Puget Sound Council of Teachers of Mathematics

March 10, 2021





Puget Soundings



"If the 1 is invisible, does that mean I am too?" The role of personal identity in the mathematics classroom. - - - James Stallworth, Spring speaker

Renew your PSCTM membership online here!

March 10, 2021

Happy Pi Day, March 14th!

Editor: Joyce Frost (frostjoycee@gmail.com)

Monday, May 17th 5 – 6:30 pm James Stallworth, 7th Grade Principal, Princeton Community MS

"If the 1 is invisible, does that mean I am too?" The role of personal identity in the mathematics classroom.

Like a leading coefficient, our students may be invisible, and their presence taken for granted. But in doing so are we, like that leading coefficient, ignoring their identity and contribution to the whole equation? With all that is happening in the world around us, we would miss a great opportunity to celebrate our individual students. Or miss out on a chance to advance conversations in our classrooms by embracing the role that equity and diversity should play in mathematics and mathematics education.

Dear PSCTM members,

The other night I returned home from an outing and discovered a frog stuck to the window in the front of my house. He appeared to be peering through trying to see what might be on the other side of the windowpane. I was so excited to see the frog, and eagerly approached with curiosity and joy.

A few days later, I made a connection to recent conversations I've had with other teachers as we studied *Catalyzing Change in Early Childhood and Elementary Mathematics* from NCTM. We had a lively discussion about the importance of finding beauty, joy and curiosity in math. Developing authentic opportunities to experience these things can be challenging but are well worth the time.

As you enjoy this edition of Puget Soundings, I hope you'll find some ideas that will inspire you and bring you that same sense of joy, curiosity and beauty in mathematics. Best wishes, Traci Cotton, PSCTM President



Jane Bissonnette - Past President, Secretary, Joyce Frost – Program, Newsletter, Jane Hunter - Newsletter, Art Mabbott – Treasurer, NCTM Rep, Joe Frost - Web Page, Laura Beckett, Maryke Haynes - Equity, Angela Ensminger – Membership/Social Media,



James Stallworth, PSCTM Spring Presentation – May 17, 2021

James is an Ohio kid that still remembers when one of his teachers taught him 1-2-1 when learning how to spell "Cincinnati" (1 n, 2 n's, and 1 t). But rather than staying in the land of cocoa and cinnamon in his chili, he ventured off to the east coast to finish his high school experience at boarding school and received a Bachelor of Arts from the University of Pennsylvania before returning to the Midwest to pursue his dream of working with adolescents in mathematics and science. Now armed with degrees, diplomas, and licenses from a prestigious high school, an Ivy League undergrad, and a local university (think 1-2-1), he started a career as a secondary mathematics teacher in Cincinnati Public Schools.



More than once, he heard that he was the very first African American male mathematics teacher many of his students had ever had. And seeing that more than 90 percent of his students looked just like him, that information had an impact. It was not just important that he taught his students that HE could do mathematics; it became important that he showed them that THEY could do mathematics.

In his over twenty years in education, James has taught just about every secondary mathematics course and served as a department chair, curriculum council representative and writer, union vice president, and professional development leader. Currently he is serving as the 7th grade principal at Princeton Community Middle School in Cincinnati, a 5800+ student district, that is the most diverse school in the state of Ohio. And for each of those over twenty years, he would open his classes by saying, "By the end of this school year, you may not love mathematics as much as I do. But I can guarantee that we will move the needle away from hatred of the discipline. Together." Now isn't it time that we work on the same thing with our students?

James' favorite Pi Day Activity. What's yours?

"One of my favorite Pi Day activities is a really simple one. I assign a color to each digit from 0-9 and have corresponding paper strips available in the front of the classroom. We talk about the definition of irrational numbers and the notion that they are non-repeating and never ending. On the whiteboard, I print out the first 1000 decimal places for pi and explain that we will be working as a team to see how far we can get throughout the school day. We take that list, break the numbers in groups of 10 and allow each student to make a part of the Pi Paper Chain out of the corresponding colors and see how long we can make our chain. This takes teamwork and communication between the students and planning between the classes. At the end of the day we stretch it out to see how we have done. - - James Stallworth



<u> 100 Digits of Pi Video – Sing Along!</u>



Jane Hunter suggests this website for great Pi Day activities! weareteachers.com/pi-day-activities/

Angela Ensminger suggests her favorite Pi Day Activity! Check out this website and simulation!

