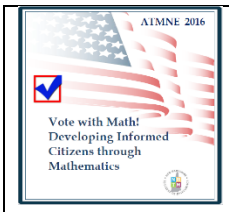
Mathesis

Volume 49, Issue 2 November 2016



Vote With Math! Developing Informed Citizens Through Mathematics is Now History!

By Cecile Carlton
NHTM Past-President

ATMNE 2016 was held on October 20-21, 2016 in Manchester NH. NHTM served as the host for the event where 374 mathematics educators from six New England states converged to participate in over 75 sessions to learn from peers and leaders in the profession. Annie Wallace, NHTM President, welcomed teachers and introduced Virginia Barry, New Hampshire's Commissioner of Education. Matt Larson, NCTM's current President, presented the opening keynote session where he addressed *Overcoming Obstacles to Make Mathematics Work for All!* – focusing on raising student achievement for all by reviewing six principles of highly effective mathematics programs as outlined in NCTM's document *Principles to Action.* Tom Reardon, from Youngstown State University in Ohio, provided Thursday's Luncheon Keynote about combining technology and mathematics activities. On Thursday afternoon, our own, Dr. Richard C. Evans, retired from Plymouth State University, honored as the Balomenos Memorial Lecturer and provided a thought provoking presentation about the need to have citizens who can recognize and analyze reliable data while he explored some data related to this election year.

On Friday, we were honored to have Margaret 'Peg' Smith, from the University of Pittsburgh, PA, who served

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Vote With Math!

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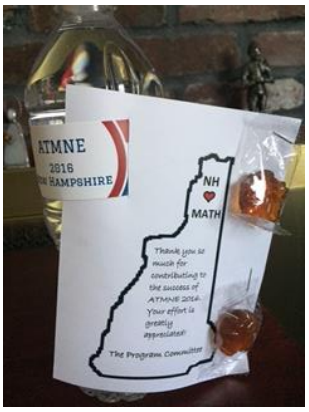
on the writing committee for the NCTM document *Principles to Action.* Peg provided the luncheon keynote, which addressed teaching practices that support student understanding and learning of mathematics and she integrated resources provided through NCTM to further teachers' professional growth. Several presenters shared materials, which can be found at the atmne2016.org web site.

John Donovan and Kim Knighton are to be commended and congratulated for putting together an excellent program of speakers. John and Kim along with Laurie Boswell made the conference an enriching experience for all who could attend. We also need to thank the committee members who volunteered many hours, which include:

- Registration Chairs, Karen Graham, Sharon McCrone, and Connie Upschulte;
- Terri Magnus who took charge of the NCTM materials tables;
- Bernadette Kuhn and Judy Curran Buck who worked with ESANE to arrange vendors;
- Amanda Barton who arranged for the on-line guidebook and worked on publicity prior to the conference;
- Jessica Jacques did awesome with signs;
- Ray Morin was outstanding with 'Session Support' in conjunction with Beverly Ferrucci who arranged scheduling of Pre-Service volunteers as well as Leslie Fallu who managed all the intricate details for her students to assist speakers and participants;
- Toni Taylor provided local information via the hospitality table and
- Scott Trahan and Bil Bowdish arranged technology.



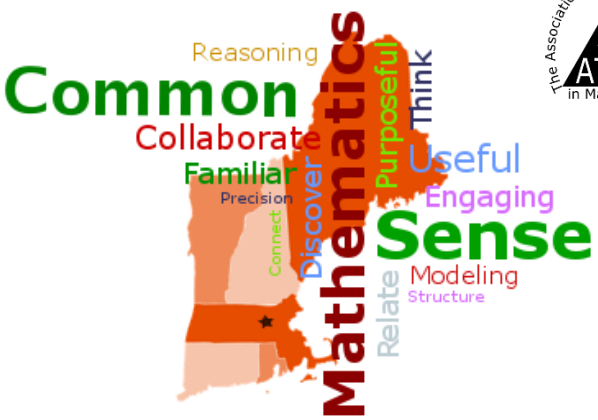
Many hours and many hands were available to make the conference run smoothly.

Roberta Kieronski and her husband Joe also collected and arranged for a Raffle of themed baskets to help raise funds for our NHTM Scholarship Fund. They manned the table selling chances and took charge of the raffle to raise around $600. They spent the entire two days and did an excellent job in that role. Thank you so much for all your hard work on this special activity.

Finally, a HUGE Thank You to our New Hampshire teachers who supported the conference as speakers and participants.

Plan now for **ATMNE 2017**

Marlborough, MA - November 2-3



President's Message
Sharing, Growing and Learning Together.

By Annie K. Wallace

Good day to math educators and supporters of math education. It looks like fall is quickly fading into the beginnings of winter as the weather turns colder and we need to warm up our vehicles and scrape the windscreens before we head off to school. Hopefully by now we are settled into routines, know our students and have a rhythm to our days.

On 20 and 21 October, NHTM had the honor of hosting the ATMNE Fall Conference, *Vote with Math! Developing Informed Citizens through Mathematics!* in Manchester. I am hoping that many of you had the opportunity to attend at least one day of this wonderful time to share, grow and learn together. I thank everyone on all of the committees, subcommittees and the co-chairs, Cecile Carlton and Laurie Boswell, who put in countless hours of hard work for more than a year to bring us the event. Without them we would not have had the chance to share with and learn from our colleagues from all over New England. Thank you to the keynote speakers and to the session presenters who gave us numerous choices. Over 300 participants attended these opportunities to learn. It was also good to just be able to touch base with friends, as well as to meet new people.

