ISSN 1481-7799 **Spring/Summer 2018**

President's Message

Preparations for the 2018 October MTA Conference are ongoing and we anticipate another outstanding day of authentic Mathematics Professional Development. The conference will once again be held at C.P. Allen High School in Bedford. If you are interested in facilitating a workshop please contact any member of the MTA Executive. We value your feedback so please advise us of any suggestions that can make your conference a more rewarding experience.

The 2017 – 18 year has been another challenging year for Nova Scotia teachers. Despite the uncertainty brought on by recent changes, teachers have continued to focus on the needs of students. It is truly encouraging to note that when compared to learners in other provinces Nova Scotia students have demonstrated the third highest increase in achievement since 2010 on the Pan Canadian Mathematics Assessment. As well, grade six students have continued to show improvements on meeting or exceeding expectations on the provincial mathematics assessment. This is a testament to the outstanding work done by exceptional Nova Scotia educators each and every day.

The MTA Executive would like to extend a welcome and congratulations to Janine Ryder, EECD Provincial Mathematics Lead. Janine joined the Department in October 2017, bringing a wealth of experience in Mathematics education.

I would encourage all teachers to consider attending the National Council of Teachers of Mathematics (NCTM) Annual Conference. I was fortunate to be one of a group of Nova Scotia teachers who attended this conference in Washington, D.C. this year. The conference offers hundreds of sessions by educators, researchers, and leaders in Mathematics from around the world. The 2019 Conference will be held in April in sunny San Diego. The MTA will reimburse active members up to 50% of the NCTM registration fee. Membership in NCTM provides teachers with access to a rich variety of resources for classroom use.

To keep up with what's new find us on Facebook, https://www.facebook.com/novascotiaMTA, follow us on Twitter, https://twitter.com/MTA_NS, or visit our website, http://mta.nstu.ca/.

On behalf of the MTA Executive, I wish you all the best as another school year draws to a close. Continue to do all you do for your students and be proud to be a Nova Scotia Mathematics Educator!

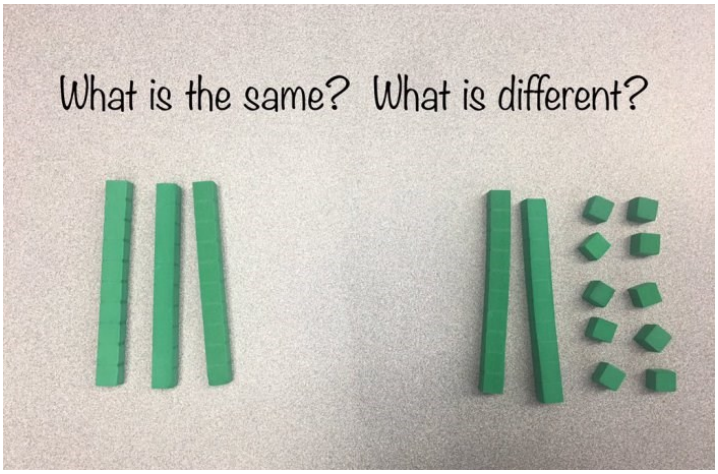
Joe MacDonald
President
Nova Scotia Mathematics Teachers Association

Math in the News and Around the Web

A New Largest Prime Number! $2^{77232917} - 1$ is the largest known prime number and was discovered on January 3rd, 2018. This newly-discovered prime is 23.2 million digits long. Primes of the form $2^P - 1$ are called Mersenne Primes. The new prime number was discovered by Jon Pace, a longtime FedEx employee, as part of a project called the Great Internet Mersenne Prime Search (GIMPS).

Read more at: https://www.popsci.com/worlds-largest-prime-number-discovered

Same or Different? From Brian Bushart - This new website contains images with the questions, "What is the same?" and "What is Different?" An instructional routine like *Same or Different?* provides accessible opportunities for even our youngest students to learn how to talk about various features of mathematical objects – quantity, shape, color, orientation, and arrangement, to name a few.



Check out the site:
https://samedifferentimages.wordpress.com/

Former Halifax Child Prodigy Grows Up to Design Self–Folding Origami Robots - CBC recently published an article by Adina Bresge (@abresgeabout) about Erik Demaine. Erik Demaine is a 37-year-old MIT computer science professor who grew up in Halifax. He is currently conducting research on printable self-folding origami robots. The article states that he thinks, "the technology behind his self-folding printable robots could one day evolve into downloadable smartphones, biomedical devices that deliver cancer-killing drugs, and even gadgets that could take on any form." Erik recently visited Dalhousie University where he enrolled as an undergraduate student at 12 years old.