Buffon's Needle – An Analysis and Simulation



"Buffon's Needle is one of the oldest problems in the field of geometrical probability. It was first stated in 1777. It involves dropping a needle on a lined sheet of paper and determining the probability of the needle crossing one of the lines on the page. The remarkable result is that the probability is directly related to the value of pi."

Celebrate Pi Day with MoMath!

Join them for pi throughout the day on Sunday, March 14.

11:00 am ET (New York):

Start your morning off right with some eye-opening pi. **Roping Around the World** – Come test your intuition with a mathematical problem about a rope tied around the Earth.Explore the counterintuitive solution with an engaging, hands-on activity. **Why Don't We Celebrate Phi Day?** Phi, also known as the Golden Ratio, is one of the most unique irrational numbers in all of mathematics. Come learn about this fascinating number that shows up in all sorts of unexpected places, including a number of MoMath exhibits. Discover how the number pi truly is more special and deserving of its own holiday and how pi transcends the basic rules of arithmetic.

2:00 pm ET (New York):

Who needs high tea when you can have pi glee? Probably Pi

While it is impossible to write pi in its entirety, various methods exist to generate better and better approximations. In this crowsourced experiment, we see how the law of large numbers lets us confidently approach pi by using probability. By randomly dropping a needle onto a set of lines, we can converge on pi experimentally, without the need for direct measurement. Come help us generate data to see how far we can get in the digits of pithe more, the mathier!

What Is the Value of Pi?

Throughout history, people have tried to compute the exact value of pi. Ancient Babylonians believed that pi = 25/8, Egyptians thought that $pi = (16/9)^2 = 256/81$, while the Indiana state legislature almost passed a bill in 1897 stating that pi = 3.2. We know now that pi cannot be computed exactly; join us as we use geometric constructions to find rational approximations.

7:00 pm ET (New York): Pi by night!

BYOP ... Join Alex Kontorovich for an evening exploration — and bring your own (pizza) pi!

Join MoMath's Distinguished Visiting Professor Alex Kontorovich for an exploration of pi. What does pi have to do with circles? How can we be sure that pi is bigger than three ... or smaller than four? How can the power of pi surprise us when we look at everyday household items? And how can we use everyone's favorite food to learn more about this amazing number? Join us to find out ... and bring your own pizza pi!

Learn more and register at piday2021.momath.org.

National Museum of Mathematics

Support MoMath at momath.org/contributemomath.org11 E 26th StNew York, NY 10010United States212-542-0566

Follow PSCTM on social media! Share your lesson ideas, news with us, too! @PSCTM



Celebrate Pi Day with NCTM!

There are many fun and innovative ways to celebrate Pi Day in your classroom and beyond—you probably already use it as a jumping-off point for key mathematical lessons. If you're in need of something to invigorate your tried-and-true Pi Day traditions, NCTM has you covered! We've gathered our best pi-related activities from each of our publications and resources that will suit your grade level. Try them with your students throughout the month of March and share the fun with others on social media. Include the hashtag #PiDay - tag @NCTM!



Edutopia: "What Pi sounds Like," produced by musician Michael Blake. <u>Click to listen!</u>

Save these PSCTM Dates!

March 15 – Board Meeting April 19 – Board Meeting May 17 – **Spring Dinner Event** June 7 – Board (*End of Year*) Meeting

Beaufort Scale – Wind force scale for boating - - - Joe Frost

I was under the impression that the Beaufort scale for wind velocities was exponential, like so many realworld measuring scales. But I was wrong. The original Beaufort scale was based on previous scales, including one by Daniel Defoe, trader and author of *Robinson Crusoe*. Defoe's scale ranges from 1 to 11, and each step has a name, but not necessarily a wind speed. The scale is 1- stark calm, 2 - calm weather, 3 - little wind, 4 - a fine breeze, 4 - a small gale, 5 - a fresh gale, 6 - a top sail gale, 7 - blows fresh, 8 - a hard gale of wind, 9 - a fret of wind, 10 - a storm, 11 - a tempest. His scale is very useful for novelists, but not for engineers.

