PUGETSOUND COUNCILOF TEACHERSOF MATHEMATICS

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## About PSCTM



## A Message from the Editor

## Dear PSCTM Members,

As we approach the end of the school year, please take some time to read through the contributed articles in this newsletter and reflect on some of the local mathematical events over the last year. You can find summaries of PSCTM dinners and read about the new pentagonal tiling of the plane discovered by UW Bothell researchers that we heard about last spring. Then in the fall, we heard the timely talk about the mathematics on voting and apportionment. At the winter dinner, we heard about inclusion in the mathematics classroom by speakers from the Seattle Girls' School. And don't forget our recent spring dinner featuring IGNITE talks, where each speaker had 5 minutes and 20 slides to do a quick, yet enlightening presentation!

You can also find some interesting articles about the Northwest Math Conference, tools for the classroom, mathematics behind public-key encryption, and an essay contest highlighting contributions and experiences of women in mathematics. And the year isn't over yet! Don't miss two upcoming opportunities: The Northwest T3 Professional Development Summit at Mercer Island on June 27th and a Mathematical Problem-Solving Workshop at the University of Puget Sound from July 10-12th. You can find more information about both workshops in this newsletter (pages 18 and 11 , respectively).

Thanks again for your participation in the Puget Sound Council of Teachers of Mathematics. Follow us on Twitter and like our Facebook page. We'd love to hear your feedback-email us at psctm.newsletter@gmail.com.

Best wishes for a wonderful conclusion to the school year!
Sincerely,

## Clint Chan

Newsletter Editor


What a joy it was to hear Casey Mann and Jennifer McLoud-Mann speak about the new pentagonal tile discovery! Doing a quick google search gives a nice picture of what a big deal this was! What a way to put UW Bothell on the map! Check out these headlines:

ZME Science "Finally, a new pentagon shape that tiles in a plane" August 11, 2015.

The Guardian "Attack on the pentagon results in discovery of new mathematical tile"

Aperiodical "New pentatgonal tiling discovered" August 12, 2015

INPR "Scientists Discover $15^{\text {th }}$ Convex Pentagon I Able To Tile A Plane" August 14, 2015

Huffington Post "Historic 'Tile’ Discovery Gives Math World a Big Jolt" 8/19/2015

Daily Mail "Mathematicians Find New 'Perfect Shape' That Solves One of Their most Complex Problems" August 17, 2015.

Casey gave us a bit of history about pentagonal
tilings stating that there are now at least 15 classes of convex pentagonal tilings, as illustrated below. German mathematician Karl Reinhardt discovered the first five in 1918. Fifty years later, R. B. Kershner found three more in 1968. Richard James discovered a ninth type of pentagonal tiling in 1975.

Next came discoveries by Marjorie Rice, a San Diego housewife in her 50s with only a high school education. She had read about James' discovery in her son's copy of Scientific American. An amateur mathematician, Rice developed her own notation and method and over the next two years discovered four more types of pentagons that tile the plane.

The 14th tiling was found by Rolf Stein in 1985. Jennifer went on to give us the story of how, thirty years later, the 15 th tiling was found by their three person team which included, David Von Derau, a recent undergraduate Computer Science major, also of University of Washington Bothell. They used


$$
\begin{array}{ll}
A=60^{\circ} & a=1 \\
B=135^{\circ} & b=1 / 2 \\
C=105^{\circ} & c=\frac{1}{\sqrt{2}(\sqrt{3}-1)} \\
D=90^{\circ} & d=1 / 2 \\
E=150^{\circ} & e=1 / 2
\end{array}
$$

CASEY MANNUNIVERSITY OF WASHINGTON BOTHELL
The newly identifled pentagon.
mathematics to set up the parameters. "We discovered the tile using a computer to exhaustively search through a large but finite set of possibilities" according to Casey and Jennifer who spoke at our Spring PSCTM dinner. It has not yet been proven whether this now exhausts all possible cases of pentagonal tilings - perhaps this remains as an open question?

Joyce Frost
PSCTM Program Chair


With the latest discovery, there are now 15 known convex pentagons, or non-regular pentagons with the angles pointing outward, that can 'tile the plane'


## PSCTM 2016 FALL DINNER

# Reflections on Is Democracy Fair: <br> The Mathematics of Voting and Apportionment 

Featuring Dr. Leslie Nielsen, Math Program Manager

Puget Sound ESD

Many of us were avidly following one or more races in our recent election, but few of us question if elections are mathematically "fair". In this talk, Leslie explored some mathematical perspectives on voting and shared some activities from her co-authored 1997 book. The activities can be used with students grades 6 through 12, at differing levels of mathematical complexity. We pondered questions of mathematical fairness in elections. Leslie has been a math teacher since 1983, working at the UW for 3 years in the Secondary Teacher Ed program, in Issaquah for 7 years as a teacher followed by 8 years as the math specialist. She has also taught in Pennsylvania, California, and Denmark. Is Democracy Fair was written while she lived in Denmark.

