CTTCS Math Newsletter

Dec 2023

Fall

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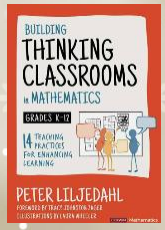
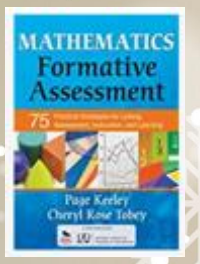
New Titles in the Central Resource Library

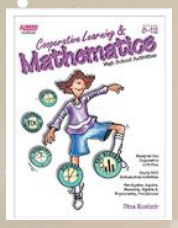


Check out these new books in the CTTCS resource library!

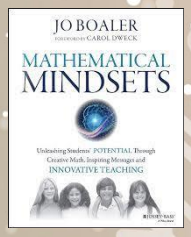
Peter Liljedahl's *Building Thinking Classrooms* is changing math instruction globally. For the last couple years, this has been one of the widest read books about math instruction. Several divisions in Sask are embracing "Thinking Classroom" style teaching and learning. This is a very readable book! **If you'd like to learn more, call me.



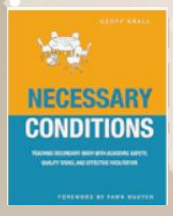
Keeley and Tobey; 75 *Formative Assessments for Mathematics* has formative assessment ideas that can be used in many subject areas, not just math. They are fun, engaging, often provide movement breaks or changes in pace in the classroom, as well as providing the teacher with feedback on what students know and what their misconceptions are. This would make a fun staff workshop, where teams of teachers each facilitate some of their favourite strategies and help staff experience them.



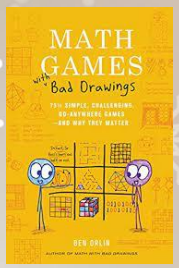
Dina Kushnir;*Cooperative Learning Activities for Math Gr 8 – 12* is full of great ideas to find original ways to review, practice, learn, peer coach, provide feedback, and involve students in math lessons in an active way. Many of the activities here can be adapted to any grade or topic. If you want to add some pizzaz to your math, and have kids loving your class, check out this book!



Jo Boaler; *Mathematical Mindsets* would make a great staff book study. Jo Boaler teaches us now neuroscience informs our practice, by exploring how our brains learn. This book challenges the myth of ability, teaching us how important students' belief in their ability is, and how achievement is impacted by a students' self efficacy. A student's belief in their ability has more to do with success in math than their actual ability.



Geoff Krall; *Necessary Conditions: Teaching secondary math with academic safety, quality tasks,and effective facilitation* summarizes the elements required for a successful math classroom. Geoff, who was our guest speaker at the SUM conference this year, advocates for instruction that is rigorous, helps kids feel confident, creates engaging and dynamic learning, and high-quality assessment. Geoff endorses many of the practices we are working at in CTTCS, like growth mindset, small group instruction, number talks, and triangulated



Ben *Orlin; Math Games with Bad Drawings* is a book that comes highly recommended from math educators. These games are simple, easy to play (often with just pencil and paper) and promote deep thinking. This book offers a playful way to engage in math!

The science of recall; Helping students retain learning

How many times have we heard it? "I knew it, but I forget". "I do great on the unit exams, but I bomb the final." "I can't remember what my teacher said about that last year."—or: "Our teacher didn't teach us that last year!"

Kids, like all people, **learn** and then quickly begin to **forget**. This creates problems for us in mathematics, because most content we teach is dependent on some prerequisite knowledge and understanding. Not only that, but some things, like multiplication facts, are best committed to memory as much as possible; otherwise, student brains are tied up with computation, and they do not have enough working memory to think about deeper math processes, language, and contexts.

Lately there has been a lot of research around "recall", the ability to retrieve knowledge over time. Here's what we're learning.

There are three main types of memory: Long-term memory is for storing information for long periods of time We can store both explicit memories, which are facts, information, and events, and implicit memories, which are things we aren't conscious of, but may affect our behaviour and reaction. Short-term memory retains information temporarily and has limited capacity. Working memory is a type of short-term memory that allows us to retain and use information to problem solve and make decisions.

THE FORGETTING CURVE

We often think of memories as books in a library, filed away and accessed when needed. But they're actually more like spiderwebs, strands of recollection distributed across millions of connected neurons. When we learn something new—when a teacher delivers a fresh lesson to a student, for example—the material is encoded across these neural networks, converting the experience into a memory.