Commander Francis Beaufort of the Royal Navy came up with a more exact scale in 1810 based on what kind of sails his ship could carry under that wind. His scale included such indicators as 1 - "light air, or just sufficient to give steerage way," 4 - "moderate breeze, or enough wind that a man-of-war with all sail set and clean hull would go in smooth water from 4 to 5 knots," 5 - "fresh breeze, or that in which a well-conditioned man-of-war could just carry, in chase, full and by, royals, etc.", up to 10 - "whole gale, or that in which she could scarcely bear close reefed main topsail and reefed fore sail" and 12 - "hurricane, or that which no canvas could withstand." His wording caught on, and ships' captains saved ink by noting the number of the Beaufort scale in their daily logs rather than lengthy descriptions. With the advent of steam ships, the indicators for the scale were changed from how many sails could be used to how the waves looked. For example, Force 4 winds are characterized as "Moderate breeze, small waves, becoming longer, fairly frequent white horses." At some point, a set of wind-speed ranges was added to the scale, so that Force 4 winds are in the 11 to 16 knot range, and a Force 12 hurricane is anything over 64 knots. Even at that, the wind speed in knots is not a smoothly increasing function, though popular wind charts make it look smooth. Proof that someone with a French curve and big data symbols can draw a graph that looks legit, whether there is a function that actually fits the data or not. In general, the wind speed W in knots for a given Beaufort force of Bis approximated by the formula $W = 1.5 * (B^{3/2})$.

Out of curiosity, I decided to see how much force it would take to move Captain Beaufort's ship at 4-5 knots, a Force 4 wind. We start with the formula of wind pressure on a flat surface, $q = \frac{1}{2} (\rho * V^2)$, where q is the dynamic pressure in pounds per square foot, ρ is the air density in pounds per cubic foot, and V is the wind speed in feet per second. Air density changes with altitude and temperature, but the standard value for sea level and 60°F is .075 pounds per cubic foot. I don't know how big the sails on his ship were, but the USS Constitution boasts 42,710 square feet of sail, so let's assume his ship had a similar sail area to hull displacement ratio. So, for an 11 knot wind (18.3 feet per second), the pressure on the sails is $\frac{1}{2} * .075 * (18.3)^2 \approx 12.6$ pounds per square foot, and the total force on the sails is roughly 540,000 pounds to push 2200 tons (4,400,000 lbs.) through the water, roughly one pound of force for eight pounds of ship. Captain Beaufort's sloop was a 380 ton ship, so we can estimate that his sails generated about 45 tons or 90,000 pounds of force in a Force 4 wind. In a hurricane (more than 5 times as high a wind speed) the force would be more than 25 times as great as a Force 10 winds: <u>https://www.youtube.com/watch?v=eLlzp3WLpQE</u>





My name is Tara Ryan, reaching out to you and the Puget Sound Council of Teachers of Mathematics on behalf of **the Washington Student Math Association (WSMA**). We are a student-run nonprofit dedicated to promoting the beauty of mathematics. I'm writing to let you know about our grant for math teachers in Washington state.

As students, we know first-hand the difference that additional materials make in the classroom: books, calculators, special activities. For that reason, we are continuing a program to award up to \$300 of grant money to selected eligible teachers for the 2021-22 school year.

We were hoping that you could share this opportunity with any math teachers who may be interested; our goal is to provide resources for as many people as possible. The application form and information is on the WSMA website at <u>https://www.wastudentmath.org/pages/events/grants.aspx</u> If you have any questions, feel free to reach out to us at <u>contact@wastudentmath.org</u>. **Tara Ryan**, Volunteer, Washington Student Math Association tarar@wastudentmath.org www.wastudentmath.org

Get Ready for the Northwest Math Conference in Tacoma in 2022!