When Leslie started working on this book, Is Democracy Fair: The Mathematics of Voting and Apportionment, she was living in Denmark, Michael DeVilliers, her co-author, was living in South Africa, and their editor, Crystal Mills, was living in California. Leslie remarked that the movie, "While You Were Sleeping", had just came out and they felt that the title aptly described their experience - sending emails back and forth through three different time zones as they worked on the manuscript together.

So, what does fair mean? Mathematically, we speak of equal chances. Politically, we believe that the winner should be the person that the most people want. How has that been working for us? Our system is based on plurality - the winner takes all. Sometimes, interesting things can happen. In 1992, Bill Clinton took $43.0 \%$ of the popular vote compared to $37.4 \%$ for George H.W. Bush and $18.9 \%$ for Ross Perot. In 2000, George W. Bush garnered $47.9 \%$ of the popular vote to AI Gore's $48.4 \%$, but managed to become President with 271 electoral college votes over AI Gore's 266 electoral college votes.

Are there alternatives to plurality? Another option is ordinal ballots, where voters rank their preference listing them from most to least favorite, and then use that information to create a preference schedule. Leslie illustrated how this would work by giving a pizza for our next meeting example. Yet another option is the standard run-off election, where the task is to eliminate all the candidates except the top two. A different option is called 'hare elimination' which uses a sequential run-off: refer to the ballots and repeatedly eliminate the least favorite choice until a single winner remains. Another option is one used in the House of Representatives, called sequential pairwise procedure. By this method, pairs of candidates are chosen randomly and then preference schedules are used to simulate elections. Using the pizza order example, we looked at how each method would play out with some pizza choices and data. If you would like to read through Leslie's power point, which she has kindly shared with us, please email me at: frostjoycee@gmail.com. Also, if you are interested in a PDF copy of the book (Making Democracy Fair: The Mathematics of Voting and Apportionment), use this link: http:// dynamicmathematicslearning.com/13226640-math-voting.pdf

Leslie and I first met while both serving as Microsoft Math Coaches through the eight district Microsoft grant September 2007 - June 2010. I was a math coach through Lake Washington School District and Leslie was representing Issaquah School District. From there, Leslie went on to get her doctorate in Math Education at the University of Washington and now works at the Puget Sound ESD. Some of you may know that fellow PSCTM member, Remy Poon also works there. When I asked Leslie to speak for our dinner, I specifically asked her to speak about her book,
even though I knew that it was from 1997 and she would probably rather speak on her dissertation topic, working with quadratics. Happily, I was able to attend her 55th Northwest Mathematics Conference workshop in Yakima, WA almost two weeks later. Her workshop was entitled, "Examining Quadratics: Deepening Our Content Knowledge and Implementing Rich Tasks". It was fabulous as well. Thank you so much, Leslie Nielsen, for a terrific Fall Dinner presentation that really made us think.

Joyce Frost
PSCTM Program Chair

## PSCTM 2017 Winter Dinner

## Inclusion in the Mathematics Classroom

## Featuring Esther Andrews and Rosetta Lee of Seattle Girls' School

Hear from a middle and high school math teacher and a diversity expert on practical strategies you can employ in your classrooms to increase inclusion, engagement, motivation, equity, and achievement. Whether you're looking for simple changes you can make tomorrow or you're advocating for systemic shifts, walk away with applicable ideas that make mathematics success accessible for all students.

Here is a bio about Rosetta Eun Ryong Lee.
Rosetta Lee serves Seattle Girls' School in dual roles. SGS is an innovative school for Junior High School girls, aiming to empower women leaders and change agents and dedicating its energies to a diverse community of students and faculty, an anti-bias mission, and an integrated curriculum. As a faculty member, Rosetta teaches subjects such as science, math, technology, art, ethics, model building, and more. As a professional outreach specialist, she designs and delivers trainings for all constituencies of the school community, as well as the local and national educational and nonprofit sectors.

Since 2004, Rosetta has been a diversity speaker and trainer on a variety of issues, including cross cultural communication, identity development, prejudice reduction and coalition building, gender and sexuality diversity, facilitation skills, bullying in schools, and gender bias in the classroom. Rosetta has presented at numerous conferences and nonprofit organizations such as the White Privilege Conference, Junior League, and City Year. She has also worked with over 90 K-12 public and independent schools throughout the country, as well as a number of colleges and universities. She has served several years on the faculty of the National Association of Independent Schools (NAIS) Diversity Leadership Institute, as well as NAIS' diversity think-tank cadre, Call to Action.

Rosetta has served as President on the Board of Directors of SMARTgirls, a Director on the Board of the Northwest Association for Biomedical Research (NWABR), Chair of the 2006 Seattle Expanding Your Horizons Conference, Co-Chair of the 2006 NAIS People of Color Conference, Think Tank Member of the 2012 NAIS Annual Conference, and as a trainer/facilitator with the National Coalition Building Institute. Rosetta is the recipient of the 2007 Outstanding Partner in Education Award from the Northwest Association for Biomedical Research and recipient of the 2005 Distinguished Teacher Award for the Washington Federation of Independent Schools.


