



BLUEBIRD MATH CIRCLE Alliance of Indigenous Math Circles

Issue 25: Traci Sorell reads *Classified*, and Slide Calculators

Share your problems, solutions, models, stories, and art:
<https://aimathcircles.org/Bluebird>

Do the best you can and search out available knowledge and build on it. I started with a firm foundation in mathematics and qualities that came down to me from my Indian heritage.

—Mary Golda Ross, quoted in *Classified*
by Traci Sorell

Join LIVE Bluebird Math Circle to work on these activities together with friends and family.

NEWSFLASH

Monday April 11, 5-6 PM MDT online.

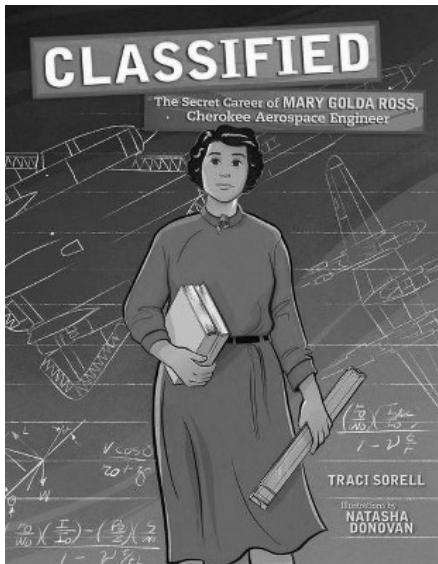
Sign up at <https://aimathcircles.org/Bluebird>

MATH JOKE



"No, thank you. If I lie down, we will be here forever." *Cartoon by Fabio Magnasciutti*

Special Session: Traci Sorell reads *Classified*



The acclaimed Cherokee author Traci Sorell will read her book *Classified*, and answer questions from Bluebird Math Circle participants. Traci enjoys crafting poetry, historical and contemporary fiction, and compelling nonfiction about people and events not usually found in classroom texts. <https://www.tracisorell.com>

The book spotlights the story of an innovative Cherokee aerospace engineer, whose life sets an inspiring example for all children.

Mary Golda Ross worked on many classified projects as a twentieth-century aerospace engineer—and much of what she did remains a secret to this day. Yet her work was of tremendous importance to the US space program, and she broke barriers as a Cherokee woman in a male-dominated field. Discover the story of how a math-loving girl from northeast Oklahoma blazed a trail for herself and others, drawing on traditional Cherokee values throughout her career.



Mathical

You can find teacher kits and learner resources connected to the book at the Mathical Honor Book page: <https://www.mathicalbooks.org/projects/classified/> The full Honor Books list is here: https://www.mathicalbooks.org/wp-content/uploads/2022/02/Mathical_BookList_2015-2022.pdf

Family Circle: Make Your Own Slide Calculators

On the cover of *Classified* and on illustrations within, Mary Golda Ross is holding her slide rule. The slide rule is an elegant computing tool. Depending on its design, a slide rule can help you work out sums and products, or compute special functions such as logarithms and trig. So can computers. Why do people still love slide rules in our day and age? The power of estimation!

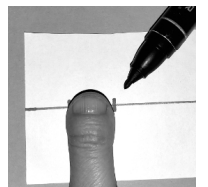
Get a taste of this with a few quick experiments below. We describe them with paper cards, but any paper will work. Mathematicians and scientists often design their own tools, physical or virtual (such as software).

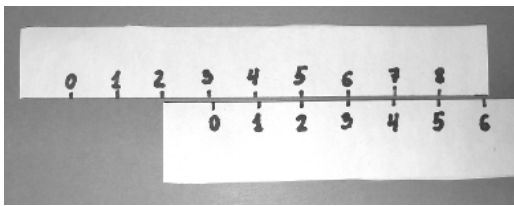
Activity 0. Paper strips

Fold a sheet of paper in half, and then in half again. Cut along the folds to make paper strips.

Activity 1. Addition slide rule

Take a paper strip, and draw a line through the middle. Use your thumb or a ruler to mark equal units across the line.





Label the marks 0, 1, 2, 3... on the top AND bottom of the line. Then cut along the line. You will have your own addition slide rule, made of two slides: top and bottom.