Ways to enhance memory and improve retrieval

1. Memories are more deeply encoded when they are created actively. The more we can engage students in ***active* learning**, the more likely they will be able to recall information. Peer-to-peer explanations and other student **dialog** strategies in math helps strengthen and consolidate memories. We also know that the more senses we engage when we create memories, the more likely we will be able to recall them.

2. Synapses are strengthened when neurons are fired repeatedly. This is why **spaced practice** helps embed information. Revisiting a concept frequently helps us to retain it. Using lots of **formative assessments** provides more contact with information, as does ensuring that students **summarize** their learning to consolidate information. Another strategy for providing ongoing contact with information is "interleaving" assignments. This means that students don't only work on tasks to practice current course content, but that the assignment includes questions about past learning and concepts already studied. We must never just finish a section and then forget about it till end of the year. Instead, we need to remind students again and again, and create opportunities for **repeated contact** with curriculum material over time.

3. The more **connections** we can make when we teach a math concept, the more neurons are involved in the retention of that information. Connections are one of the mathematical processes embedded in our curriculum. We connect math to self, math the world, and math to other math (like fractions to division, and linear graphs to ratios, and so on).

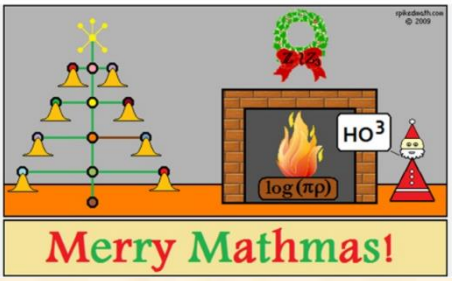
4. Another mathematical process is **visualization**, and helping students visualize models and concepts also helps them make more mathematical connections to retain information longer. Text is more easily remembered when it is accompanied by **images, drawings, models, and diagrams**. Students should draw diagrams whenever appropriate. Many students remember mathematical concepts in terms of shape of space.

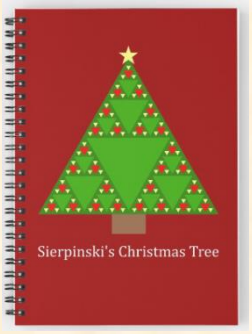
Psychologist Hermann Ebbinghaus (1880) studied retention and learning, and observed the "forgetting curve", a measure of how information much we forget over time: roughly 56% in an hour, 66% in a day, and 75% after 6 days, if our memories are not connected to prior knowledge or reinforced in some way.

5. Learning in **social situations** activates more senses, more language, more connections, and more interaction with content. The experiences created when students **communicate and collaborate** involve more neurons and help embed information.

Why Students Forget, and What you can Do About It https://www.edutopia.org/article/why-students-forget-and-what-you-can-do-about-it?utm_source=Twitter&utm_medium=Social&utm_campaign=Fall+23&utm_id=Fall23&utm_term=fall+school+season&utm_content=students+forget

The Science of Memory https://medium.com/@dcndaviddcn/the-science-of-memory-how-to-improve-your-memory-and-recall-ee3e09cbf171





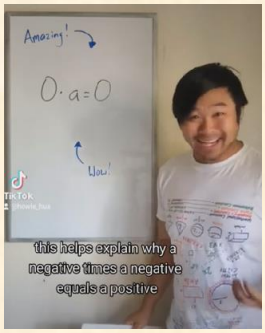
SUM Conference 2024 info is out!! Keynote is **Marian Small.** Consider joining us for the preconference—All day April 18.

Saturday Keynote is **Howie Hua.** Howie Hua is a dynamic math professor with a large following on social media. Check out some of Howie's videos here:
Why do we teach math differently:
https://youtu.be/tesUh84k6d4?si=iMBaHLwtvrieZRsm
Why does a negative divided by a positive equal a negative?
https://youtube.com/shorts/WmTpQeCjEFE?si=-cll59-vkQDDCveA

Making the long division algorithm understandable:
https://youtu.be/Hvp69HcY_5k?si=sL9huc6JXcfjrsBH

Howie's mission is to break down math "rules" into logical, understandable relationships.

Why does a negative times a negative equal a positive?