## '55th Northwest Mathematics Conference Win with Math - Yakima, Washington - October 2I-23, 2016

As usual, I made the absolute most of conference experience! Joe and I joined up with fellow PSCTM member, Art Mabbott, to tour the Makerspace Showcase, to learn about some of the programs involving robotics, coding, drones, 3-D printing, and computer science in our schools across the state. As always, the best part was talking to the kids about their projects and achievements. It was fabulous to hear the eloquence and passion that these middle and high school boys and girls shared for technology.

My first session on Saturday was by featured speaker, Ruth Parker, on "Letting Go: Using Number Talks to Transform Our Practice". After hearing the background and getting a chance to experience a bit of a Number Talk with other participants, Ruth shared a stunning video illustrating a 15 minute number talk in practice. It was hard to believe that the students were only $3^{\text {rd }}$ graders - their mathematical maturity was beyond their young ages. When the teacher participants worked on the problem (81-26), we were surprised to discover that four or five different ways were showcased. The 3rd graders had a few additional strategies of their own! But, even more amazing was the mathematical respect for each other and their work that was exhibited. I wish that our political discourse was this respectful! The teacher in the video is math coach Hailey Guilmore. She had been working with the 3 rd grader's teacher and doing $15 \mathrm{mi}-$ nute number talks with the kids from September - March. This video was from March. This was empowering and I believe, could transform mathematics education. Number talks, done well, could be a way to put joy back into teaching mathematics while empowering students to be mathematicians - a pretty exciting thing.

Finally, here is a quote by Ruth Parker that really resonated with me: "I used to think my job was to teach students to see what I see. I
no longer believe this. My job is to teach my students to see; and to recognize that no matter what the problem is, we don't all see things the same way. But when we examine our different ways of seeing, and look for the relationships involved, everyone sees more clearly; everyone understands more deeply."

Next, I slipped out of one workshop to pick up the $2^{\text {nd }}$ half of a workshop by our very own PSCTM president, Christy Frary! What a wealth of technology tips she had to share with us to really power our classrooms. I will highlight a few of the sites that she suggested to check out.

Coolmath.com
Purplemath.com
RegentsPrep.org
Desmos.com (terrific free online graphing calculator)
Geogebra
ThingLink
Quizzizz (for Formative assessment)
Kahoot
ExitTix
Google Forms (for Summative assessment)
Canvas
PBLs
Next up was a session by past NCTM president, Gail Burrill, who also works with Texas Instruments as well as teaching at MSU and heading the annual Park City Math Institute Secondary Teachers Program. Her talk was on, "Understanding Chance Events: From Probability to Random Sampling". Since I have recently tutored a student in AP Statistics, this was particularly helpful. As always, her sessions are quite informative and inspiring.

After hearing Leslie Nielsen's PSCTM Fall dinner talk on, Is Democracy Fair?, it was a joy to participate in her workshop "Examining Quadratics: Deepening Our Content

## 55 th Northwest Mathematics Conference

## Continued from previous page

Knowledge and Implementing Rich Tasks". We were given a group task (groups of four) and led through the process of effective group work, including assigned roles and tasks, culminating in a group poster created by all group members. We then did a gallery walk, with post its, to examine all the various groups' work. As Leslie commented, this was a rich, relevant, rigorous task planned to engage all students' viewpoints and methods.

The last session for Saturday, was featured speaker, Steve Leinwand. He worked with the three year Microsoft Math Coach grant that I participated in from 2007 - 2010, so I was delighted to hear him speak again. He was also our closing keynote speaker for the 2013 Northwest Mathematics Conference in Bellevue, WA. His session was entitled, "Insights and To-dos Drawn from 1000 Classroom Observations since 2010". As many of you know, Steve is a very fast talker! That said, here are a few of the gems from his talk. What an amazing time to be teaching mathematics! According to Steve, we should be particularly excited about the Common Core Math Practices $1-4$. This is a fabulous place to start:

Make sense of problems and persevere in solving them

Reason abstractly and quantitatively
Construct viable arguments and critique the reasoning of others

Model with mathematics
Start by considering two of your units that you really think suck or that you hate to teach or that do not go well. He said that it is unreasonable and unprofessional to change by much more than $10 \%$ per year, but, it is also unreasonable to not change $10 \%$ per year. Rather than setting up our lessons for "You - We \| - I" formats, we should be setting them up as " $\mathrm{I}-\mathrm{We}$ - You". This is turning the lesson idea upside down from: (You) you instruct, (We)
you work some problems with them, and then (I) they do some individual work. Try replacing this with: (I) they work on something individually, (We) they work together with other students on the task, and (You) then you pull together the results with the whole class. Check out some amazing resources at: steveleinwand.com.

Sunday morning was my workshop on "Amazing Dissections of the Cube". It was a real joy to share my passion for modeling math concepts and making sense out of structure and formulas.

Next, it was a delight to attend fellow PSCTM member, Lynn Adsit's workshop on "What's My Line? A Fresh Look at Linear Data" Lynn and I have taught together at two different schools, Evergreen JH and Lake Washington HS for probably 12 years total. But, Lynn always has something new and this workshop was a wealth of new ideas on collecting and interpreting interesting data to use in the classroom.