PSCTM is excited to be partnering with **Washington State Math Council** on the **2022 Northwest Math Conference.** The conference will be returning to the Tacoma Convention Center in October 2022. We have settled on a theme - *"Math: You Are Invited"* and will be focusing on strands of inviting all voices into math, addressing diversity and inclusion, planning for equity and access, inviting in through play and curiosity.

We plan to provide several ways to participate through registration options (Saturday only, Keynote streaming) and intentionally creating space for educators to connect with each other. If interested in helping or you have questions, please let me know!

Maryke Haynes (co-chair, logistics) mhaynes@everettsd.org, 206.351.3095

Play to Learn, Learn to Play: PSCTM Winter Presentation, Feb. 8, 2021





Power of Play: Play is "voluntary, it's pleasurable, it offers a sense of engagement, it takes you out of time. And the act itself is more important than the outcome." – Stuart Brown, play researcher During Play, our brains are experiencing the release of Dopamine, Oxytocin, Serotonin, and Endorphins - your Daily Dose of play. Play can heal trauma. Play connects us. Through play we find joy. Games are key to teaching kids about life lessons while having fun! Kids have permission to take risks, push their potentials and stay socially connected. Thank you to Mikaela Wingard-Philips!

"This problem has problems": A lesson in implicit bias

When I learned that my Algebra class loved logic puzzles and graph theory questions, I was excited to share classic math problems: The wolf, sheep and cabbage problem, the Seven Bridges of Königsberg, and more. I spent some time thinking about "the couples crossing the river problem" and how to address the rule: "The husbands are so jealous they cannot leave their wife with another man, without their presence." I tried looking at species of animals to replace these couples, but ultimately decided to call it out as ridiculous and let it stand. It made the problem more interesting if they were jealous. When reviewing their work, one student simply stated, **"This problem has problems"**, which I knew. But then the student went on to wonder, "Are the couples all male/female?" And there it was, my bias was called out. In the graphic put forth by Ibram X Kendi in <u>How to be Anti-Racist</u>, I was dropped squarely into the "learning zone" by this question.

Later that day, the WEA sent an email inviting us to a workshop series, the first of which covered "Implicit Bias". Which I immediately signed up for. In the meantime, I thanked the student for asking the question that pointed out the bias in the question that I had not seen and for being brave enough to point that out to me.

In the "Implicit Bias" workshop, hosted by Jo Barber and Estevan Bourgeoia, I learned to address the impact on others rather than defend my intent. They shared in the workshop the steps to anti-bias:

1) Identify the bias, 2) Name the bias, 3) Interrupt the bias, 4) Replace the stereotype with an inclusive response/portrayal. In the case of the couples crossing the river, the bias is the assumption that couples are male/female, a heteronormative position. I am grateful for my student to help me interrupt this bias. I have not yet figured out a replacement for this problem, but I am working at examining bias in other areas. They shared a <u>tool from Harvard</u> to assess your own implicit bias around race. It was humbling and challenging to see the results and realize how much work I have left to do.

A simple shift shared in the workshop is to use "agreements" instead of "norms" for meetings and classes. Agreements is a more flexible phrasing that promotes inclusion of voices instead of declaring that some students are outside of the norms. Barber was clear to say that this did not mean that all actions were acceptable. She suggested being clear on your "deal breakers" for your classroom management goals and explain why they are deal breakers for you. These concepts fit well with the ideas shared in the third session "Restorative Justice" which focused on the importance of cultivating relationships to support academic, social-emotional, and behavioral learning.

The second session "Bringing Social Justice into the classroom", hosted by Jo Barber with dindria barrow, included many ideas for the classroom to engage students in considering social justice. Barber again stressed the importance of examining your intent against the impact on students. She asked us to look at the Civic standards for our grade level and use those as a guide for how we apply social justice. I was surprised to discover that an activity I do around learning about loans in the context of compound interest overlapped well with "E1. Understands that people have to make choices between wants and needs and evaluates the outcomes of those choices." Reading this standard was empowering and supported the purpose of teaching about loans in math class beyond the mechanics of the mathematics involved. Here are the <u>Social Studies</u> <u>Standards</u>. Consider how you can connect the math you are teaching and social justice while incorporating the adopted and approved Washington State Standards.