One of the key messages presented to us by Matt Larson, current President of NCTM, in his opening address was that "effective teaching is the non-negotiable core necessary to ensure that all students learn mathematics" (2016). (See Fall State Math Conference presentation at *http://www.nctm.org/larson/*) He then went on and said that an effective teacher is the greatest factor in a child's mathematical learning.

In order to accomplish this we cannot shut ourselves away behind closed doors and ignore the changes and research going on around us, but must continually be learners ourselves. We must look for opportunities to get better and to strengthen and perfect what we already have --- it is like Zeno's paradox --- we must strive for perfection, but realizing we can always go half way further in reaching the goal. NHTM, ATMNE, NCSM and NCTM, along with other state and national organizations, provide professional development opportunities, chances to talk to others about what we do and what we would like to do, and resources to explore on their sites.

NHTM's next state-wide PD offering will be on March 16, 2017 at the Holiday Inn in Concord, NH, when we will be holding a Spring Dine & Discuss and Annual Meeting. Our guest and presenter will be Greg Tang. If you are not familiar with Greg Tang and his work in supporting math education and learning, please consider this as a valuable opportunity to find out and to learn and grow with others. Also feel free to contact your NHTM Regional Coordinator to see when they will be having offerings in their area.

President's Message

Sharing, Growing and Learning Together

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Outside of our state, region and national math organizations, we can look for or create opportunities for ourselves. There are also good books, such as NCTM's *Principles to Actions: Ensuring Mathematical Success for All* and *5 Practices for Orchestrating Productive Mathematics Discussions* by Margaret Schwan Smith and Mary Kay Stein. We can form PLCs and/or book studies around these or other books. We can visit our colleagues in their classrooms and welcome them into ours. We can plan lessons or look at and analyze student work together. The NH Department of Education has also created The NH Network whose aim is to allow educators to connect to other teachers, to contact experts in the field, to explore hundreds of resources in their library and to see some of the communities and networks that are around the state.

Look for volunteer opportunities, NH is a state that relies on volunteers; you never know where this will lead you in your own learning and experiences. One opportunity is to consider running for a seat on the NHTM Executive Board. Contact Cecile Carlton, our Past-President and chair for NHTM Nominations if you want to run for the treasurer, middle-level representative, secondary representative, ATMNE representative or president-elect positions or if you would like to nominate an individual. (Those running for office need to be members whose dues are up-to-date.). Please see the NHTM website for position descriptions and responsibilities. Join our listserve to be notified of other opportunities that occur during the year.

Along with looking for and taking opportunities for ourselves as math educators, we can honour those that we look to as having excellence and effectiveness in their teaching. During the months of November-February you can nominate outstanding teachers for NHTM's Prevost Award (teachers in their first 5 years of teaching), Evans Award (teachers with more than 5 years of teaching), or Balomenos Service Award (members who provide service to the mathematics education community).

In closing, I also want to say congratulations to Dr. Richard "Dick" Evans and Ann Gaffney. Ms. Gaffney was recently notified that she received the Presidential Award for Excellence in Science and Math Teaching (PAESMT). She will be off to Washington, DC to meet the other awardees and be honored. The PAESMT is the highest national award given to teachers in math and science (including computer science). For more information on this award and to see other math educators in NH are who have been given this honor, go to http://www.nhmathteachers.org/page-1733382 . If you are interested in applying for this honor or would like to nominate a colleague please feel free to contact myself or Donna Dubey at the NH DOE for further information. Congratulations to Ann Gaffney for this huge honor and for all that she gives to her students as an excellent and effective teacher.

President's Message

Sharing, Growing and Learning Together

(CONTINUED FROM PAGE 4)

Dr. Evans was honored as the Balomenos Memorial Speaker by the Association of Teachers of Mathematics in New England (ATMNE). Dr. Evans has been a model for teachers and those wishing to be teachers of mathematics. He has guided and supported many of us in our journeys of becoming more effective teachers and in how we develop and present lessons and tasks to students to ensure that a secure understanding is had. His dedication to student learning and to teachers guiding and developing this learning has been exemplary and has provided a structure for mathematics teaching in New Hampshire and New England. It is a pleasure to say congratulations to Dr. Evans and to say that this award is well earned.

NEW RESOURCE FROM NCTM ---ARCs

What are ARCs?

ARCs are **Activities with Rigor and Coherence**. Each ARC is a sequence of 2 – 4 lessons that:

- Support *Principals to Actions*
- *Addresses a specific math topic*
- *Scaffold effective teaching*
- *Support the 8 Standards of Mathematical Practice*
- Demonstrate the 5 Practices for Orchestrating Productive Mathematics Discussions
- Integrate the wide range of NCTM resources such as:
    - Illuminations
    - Student Explorations in Mathematics
- Includes community features that offer opportunities for social interaction.

Find out more and explore at: http://www.nctm.org/ARCs/

Middle Level Representative
What is Fair in an Election?