Suppose you want to add $3+5$. Move the bottom slide until the bottom 0 lines up with top 3. Now find 5 on the bottom slide. It is directly under 8, which is your answer! Try with your own example. Can you explain why your addition slide rule works?

Activity 1.5 Adding the numbers in-between

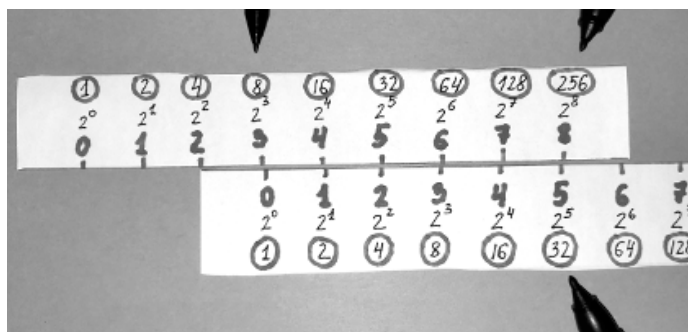
The marks on your slide rule are *discrete*. That is, you need to jump to get from one mark to another. But the lines themselves are *continuous*. That is, you can smoothly slide from point to point along the lines without jumping. Continuous lines present a great opportunity to make your slide rule more powerful! Imagine the numbers in-between your marks, such as $\frac{1}{2}$, $6\frac{1}{2}$, 3.7, etc. Is it possible to use your addition slide rule to estimate sums of fractions and decimals? How?

Activity 1.999 What about multiplication?

If you have time to explore, try this on your own before the next guided activity. Now that you have a slide rule that adds, can you build a similar one that multiplies? Would it work in the same way?

Activity 2. Even more power(s)

This slide rule's trick comes from a clever link between addition, multiplication, and powers. Building this slide rule can help you understand the link. Get a new paper strip. As before, draw a line through the middle of your strip. Use your ruler to mark equal units across your line, and label them 0, 1, 2, 3... On this slide rule, the labels stand for *exponents* in *powers* of 2. Next to each label, write out the exponents: $2^0, 2^1, 2^2, 2^3 \dots$ Finally, calculate these powers, write them on your card, and circle them: 1, 2, 4, 8...



Repeat the previous example, $3+5$, using this power slide rule. Move the bottom slide until the bottom label 0 lines up with top label 3. Find 5 on the bottom slide. As before, it lines up with 8 at the top, because $3+5=8$. Now look at the circled powers next to 3, 5, and 8. They are 8, 32, and 256. In fact, $8 \cdot 32 = 256$. This slide rule multiplies the circled powers! Try to multiply powers with your own examples. Can you explain why the circled powers multiply when you add their exponents?

Activity 2.5 Multiplying numbers in-between

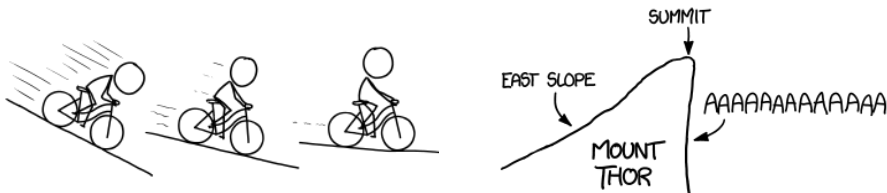
What if you want to multiply numbers that aren't 1, 2, 4, 8... and other powers of 2? Continuity to the rescue! Where do you think $\frac{1}{2}$, 3, 5, 6, 7.2 and other numbers in-between powers of 2 should be on your powers slide rule? Why? Is it possible to use your powers slide rule to estimate products of fractions and decimals? How?

Try a virtual slide rule similar to the professional tool Mary Golda Ross used: <https://www.sliderules.org/react/raven.html>

Ask Bluebird

QUESTION—What do Bluebird's math friends enjoy the most about slope? From Anonymous

BLUEBIRD SAYS—One of the answers: because we deal with physical slopes all the time, the mathematical idea of steepness feels intuitive. We can estimate or approximate slopes based on how they'd feel.



Images: xkcd

FUN FACT OF THE FORTNIGHT



A slide rule is to a calculator what an analog clock is to a digital clock. Slide rules or clock faces give us more or less rough estimates at a glance. Meanwhile, digital tools are great for high-precision calculations.

Images: Wikipedia

