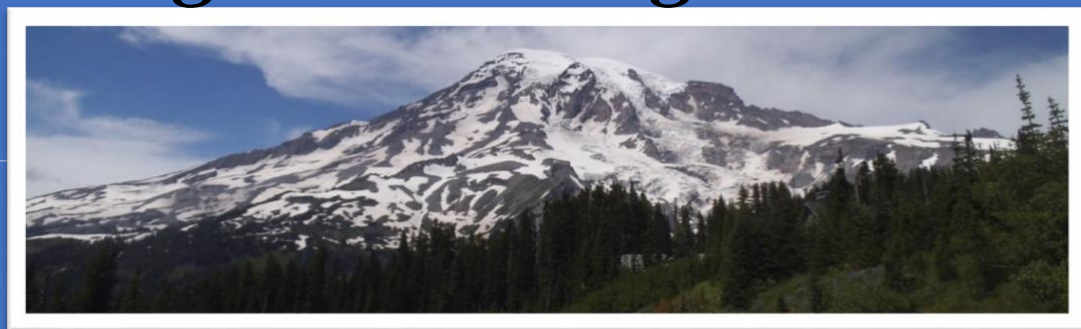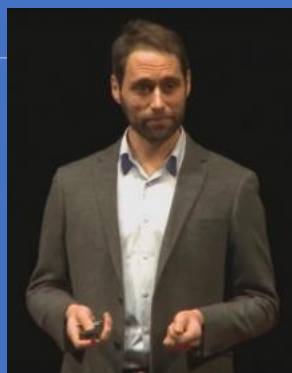# *Puget Soundings*

How Mathematicians Play: Creating a Culture of ownership, Rigor, and Joy in Math Class - Dan Finkel, Founder Math For Love

Spring Dinner - May 18, 2020

| March 15, 2020 | Happy Pi Day Yesterday! | Editor: Joyce Frost (frostjoycee@gmail.com) |

**Join us for the PSCTM Spring Dinner,
Monday, May 18, 2020
featuring, Dan Finkel,
Founder, Math For Love
Bishop Blanchet HS
5:00 pm Social
5:30 pm Dinner
6:30 pm Presentation**

President/ and Social Media- Traci Cotton
Past President- - Jane Bissonnette

*Joyce Frost- Program/ Newsletter, Jane Hunter
Art Mabbott- Treasurer/ NCTM Rep,
Joe Frost- Web Page, Lynn Adsit - Membership
Laura Beckett, Maryke Haynes, Angela Ensminger*

President's Letter - Traci Cotton

Hello PSCTM members!

This spring will be a season of change for many reasons, but one constant remains…our passion for mathematics. We hope you enjoy the collection of lessons, jokes, and opportunities in this edition of Puget Soundings.
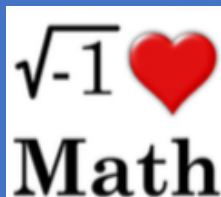
We'd like to express our thanks to Shelly Henderson for a wonderful conversation about bringing mindfulness into our math classrooms. Shelly was our guest speaker for the PSCTM Winter Dinner event. Mindfulness helps develop improved focus, concentration, compassion, sense of calm, and stimulation of the PFC (prefrontal cortex). Shelly shared, "you can't teach someone to swim if you don't get wet yourself." So, to better support our students with mindful behavior, we as educators need to practice mindful behavior.
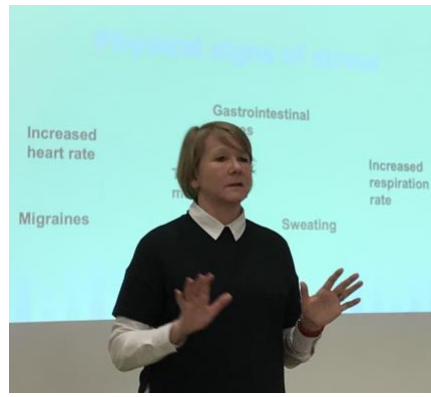
Life today presents busy schedules, pressure to perform, and large amounts of media. This results in difficulty paying attention, impulsive behavior, social struggles, and increased depression and anxiety.

Ready to get started? Check out this video from the folks at Happify. https://www.youtube.com/watch?v=w6T02g5hnT4

Wishing you well,
Traci Cotton
PSCTM President

$\sqrt{-1}$ ❤ Math

Attendees from PSCTM Winter Dinner   *Shelly speaking at Winter Dinner   Resources shared by Shelly Henderson*

Mindful Mathematics - PSCTM Winter Dinner featuring Shelly Henderson!

Lao Tzu said, "If you are depressed you are living in the past. If you are anxious you are living in the future. If you are at peace you are living in the present."