By Katrina Hall

The past few years, we have been lucky enough to live through the positives and negatives of a presidential election. With all the political angst that arose from this recent election, one can't help but wonder what mathematics are involved in the electoral process. *Electoral College 101* by Olivianett Singer, David Deschamps and Leslie D. Farrel, provides a video introduction to the fairness of electoral voting. The idea of popular vote versus Electoral College is explained quite simply using a classroom of third graders. A seemingly simple vote on colored pencils or markers sparks a heated discussion within the classroom that can easily be transferred into any classroom.

With 24 students in a classroom, 14 voting for markers and 10 voting for colored pencils, who is the winner? The natural answer response uses the popular vote with markers winning by 4 votes. Putting the 24 students into 5 groups puts the concept of the Electoral College into play. The result is 3 of the five groups having a majority vote (over 50% vote) in their groups for colored pencils and the remaining 2 groups having a majority vote for markers. Using this method, the colored pencils win overriding the popular vote. A question posed to a classroom of students is what a possible arrangement for colored pencils to win the electoral votes given 10 students who vote for colored pencils and 14 students who vote for markers? With 24 students in a classroom and 5 groups, what is the minimum number of colored pencil votes needed to win the electoral vote?

The discussion of the voting process and fairness is a prime opportunity to discuss other voting methods that exist. In a plurality, individuals vote for their first choice and the choice with the most votes wins. If a majority vote is required then the winner must win with more than 50% of the votes.

Val	Val	Olivia	Olivia	Tim	Tim	Tim	Ethan	Ethan	Ethan
21	4	15	20	7	6	2	13	10	2

In this example Val has 25 votes, Olivia has 35 votes, Tim has 15 votes and Ethan has 25 votes. Olivia wins the plurality vote with 35 votes. If a majority vote was needed, then there would be no winner since the winner would need more than 50 votes (50/100) to win.

Plurality with elimination the choice with the least votes has all of votes removed. These votes are then given to the second choice of the individual voter. This process is repeated until one of the choices has a majority.

Middle Level Representative

What is Fair in an Election?

(CONTINUED FROM PAGE 6)

Val	Val	Olivia	Olivia	Tim	Tim	Tim	Ethan	Ethan	Ethan
Tim	Ethan	Val	Tim	Val	Ethan	Ethan	Val	Tim	Tim
Ethan	Olivia	Tim	Val	Ethan	Val	Olivia	Tim	Val	Olivia
Olivia	Tim	Ethan	Ethan	Olivia	Olivia	Val	Olivia	Olivia	Val
21	**4**	**15**	**20**	**7**	**6**	**2**	**13**	**10**	**2**

From the first choice votes, we see that Val has 25 votes, Olivia as 35 votes, Tim has 15 votes and Ethan has 25 votes. No person has a majority vote so we begin elimination by taking out all of Tim's votes and giving them to the second choice candidates.

Val	Val	Olivia	Olivia	~~Tim~~	~~Tim~~	~~Tim~~	Ethan	Ethan	Ethan
Tim	Ethan	Val	Tim	Val	Ethan	Ethan	Val	Tim	Tim
Ethan	Olivia	Tim	Val	Ethan	Val	Olivia	Tim	Val	Olivia
Olivia	Tim	Ethan	Ethan	Olivia	Olivia	Val	Olivia	Olivia	Val
21	**4**	**15**	**20**	**7**	**6**	**2**	**13**	**10**	**2**

The votes now change to Val with 32 votes, Olivia with 35 votes and Ethan with 33 votes. Still with no majority winner, another round of elimination requires Val to give up votes.

~~Val~~	~~Val~~	Olivia	Olivia	~~Tim~~	~~Tim~~	~~Tim~~	Ethan	Ethan	Ethan
~~Tim~~	Ethan	Val	Tim	~~Val~~	Ethan	Ethan	Val	Tim	Tim
Ethan	Olivia	Tim	Val	Ethan	Val	Olivia	Tim	Val	Olivia
Olivia	Tim	Ethan	Ethan	Olivia	Olivia	Val	Olivia	Olivia	Val
21	**4**	**15**	**20**	**7**	**6**	**2**	**13**	**10**	**2**

Middle Level Representative
What is Fair in an Election?

(CONTINUED FROM PAGE 7)

The votes change to Olivia with 35 votes and Ethan with 65 votes. Ethan wins with majority. Already with this alternative method of voting, the idea of what is fair can be discussed.

There are numerous methods and theories of voting to consider. A third method that can be shared with students is the *Borda Count* that takes into account each individuals top three choices and each choice is given a point value. Each first choice vote is given 2 points, a second choice vote is given 1 point and a third choice vote is given 0. The choice with the most points wins. A fourth method is the *Condorcet Method* that involves a sequence of head-to-head contests. There are several Condorcet Methods, however, the simplest is when the choice that wins the most head-to-head contests is the winner.

In all cases, the comparison of points, percentages and votes helps students to see how mathematics can be used to determine a winner and consider fairness in the process. The question is: What is fair? Leading students (and even adults for that matter) in election simulations, using various methods of counting, to expand the views in what is fair in an election

Support for these concepts:
Election Lesson: Voting Systems from Kids Voting

Is the Electoral College Unfair? from www.yummymath.com

The Plurality Method and Other Voting Systems from Illuminations of NCTM

Yong, D.H. "Mathematics of Voting," ComMuniCator (California Mathematics Council), 31:1 (September 2008), 49-52.