Read the full story at: http://www.cbc.ca/news/canada/nova-scotia/origami-robots-halifax-child-prodigy-1.4569219

Number Talk Images de Pierre Tranchemontagne - Ce site web bilingue est un projet collaboratif qui a pour but de recueillir des images intéressantes qui peuvent servir comme point de départ pour des jasettes mathématiques au sujet des nombres. Les exemples et les liens y sont inclus sur le site pour modéliser la mise en oeuvre des routines qui vont permettre à **tous** vos élèves d'approfondir leur sens de nombre ainsi que développer leurs compétences en communication orale, pensée critique, et raisonnement.

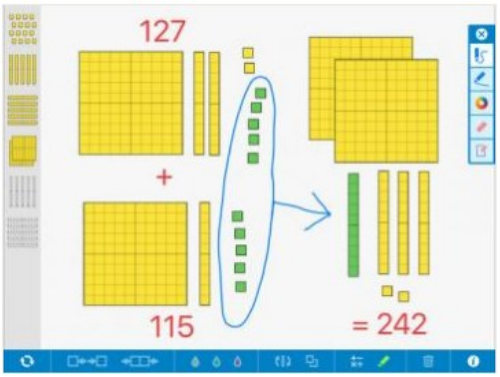
Voir aussi l'onglet « Ressources » pour les outils de planification et les fiches à imprimer. http://ntimages.weebly.com/

Technology News

EquatIO from Texthelp - Texthelp recently announced that EquatIO is now FREE for teachers! EquatIO is an easy-to-use software solution that enables students and teachers to create digital equations, formulas, geometric shapes, graphs and more directly on their computer or Chromebook. Pretty awesome if you ask me.
Get the full details at: https://goo.gl/jqkhZp

Free Math Apps from the Mathematics Learning Center - A number of very high quality interactive math apps are available in multiple formats (iPad, Web, and Chrome) from the Math Learning Center. My current favourite is one called Number Pieces. This app allows students to use virtual base 10 blocks to represent multi-digit numbers, regroup, add, subtract, multiply, and divide.

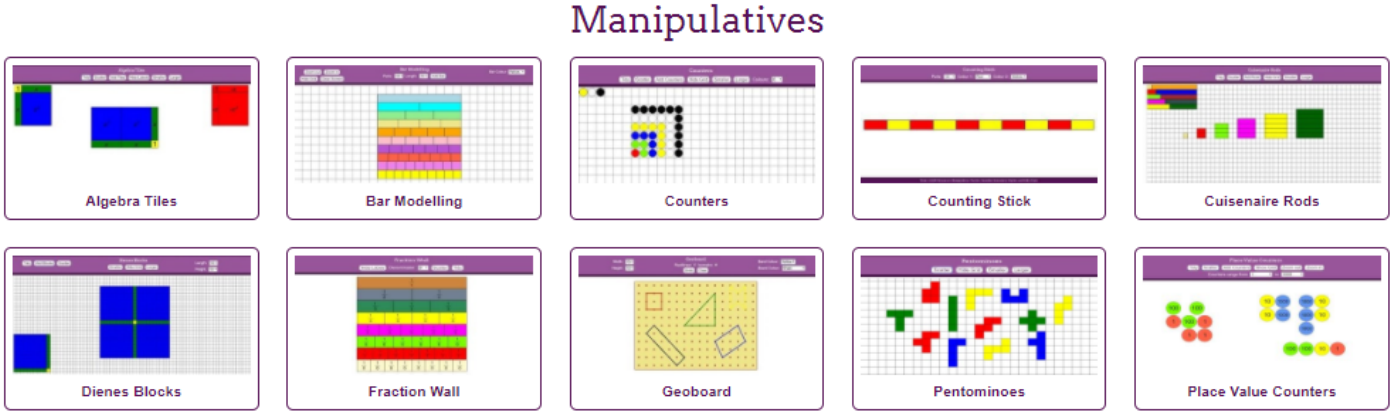
Math Apps page: https://www.mathlearningcenter.org/resources/apps