The closing keynote was Michael Stevens who created the YouTube channel Vsauce 1 in 2010. It started as a channel focused on video game comedy content, but later evolved into one which explores such puzzling math/ science questions as: "Why are Things Creepy?" or "What If You Were Born In Space?" Michael is based in London. He writes, hosts, and edits videos to feed our hunger for cool and interesting facts and ideas. Vsauce 1 received a 2014 Streamy Award for Best Science and Education Channel and the 2014 People's Voice Webby Award for Best News and Information Channel. Check out VSauce 1 as well as his partner channels, Vsauce2 and Vsauce3 (run by Kevin Lieber and Jake Roper). Michael has also been a featured speaker at TEDActive 2013 and TEDxVienna 2013. Enjoy!

Joyce Frost PSCTM Program Chair

## Last Mathematician Standing

Choral counting is a favorite classroom routine of mine! It's quick, it takes just a little preparation, and it's engaging for my students. I like to play a game I affectionately call, "Last Mathematician Standing". In this version of choral counting, students make a large circle around the room. I choose a number for us to count by and a target number for us to stop on. For example, when we are exploring lessons about multiplication or repeated addition, I might have students count by 6 . Then I choose our target number, for example 48. As a whole group we will count the sequence of multiples out loud to be sure all of the students will know what to expect. If the students are new to learning the multiples of 6, l'd record the pattern on the board as reference.

I pick a student to start the counting and the fun begins. He or she says " 6 ", and the next student says " 12 " and each mathematician states the next number in the sequence as we make our way around the circle. When a mathematician states the target number he or she quickly sits down. The person to his or her side, who has not yet said a number, begins the sequence again. The counting sequence begins and ends again and again until one mathematician in left standing.

I like to stop a few times as we are playing the game, and I ask students to stop and think about who they believe will be the next person to say our target number. Sometimes, as we get closer to having a final round, I ask the students to predict who they think will be the Last Mathematician Standing. I encourage students to point to the person who they think will "win" the game. Stopping to make predictions along the way helps keep the students sitting engaged in the learning. We typically celebrate the winner with a classroom cheer.

A variation of this game is to allow students to use calculators. I hand out calculators to all of the students and $I$ teach them how to skip count using the device. This is especially fun when counting by numbers that are less frequently used. For example, I might suggest to my students that today we will count by a baker's dozen. It's such fun! I've also found that having a calculator, or a list of the multiples we will say out loud, allows everyone to feel comfortable to enjoy this fun classroom routine.

More Number Fun!
Try having your students do this trick and discover why it always gives the same result.
I. Pick any three digit number
2. Multiply the number by 7
3. Multiply the result by II
4. Multiply the result by 13 .
5. What's your answer? It should be your original number twice.

For example if your original number is 123 then your final answer is 123 I 23 .
Here's why you always get the same answer:

| Reason | Statement |
| :--- | :--- |
| Original number $=\mathrm{abc}$ | $100 a+10 b+c$ |
| $7^{*} 11^{*} 13=1001$ | $(100 a+10 b+c) 1001$ |
| Distributing | $100,100 a+10,010 b+1,001 c$ |
| Rewrite in place value form | $100,000 a+100 a+10,000 b+10 b+1,000 c+1 c$ |
| Rearrange to place value order | $100,000 a+10,000 b+1,000 c+100 a+10 b+1 c$ |
| Write in numerical equivalent | abcabc |

Jane Bissonnette

## Blogs and Websites I like...

- Math Munch
https://mathmunch.org/2016/09/29/the-dice-lab-sum-of-cubes-and-double-polyhedra/
- Math For Love
http://mathforlove.com/
- Jo Boaler YouCubed
https://www.youcubed.org/
- NCTM blogs
http://www.nctm.org/tcm-blog/
- The power of having more than one right answer: Ambiguity in math class http://www.nctm.org/Publications/Teaching-Children-Mathematics/Blog/The-power-of-having-more-than-one-right-answer_-Ambiguity-in-mathclass/
- Achieve The Core: UnBounded Ed https://www.unbounded.org/


## RSA Cryptography and Prime Numbers

In 1976, three MIT researchers, Ron Rivest, Adi Shamir, and Len Adleman, released a public key cryptographic system, called RSA, based on Fermat's Little Theorem and the Chinese Remainder Theorem. The great advantage of a public key system is that the person sending the coded message can use a key that anyone could have access to and still create an encrypted message that only the person who created the key can read. One of the common uses of public key encryption is for online credit card payments. In the RSA system, they make use of the fact that it is relatively easy to multiply large numbers with computers, but fiendishly difficult to find prime factors of large numbers. Finding the prime factorization of a large composite number can only be done, at present, by trying all of the likely primes to see if they divide evenly into the number.

Sarah Flannery wrote a very nice explanation of encryption in general and the RSA encryption system in particular in her book "In Code, A Young Woman's Mathematical Journey" published in 2001. Her book is fun to read, has some interesting puzzles to illustrate how she learned to think mathematically, and is accessible to anyone with a knowledge of basic Algebra. It is the story of research and discoveries that won her Ireland's Young Scientist of the Year award at the age of sixteen.

