

Upcoming Workshops

Tuesday, April 13: Aiming for Deeper Understanding - Review of Standards 4th and 5th Grade @3:45pm

Tuesday, April 13: Finding, Editing, and Creating Your Own Desmos Instructional Activities @4:30pm

Tuesday, April 13: Thinking Classroom Book Study @ 7:30pm

Wednesday, April 14: Leverage the Standards High School Algebra 1 Workshop Series @4:15pm

Thursday, April 15: Leverage the Standards High School Geometry Workshop Series @4:15pm

Bank Robbers, Mathematics Education and Me

As McArthur Wheeler was being arrested by the FBI at his home on April 19, 1995, charged with multiple bank robberies, he dejectedly asked, "How could you see me? I wore the lemon juice! I was wearing the juice."

The failed robber had heard that rubbing lemon juice on his face would make him invisible to security cameras. You laugh, but he tested the idea! With lemon juice in his eyes, he snapped a polaroid selfie of his face.
The result? No face, just the wall!
How could he have been so confident, yet incompetent?!

While we might agree that this is an extreme example of confidence over incompetence, I wonder if we, as educators, are often blind to some of our shortcomings. Like the miss-aimed Polaroid camera, sometimes we see what we want to be true. Rising graduation rates, state testing scores, and our grading systems may tell one story. The picture of the wall exists with no face present.

What does common sense tell us about our mathematics education practices?
What do people say when they find out you are a math teacher?
How many times have you heard stories about a store employee giving incorrect change?
How often do you hear teachers say?

- *I taught that last week. Why don't students remember?*
- *They see no point in doing the work. They can Google it.*
- *Photomath does the problem for them.*
- *We are so far behind.*
- *They won't read the problem.*
- *They have just quit.*

Any math teacher could add to the list. We know something does not sit right here.

The point is not that we are bad teachers or have bad students (*Well, ok. Maybe students are bad. jk*).
We are, by and large, good, hard-working, smart, dedicated educators. We are working with ideas that are more than a century old and were never really good for improving students' learning anyway.

I do not want to be the McArthur Wheeler of mathematics education.

I do not have all the answers. But I believe that we, *as a community*, have many solutions to the challenges we face. Please consider joining The Math Collaborative for a book study of Thinking Classrooms-- a once-a-week, focused, but relaxed look at teaching practices. It may make us aware of the lemon juice in some of our educational practices.

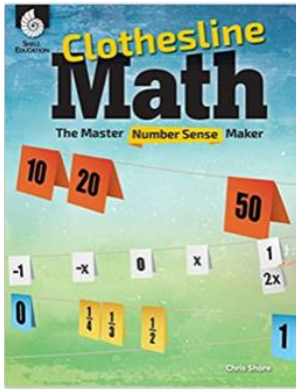
Happy Maths,
Peter

Clothesline Math

I'm always looking for innovative ways to teach math content. However, the two things I want are often mutually exclusive – something inspiring and easy to implement. So many great ideas are complicated. I want a no-fuss, no-muss idea…and, I've found it – Clothesline Math.

Many of you have secured a piece of clothesline to your board or across your room and placed numbers on it. This is referred to as an *open* number line. You determined the boundaries, or *benchmarks*. Students then determined how the values were placed between the benchmarks. The business of clotheslines doesn't involve a computer *screen*; it is a "living" document of learning.

For years I have used a clothesline to display the whole gamut of rational numbers – fractions/decimals/percentages/integers. Students are actively engaged in a variety of worthwhile tasks: partitioning; ordering values based on magnitude; determining equivalent values; justifying their placements; making sense of…well, an open space.
This requires reasoning.
This requires thinking.
This requires sense making.
These things are at the heart of good experiences in math class!



What content, other than rational numbers, is appropriate for clothesline math? According to Chris Shore: numbers, algebra, functions/graphs, geometry, and statistics. You can find multiple printable card sets on Shore's site, www.clotheslinemath.com . Each card set is composed of three values, plus benchmarks. Benchmark cards are print-ready PDFs. A blank template allows you to create cards of your own.