There are so many great resources available to support our work in learning more about mindfulness.

Have you read, *Happy Teachers Change the World*? It's a game changer!

https://www.parallax.org/product/happy-teachers-change-the-world-a-guide-for-cultivating-mindfulness-in-education/

Are you searching for more ideas? Mindfulschools.org has lessons and resources for educators.

Looking for an app?

Headspace walks you through your entire mindfulness journey step-by-step.

Stop, Breathe, and Think has a unique approach that allows you to check in with your emotions, and then recommends short, guided meditation yoga and acupressure videos.

Insight Time is the #1 free meditation app. Join millions learning to meditate to help calm the mind, reduce anxiety, manage stress, sleep deeply, and improve happiness.

Chill.   Instead of guided formal meditation practice, this app allows you to activate the "Mindfulness Reminder" to come back to the present moment throughout the day.

Calm. A meditation and relaxation aid that was named 2017 iPhone app of the year.

Let's continue the conversation! Check our social media links on Facebook and Twitter as there's a collection of ideas from educators there as well. We'd love for you to share your suggestions too!

Traci Cotton

Sorry we missed some of you at the PSCTM Winter Dinner!

The food and the presentation were amazing! We even decorated rocks and sleep masks during the social time!

Why outbreaks like coronavirus spread exponentially, and how to flatten the curve - Harry Stevens, March 14, 2020

"This so-called exponential curve has experts worried. If the number of cases were to continue to double every three days, there would be about 100 million cases in the United States by May. **That is math, not prophesy**."

https://www.washingtonpost.com/graphics/2020/world/corona-simulator/?fbclid=IwAR3TbpjZZ7dm1XgLPQKmA9OtCCA4ln6TJZnXwSOkd6K7g59VpjpIh6Y5Z8Y

"EVEN WITH DIFFERENT RESULTS, MODERATE SOCIAL DISTANCING WILL USUALLY OUTPERFORM THE ATTEMPTED QUARANTINE, AND EXTENSIVE SOCIAL DISTANCING USUALLY WORKS BEST OF ALL.
*Below is a comparison of the results."*

Free-for-all	Attempted quarantine	Moderate distancing	Extensive distancing
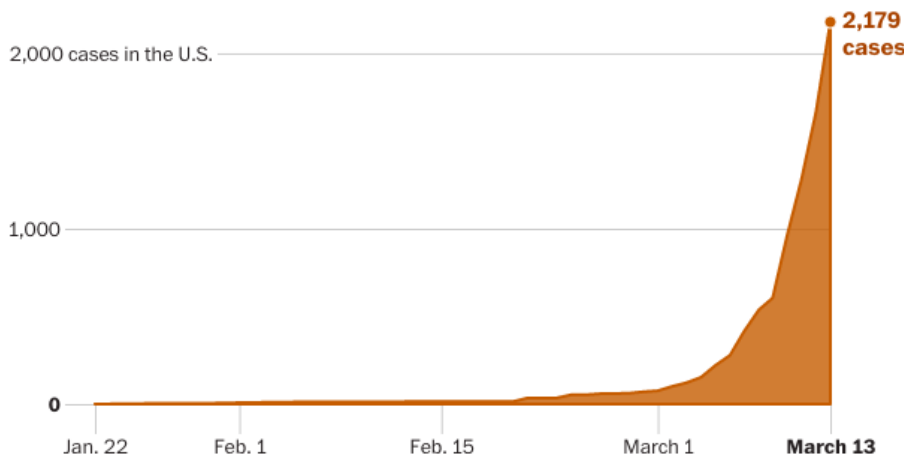
This graph shows Covid-19 cases in the US from January 22 - March 13.
"The spread can be slowed," public health officials say, "if people practice 'social distancing' by **avoiding public spaces and generally limiting their movement**."

Let's practice "Social Distancing" to Flatten the Curve!
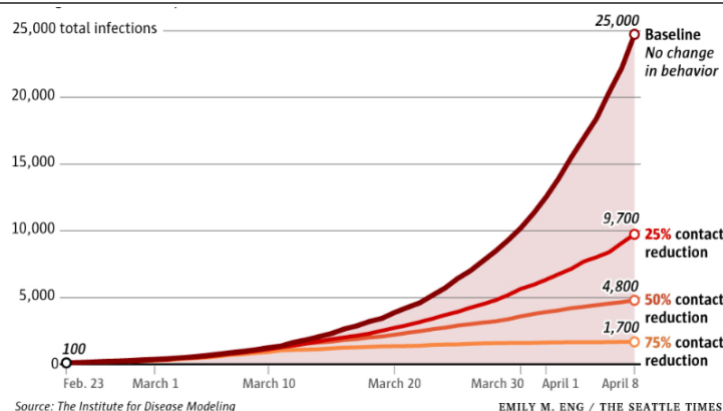
How big will the coronavirus outbreak get? This Bellevue scientist is figuring that out.
https://www.seattletimes.com/seattle-news/how-big-will-the-coronavirus-outbreak-get-this-bellevue-scientist-is-figuring-that-out/
"Social-distancing measures in place before Gov. Inslee banned big crowds & closed schools probably reduced contact and transmission by 25%, the researchers estimate. Now, they're trying to figure out if the additional restrictions will reduce transmission enough to stem the epidemic."