The gory details of how the RSA system works are as follows:

In modular arithmetic, also sometimes called remainder arithmetic, $\boldsymbol{a} \equiv \boldsymbol{r}(\bmod \boldsymbol{p})$ means that for some integer $\boldsymbol{k}, \boldsymbol{a}=\boldsymbol{k}^{*} \boldsymbol{p}+\boldsymbol{r}$, or, stated in another way, $\boldsymbol{a}$ divided by $\boldsymbol{p}$ has remainder $\boldsymbol{r}$. The inverse of a number $\boldsymbol{a}(\bmod \boldsymbol{p})$ is the number $\boldsymbol{b}$ such that $\boldsymbol{a}^{*} \boldsymbol{b}=\boldsymbol{k}^{*} \boldsymbol{p}+\mathbf{1}$, or $\boldsymbol{a}^{*} \boldsymbol{b}$ $(\bmod \boldsymbol{p}) \equiv 1$. For example, 5 is its own inverse modulo 12 , because $5 * 5=25(\bmod 12) \equiv 1$.

Fermat's Little Theorem says that: if $\boldsymbol{p}$ is prime and $\boldsymbol{a}$ is an integer not divisible by $\boldsymbol{p}$, then $\boldsymbol{a}^{\boldsymbol{p}-\mathbf{1}} \equiv \mathbf{1}(\bmod \boldsymbol{p})$.

In the RSA algorithm, the system works as follows:

Take two large prime numbers, $\boldsymbol{p}$ and $\boldsymbol{q}$, and a number $\boldsymbol{e}$ that is relatively prime to the product $(\boldsymbol{p}-\mathbf{1})(\boldsymbol{q}-\mathbf{1})$. These large primes are on the order of 200 digits, so their product is on the order of 400 digits. The number $\boldsymbol{e}$ and the number $\boldsymbol{p}^{*} \boldsymbol{q}$ are distributed as the public part of the key. Anyone who wants to encode a message to you translates the message into a number $\boldsymbol{M}$, then computes the coded message $\boldsymbol{C} \equiv \boldsymbol{M}^{\boldsymbol{e}}(\bmod \boldsymbol{p q})$. The gibberish number $\boldsymbol{C}$ is then sent to the recipient, who alone knows $\boldsymbol{p}, \boldsymbol{q}$, and the number $\boldsymbol{d}$, which is an inverse of $\boldsymbol{e}$ modulo $(\boldsymbol{p}-\mathbf{1})(\boldsymbol{q}-\mathbf{1})$. The recipient retrieves the message when he computes $\boldsymbol{M} \equiv$ $\boldsymbol{C}^{\boldsymbol{d}}(\bmod \boldsymbol{p q})$. The reason this works is:

$$
\begin{aligned}
& \boldsymbol{C}^{\boldsymbol{d}}(\bmod \boldsymbol{p q}) \equiv\left(\boldsymbol{M}^{\boldsymbol{e}}\right)^{\boldsymbol{d}}(\bmod \boldsymbol{p q}) \\
& \equiv M^{\boldsymbol{e d}}(\bmod p q) \\
& \equiv \boldsymbol{M}^{(\mathbf{1}+\boldsymbol{k}(\boldsymbol{p}-\mathbf{1})(\boldsymbol{q}-1))(\bmod \boldsymbol{p q})} \\
& \equiv M
\end{aligned}
$$

Example: $\boldsymbol{p}=43, \boldsymbol{q}=59, \boldsymbol{e}=13$. Represent the message STOP by each letter's position in the alphabet as 18191415 , then block the letters in pairs.

Compute $1819^{13}(\bmod 2537) \equiv 2081$ and $1415^{13}(\bmod 2537) \equiv 2182$. The coded message is 20812182.

The secret key, $\boldsymbol{d}=937$, was created by finding the inverse of 13 modulo $42 * 58$.

Recovering the message, $2081{ }^{937}(\bmod$ 2537) $\equiv 1819,2182^{937}(\bmod 2537) \equiv 1415$.

Material summarized from Kenneth H Rosen, Discrete Mathematics and Its Applications, 2nd Ed. pp 139-142.

# Nathematical Problem-Solving Workshop 

Monday, July 10th - Wednesday, July 12th 9am-3:30pm<br>University of Puget Sound



South Sound Circles will be holding a three-day workshop in mathematical problem solving MonWed July 10-12 at the University of Puget Sound. This workshop will be valuable for both math teachers and individuals in the community who are supporting efforts to close the achievement gap in mathematics. This latter group includes tutors and those involved in out-of-school math and science programs.

Mathematical problem solving does not require a particular background in mathematics but just a willingness to explore quantitative and geometric problems through reasoning.

In this workshop participants will explore a variety of questions that will connect them to the joy of mathematics and will expose them to a variety of problems and problem solving methods that can be used in classes and in enrichment programs in mathematics. The workshop is aimed at the middle school level, but individuals working with youth of all ages can benefit.

The workshop will run from 9:00 to 3:30 each day with refreshments available starting at 8:30. South Sound Circles will host lunch.

If you are interested in attending please fill out the information below and email it to David Scott at scott@pugetsound.edu.

To be sure of having a place please respond by Tuesday July 4.