My Criteria for Fact Based Math Apps from Tracy Zager - Tracy uses three baseline criteria when assessing fact based math apps that she finds online. She does not compromise on any of them. Her full description is at http://tjzager.com/2016/01/05/my-criteria-for-fact-based-apps/ but here is a short summary:

1. **No time pressure**. In some apps, there is a giant timer counting down. Or you have to answer before the sun sets. Or the context is such that the whole experience feels like an anxiety nightmare. Under no circumstances will I recommend any apps that involve time pressure or speed rounds.
2. **Conceptual Basis for the Operations.** I don't want to see naked number drills, especially not for 3rd graders. Flashcards embedded in silly or glitzy contexts are still flashcards. I want to see mathematical models like arrays, groups, hundreds charts, and number lines.
3. **Mistakes Must Be Handled Productively.** The first thing I do when I trial a game is I make mistakes on purpose to see what will happen. Most apps just move to the next problem after a mistake. The kids don't get to figure out where they went wrong; don't get to learn from the mistake; and don't get to try again. Talk about missed opportunities.

What criteria do you use when assessing what math apps and programs you will use in your class?



Virtual Manipulatives from MathsBot - The image above shows a variety of really useful free online math manipulatives. These manipulatives are from Jonathan Hall (@StudyMaths), a full time math teacher working in the UK. Check them out at http://mathsbot.com/#Manipulatives

Moving with Math

By Erick Lee (@TheErickLee), Halifax Regional Centre for Education (HRCE) 7-12 Mathematics Consultant. Additional links and suggestions are available at https://pbbmath.weebly.com/blog/moving-with-math

I was recently asked by a junior high school to support their math teachers to infuse opportunities for movement into their math classes. I've been brainstorming some ideas and I thought I would share them here. I'm including some general routines for including movement in meaningful ways as well as some examples of activities for specific math outcomes. I'm not including generic "brain breaks" or "movement breaks" which are short bursts of physical activity designed to energize students.

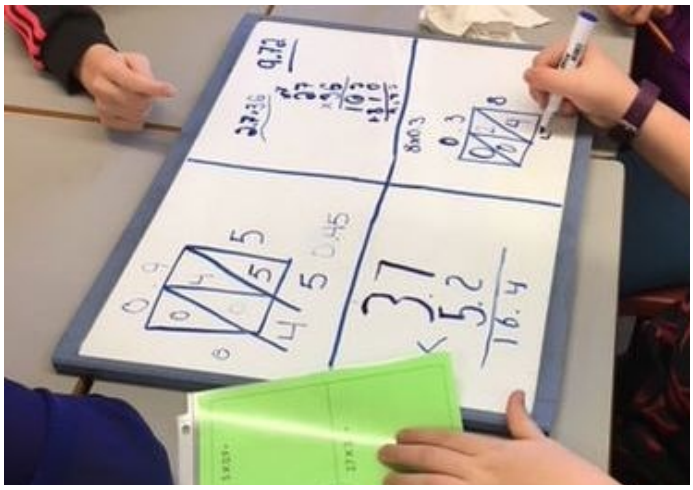
Math Movement Routines:

Stand and Talks from Sara VanDerWerf - Sara describes a tweak to the standard "Think/Pair/Share" routine that has greatly improved the number of students participating in her classroom discussions at https://saravanderwerf.com/2017/08/09/stand-talks-the-best-thing-i-ever-did-to-get-students-talking-to-one-another/. This strategy incorporates movement that gives every student a chance to talk out loud and share their ideas without distractions. "Learners, I'd like everyone to stand up. Do not have anything in your hands. No calculators. No notebooks. No phones or pencils. Nothing. In a moment I am going to give you something that I want you to look at with a partner... I want to hear you asking each other things you wonder about. Please go now and find your partner."

Vertical Non-Permanent Surfaces (VNPS) from Peter Liljedahl - Students work in small groups standing at vertical non-permanent surfaces such as chalk boards or dry erase boards around the perimeter of the classroom. This allows the teacher to easily see what each group is working on and encourages discussion. The non-permanent nature of the surface lowers the risk of making mistakes and prompts students to start working faster and persevere longer. Check out a description from Alex Overwijk discussing how he implements this instructional strategy in his classroom in Ontario http://slamdunkmath.blogspot.ca/2014/08/vertical-non-permanent-surfaces-and.html .