3

Big Question About Primes Proved in Small Number Systems

Will Sawin of Columbia University and Mark Shusterman of the University of Wisconsin, Madison, have solved the twin primes conjecture in the setting of finite number systems, using prime polynomials as their analog for prime numbers. This doesn't prove the conjecture in the set of integers, but it is a big step towards validating that such a proof is possible.

Andre Weil devised a precise way of translating arithmetic in small number systems to arithmetic in the integers in the 1940's. He used the technique to prove the Riemann hypothesis in curves over finite fields (a problem known as the geometric Riemann hypothesis) and others have exploited the technique, including Sawin and Shusterman.

Finite number systems can be thought of as clock arithmetic, where there is a limited set of numbers arranged on a clock face rather than a number line. The next number after the largest number is one, just like on an old clock face. When you add or multiply, you ignore how many times you passed go and just take the remainder with respect to the largest number in the field. Unfortunately, in finite number systems there are no prime numbers, because, for a number system whose highest number is n, every number is divisible at least by $(n-1)$. That is because, for any number k, $(n-k)(n-1) = n*n -kn - n + k$, which is congruent to k in the finite number system n. What Sawin and Shusterman used, instead of prime numbers, is prime polynomials. A polynomial with integer coefficients is prime if it cannot be factored into polynomials of lower degree, also with integer coefficients. The coefficients can be converted into a geometric representation by plotting the coefficients in space. A polynomial of degree 2 is plotted on the surface of a sphere, a polynomial of degree n is plotted on the surface of an object of dimension n+1.

At this point, my further paraphrasing is likely to be wrong or misleading, so I urge you to read the article at: https://www.quantamagazine.org/big-question-about-primes-proved-in-small-number-systems-20190926/

- - - Joe Frost

Editorial: *Art Mabbott, Scholars Online*

I have heard from several school districts that they have gone to on-line teaching and learning. This is great because all that the student will need to learn at home is a desktop, laptop or tablet and wifi, right? What if they don't have a computer and wifi? Then, these next six weeks (through April 24th) of learning or non-learning will present a real civil rights issue; an excellent example of the divide between HAVES and HAVE-NOTS. They will be disenfranchised for learning for 6 weeks. Who will provide each and every student with these two essential tools for the next 6 weeks of learning? And if the district won't or more likely can't, then who? The state? The federal government? And, if we do it for one student in our state, then to achieve justice (more than equality and more then equity), we must provide the same access to learning for all. Until that is decided, we need to re-think what these 6 weeks will mean for all of our kids.

Trigrams are a set of 9 similar right triangles: 1 large, 3 medium, and 5 small triangles that form a rectangle. I bought the book, ***The Tortoise Who Bragged,*** and the Trigram puzzle was included. Since the book is intended for students grades 2 - 4, I asumed the puzzle would be relatively easy to put together. It was much more challenging than I thought it would be. I look forward to spending more time playing with this an analyzing the mathematics behind the pieces. *- - - Joyce Frost*

9 Trigram pieces: http://www.drsuper.com/product.html#IV

Tortoise Who Bragged Book:
https://www.rainbowresource.com/product/038948/Tortoise-Who-Bragged-Storybook-With-Trigram-Puzzle.html

## Math Break - by *Jane Bissonnette, past President*

Here's a fun way to multiply two-digit numbers. Once you get the hang of it, you'll be able to multiply two- digit numbers in your head.