Name: $\qquad$
Address: $\qquad$
Email: $\qquad$
Phone: $\qquad$

To help us plan, please say a few words on what you hope to get out of the workshop.

Also pass this announcement along to anyone you think might be interested.

David Scott, Professor University of Puget Sound

Tacoma WA 98416

If you have questions contact David Scott at
phone: 253.879.3565
fax: 253.879.3352

## GradeCam was a GameChanger

One of my colleagues share an amazing AND FREE technology tool for grading called GradeCam. Since I teach AP Statistics and we do a lot of multiple choice practice, this could be a way to give students immediate feedback in a variety of ways.

So let me first share the features of this product. As stated on the GradeCam website, teachers can

- Have immediate feedback for students
- Create and print answer forms on plain old paper
- Correlate assessment items to the Common Core or other state standards (for the paid version)

Transfer grades into any electronic grade book (for the paid version)
GradeCam Go! Plus is the paid version and costs $\$ 15 /$ month. The nice thing is you can sign up for one month (when you give finals) and then stop the service and return back to the Basic plan.

If you are interested in this free game changer, here
is the bare-bones description of how to get started for FREE!! First you sign-up for a GradeCam Go! Basic account at https://gradecam.com/ . With the free account, you can have a multiple choice assessment with up to 10 questions. Right now, though, if you sign up you can get a 30 day trial with up to 1000 questions per assessment (gosh who would have 1000 MC questions?!!) and the


To create your free GradeCam account, please enter your email address below.

Email Address ability to transfer the results to your electronic grade book.

Secondly, you either create a class under the Classes tab or use the pre-made class of 30 (I used that for some formative assessment in which I didn't need the results, but the kids did). You can import class lists or type them in. When you do this, each student needs an ID number which is then printed on the scan sheet (bubbled in, too).


Print a Custom Form



## GradeCam was a GameChanger

## Continued from previous page

Next, you create an assignment. Name it and enter the answers on the bubble screen. You can also decide to have multiple forms. On the student's answer sheet, they need to indicate which form they took.


## Done

Then, you print out scan sheets that have each student's name and ID already on the sheet; or you can have students bubble in their own ID. Hand out, have the students take the assessment. If you have multiple forms, be sure the student indicates the form taken. You can use the camera on your computer to scan, a doc camera connected to your computer, or your cell phone to scan the filled out answer sheet. Today I chose to walk around and scan with my phone (see phone screenshot). I could tell the students how they did or tell them which question they should rethink...immediate feedback!


# Association for Women in Nathematics 

Each year, the Association for Women in Mathematics sponsors an essay contest open to students from grades 6 to college undergraduates. Students are invited to submit an essay about a woman working in a mathematical sciences career. Submissions must be received by January 3Ist each year. More details can be found at https://sites.google.com/site/awmmath/programs/essay-contest.

The following essay was written by Lyudmila Polevoy, a sophomore at the University of Washington and 2015 graduate of Lynnwood High School in the Edmonds School District..

## The Most non-Mathematician Mathematician

On December 6, 1989, a horrific shooting occurred at the École Polytechnique in Montreal, Canada. Annie Raymond was a three-yearold toddler on that tragic day of the Montreal Massacre. "It was a shooting done by a young man who felt women didn't have a place at a university," recalls Annie, now one of two female postdocs in the math department at the University of Washington. "He made all the men leave and shot all the women." For a young child, this was a very traumatic, yet memorable childhood incident-as it stands as a stark reminder of the sexism faced by women in education, and by Annie personally.

Throughout grade school, because the schools Annie attended had no cliques her 'nerdiness' was, in fact, a desirable trait. Annie spent much of her time helping other students with their math homework. "One of my best memories," recalls 30-year-old Annie, "was when every single kid called about one particularly hard problem [in the same night]." Annie felt so popular because of it.

Annie excelled in school. While her father and other male relatives had received a university education, none of the women in her family did. Annie's mother was an extremely intellectual individual-she was ahead of her class in school and even skipped two grades. However,
as for most women at that time, the possibility of going to a university was never explored. Annie's mother became a library technician at a hospital and though she loves her job, she wonders what her life would have looked like had she developed herself further with higher education. Annie took this as even more motivation to attend a university.

Even though Annie knew she was a future university student, she couldn't see herself going into math because in her head, math was useless. She wanted to do good in her life and couldn't see how one could do good with math. So for a long time, she resisted the idea of herself in mathematics-though math brought her immense pleasure. When she was young, her father showed her a Möbius strip and, fascinated as she was, she couldn't help but be that annoying kid who asked all her teachers why the Möbius strip worked. At last, in Cégep-a Canadian program between 11th grade and workforce or university life- a teacher of hers could explain what nonorientable surfaces were.

As a last year postdoc at the UW, Annie is now not only teaching, but also facing a major decision about her future employment. This academic year, Annie is teaching multivariable calculus courses as well as conduct-

## The Most non-Mathematician Mathematician

## Continued from previous page

ing research that exploits the symmetry in semi-definite programs. Annie loves what she does because it excites her, as it pulls together many different aspects of mathematics including optimization, algebraic geometry, combinatorics, representation theory and theoretical computer science. She wants to be a professor, and though she already has offers, she must decide what kind of school she wants to work at. With two options-a research versus a liberal arts school-Annie must decide whether she wants more emphasis on teaching or research in her future mathematics career.