Admittedly, with my lens as a secondary math teacher, I was a little hesitant to cross into social studies and deem myself qualified to teach the topic. As I considered, I thought about mathematics and how it has advanced society, especially in the form of data displays. For example, using <u>What is going on with this graph?</u> from the New York Times is a mathematical way to examine current issues. The <u>Gapminder Bubble</u> Chart tool is an intriguing site that helps my students find issues they care about. I learn something new every time I ask students to use it; they carry a different perspective that I should be seeking out and learning from.

Barber and dindria challenged us to help students "find their magic" and change education away from white supremacy. I am currently accepting this challenge by using problem-based learning to help students discover problems they want to solve in the world. My role as teacher is to help students understand that they are capable of learning what they need to solve a problem we haven't discovered yet. This has led me to programs such as <u>WABS ACCESS STEM</u> units and <u>Sustainability Ambassadors</u> that provide resources that cut across topics. They have enhanced the mathematics in my classroom by helping students connect to the story math can tell. I am really excited about the Climate Science/Justice Solutions PBL event on March 27th by Sustainability Ambassadors. I attended the last one on Salmon Population. It was inspiring to see all the ways math was used and to know it was accessible to my high school students in gaining historical and ecological perspectives about their own backyards through data.

Throughout this journey, I have reflected on the "**problem with problems**" and the student who was gracious with me and my bias. While I haven't determined how I "should" have handled it, I hope my journey, through the WEA and PBL workshops, has prepared me to handle my bias and its impact on others, now and in the future. I am ashamed that I spent so much time in fear of becoming anti-racist so that I missed out on truly hearing the perspectives of those around me. I would love to hear from you. What has helped you hear perspectives? How have you helped students see math in new ways? - - Maryke Haynes mhaynes@everettsd.org

"This problem has problems" lesson idea...

Maryke's article made me think! I, too, have had a "problem with problems". So many classic problems are not really very interesting, culturally sensitive, or even very creative. Is math really this boring and insensitive? Consider the following problem from the recent February 2021 Mensa Bulletin (loaned from a friend):

Age Problem: There are four members of the Hagen family – Dad, Mom, Son, and Daughter. At this time, the sum of their ages is 95. Dad is two years older than Mom. Mom's age is three times Son's age and four times Daughter's age. How old is each member of the Hagen family?

Why not challenge your students to rewrite this into a much more interesting and relatable problem? Is there a more interesting topic than age of the family members? What would be of more interest to Middle School or High School kids? Would your students enjoy inserting some humor into the problem? How about using names of your own family members?

Years ago, I did some work for the educational software company *Edmark*. One project included writing logic problems for one of the programs. I inserted names of various family members and pets and enjoyed including my students in thinking of clever ways to pose the problems. Perhaps consider this activity as an actual example of what textbook authors do – create application problems. And, of course, they would need to include a detailed solution manual to go with their creative problems. Perhaps your class might even create a great resource for classes in the future with meaningful, sensitive, creative problems. - - Joyce Frost

And the winner is... Joyce Frost!

Joyce first won the Penewell door prize about 20 years ago when she attended her first PSCTM dinner. She likes to tell people that she won the first time she came to a dinner! Joyce is a retired grades 7-12 math teacher and math coach. Currently, she is a private math tutor and loves editing the PSCTM newsletter and planning the speakers for the dinners. Her claim to fame is inventing 3-D math puzzles.

These are the Highest Resolution Photos Ever Taken of Snowflakes

Photographer and scientist Nathan Myhrvold has developed a camera that captures snowflakes at a microscopic level never seen before. - - - *Smithsonian Magazine*



"Myhrvold, who holds a PhD in theoretical mathematics and physics from Princeton University and served as the Chief Technology Officer at Microsoft for 14 years, leaned on his <u>background</u> as a scientist to create the camera. He also tapped into his experience as a photographer, most notably as the founder of <u>Modernist Cuisine</u>, a food innovation lab known for its <u>high-resolution photographs</u>"

Imaginary Numbers May Be Essential for Describing Reality

A new thought experiment indicates that quantum mechanics doesn't work without strange numbers that turn negative when squared. – Quanta Magazine

Math in the News!