Multiply 64 x 32		ANSWER
1) Multiply the tens place of each number and write that number to the left.	6 x 3 = 18	18
2) Reserve a space for the tens place		18___
3) Multiply the ones place of each number and put that in the ones place of your answer	4 x 2 = 8	18___8
4) Multiply the outside numbers and then the inside numbers and sum the result. Place this answer in the tens place. If the answer is greater than one digit you will need to add the tens digit of your sum to the result in step 1.	6 x 2 + 4 X 3 = 24	18___8 _24___ 2048

Algebra teachers: Have your students look at the algebra by assigning the variables a, b, c, and d to each digit to create a formula:

In our example a = 6, b = 4, c = 3 and d = 2

1) substitute variables for the general case	$(10a + b)(10c + d)$
2) foil	$100ac + 10bc + 10ad + bd$
3) factor the middle terms for the final formula	$100ac + 10(bc + ad) + bd$
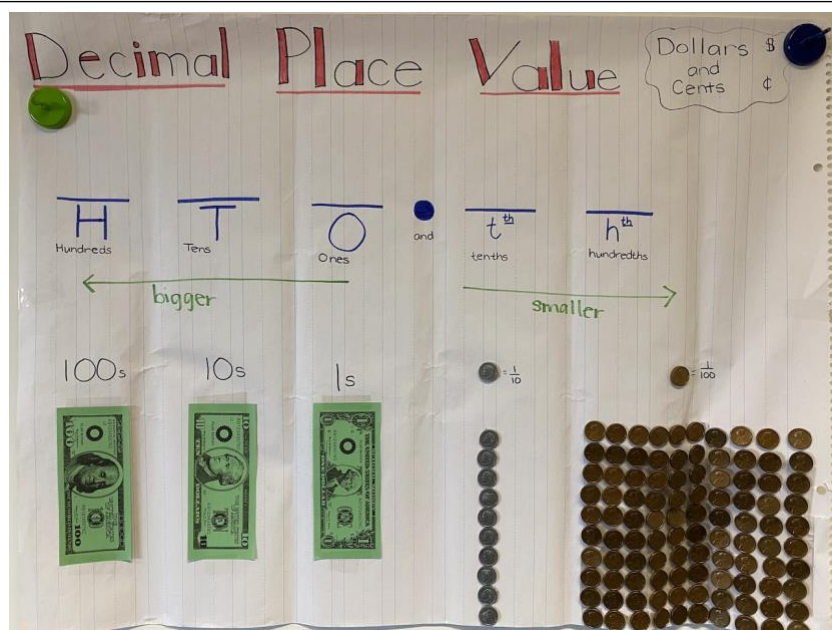
Heidi Bradley's Decimal Place Value Chart using money.

St. Patrick's Day observes the death of St. Patrick, the patron saint of Ireland. The holiday has evolved into a celebration of Irish culture, with parades, special foods, music, dancing, drinking and a whole lot of green.

St. Patrick's revelers thought wearing green made one invisible to leprechauns, who would pinch anyone they could see; i.e., anyone not wearing green.
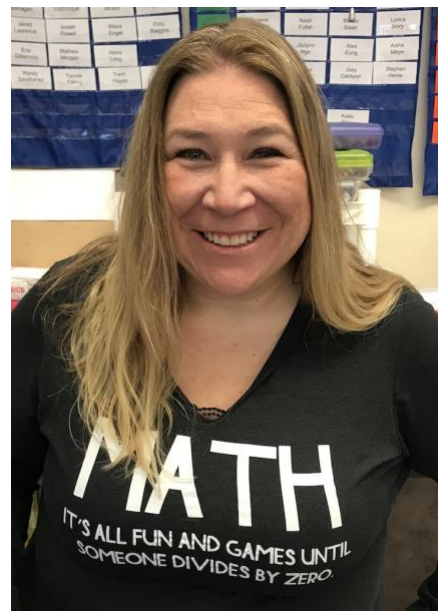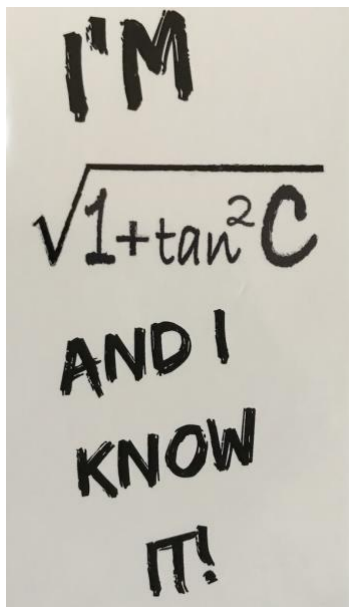
The first recorded St. Patrick's Day parade was held not in Ireland but in New York City, in 1762.
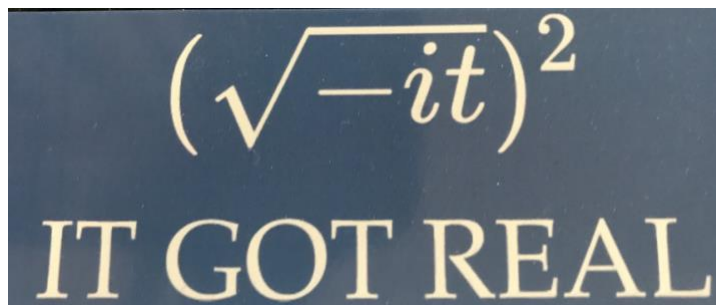
March 2020 *Costco Connection*

Celebrating Math through pictures, jokes, and travel!