The Raymond family has always been very supportive and understanding of Annie. They believe that going further in a university is important and good for both boys and girls. Though the gender gap is large in the work-place-there are fewer and fewer women in more advanced levels of mathematics-there is now, because of people like Annie, greater awareness of the issue. Though she does not feel that her male colleagues regard her as less intelligent because of her gender, Annie does note that there are many studies that show that equally qualified applicants are judged differently based on their gender and race.

Annie says that the UW is a wonderful place to be in terms of how men treat women. She notes that in other environments, gender bias remains a glaring problem. At MIT, where she did her undergraduate degree, everyone is intelligent and highly capable, yet men would frequently make obtuse comments about women. A former colleague claimed his buddy,
who didn't get in, was much better than Annie, and Annie got in only because she was a girl. Professors would make negative remarks in class about women which, given that often Annie was the only female in the classroom, she couldn't not take personally.

Annie considers herself lucky because she would have quit had it not been for two visiting professors in the spring of her sophomore year: Professors Richard Ehrenborg and Margaret Readdy. The couple, who taught the class together, saw that Annie had lost selfconfidence. They were very supportive in helping her rebuild her self-esteem and formed a personal bond that remains to this day. As a result of their support, her grades turned around and she scored high on the final. Professors Richard Ehrenborg and Margaret Readdy restored Annie's hope and direction. Because she succeeded in their polytopes class, she began taking more math courses and met her future postdoc mentor, Rekha Thomas. The encouragement that Rekha gave Annie meant everything: working closely with a female professor encouraged Annie to not abandon her aspirations in mathematics. Annie now is in a position to take up and carry the mantel of her mentors. Annie believes it is important, especially for young women going into mathematics, to have a female role model to look up to. Thus Annie struggles make a decision: should she go into a competitive research school, where women professors are very scarce, to perhaps become the role model that female students deserve or, would she be happier in a place where there already exists a very supportive environment for women?

Annie believes that though America has pro-

## The Most non-Mathematician Mathematician

\| gressed in terms of their views of gender, we must not stop now because it is too easy, when a || struggle isn't yours, to be dismissive it and sweep it under the rug. We must remain vigilant;
$\|$ we cannot become complacent as sexism and discrimination against women still exist, particu|| larly in STEM subjects. Women often feel "forced out" of math simply because of sexist attitudes, and not because of aptitude. Annie strongly believes that women would be no less than equals to men in STEM, except due to social attitudes that sciences are not a woman's place, which sadly are too often already ingrained in women themselves.
Annie describes herself as a "most non-mathematician mathematician," since her life encompasses far more than just the pursuit of mathematics. When she is not teaching or research\| ing, Annie loves to give talks to young women and children, who might otherwise not consider a $\|$ career in STEM. She encourages them to pursue a STEM field and not fall prey to stereotypes $\|$ or social expectations. Annie also volunteers at a prison, teaching college math to inmates so they can get an associate's degree. Annie believes that her mathematics research isn't the only thing that defines her life. While on a personal and professional level it is highly gratifying to her, it has become far more gratifying in that she has found ways to channel it into doing good in society.


## 2017 CSTA Annual Conference July 8-11, 2017

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## GradeCam was a GameChanger

## Continued from page 13

Last of all, if you are interested in item analysis or whole class performance, you can look at the results.


What new FREE technology have you used lately that has positively impacted your practice in the classroom?

Lynn Adsit
Mercer Island High School


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Dan Meyer, presenter of TED Talk "Math Class Needs a Makeover" and Chief Academic Officer of Desmos
Fawn Nguyen, math teacher, presenter, curriculum writer and author of several online curricular resources, including visualpatterns.org and mathtalks.net

## Nationally Known Speakers:

Catherine Twomey Fosnot: Founding Director of Mathematics in the City and is the lead author of the Contexts for Learning Mathematics series as well as the Young Mathematicians at Work series.

Annie Fetter: Math educator with the Math Forum at NCTM.
Graham Fletcher: Classroom teacher, math coach, district math specialist with a passion for conceptual understanding through problem-based lessons.
Robert Kaplinsky: Trainer of mathematics educators who want their students to be better problem solvers.
Chris Shore: High school math teacher, coach, presenter and trainer, and author and editor of The Math Projects Journal.
Andrew Stadel: Creator of estimation180.com, math teacher, coach and consultant.
Kim Sutton: Teacher, math specialist, consultant and author of 15 books including Dazzling Dominoes.


Important Information:
Pre-registration for OCTM or other math association members is only \$185 (\$210 for non-members). One box lunch is included with early registration (for Friday).

David Purdy, Co-chair
Jennifer Bell, Co-chair
Stephanie Blair, Co-chair
Marilyn Harlow, Program msharlowmath@gmail.com


To increase awareness of women's ongoing contributions to mathematics, the Association of Women in Mathematics and Math for America are co-sponsoring an essay contest for biographies of contemporary women mathematicians and statisticians in industrial, government, and academic careers.