Math "Scavenger Hunts" / Circuit Training / Around the World - The idea of a math scavenger hunt is that questions are posted on the walls around the room. The answer to each question will lead to the next question. Students move from question to question until they have completed the loop. The activity is self-checking because if students don't find their answer then they know they've made a mistake and need to work to correct it.

Math Stations - This instructional strategy does not have to be complicated. I've seen teachers successfully push some desks together to make stations and put some math problems at each station. Students work in small groups completing the questions at their station and move to the next station when finished. I like to have one more station than there are groups, so that there is always an open station to move to. This helps to minimize wait time between stations. It takes a bit more up-front work, but having some self-checking questions at each station allow students to have instant feedback. Check out https://pbbmath.weebly.com/blog/self-checking-activities for suggestions of self checking math activities.

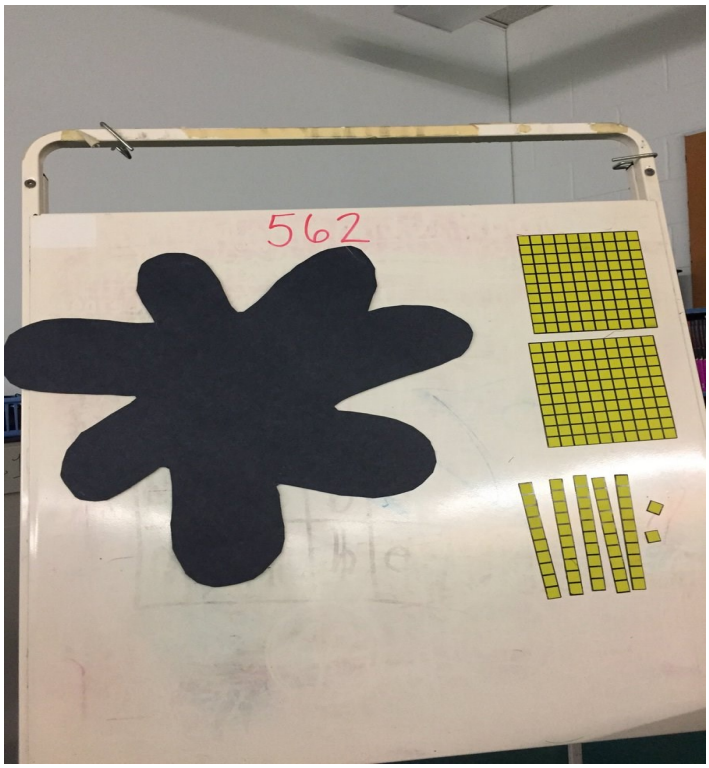


Take Your Class Outside - Every once in a while, when the weather is nice, it is great to get outside. Stock up on some sidewalk chalk and hit the pavement to do some math. Not only do students get up and moving, they get some time to practice as well as decorate the playground or sidewalk with beautiful mathematics.

Partitioning Numbers with Splat!

By Amanda Messervey Hall (@AMesserveyhall), Halifax Regional Centre for Education (HRCE) Elementary Mathematics Support Teacher

As a Math Support Teacher, a great deal of my time is spent supporting students to further their understanding of partitioning numbers in a small group setting. I am in constant search for innovative ways to engage students with this concept using games and hands-on activities with a variety of manipulatives. Twitter has turned out to be an amazing source of inspiration and collaboration. While browsing through my Twitter feed one day, I luckily stumbled upon an activity created by Steve Wyborney (@SteveWyborney) called "SPLAT!" (http://www.stevewyborney.com/?p=893) In this activity, students are presented with a series of dots ("the whole"), some of which are covered with a splat. The object of the game is to deduce how many dots are under the splat ("the missing part").

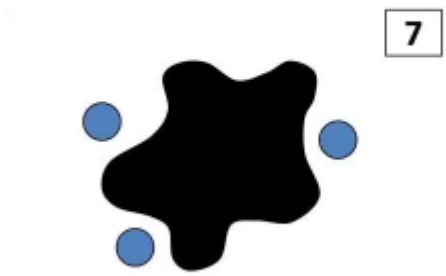


Although Steve has downloadable, electronic versions of his game, I decided to keep it simple. I created my splat from construction paper and added magnetic tape to the back so that it can be easily placed on the whiteboard. To play the game, I start by writing a 2 or 3-digit number at the top of the whiteboard. Then, I create this number using magnetic base 10 tiles. Using my constructed splat, I can hide some of the base 10 tiles. Students then need to solve for the missing part and explain their strategy.