What's Fair in an Election?
Activity

1st Choice	Val	Val	Olivia	Olivia	Tim	Tim	Tim	Ethan	Ethan	Ethan
2nd Choice	Tim	Ethan	Val	Tim	Val	Ethan	Ethan	Val	Tim	Tim
3rd Choice	Ethan	Olivia	Tim	Val	Ethan	Val	Olivia	Tim	Val	Olivia
4th Choice	Olivia	Tim	Ethan	Ethan	Olivia	Olivia	Val	Olivia	Olivia	Val
Total Votes	**21**	**4**	**15**	**20**	**7**	**6**	**2**	**13**	**10**	**2**

Plurality

Who is the winner based on *Plurality*? _____

Who is the winner based on a majority vote? _____

Plurality by Elimination

Who is the winner based on *Plurality by Elimination*? _____

Condorcet Method

Val vs. Olivia: _____ Olivia vs. Tim: _____

Val vs. Tim: _____ Olivia vs. Ethan: _____

Val vs. Ethan: _____ Tim vs. Ethan: _____

Provide each winner of the head-to-head with 2 points. If there is a tie then provide each person with 1 point.

Val's Points Earned: _____

Olivia's Points Earned: _____

Tim's Points Earned: _____

Ethan's Points Earned: _____

Who is the winner based on the *Condorcet Method*? _____

Borda Count

Use the following point assignments: 1st choice= 3 pts., 2nd choice= 2 pts., 3rd choice=1 pt. and 4th choice= 0 pt.

Val: ____ x 3 + ____ x 2 + ____ x 1 + ____ x 0 = _____

Olivia: ____ x 3 + ____ x 2 + ____ x 1 + ____ x 0 = _____

Tim: ____ x 3 + ____ x 2 + ____ x 1 + ____ x 0 = _____

Ethan: ____ x 3 + ____ x 2 + ____ x 1 + ____ x 0 = _____

Who is the winner based on *Borda Count*? _____

Summary

Which voting method do you consider to be the fair method for choosing a winner for this election? Explain your reasoning.

Spring Dine and Discuss

SAVE THE DATE

NEW HAMPSHIRE TEACHERS OF MATHEMATICS

Featuring Guest Speaker

GREG TANG

Author of *The Grapes of Math* and
Gold Medal eBook *Math Appeal*

Dinner Meeting
March 16, 2017
4:30 - 7:30 PM
Holiday Inn
Concord, NH

Check out the NHTM website
for registration and details
http://www.nhmathteachers.org

Stay Informed!

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follow us on twitter

- @NHTM1964

Secondary Representative
QPAs and the PACE initiative

By Michelle Fox

I don't know how many schools across the Granite State are doing QPA work with the DOE and are tiered schools through the Performance Assessment of Competency Education (PACE) initiative, but Groveton High School is one of them. I participated in an all-day workshop recently, with consultants from the DOE, that are helping us create Quality Performance Assessments, that may someday take the place of yearly standardized computer testing. I pondered the process of creating Quality Performance Assessments and how the competencies that have been published by the DOE would impact our courses at GHS. I am sure that all teachers statewide want their students to be on the same page as all other students when they leave Algebra I. There are particular things that are "definites" as far as curriculum goes. Students need to be able to reason, graph the equation of a line, create equations from verbal descriptions, solve equations involving multiple steps, and so on and so forth. This would be the same for Geometry, Algebra II, and all other classes we teach. I am not sure how many schools across the state are using a competency-based only approach and are using competencies to ensure that when a student leaves a course they don't just have a particular grade of passing (ie. a 70%) but also have demonstrated mastery of those "definite" curricular items. I am all for making sure that when a student leaves my course it isn't just because they achieved a particular grade. I want to make sure that they actually LEARNED the material and are prepared for the next course that they are moving on to.

I am excited to see how successful PACE will be and how it will impact our students statewide. Also, I am excited to see what the "common" statewide QPAs will look like, what they will test, and how in-depth they will be. I think that QPA work will be a welcome alternative to standardized testing that can take weeks out of the normal school schedule. Weeks that are better spent in the classroom where students are actually learning! And so, the adventure of being a math teacher continues…can't wait to see what happens next!

Post-Secondary Representative
Professional Development for All

By Sharon McCrone

The ATMNE 2016 Conference and the recent US Presidential election have something in common. They are both reminders that it is our duty and our right to act on our behalf and the behalf of those around us. In the Presidential election, it was our right to vote and our civic duty to be responsible citizens. With professional development conferences such as ATMNE, it is our right as professionals and our duty to our students to remain active and life-long learners. And so the ATMNE 2016 Conference in Manchester, NH (whose theme was, of course, "Vote With Math") was

Post-Secondary Representative

Professional Development for All

(CONTINUED FROM PAGE 11)

a terrific opportunity for teachers across the state and the region to engage in conversations around mathematics content, effective pedagogical practices, and cutting-edge teaching ideas.