The essays will be based primarily on an interview with a woman currently working in a mathematical career. The AWM Essay Contest is open to students in the following categories:
grades 6-8
grades 9-12
undergraduate

Winners in each category will receive a monetary prize, and their essays will be published online at the AWM website.

The grand prize winner will have his or her entry published in the AWM Newsletter.

For more information, contact organizer Dr. Heather Ames Lewis at hlewis5@naz. edu or see the contest web page: https://sites.google.com/site/awmmath/programs/essay-contest. The deadline for receipt of entries is January 31, 2017.


## The Association for Women in Mathematics (AWM) is a non-profit organization founded in

 1971.The purpose of the Association for Women in Mathematics is to encourage women and girls to study and to have active careers in the mathematical sciences, and to promote equal opportunity and the equal treatment of women and girls in the mathematical sciences.

AWM currently has more than 3000 members (women and men) representing a broad spectrum of the mathematical community - from the United States and around the world!

More information is available at https://sites.google.com/site/awmmath/awm


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## The Beauty and Joy of Computing

The Beauty \& Joy of Computing is offering a free Professional Development opportunity for high school computer science teachers this summer for Computer Science Principles. We are a College Board endorsed AP CS Principles curriculum and professional development provider. If you attend BJC PD Palooza (or another BJC PD) you do not need to attend an AP Institute.

Our BJC PD Palooza workshop is July 17-21 at San Francisco State University in San Francisco, CA. This will be an all expenses paid workshop -- including the teacher's travel, lodging and meals for the entirety of this particular workshop. Teachers do not need to have any background experience with computer science to attend. A principal's commitment letter is required for either academic year 2017/2018 or 2018/2019.

The Beauty and Joy of Computing (BJC) curriculum, developed at the UC Berkeley, emphasizes the joy and complexity of creating visual computer programs and apps, balanced with critical reflection on both the potential benefits and harms of new computing technologies. Our curriculum has a strong design and programming focus, using the visual programming language Snap! and a collaborative, exploratory approach where students work in pairs and teams to bring their own unique creations to life. BJC situates computing in the context of how students interact with computers and devices in their daily lives. Our endorsed curriculum will prepare your students for the AP Computer Science Principles exam.

II Feel free to explore BJC at bjc.berkeley.edu and our curriculum at bjc.edc.org. Check out a BJC Flyer. Apply for our BJC PD here!

Do you have a favorite math topic to teach? Mathematical pictures from your travels? A book review or website you'd like to share? A blog you find has lots of interesting ideas? A conference or workshop you love attending? Are there features of Puget Soundings that you particularly enjoy? Is there an article you'd like to respond to?

Send an email to psctm.newsletter@gmail.com and see your tips or editorial comments published in the next newsletter!


CS4HS at the University of Washington is a 3-day workshop teaching the basics of CS and CS education to high school and middle school STEM teachers. CS4HS is hosted by the Paul G. Allen School of Computer Science \& Engineering, with guest speakers from local tech industry, Carnegie Mellon University, and related UW departments.

CS4HS details: https://cs4hs.cs.washington.edu/
Who: Teachers of high school and middle school math, science, or computer science

What: Learn what the field of computer science has to offer and take home ideas on how to incorporate computational thinking into your classes

When: Wednesday, August 2nd - Friday, August 4th, 8:30am - 5pm
Where: UW campus (Seattle)
Why: All students should understand the basics of computational thinking and how technology works! Basic CS experience can foster creativity, inspire interest in other STEM disciplines, and provide valuable skills for later courses and work

Cost: \$50 registration fee includes light breakfasts and lunch each day, an evening reception at the end of the first day, parking/bus reimbursement, dorm housing for out of town participants, and clock hours

Clock hours: 20
Questions: Contact Raven, at cs4hs@cs.uw.edu


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## Summer Conference *August 6-9, 2017

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KEYNOTE SPEAKERS:
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"What Connected Educators Do Differently"
RAY CONNOR
"BOEING-Career Connected Learning"
GARY MOORE
"100 YEARS of CTE"
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## TENTATIVE AGENDA

Sunday, August 6, 2017

- STEM Training
- Boot Camps
- CTE Program Sessions
- Exhibitors

Monday, August 7, 2017

- Breakfast
- Opening Session
- Exhibitors
- OSPI Pathway Updates
- STEM Training
- CTE Program Sessions
- Lunch with Exhibitors
- CTE Program Sessions

Tuesday, August 8, 2017

- WA-ACTE AWARDS Breakfast
- STEM Training
- Program Specific Sessions
- Buffet Luncheon
- Program Specific Sessions
- WASTS BBQ

Wednesday, August 9, 2017

- Continental Breakfast
- STEM Training
- Program Specific Sessions
- Closing Session
- Clock Hours


## Click Here for the Summer

Conference Webpage

## Hotel Info

The Davenport Grand
333 West Spokane Falls Blvd, Spokane WA \$99 Single/\$109 Double/\$119 Triple/\$129 Quad Self Parking Rate: \$10 a day Registered Guests
Puget Sound Council of Teachers of Mathematics is a professional or-
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