I'M $\sqrt{1+\tan^2 C}$ AND I KNOW IT!

ELEVATOR OUT OF ORDER

MATH IT'S ALL FUN AND GAMES UNTIL SOMEONE DIVIDES BY ZERO.

Do you remember your trig identites?   7,2,1,3,8,5,6...   It's all fun and games until someone divides by zero!

$(\sqrt{-it})^2$ IT GOT REAL

Infinity Deck! - Azek Building Products
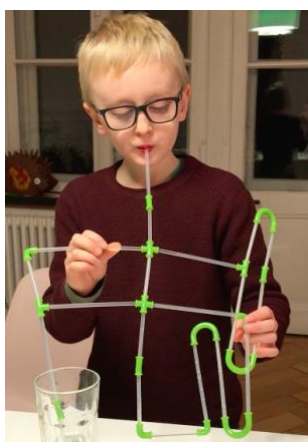
Basilisk fountain, straw kit, concrete #'s

Katherine Johnson, NASA mathematician has passed away at age 101
August 26, 1918 - February 24, 2020

NASA released the following statement:

"NASA is deeply saddened by the loss of a leader from our pioneering days, and we send our deepest condolences to the family of Katherine Johnson. Ms. Johnson helped our nation enlarge the frontiers of space even as she made huge strides that also opened doors for women and people of color in the universal human quest to explore space. Her dedication and skill as a mathematician helped put humans on the moon and before that made it possible for our astronauts to take the first steps in space that we now follow on a journey to Mars. Her Presidential Medal of Freedom was a well-deserved recognition. At NASA we will never forget her courage and leadership and the milestones we could not have reached without her. We will continue building on her legacy and work tirelessly to increase opportunities for everyone who has something to contribute toward the ongoing work of raising the bar of human potential."

https://www.nasa.gov/press-release/nasa-administrator-statement-on-passing-of-katherine-johnson

"We will always have STEM with us. Some things will drop out of the public eye and will go away, but there will always be science, engineering, and technology. And there will always, always be mathematics."

"Girls are capable of doing everything men are capable of doing. Sometimes they have more imagination than men."

"Let me do it. You tell me when you want it and where you want it to land, and I'll do it backwards and tell you when to take off."   Quotes by Katherine Johnson (8/26/1918 - 2/24/2020)

PSCTM Membership Awards in honor of *Diane Lustyk and Reg Waddoups*

Do you know someone who would be interested in a free year of membership to PSCTM and a prepaid opportunity to attend three dinner events in 2020/2021? (Fall, Winter, Spring)

In honor of two great mathematics educators, **Diane Lustyk and Reg Waddoups,** the PSCTM is offering two scholarships for membership which will include paid admission to the winter, spring dinner events for the 2020 calendar year. One scholarship will be awarded to a teacher working with elementary aged students, in memory of **Diane Lustyk**. One scholarship will be awarded to a teacher working with middle school or high school students, in memory of **Reg Waddoups**.

Diane Lustyk was a teacher in Bellevue and Everett Public Schools. Diane served as an elementary math specialist in Everett Public Schools for over 25 years. She was also a very active member of PSCTM and served on the board as the Snohomish County Representative. Diane loved sharing math with her students. She was also happy to encourage other teachers to join PSCTM, and other math focused events.

Reg Waddoups was a teacher in Seattle Public Schools and Lake Washington School District for many years. In both districts, he started and ran the Math Olympiad program, writing the competition questions and running the events. He was a regular presenter at the annual NWMC sharing amazingly creative math projects, puzzles, games, etc. He was well loved by all who knew him.

To nominate yourself, or a colleague, please send an email to tostrick@everettsd.org. Please include:
- Nominee name
- Grade level the nominee teaches
- A brief explanation, in a few sentences, why the nominee should be awarded the PSCTM membership scholarship
- The name of the person suggesting the nomination (unless this is a self-nomination)
- Phone number and email address for the nominee

The PSCTM Membership Award deadline is May 15, 2020.

Great advice/activities to do with your kids at home from: Math For Love's Dan Finkel

The coronavirus situation has become dire with incredible speed. Here in Seattle, the public schools have closed, and people have gotten very serious about social distancing.

You'll probably see a lot of explanations about exponential growth of viruses in populations. It surprises our intuition when the time it takes for the disease to move from 10 to 1000 cases is the same it takes for it to move from 10 thousand to 1 million cases. Which means that, pretty much wherever you are, you should start social distancing now to avoid the rush.