Secrets of the Surface,

The Mathematical Vision of Maryam Mirzakhani (Movie Trailer)

Maryam Mirzakhani (May 3, 1977 – July 14, 2017) was an Iranian mathematician and a professor of mathematics at Stanford University. On August 13, 2014, Mirzakhani was honored with the <u>Fields Medal</u>, the most prestigious award in mathematics. She became both the first, and to date, the only woman and the first Iranian to be honored with the award. The award committee cited her work in "the dynamics and geometry of <u>Riemann surfaces</u> and their <u>moduli spaces</u>". For more, watch <u>Maryam Mirzakhani – in her own words</u>.



The NASA Engineer Who's a Mathematician at Heart

Christine Darden worked at NASA for 40 years, helping make supersonic planes quieter and forging a path for women to follow in her footsteps.

"Darden retired from NASA in 2007 after a 40-year career. She was featured in <u>Margot Lee Shetterly</u>'s 2016 book Hidden Figures, alongside <u>Katherine Johnson</u>, <u>Dorothy Vaughan</u> and <u>Mary Jackson</u> — three Black women mathematicians at NASA who made significant contributions at pivotal moments in the space race. All four women were awarded <u>Congressional Gold Medals</u> in 2019 for their scientific contributions."

In the Video below, Darden describes what it was like working at NASA in the 1960s and how she became an authority on minimizing sonic booms.





Math in the News!

Statistics Postdoc Tames Decades-Old Geometry Problem

To the surprise of experts in the field, a postdoctoral statistician has solved one of the most important problems in high-dimensional convex geometry.



Yuansi Chen atop Chäserrugg, a mountain in Switzerland in December 2020. Chen is a postdoctoral researcher at the Swiss Federal Institute of Technology Zurich who is about to join the statistical science faculty at Duke University.

Mathematicians Report New Discovery About the Dodecahedron

Three mathematicians have resolved a fundamental question about straight paths on the 12-sided Platonic solid.

Especially satisfying about this discovery is that one of the three mathematicians is *Jayadev Athreya*, from the University of Washington. Many of you will remember him as one of our past PSCTM presenters! Some of us also attended one of his 2018 presentations: *The Intersection of Art* + *Math* in Seattle & Everett. Check out the video below where Jayadev explains how he and his colleagues solved a longstanding problem.



A paper dodecahedron constructed in 2018 by David Aulicino and Jayadev Athreya to show that straight paths from a vertex back to itself while avoiding other vertices are in fact possible.

pentagon.



What is the Puzzle Hunt?

Teams of up to 6 people solve a total of four hour-long puzzles gathering clues along the way to solve one final meta puzzle! These are no ordinary puzzles though! It will take a diverse set of skills and talents to solve them! Our mission is to celebrate everyone's talents and demonstrate knowledge comes in many forms. Everything is timed using your phone, QR codes, and our online game platform! So yes, you can win! :)

WHO? WHAT? WHEN? Everyone! However, each participant Hands-on brain adventures involving Saturday, April 17, 2021 from 9:30 AMunder age 14 must have permission 4:30 PM (PST). Leaderboard posted and paper-folding, logic, patterns, and a from a parent/legal guardian. The prizes awarded at 5:00 PM (PST). variety of skill sets. puzzles are created for ages 14 and older. WHY? WHERE? Stretch your mental muscles, bond with your teammates, compete alongside The 2021 Puzzle Hunt is virtual, so people of all ages and walks of life, and anywhere that has internet access, a have a lot of fun! smartphone or computer, a black and white printer, and materials listed in the FAQs What should I have on hand?