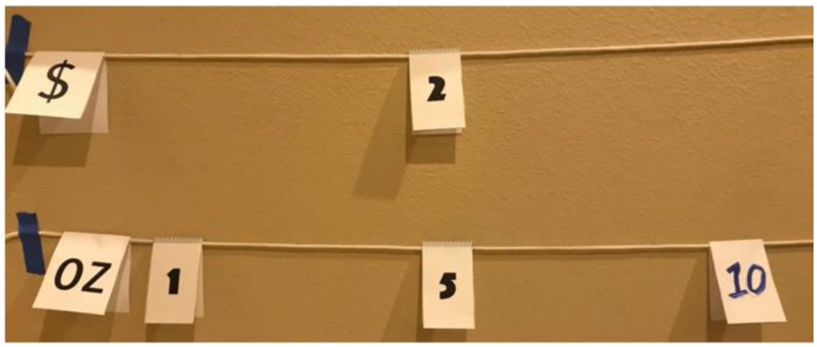
Shore's website includes enough content to begin using a clothesline number line in your classroom whenever you are ready. I purchased his book on Amazon for less than $12. I wanted access to his pre-made card sets (for K-12) and lesson excerpts, including his questioning. Believe me, Shore will challenge your thinking as to what a number line and sets of values can accomplish.

When a small group of students explains their thinking at the number line, what do other students do? Shore recommends that student pairs recreate the number line on a whiteboard or sheet protector. All students should have conversations about where the three values in the card set lie, not just the group at the class number line. On his website Shore provides a template for the final product – a page with a pre-drawn number line and space to justify work. His version looks good but isn't a requirement; students could create their own.

Just to let you know, one number line doesn't always suffice. Look below to see when to use a single number line and when to use two or more.

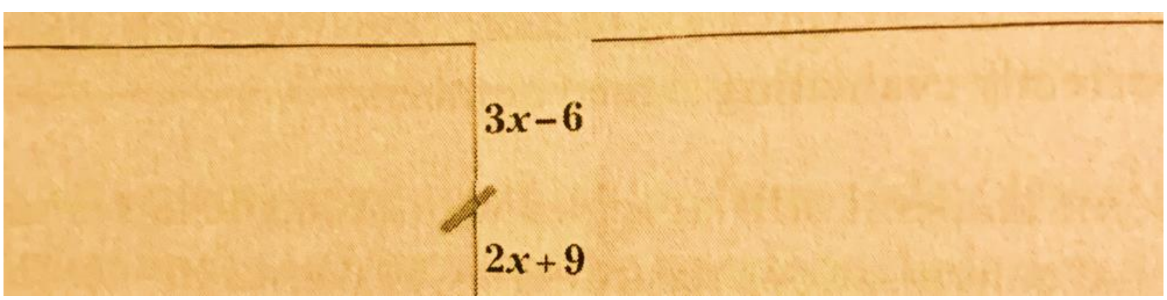
Use multiple number lines for content with multiple units. Equivalents align based on position. In this example: A five-ounce serving costs $2. What other information can you determine?

Use one number line for content with a single unit. ***Clothespins attach equivalent values to original values.***



Though I highlight my favorite application for the number line below -- to develop students' algebraic reasoning – elementary teachers, don't tune out yet. Here's a link to Kristen Acosta's elementary "clothesline" concepts and free card sets. https://kristenacosta.com/clotheslines/

Now, let's look at these two algebraic expressions, 3x-6 and 2x+9. We know they are equivalent because they are attached to each other by, of course, a clothespin.

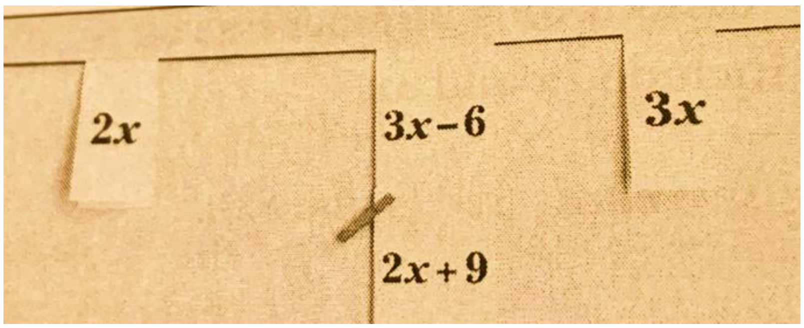


In his book Shore asks students to place 2x and 3x. What do you think? Can you do this based on the given information? If your answer is, "Yes, but I have to think about it," then you already see the power of the task! Clothesline math requires reasoning, not mimicking, to solve.