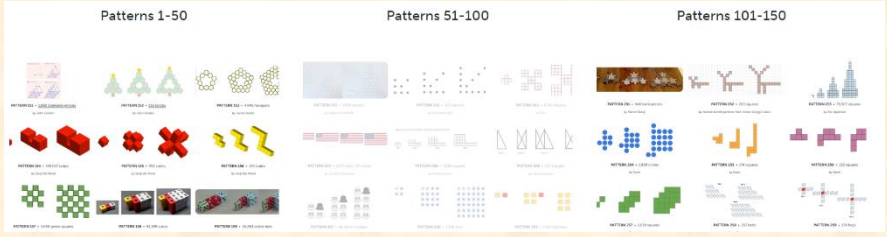
https://youtu.be/UUPRQZfq87g?si=CEn5H3wbowXi7Shl

Check out Saskatchewan Math Teachers on Facebook
https://www.facebook.com/SMTS.ca/

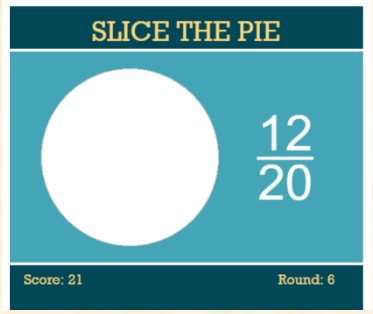
Twitter (X) https://twitter.com/SMTSca
Or our home page
https://www.smts.ca/

Great Websites for Math Instruction:
https://sk.mathgames.com/ Free online games correlated to Sask Curriculum. You can sort by grade or topic. Note that once you're in a topic, you can scroll down to find Sask Curriculum correlations!

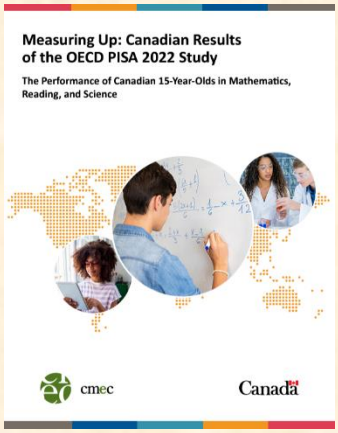
Patterns and more patterns! Use these for teaching early patterning but also algebra and relationships
https://www.visualpatterns.org/



Slice the Pie! Helping students visualize and estimate fractional quantities https://mathmagi.com/slice-the-pie.html



PISA (Programme for International Student Assessment) are in. So how are we doing in Canada? **How are we doing in Saskatchewan?**