Clock Hours for PSCTM events – from our Clock Hour Guru:

If you attended one of our PSCTM events: Spring 2019, Fall 2019, or Winter 2020 and forgot to submit a request for clock hours, it isn't too late. Just send an email to <u>art@mabbott.org</u> to start the process. We keep a list of our attendees and can help. **PSCTM's simplified process:**

- Request clock hours for any one of the events
- Art will send you an evaluation form
- Complete evaluation form and email to Art
- Art will send you the clock hour form for the event that you attended
- You complete the clock hour form and keep it for your records. (*email Art if you have questions*)

<image>

ROMMEO (Retired Old Math Men Eating Out) is a group of Retired Male Math Teachers who have been meeting once a month for lunch for nearly 20 years. During the pandemic, we have continued to meet virtually over ZOOM. Members join us from Tri-cities, Cle Elum, Santa Fe, Olympia and from throughout the Puget Sound area. Our oldest member is in his 90's and the youngest is in his 60's. As members downsize their math collections, we would like to offer these to our PSCTM membership. If you would like any of the items, let me know at: <u>mathguy2016@gmail.com</u>. We will arrange to get them to you.

- 1) The World of Mathematics: A small library of the literature of mathematics from A'h-mose, the scribe to Albert Einstein by James Newman (1956). A 4 volume set.
- 2) More Mathematical People by Albers, Alexander, & Reid (1990)
- 3) Solid Shapes (3 sets).

The NCTM 2021 Virtual Annual Meeting is next month! Registration is open!



The meeting will take place over two weeks, *April 21-24* and *April 28-May 1*, with a single registration fee for all of the sessions. The NCTM Virtual Annual Meeting offers live presentations with hundreds of on-demand and community activities available.

Dan Finkel gave the Opening Keynote at the 2021 Texas Instrument's International Conference!

Dan Finkel, our PSCTM spring 2020 speaker, organizer of the Julia Robinson Math Event at the UW, and founder/director of Math for Love, was the opening keynote speaker for the 2021 T^3 International Math Conference last month. It was exciting to hear Dan's presentation on:

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 ideas. But without thoughtful structure, play won't help us to achieve our teaching goals. We need boundaries and strategies to promote meaningful exploration and help students develop true mathematical understanding.

By looking at how mathematicians play — with structures based on conjectures and counterexamples in particular — we can offer students an invitation to genuine mathematical thinking and ownership. We'll explore some specific routines and tools that can transform classroom culture and make rigorous, joyful play a driving force in math class. - - - Art Mabbott

\prod in Odd Places

Joe Frost

Pi is a crucial constant in <u>Geometry</u> and it shows up in other areas in surprising ways. 1 - Leonhard Euler shocked the math world with his solution to the Basel Problem where he demonstrated that the summation of the reciprocals of the squares of the natural numbers is $\Pi^2/6$,

or $\sum_{k=1}^{\infty} \frac{1}{k^2} = \frac{\prod^2}{6}$. He found solutions for the reciprocals of the natural numbers taken

to the fourth power, the sixth power, the eighth power, the tenth power, and the twelfth power, all expressed as \prod to the associated power over some constant.

2 – In the Mandelbrot set, if we iterate the function $f(z) = z^2 + c$ starting at $z_0 = 0$ and $c = \frac{1}{4}$, then the sequence slowly converges to $\frac{1}{2}$. If we choose $c = \frac{1}{4} + \delta$ where δ is a positive number, the function diverges no matter how small δ is chosen. In fact, its "escape" to $z_N = 2$ can be predicted where N(δ) is the number of iterations before $z_N > 2$ using the formula $\lim_{\delta \to 0} N(\partial) * \sqrt{\partial} = \Pi$

3 – Wallis's Product – John Wallis helped set the stage for the invention of the Calculus by using infinitesimals to calculate that $\frac{\pi}{2} = \frac{2*2*4*4*6*6*8*8*...}{1*3*3*5*5*7*7*9*...}$.

4 – The "most beautiful equation in Mathematics" – Credited to Euler ($e^{-i\pi} = -1$)



In honor of Dr. Seuss' Birthday celebration on March 2, 2021...

PSCTM Newsletter

March 10, 2021