I have found this to be one of the most fun and productive tasks for my students to strengthen their partitioning skills. When they beg to play SPLAT there is no better measure of student engagement!

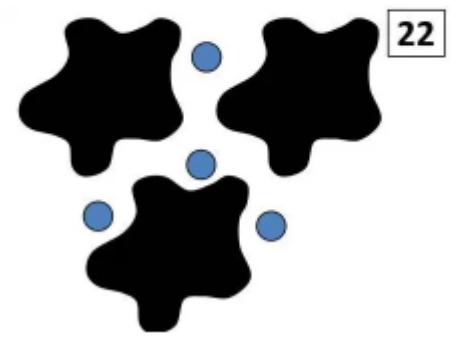
Splat Through 10

How many dots are under the Splat?



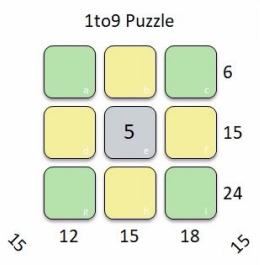
Multiple Splats

(Note: Splats that are the same color must cover the same number.)

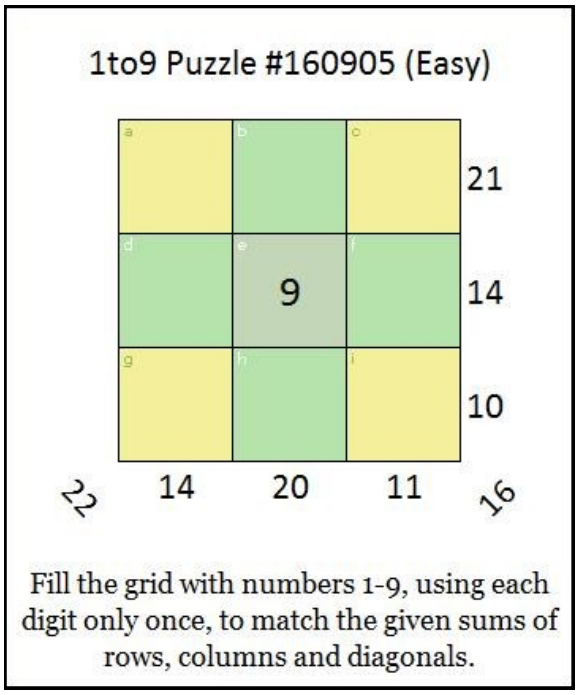


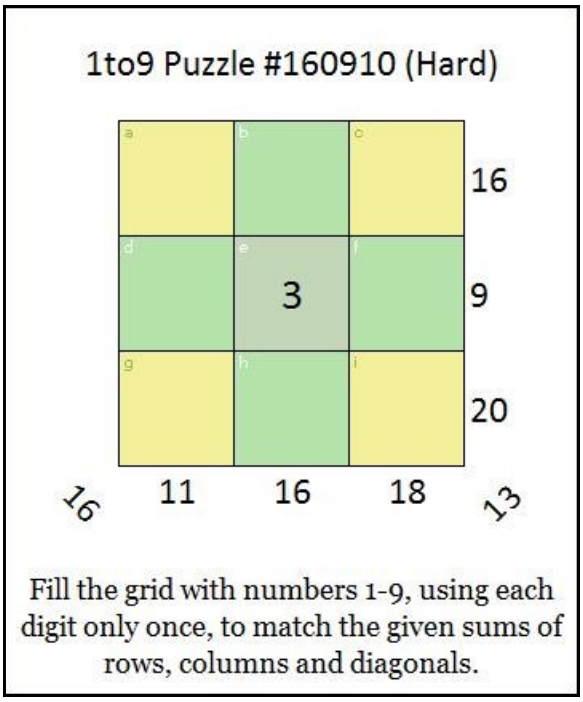
Adventures in Logic and Reasoning

1to9 Puzzles



Prem Prakash creates and shares a variety of puzzles on Twitter using the handle @1to9puzzle. He also has a website where he also shares these puzzles at https://maththinkblog.wordpress.com/. All of these puzzles are logical and can be solved purely by reasoning, without any need for guesswork or trial-and-error. I quite often post the step-by-step reasoning along with the solution on Twitter.