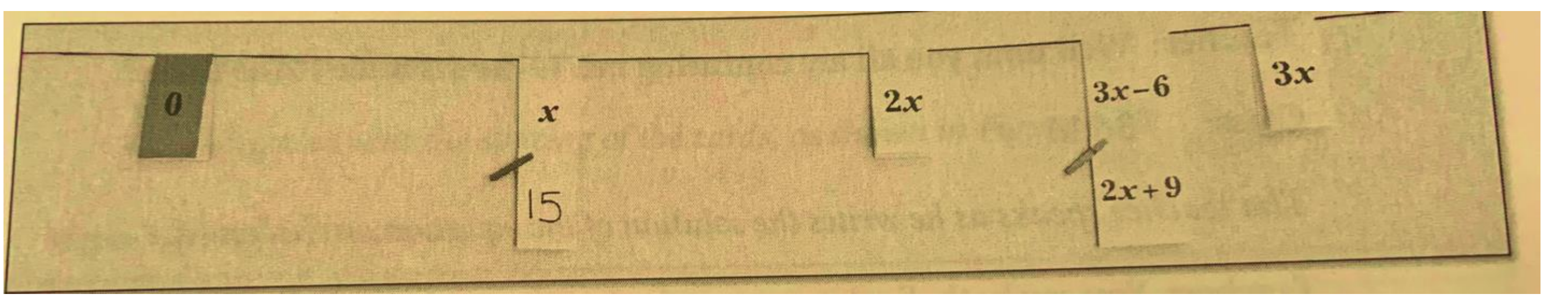
Here's the way Shore approaches this problem with his students –

1. 3x must be placed to the right of 3x -6. Why? Because the placement of 3x-6 is what happened to 3x ***after*** 6 was subtracted from it.

2. 2x must be placed to the left of 2x + 9. Why? Because the placement of 2x + 9 is what happened to 2x ***after*** 9 was added to it.

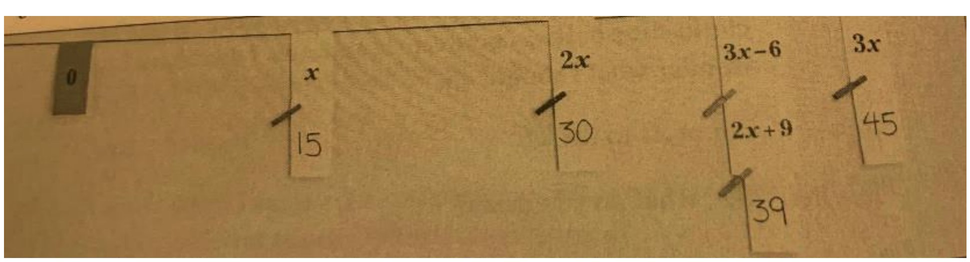


3. The distance from 2x to 3x-6 and 2x +9 and 3x to 3x-6 and 2x +9 is not the same. Why? Since 6 is 23 of 9, a shift of 6 must be closer than a shift of 9.



4. What is the distance between 2x and 3x? Distance on a number line is determined by subtraction. So, 3x – 2x. The difference is 1x, so "x" is the distance between 3x and 2x. The *value* of "x" is 15.

5. Shore asks if we locate zero on the number line. Yes, if we count back by "x." That is, 3x, 2x, 1x, 0x.



6. With a known value of “x,” we can evaluate the expressions. Do the values of the expressions line up in chronological order? Is their relative positioning correct? Yes!

All I can say is, “Wow! This clothesline approach is so much more powerful than I have ever looked at algebraic expressions. Good math should (most) often elicit a reaction like this. If I have unleashed your math curiosity, check out Shore’s website http://www.clotheslinemath.com/or purchase his book.

For additional information and resources, visit http://www.meaningfulmathmoments.com/clothesline-numberlines.html

Contact us if you have ideas, are open to forming partnerships or working towards grant opportunities.
Peter Anderson

If you made it this far, here is an Easter egg!

Picture created with equations: Click on this Link: "Hummingbird" by Veronika Price from Berkeley High School!

Throw a  down for Veronika!