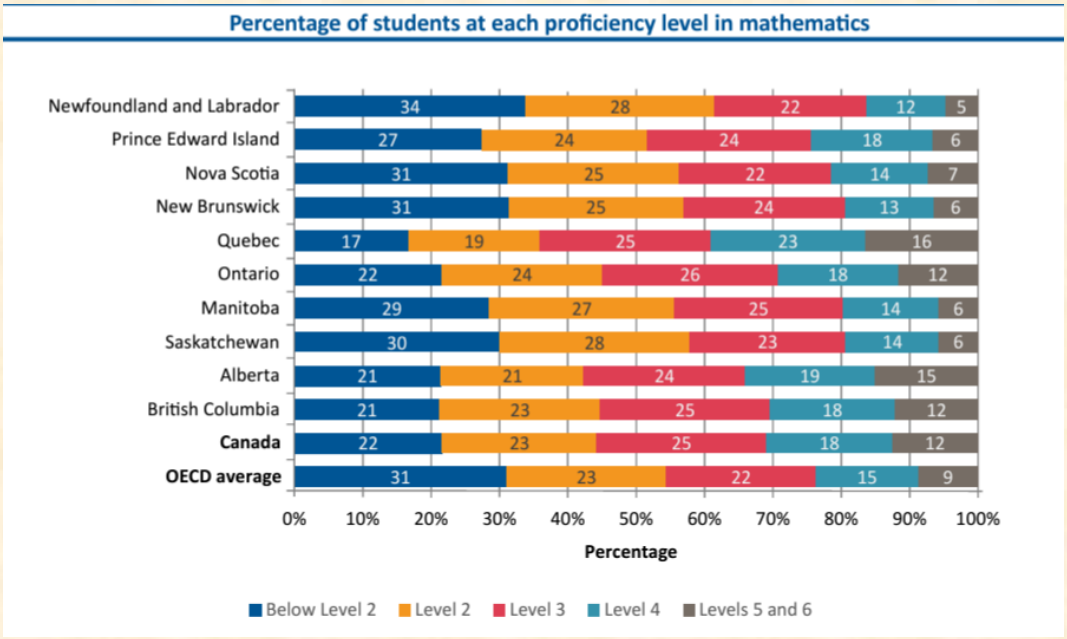
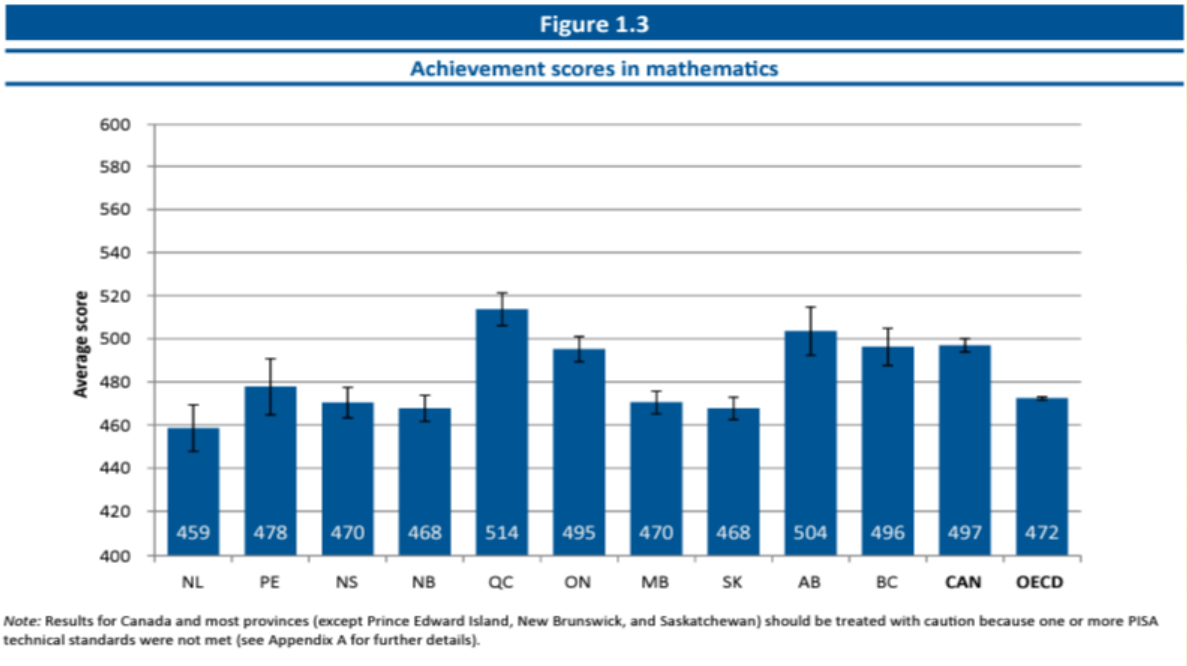
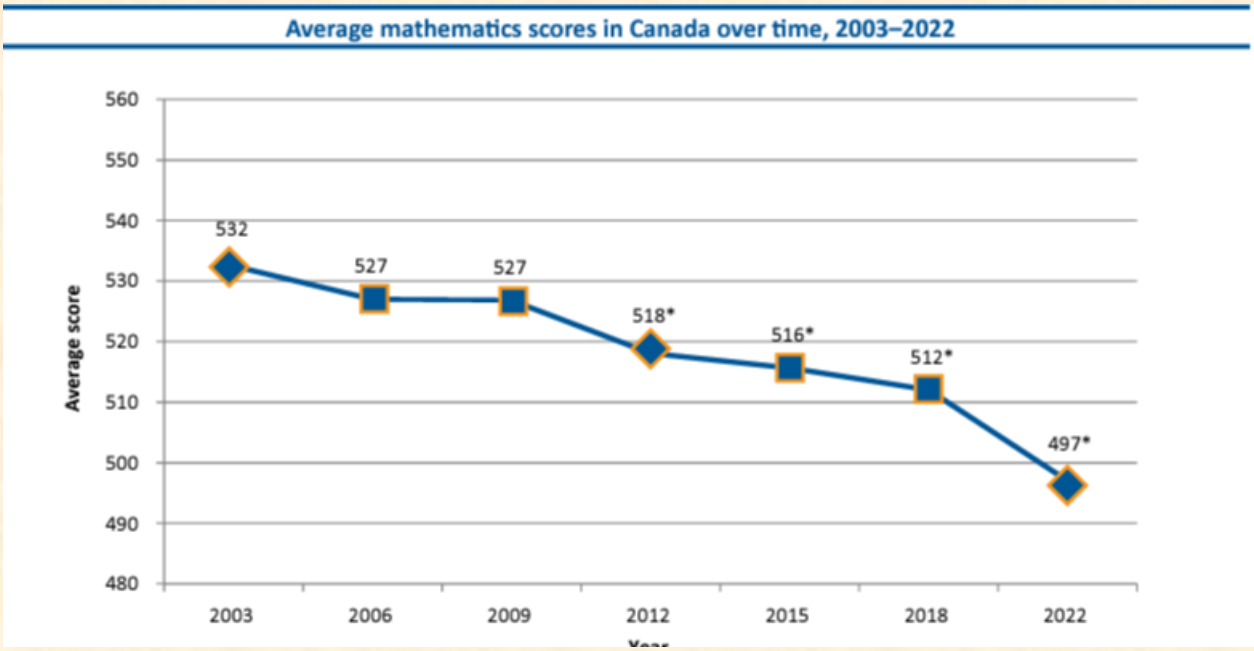