1to9 Puzzles reprinted with permission from Prem Prakash (@1to9puzzle)

The Three Teacups

The following puzzle is summarized from Henry Ernest Dudeney's book The Canterbury Puzzles published in 1907.

One young lady placed three empty teacups on a table, and challenged anybody to put ten lumps of sugar in them so that there would be an odd number of lumps in every cup. "One young man, who has been to Oxford University, and is studying the law, declared with some heat that, beyond a doubt, there was no possible way of doing it, and he offered to give proof of the fact to the company." It must have been interesting to see his face when he was shown the correct answer.

To see the solution to this puzzle, you can check out the full book on Project Gutenberg. http://www.gutenberg.org/files/27635/27635-h/27635-h.htm#s55.

Grading, Assessments, and Hot Pockets

By Carl Oliver (@carloliwitter) - Assistant Principal at an alternative high school in New York City. Reprinted with permission from http://www.coast2coast.me/carl/2018/03/17/grading-assessments-and-hot-pockets/

So you're at a PD, a really awesome one at that. Everybody is quietly thinking about the prompt "What is assessment?" Your neighbors are writing things like "Assessment is knowing where kids are, where they need to go, and what you should do next." These poetic statements allude to many parts of a real-time data gathering and analyzing process. Diagnostic assessment, summative assessment, formative assessment are all critical pieces of information that end up letting the teacher know what they need to maximize student growth and learning. The information gained from assessment become the ingredients that "Chef Teacher" can use to create any number of delicious stews, or salads, or souffles.

The facilitator tells everyone to stop writing and to stand up and share with someone new. After 15 awkward seconds of trying to lock eyes with someone, you find a partner across the room. After shaking hands you read your poetic statement with a serious flourish. Your partner responds with the following:

"Assessment is how you give kids grades."

You wonder for a second if their table was given the same task. This statement describes a calculation chore that happens at the middle and the end of each term. Grades are what you show to parents and administrators if they want to know how the kids are doing. Assessment is a process that ensures that you have the information at any given point to be able to make the grade, but also to do so much more. Assessment can help you make decisions in the moment, tweak tomorrow's lesson, or even alter your unit structure. Your assessments can tease out which students understand what you taught today and which ones are relying on the trick they learned last year. Viewing assessment as only a tool for finding grades is like "Chef Teacher" going to the kitchen, by passing all the groceries, and microwaving a Hot Pocket.

You rack your brain for how to begin a conversation about Grading, Assessments,…and Hot Pockets, when your partner cracks a smile. Turns out he was messing with you. He didn't really believe that Assessment is solely for producing grades, but lots of teachers out there do. How would you describe all the things that assessment could be to someone who thinks it is only for getting the numbers to put on the report card?

Announcements

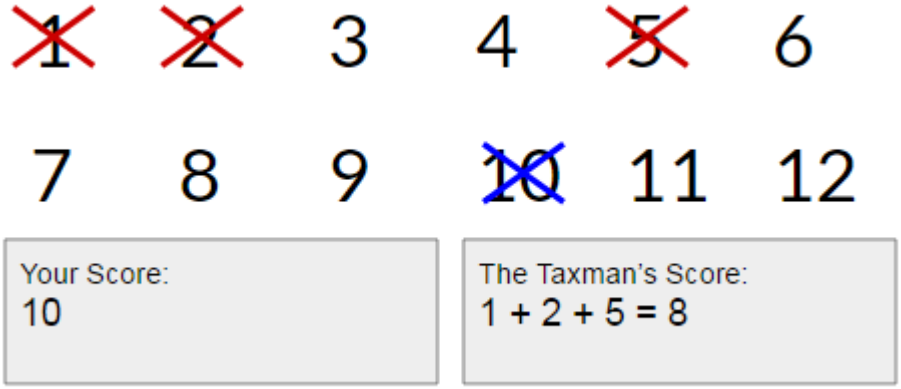
Congratulations to Sandra Joudrey, Mathematics teacher at New Germany Rural High School who will be retiring at the end of this year. Sandra has been a valued and much loved teacher at NGRHS for many years and will be truly missed. All the best Sandra as you move onto a new and exciting chapter!