There were many great sessions that had teachers talking about and reflecting on their own practice, and talking about ways to provide more productive learning opportunities for their students. Many sessions focused on addressing standards, or using cool technology (Desmos, iPad Apps, Google, and more). Other sessions focused on formative assessments, questioning, and feedback to students. Overall, I was pleased with what I saw, heard and learned over the two days of the conference. It was also satisfying to see so many teachers taking advantage of the many workshops and presentations, or sharing their ideas by making presentations at the conference. It was exciting to see and meet dozens of future teachers, the preservice teachers from Keene State College, Plymouth State University, Rivier University, and others. They were so eager to learn new things. They were not shy to admit that they had more to learn about teaching, but also more to learn about the mathematics they were preparing to teach.

It's not only the student teachers that should be eager about learning. It should be all of us, even the most veteran teachers among us, who must continue to be excited about learning. Professional development is for all teachers all the time. So here are a few reminders or "take aways" from the ATMNE conference, or any professional development day:

* It is important and valuable to be reflective of our teaching, to be cognizant of our students' needs, and to recognize that these needs are changing as demographics change, standards change, technologies change, societies change.

* Seek out others to collaborate with, garner ideas from, to mentor or to serve as a mentor. When we work together we motivate each other to try new things. When we work together we don't feel so isolated when we step into our classrooms.

* Don't be afraid to learn something new (like coding or mathematical modeling), to learn more or deeper mathematics, to be the learner in your own classroom. You might be surprised by what your students can teach you.

* If you have some good ideas and they are making a difference in your classroom, SHARE THEM! Consider presenting at the next ATMNE conference.

* Take advantage of the opportunities offered through professional development conferences, workshops, webinars... it's your right and your responsibility.

Elementary Representative **Mathematical Modeling**

By Amy Gregoire

Mathematical modeling is a powerful tool and strategy for students. NCTM has identified mathematical modeling as one of its major focal points in algebra standards across the grade levels. From pre-K through grade 12, students are expected to "Use mathematical models to represent and understand quantitative relationships" (http://www.nctm.org/Standards-and-Positions/Principles-and-Standards/Algebra/). The Common Core Standards for Mathematics also identifies mathematical modeling as one of its eight math practice standards.

One of the shifts that have taken place is that mathematical modeling has moved beyond a teacher modeling a specific concept using a particular manipulative or strategy to a place where students create their own model. It has moved from students learning math to doing math. Mathematical modeling promotes flexibility of thinking and is a departure from the idea of only one correct solution, which encourages and motivates students. Often teachers feel the pressure of covering all of the standards and curriculum and worry that having students take the time to create different models will take too much time. Research demonstrates that when students are engaged in rich modeling tasks, they develop powerful conceptual tools that increase their depth of understanding of a variety of mathematical concepts and improve their mathematical abilities. (Boaler, 2001; Kaput & Schorr, 2008; Lesh & Lehrer, 2003). As students As they decontextualize the situation and represent it mathematically, they are also reasoning abstractly (MP.2). Many models are quite versatile and can be used across a number of math skills such as open number lines, the area model, and tape diagrams.

There are many factors that contribute to an effective and rich mathematical modeling task:

* It is accessible to learners with a wide range of abilities.

* It has some basis in real-life experience.

* It lends itself to a variety of approaches and representations.

* It encourages collaboration and discussion.

* It is interesting and engaging.

* It sparks students' curiosity and promotes decision-making.

* It encourages creativity, individuality, and variety in the application of knowledge.

* It provides opportunities for extended learning and challenge for advanced learners.

(Ahmed, 1987; Piggot, 2011)

There are numerous resources out there that can be utilized to provide rich and meaningful tasks to students. NCTM's Illuminations has many lessons that include rich modeling opportunities. Dan Meyer is well known for his three act tasks. Act 1 is a visual, usually a video to

Elementary Representative **Mathematical Modeling**

(CONTINUED FROM PAGE 13)

model situations with mathematics, they are choosing tools appropriately (MP.5). problem. In Act 2 students are given some of the information to solve the problem. It is the job of the students to figure out the additional information they may need as well as the models and strategies that may be helpful in solving the problem. In Act 3 students are provided with the solution where they can then compare their strategies and solutions. Dan Meyer's tasks tend to be geared for sixth grade and up. There are several people who have introduce the challenge, this is used to grab the students and engage them in the taken Dan Meyer's concept of three-act-tasks and have created many for elementary students. Graham Fletcher has tasks for grades K-7, Andrew Stadel has created tasks for elementary to high school students, Mike Wierniki offers tasks for grades 2-8 and Brian Bushart has created some elementary tasks.
Anyone who is interested in seeing mathematical modeling in action at the elementary level may enjoy viewing some videos offered by the teaching channel.

https://www.teachingchannel.org/blog/2016/05/13/modeling-with-math-nsf/

Art's Attic **Mersenne Primes**

By Art Johnson

It is not often that mathematics makes the news. When mathematics does it can involve abstruse achievements that are barely understood by even the most advanced mathematics students. There was a noteworthy event this year that was even featured in Time Magazine. It involved a Mersenne Prime.

A Mersenne Prime is a prime number in the form $2^n - 1$, where *n* itself is prime. Using this format, Curtis Cooper found the 49th Mersenne prime, using a computer at University of Central Missouri. Previously, Cooper had found M46 and M47, as earlier Mersenne primes are known. M49 contains 22,338,618 digits, more than 5 million digits longer than the previous record holder M48.