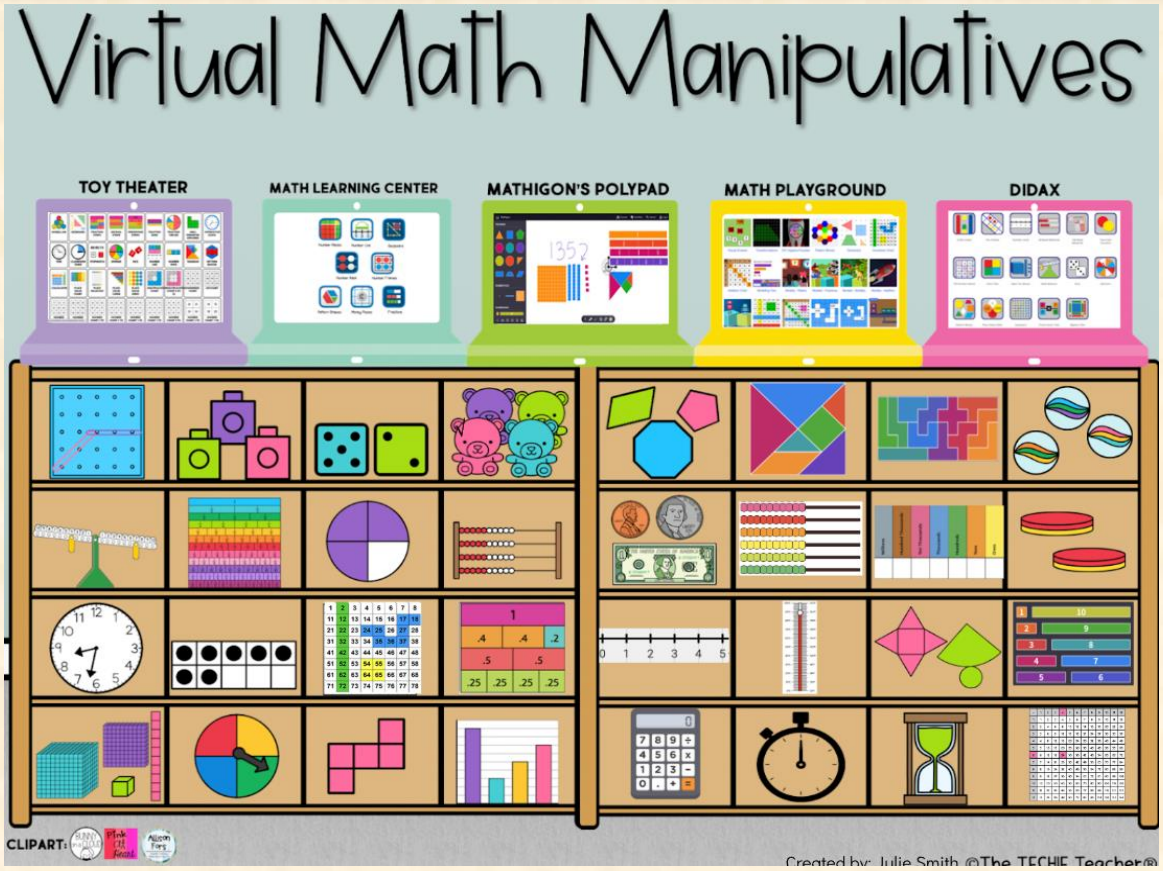
Figure 1.3 and Appendix B.1.2 present mathematics achievement scores in the provinces along with the OECD and Canadian averages. Canada overall and four provinces were above the OECD average. When compared to the results for Canada overall, Quebec students achieved scores that were above the Canadian average, while students in Ontario, Alberta, and British Columbia achieved scores that were at the Canadian average. Students in six provinces (Newfoundland and Labrador, Prince Edward Island, Nova Scotia, New Brunswick, Manitoba, and Saskatchewan) scored below the Canadian average (Table 1.4).