We've been trying to figure out how to support teachers and families during this time. We have a bunch of our lesson plans on our website already, and Seattle teachers should already have access to our supplemental curriculum to draw on for homework and math games to send home with students.

We thought some specific suggestions might be appreciated, especially for families who are at home with one of more kids and looking for fun, educational ways to pass the time. (***Prime Climb*** and ***Tiny Polka Dot*** are always recommended, of course.) While we've already mentioned some of our favoite games like 1-2 Nim and Pig in the past, here are some grade-specific ones to try out at home. Some of these games aren't on our website, so keep these links bookmarked if you want to get back to them. - - - ***Dan Finkel***

(Free) Dice Games to Play at Home

Kindergarten: <u>Number Races</u>.   1st Grade: <u>Fill the Stairs</u>   2nd Grade: <u>Save Twenty</u>

3rd Grade: <u>Blockout</u>   4th Grade: <u>Blockout (Damult Dice Variation)</u>, or just <u>Damult Dice</u>

5th Grade and up: <u>Damult Dice Division Allplay</u>; <u>Horseshoes</u>

A tip: invest in some <u>8, 10, and 12 sided dice</u>. They'll make games like ***Fill the Stairs***, ***Horsehoes***, ***Damult Dice***, and ***Odd Pig Out*** more interesting and replayable.

What to Look For in Math Games

1. Player's have meaningful choices to make in the game
2. Mathematics should be the engine of the game
3. The game should be easy to learn and quick to play

For more great math at home ideas, check out:

https://mailchi.mp/mathforlove/more-support-for-math-at-home
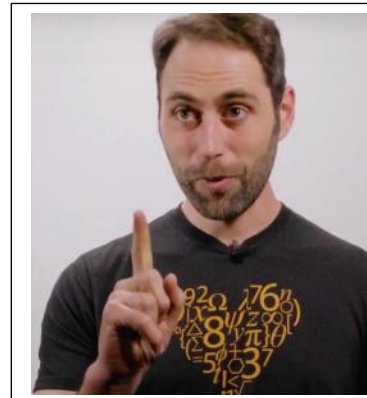
See the video

Epidemiology – Medicine from Statistics

John Graunt (1620 – 1674) is remembered as an early pioneer of epidemiology. He published an analysis of vital statistics in the city of London in 1662, just before the start of the Great Plague. He lamented the fact that the recorded cause of death was frequently wrong, because the parish recorders were easily bribed and no one wanted to be quarantined with the plague. He complained that a cup of ale and an extra groat were enough to change the cause of death to one more convenient to the householders. Modern statisticians estimate that the official death toll from the plague was probably only 3/4ths of the real total. Graunt's work set the pattern for capturing statistics based on age, gender, location, and other variables.

John Snow (1813 – 1858) is remembered as the father of field epidemiology. In 1854, he suspected there must be a factor linking the cases in an outbreak of cholera. For each person who died, he marked a map with where the person lived and where they worked. He suspected that drinking water was related, so he also marked the location of the public pumps on the same map. Follow-up interviews showed that most of the people who died got their drinking water from the same pump. Curiously, there was an island of houses just east of the pump where there had been no deaths. People in those houses mostly worked for a brewery that had its own deep well and were given a daily ration of beer, besides. Snow concluded that it was the clean water, not just the beer, that was protecting them. The city took the handle off the contaminated pump, and the outbreak was soon over. It is not known if the people switched to drinking more beer.

In general, epidemiologists use statistical information and methods to assess community health, identify causes and transmission paths of disease, and make recommendations to mitigate or prevent it. Early in my career at the University of Washington Medical Center (UWMC), physicians were conducting a study on traumatic brain injury among bicycle riders. The results showed that wearing helmets dramatically reduced the long-term effects of bike accidents. Helmets reduced the odds of head injury by 66 – 88%. The authors of the study convinced the Washington state legislature to mandate the wearing of bike helmets, and 20 other states have since followed suit. Studies show that within five years following enactment of those laws, fatalities in bicycle accidents fell by 60%.

Thirty years later, I worked with a collection of databases of the medical information of everyone who had been cared for at UWMC and Harborview Medical Center (HMC) since the 1990's, when medical records started being digitized and shared at the two institutions. We had dozens of researchers using that data, with patient identifying information removed or anonymized, to study things like drug interactions, links between some recurring illnesses, and factors that might predict the likelihood of developing some cancers. Most of those researchers had advanced degrees in statistics, biostatistics, bio-informatics, or medicine.