Marin Mersenne (1588-1648)

Art's Attic

Mersenne Primes

(CONTINUED FROM PAGE 14)

There are many reasons to look for the next Mersenne Prime. In the long history of mathematics, the next Mersenne prime will be only the 50th known member. There is also the idea of the challenge, like the challenge that mountain climbers claim, 'because it is there'. Another reason is the satisfaction of finding something never before known to mathematicians. Searching for Mersenne Primes also tests the speed and hardware of a computer. Finally, prime numbers are an integral part of all software security systems. Testing large numbers to determine if they are prime tests the security of such systems.

But who was Mersenne? And why are prime numbers named after him? French monk Marin Mersenne (1588-1648) was one of many mathematicians who was schooled by the Catholic Church but focused on mathematics. Mersenne used to host salons in his house in Paris. At these salons, discussions involved philosophical topics of the day, new scientific finds, and mathematics developments. Among his guests were Rene Descartes, and Blaise Pascal. At his salon, Mersenne presented his search for prime numbers, using the previously mentioned format, $2^n – 1$, with *n* prime. Earlier mathematicians used this format to generate primes. It works for *n* as s prime up to 10, but when n = 11, the result is 2047 (23 x 89). In *Cogitata Physica-Mathematic* (1644) Mersenne stated that $2^n – 1$ produced prime numbers for n = 2, 3 5, 7, 13, 17, 32, 67, 127, and 257.

Mersenne did not check all the primes in his conjecture, something all his salon attenders knew, but his efforts got his name attached to this prime number format and the present day search for prime numbers.

But what good is the prime format $2^n – 1$ if it doesn't always work. Actually, there is no known formula for producing prime numbers, and flawed though it may be $2^n – 1$ is as good as any other prime number generator. So, Cooper and other prime number seekers insert a prime number for n into $2^n – 1$, compute the result, and then set their computer on the task of searching for factors for the resulting number. It sounds easy, but breaking large number with millions of digits into its factors can take days of computer time.

Although any search for Mersenne Primes requires a super computer, there is a human side to M49. Cooper had set up a program for his computer to make an orderly search for primes, and to send him a notification when the program found one. As it turned out, his program found M49 on September 7, 2015, but the notification was never sent. It was only on January 7, 2016 when a graduate student was physically checking the computer results that he discovered the missed notification and M49 was revealed to the mathematics community.

Art's Attic

Mersenne Primes

(CONTINUED FROM PAGE 15)

How many Mersenne primes are left to find? No one knows, but if you decide to look, there is a reward (See www.mersenne.org). The Electronic Frontier Foundation has set up a reward for the first 100 million-digit Mersenne Prime ($150,000). For a billion digits the prize is $250,000. So, get to it, and if you win one of the prizes, don't forget who got you started.

Nominations for NHTM Executive Board Positions are Now Open. Nominate or self-nominate via our NHTM website.

Nominations are now open for positions of **President-Elect, Treasurer, Middle School Representative, Secondary Representative** and **ATMNE Representative** on the **NHTM Executive Board for SY 2017-2018.**

You can nominate a deserving individual for a leadership role or self-nominate. Individuals must be current members of NHTM. Nominees will be contacted to check on willingness to serve, asked to provide biographical information and share ideas on how s/he can best serve the organization that services mathematics teachers in New Hampshire.

Please provide complete information on the Google form found here

Electronic ballots will be sent to membership around January 15, 2017. Results will be announced at the NHTM Spring 2017 Mathematics Dinner Meeting (Greg Tang will be our featured speaker).

Check out the responsibilities of the role at www.nhmathteachers.org/page-1715832 and click on the Board position for further information.

Cecile Carlton
NHTM Past-President

NCTM Representative **Conferences, Professional Development, and Position Statements**

By Terri Magnus

Now is the time to plan for upcoming NCTM conferences and professional development opportunities. If you would like to present at one of the NCTM Regional Conferences next year, the deadline to submit proposals for the Orlando, Florida (Oct. 18-20), and Chicago, Illinois (Nov. 16-18), Regional Conferences is December 1. These regional conferences are a nice stepping-stone between ATMNE and the NCTM Annual Conference for emerging leaders in the profession to share their knowledge and practice. For more information or to submit a proposal, visit the webpage http://www.nctm.org/Conferences-and-Professional-Development/Be-a-Speaker/.

Speaker proposals are also being sought for the NCTM Innov8 Conference to be held in Las Vegas, Nevada, November 15-17. Next year's theme is *Access, Equity, and Empowerment*. The first NCTMInnov8 conference is taking place right now (mid-November 2016) and is designed "to support mathematics teachers and teams in identifying, analyzing, and planning for instruction and intervention." Participants work as a team to address challenges they face in their schools and bring back an action plan to implement. There are also keynotes, math circles, Twitter sessions, book talks, innovation lounges, and more. See http://www.nctm.org/innov8/ for more information. Teachers can come as a team or be introduced to other teachers in their grade band and geographical area.

Want to escape to San Diego in February and improve your teaching? The 2017 NCTM Interactive Institute, *Effective Teaching with Principles to Actions*, will take place there February 3-4, 2017. Individual and group registration is now open at http://www.nctm.org/ptainst/.