My Favourite Math Problem - The Taxman

By Erick Lee (@TheErickLee), Halifax Regional Centre for Education (HRCE) 7-12 Mathematics Consultant.

The taxman game is an excellent mathematics game that focuses on divisors and multiples of a set of numbers. I have used this game at a variety of grade levels and as a whole class activity or as a small group game.

Typically, I jump right into the game and ask students to figure out the rules as we go. Start the game by writing down the numbers from 1 to 12 (or from 1 to any number you'd like but I'd suggest starting with a smaller number until you know the rules). You select a number from this list and cross it off. Now the taxman gets to claim all the numbers that divide your number evenly and cross them off. The number you picked is added to your score, and the numbers that the taxman crossed off are added to his score. In the game below, you can see that the player selected 10 as their first number. The taxman then claims the factors of this number: 1, 2 and 5. Once a number is selected and crossed off, it can not be used again.



This process is repeated until there are no numbers remaining. There is just one catch... the taxman must be able to cross something off on every turn. This means that you can't pick a number that has no divisors left. In the game above, you could not select 3, 4, 7, or 11 since they have no divisors remaining. When all of the remaining numbers have no unclaimed divisors, the taxman gets the rest!

Once students have a solid understanding of the rules, let them play until they can beat the taxman. You can then challenge them, not only to win, but get the largest score they can. What is the largest possible score? To add additional complexity ask students to play with a larger set of numbers: perhaps the number from 1 to 20 or even 1 to 50. Can they figure out a strategy that will always beat the taxman? What about an optimal strategy that will always give the player the largest possible score?

Students can also play this game against each other instead of against the fictional taxman. Students break up into two teams. Team A chooses a number on the game board and claims it. This will be team A's score for that round. Team B claims all the proper factors of team A's number. The sum of those factors is team B's score for that round. The roles are switched and the play continues till there are no numbers remaining with unclaimed factors. The team with the highest total score wins.

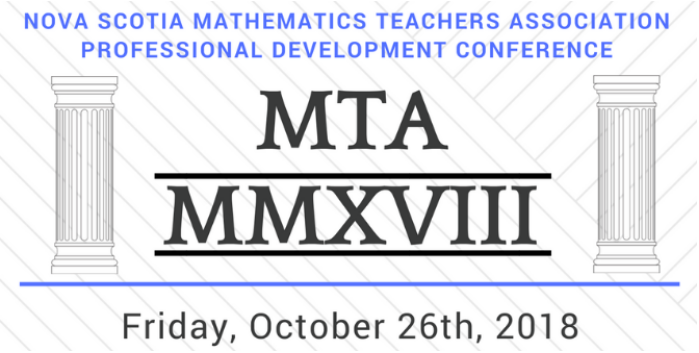
This two player version of the game, called "The Factor Game" is explained on the NCTM Illuminations website (http://illuminations.nctm.org/lesson.aspx?id=1010). There are some excellent exploratory questions for students to investigate.

There are a number of reasons why I think this game makes for a good classroom. The rules are easy to learn and this game does not require a lot of materials to set up (just a pencil and paper or better yet a number chart in a plastic sleeve and a dry erase marker). This game can be easily adapted to be played at different grade levels. It also supports Nova Scotia mathematics outcomes involving division, prime and composite numbers, odd and even numbers, square numbers and divisibility rules. Exploring these concepts while playing a game can give students a lot of purposeful practice with these skills. I also really like that finding an optimum strategy for this game is still an open question in mathematics and an example of the types of questions professional mathematicians explore and research.

Want to Present at the MTA Annual Conference?

The Nova Scotia MTA Provincial Conference will be held in October at C.P. Allen High School in Bedford on October 26th, 2018. The MTA is always seeking math teachers who are interested in presenting at this conference. Fill out the form to propose a conference session and become part of the reason why MTA is a great conference to be at.