The nursing departments at UWMC and HMC used that database and current patient data to predict patients most likely to suffer pressure ulcers, heart attacks, or other negative occurrences and to take steps to prevent the harm. A group of physicians proved that if everyone who enters a patient's room (doctor, nurse, visitor, or even IT tech) uses the hand sanitizer before entering, we could cut hospital-acquired infections by over 80%.

Data, statistics, and understanding are being used to make each of us safer and healthier, thanks to the insights of people dating back to John Graunt and John Snow. - - - *Joe Frost*

Diarra Bousso: HS Math Teacher and Designer
The brand's design process is the result of an innovative celebration of math concepts such as Euclidean geometry, combinatorics and recursion.

How Fashion Saved this High School Math Teacher's Life

Kristen Philipkoski, Forbes Magazine

"When I wore a [Diarrablu dress](#) to celebrate Thanksgiving, the beautiful wrap design, dramatic sleeves, and bold print made quite a splash. When I told my friends and family the pattern was generated by a math equation and designed by a Senegalese woman who lost her memory and nearly died on her path to becoming a designer, they wanted to know the whole story, naturally. I'm guessing you're intrigued now, too, so voila: Diarra Bousso's evolution from math nerd to Wall Stree bond trader to creative math teacher and fashion designer."

Diarra Bousso: *"I almost feel like it's too good to be true, that I can do both things. Not just for me - the fashion brand is uplifting entire communities and artisans and providing jobs. And my work in education and research is getting kids to care and learn and be successful."* https://diarrablu.com/

https://www.forbes.com/sites/kristenphilipkoski/2019/12/23/how-fashion-saved-this-high-school-math-teachers-life/#7a86c5415a25

Thank you, **Wendy Robards**, for sending this!

Dan Finkel
Founder, Math for Love
How Mathematicians Play: Creating a Culture of Ownership, Rigor, and Joy in Math Class
Play is one of the most effective ways to explore new contexts and make connections. Still, play without boundaries won't help us to achieve our teaching goals. We need to develop structures and strategies to connect meaningful exploration and develop true mathematical understanding. This session will focus on concrete methods to marry play and rigor in math class. Using conjectures and counterexamples, classroom openers, and other routines, we can build a classroom culture that motivates students to think more deeply and take ownership of their own mathematical learning.

PSCTM Spring Dinner Monday, May 18, 2020 Bishop Blanchet HS

"After completing my PhD in mathematics at the University of Washington, I decided that teaching math is the most important contribution I can make to the world. I've devoted much of my life to understanding and teaching the motivation, history, aesthetics, and deep structure of mathematics. Math is a maligned and mistreated subject, often mis-taught, often misunderstood. My goal is to give everyone the chance to fall in love with mathematics. Whether you excel or struggle, whether you're a teacher or student, parent or child, if you want to learn what math is really about, I can help." - - - Dan Finkel

OK, so now you have to start teaching online?

And, you have no time to prepare for that and no idea where to go or how to get started. As a classroom teacher in both the public and private sector for more than 30 years and who has been teaching virtually for about 10 years, I humbly suggest a couple of resources for you to explore with and for your students.

First, and most often recommended, is ***THE KHAN ACADEMY***. You can check it out at the following url: https://www.khanacademy.org/ They offer resources for Math classes as well as many other subject areas for K-12 and beyond. The creator of this site (Salman Khan) started out with math lessons created just for his nieces. That goal got blown out of the water very quickly and the site has expanded across the entire curriculum. I really like his use of color in all of his presentations; I have suggested it to many of my coaching mentees in brick and mortar classrooms. A problem that one of my students told me about my on-line teaching exists here, too. The teacher is a dis-imbodied voice. He speaks as if standing over your shoulder and that scares some kids or gets in the way of their learning. Other than that, there is a lot to be said for ***THE KHAN ACADEMY***.

The second and much less familiar site is ***THE VIRTUAL NERD*** which you can check out at the following url: http://www.virtualned.com/
They too offer resources for all Math classes and use a lot of color in their lessons. But their presentation is very different. Here, there is a teacher standing in front of the classroom talking and writing on the white board. Each lesson also comes with digital links to keywords so that the students can click to review terms that they may have forgotten (may?). The links are right below the lesson. There are also have links for prior lessons for review and for future explorations. Check out both sites to see if they might help you in this new adventure. Enjoy. - - - ***Art Mabbott***