Registration and housing reservations have begun for the NCTM Annual Conference in San Antonio, April 5-8. Plan ahead to make sure you get the room you want. Let me know if you will be there, especially if you are interested in meeting other NHTM members. Information and links to registration are available at http://www.nctm.org/Conferences-and-Professional-Development/Annual-Meeting-and-Exposition/.

Nominations are being sought for NCTM Committees (conferences, publications, research, elections, advising). Let an NHTM officer know if you might be interested in serving in such a capacity and we can forward your name. Of course, NHTM is looking for individuals interested in gaining experience in these areas on a local basis as well.

NCTM regularly posts position statements on issues relevant to mathematics education. Topics include access and equity, algebra as a strand of school mathematics, calculators in elementary school, computer science and mathematics education, teacher evaluation, procedural fluency, teaching English language learners, elementary mathematics specialists, and more.

NCTM Representative
Conferences, Professional Development, and Position Statements

(CONTINUED FROM PAGE 17)

These can be read at http://www.nctm.org/Standards-and-Positions/NCTM-Position-Statements/.

The book sale at last month's ATMNE conference was a big success. Conference attendees spent a total of $508 on books at the booth, saving $169 over list prices. Attendees also had the option to order books at a discount online. Hopefully you are finding the resources to be engaging and helpful!

Science, Technology, Engineering and Math Education Governor's Task Force (STEM) 1St Annual Report

In July 2015, Governor Hassan reconvened a diverse group of stakeholders, of which NHTM was one, to assist with the implementation of the recommendations within the *Governor's Task Force on K-12 STEM Education*, released in January of 2015. This group worked for the past year on ways in which the recommendations in the original report might be developed and implemented within the State of New Hampshire to help ensure that our students are prepared to compete within the global economy.

This work is presented in the *First Annual Report on Science, Technology, Engineering and Math Education* released in October of 2016. Information and links to the original and first annual reports may be found at http://governor.nh.gov/commissions-task-forces/stem/.

The Math Behind the US Highway System
http://para-rigger.posthaven.com/the-math-behind-the-us-highway-system

Save the Date!
Spring Dine & Discuss
Featuring Guest Speaker- Greg Tang

March 16, 2017
4:30-7:30
Holiday Inn Concord

When registering for this event, make sure to use your membership email. Not sure what the email address you used for you NHTM membership. Email Gretchen Scruton, NHTM Membership Chair, membership@nhmathteachers.org.

Presidential Awards for Excellence in Mathematics and Science Teaching

The Presidential Awards for Excellence in Mathematics and Science Teaching (PAEMST) are the nation's highest honors for teachers of mathematics and science (including computer science). Awardees serve as models for their colleagues, inspiration to their communities, and leaders in the improvement of mathematics and science education. https://paemst.org/

NOMINATIONS OPEN FALL 2016

Nominations for mathematics and science teachers of grades **7-12** will open in Fall of 2016.

Who may nominate? Anyone!

- Principals
- Teachers
- Parents
- Students
- Members of the general public

NH PAESMT Coordinator:
Donna Dubey, NH DOE Mathematics-Assessment Coordinator
Donna.Dubey@doe.nh.gov

When nominations and applications open, PAESMT can let you know!
Contact them at info@paemst.org

APPLICATIONS OPEN FALL 2016

Applications for mathematics and science teachers of grades **7-12** will open in Fall of 2016.

Who may apply?

For the 2017 cycle, any secondary (Grades 7 – 12) math, science or computer science teacher.

Applicants must:

- Teach math or science in a public or private school
- Hold at least a bachelor's degree from an accredited institution
- Bee a full time employee of their school/district AND teach students at least 50% of the time
- Have a minimum of 5 years of full-time K-12 math or science teaching experience prior to academic school year
- Teach in one of the 50 states or the four US jurisdictions
- Be a US citizen or permanent resident
- Not have received the PAESMT award at the national level in any category before.

Rewarding & Inspiring
Great Teaching
Since 1983

Nominate a NH Math Educator for a NHTM Award

NHTM encourages its members to nominate mathematics teachers for the Fernand J. Prevost Teaching Award, the Richard C. Evans Distinguished Educator Award, and the Richard H. Balomenos Memorial Award. Nomination forms and applications for each of these awards can be found on the NHTM website www.nhmathteachers.org. The descriptions and instructions for each of these awards are described on the following pages.

Fernand J. Prevost Mathematics Teaching Award

Nominees are being sought for the annual FERNAND J. PREVOST MATHEMATICS TEACHING AWARD. NHTM is presenting the award in recognition of the contribution that Ferd has made to the mathematics educators of New Hampshire during his thirty years as the state mathematics consultant. The award is being given to a beginning teacher in her/his **first through fifth year** who meets the following criteria which exemplify the characteristics which Ferd has brought to his teaching:

- commitment to good mathematics
- confidence that all children can learn
- a spirit of self reflection and professional curiosity
- caring and concern for colleagues
- a willingness to explore, to learn, and to grow as a teacher of mathematics
- a willingness to share mathematical and pedagogical activities with others

The recipient will receive a plaque of achievement, a $250 prize, and a one year membership to NHTM. The presentation of the award will be made at the NHTM Spring Conference.