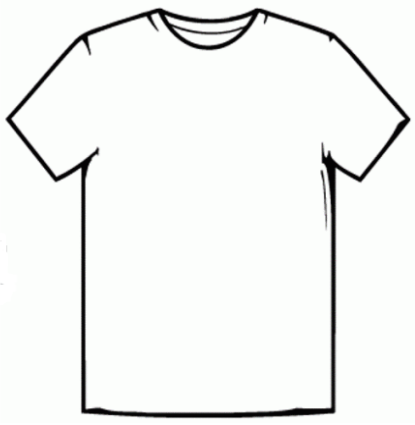
Provincial Conference Speaker Proposal form: https://goo.gl/forms/6IkGjNfpaudCmT4x1



MTA Conference T-Shirt Design Competition

Do you or one of your students like to combine mathematics, art and design? The MTA is asking you to create the official design for the 2018 conference shirt. The title of the conference is "MTA MMXVIII". *Your* design could appear on the shirt for presenters and volunteers. The winner of this competition will get a free t-shirt (as well as MTA fame and glory).

Submit your original design by email to **mtaconference@nstu.ca** no later than July 31, 2018.



Professional Learning Opportunities

Global Math Department Webinars (http://globalmathdepartment.org/conferences/) - These free online webinars are presented every Tuesday evening at 9 pm Eastern. Past presenters have included Tracy Zager, Dan Meyer, Michael Fenton and John Stevens, to name a few. In addition to watching the weekly live stream you can check https://www.bigmarker.com/communities/GlobalMathDept/conferences to see the topic of next week's conference and watch recordings from the archive.

Master of Mathematics for Math Teachers (MMT) - This program of study is offered through the Centre for Education in Mathematics and Computing (CEMC) at the University of Waterloo. The MMT is designed to provide current teachers of mathematics with the opportunity to expand their knowledge base. In addition to providing a deeper understanding of mathematical foundations relating to core secondary school curricula, students will also be exposed to areas of applications of modern mathematics. The primary goal of the courses in the program is the deeper understanding of the mathematics underlying the content taught in the classroom. Find more information at http://www.cemc.uwaterloo.ca/mmt.html.

The **National Council of Teachers of Mathematics (NCTM)** hosts a variety of conferences throughout the United States. Below are the dates and locations of events coming in 2019.

- NCSM Research Conference: April 1–3, 2019 – San Diego, California
- NCTM Annual Meeting: April 3–6, 2019 – San Diego, California
- Regional Conference: September 25–27, 2019 – Boston, Massachusetts
- Regional Conference: October 2–4, 2019 – Nashville, Tennessee
- Regional Conference: October 16–18, 2019 – Salt Lake City, Utah

Nova Scotia Math Teachers Association Executive

Below are the current members of the NS MTA Executive. The membership and the positions of the executive will change at the Annual General Meeting held on Oct. 26th, 2018 at the MTA Provincial Conference.

Name	Position	Contact
Joe MacDonald	President	jamacdonald@nstu.ca
Zeno MacDonald	Vice President	zgmacdonald@nstu.ca
David MacFarlane	Past President	sdmacfarlane@nstu.ca
Marc Deveau	Treasurer and Member-at-Large CSAP	dmmarc@nstu.ca
Anne Pentecost	Secretary	adgrenier@nstu.ca
Jennifer Courish	Member-at-Large Chignecto	courishjl@nstu.ca
Kimberley McCarron	Member-at-Large Cape Breton	kamccarron@nstu.ca
Trisha Demone	Member-at-Large South Shore	tademone@nstu.ca
Sonya O'Sullivan	Member-at-Large Halifax	slo'sullivan@nstu.ca
Erick Lee	Communications	eplee@nstu.ca

Special Projects

The MTA strives to give back to its membership by making funding available for special projects developed by classroom teachers. If you have an innovative math education project taking place in your classroom(s), MTA may be able to offer some financial assistance to help develop the project. Information on funding can be obtained by contacting any member of the Executive.

Call for Contributions

We are better together. Mathematics Matters, the MTA newsletter, is looking for a variety of contributions from elementary and secondary teachers, math mentors and coaches, math support teachers and others who are interested in the teaching and learning of mathematics. Please consider sharing a favorite lesson or activity, a reflection or blog post, a book or technology review, or another work of interest to mathematics teachers in Nova Scotia and beyond. Sharing your ideas and reflections with other teachers is a great way to contribute to a vibrant and dynamic community of mathematics educators in our province.

If you are interested in contributing, please contact me at eplee@nstu.ca. We look forward to hearing from you!

The MTA Newsletter is published by the NSTU for the Mathematics Teachers Association, Erick Lee, Editor.
The opinions expressed are not necessarily those of the Editor, the NSTU, or the MTA.