Khan Academy
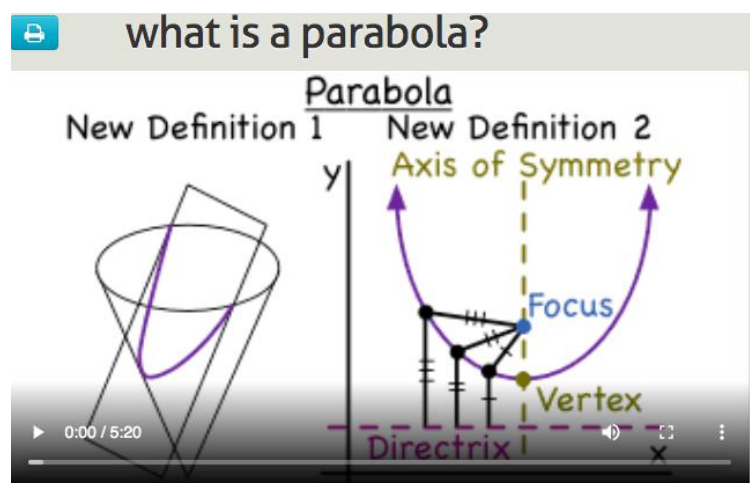
Virtual Nerd

Khan Academy: For every student, every classroom. Real results. "We're a nonprofit with the mission to provide a free, world-class education for anyone, anywhere."

Happy Birthday to Albert Einstein! Traci Cotton shares kid friendly links:

Children's introduction to Albert Einstein: https://www.youtube.com/watch?v=2Md8xj8SzPg

Albert Einstein for kids: https://www.youtube.com/watch?v=GjoYbsUoO4
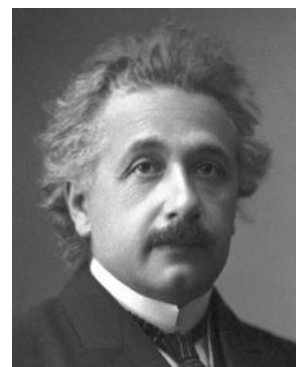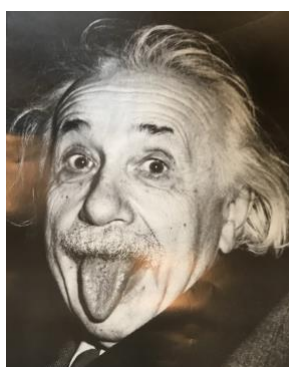
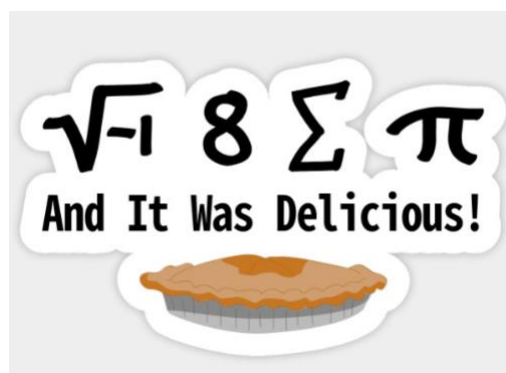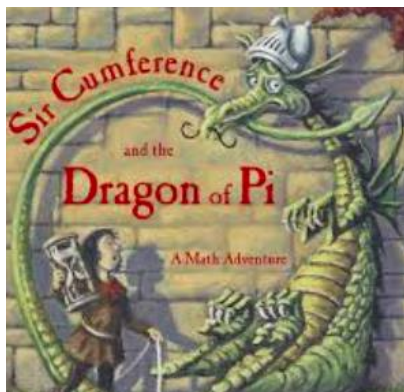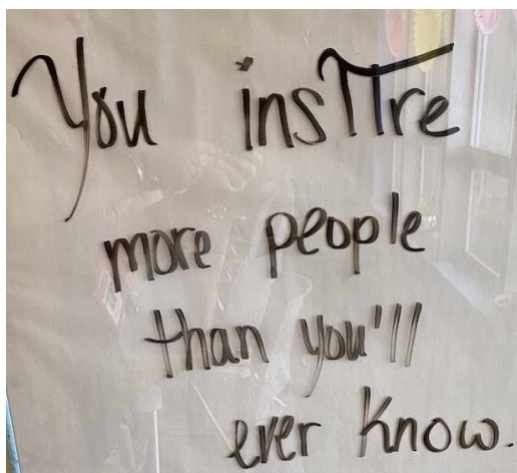1921 Nobel Prize winner for Physics

How much is that candle?   *The difference between stupidity and genius is that genius has its limits.*

Happy Pi Day! Here are a few Pi Day Resources:

Math Antics - Circles, What is Pi? https://www.youtube.com/watch?v=cC0fZ_lkFpQ

31.4 Mathtastic Pi Day Activities for the Classroom: https://www.weareteachers.com/pi-day-activities/

Exploring Pi: https://www.scholastic.com/teachers/articles/teaching-content/exploring-pi/

Here's a witty tale about Pi:

https://www.youtube.com/watch?v=xJ4MbU8928c