The 2017 Prevost Award Nomination Form is found by clicking here or obtained by sending a request to

Katrina Hall
NHTM Middle School Representative
10 Patch Road
Hollis NH 03049

or can be obtained by sending a request
to **middleschoolrep@nhmathteachers.org** **or** **katrinaleighhall@gmail.com**

Nominations are due by December 15, 2016 and should be sent to:

View the 2017 Prevost Award Nominee Cover Form by clicking here
View the 2017 Prevost Award Nominee Application Procedure by clicking here.

Richard C. Evans Distinguished Mathematics Educator Award

At the March 2007 New Hampshire Teachers of mathematics Annual Conference, the Richard C. Evans Distinguished Mathematics Educator Award was announced to honor and thank Dr. Evans for his years of service in mathematics education. The intent of this award is to highlight creativity and innovation in the teaching of mathematics to all students. The recipient of this award will represent Dr. Evans' philosophy, passion and knowledge of mathematics education. Dr. Evans has indicated that he would like to be involved in the selection process and awarding the honor at the annual spring conference. The award is presented annually at the spring conference. Nominees are being sought for this year.

Qualifications for the Award

The recipient will:

- Be an experienced teacher or someone who works actively with teachers or students with 5 or more years' experience teaching mathematics at any level (Pre-K to 16).
- Be enthusiastic, knowledgeable, and passionate as a person, teacher, and leader reflecting the character traits as demonstrated by Dr. Evans.
- Demonstrate thinking and reasoning abilities that use models to make mathematics meaningful to students.
- Portray a dedication and organized focus for his/her teaching inside and outside the classroom.
- Actively demonstrate an unsurpassed passion for mathematical process to include problem-solving, reasoning, proof, communication, connections and representations.
- Apply knowledge of standards- and researched-based instructional and assessment strategies in his/her classroom with a true commitment that all children can learn mathematics
- Offer collegiality to fellow mathematics educators through sharing of information, serving as a mentor, offering professional development support, engaging in professional learning communities, serving on school, district or state professional groups, or through other opportunities to enhance the culture and climate of an educational community.
- Be involved with the mathematics educational community through membership and participation in district, regional, state, or national mathematics organizations. His/her involvement has led to significant impact on the mathematics education of students, fellow teachers, administration, parents, or other community members.

More specific information is provided in the links below:

- To View 2017 Evans Award Details click on Award Details
- To view 2017 Evans Application Procedures click on Application Procedures
- To view 2017 Evans Application Cover Sheet click on Cover Sheet
- To view 2017 Evans Nomination Form click on Nomination Form

Completed Nomination Form is due by December 15, 2016 and should be sent to:

Michelle Fox
NHTM Secondary Representative
Groveton High School
65 State Street
Groveton, NH 03582
or emailed to secondaryrep@nhmathteachers.org or m_fox@sau58.org

Completed Nomination Packets are due no later than January 15, 2017.

If you have questions, you may contact Michelle Fox
at secondaryrep@mathteachers.org or call 603.586.7199

Richard H. Balomenos Memorial Service Award

The Richard H. Balomenos Memorial Service Award was established by the Executive Board of NHTM in 1987, to remember and honor a former colleague, educator and friend. Richard Balomenos and his wife, Georgia, died tragically in an automobile accident in December 1986. As both teacher and administrator at the University of New Hampshire for almost 25 years, Richard had a profound influence on mathematics education in the state of New Hampshire. The award is presented annually to a New Hampshire mathematics educator who has shown outstanding or meritorious service or leadership to the mathematics education community on a statewide basis.

To nominate a deserving individual for this award send the nomination information explaining why this individual merits this recognition, the name and contact information of the person making the nomination to the current President of NHTM no later than January 1, 2017 by e-mail to: nhtmpresident@nhmathteachers.org or mail the information to:

Annie Wallace
c/o 3 Old Danville Rd.
Brentwood, NH 03833

Nominate a worthy math educator for the Rev. Bezuszka Lifetime Service Award for Mathematics. Visit the ATMNE website for more information http://www.atmne.net/.

NH STATE MODEL MATHEMATICS COMPTENCIES
These competencies are approved by the State Board of Education for statewide use.
2016 revised HS Mathematics Competencies
Mathematics K-8 Competencies

NHTM Executive Board

http://www.nhmathteachers.org/page-1715832

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Please visit http://www.nhmathteachers.org for more detailed Board information.

Professional Development & Conferences

National

Joint Mathematics Meetings	Atlanta, GA	January 4-7, 2017
ICTCM 28th Annual Conference	Chicago, IL	March 9-12, 2017
T3 Annual Conference	Chicago, IL	March 10-12, 2017
2017 NCSM Annual Conference	San Antonio, TX	April 3-5, 2017
NCTM Annual Meeting & Exposition	San Antonio, TX	April 5-8, 2017

State

NHTM Spring Dine & Discuss Featuring Greg Tang	Concord, NH	March 16, 2017
43rd Annual State Mathematics Contest	Plymouth, NH	March, 2017

Mathesis is the newsletter of the New Hampshire Teachers of Mathematics. It is published four times a year: August, November, February, and May. The mission of the New Hampshire Teachers of Mathematics shall be to provide vision and leadership in improving the teaching and learning of mathematics so that each student is ensured quality mathematics education and each teacher of mathematics is ensured the opportunity to grow professionally.

Upcoming Deadlines

- Information for February Mathesis- January 17th
- Prevost and Evans Award Nominations- December 15th
- Balomenos Award Nominations- January 1st