Note: Results for Canada and most provinces (except Prince Edward Island, New Brunswick, and Saskatchewan) should be treated with caution because one or more PISA technical standards were not met (see Appendix A for further details).



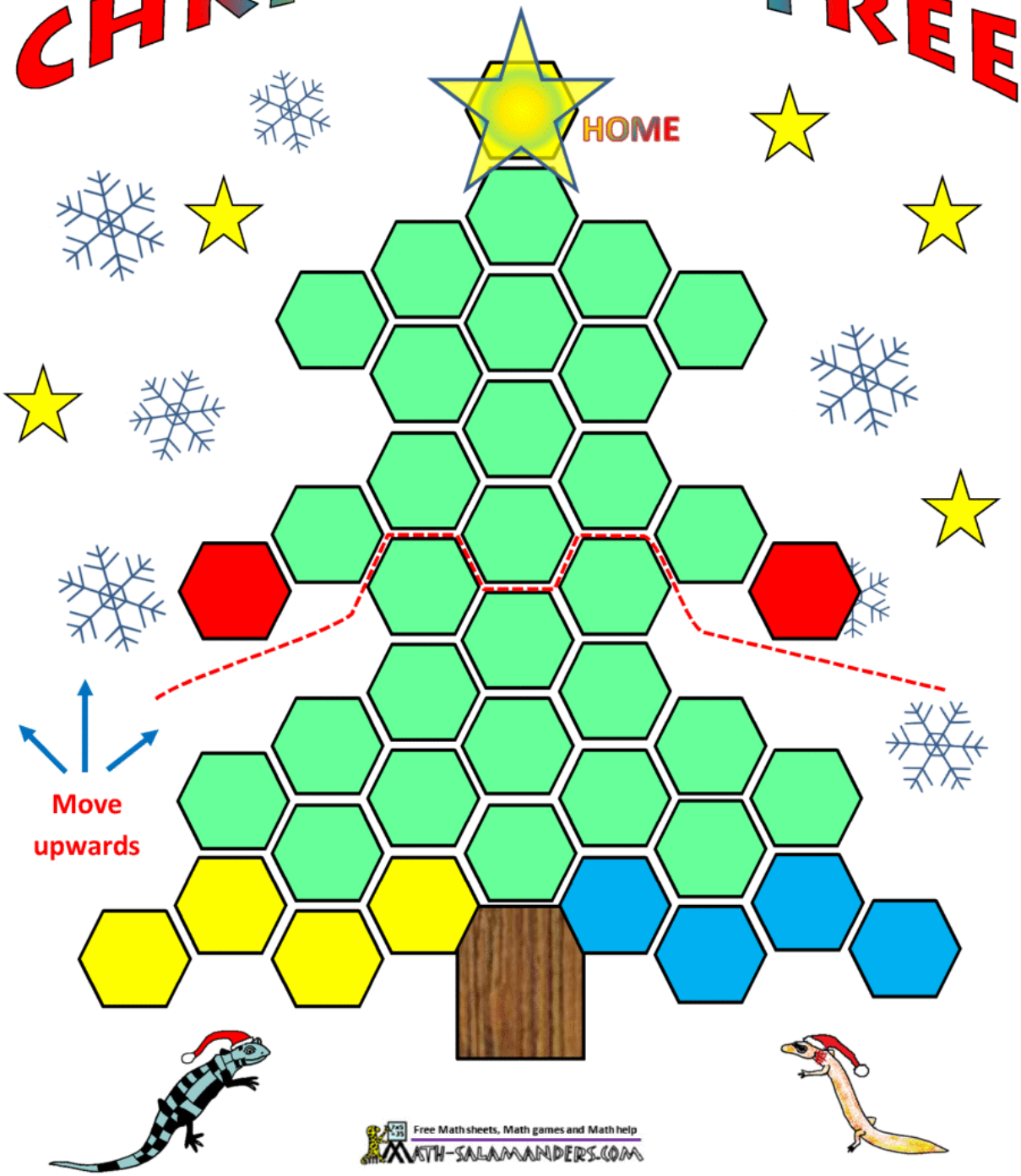
Check out the full report for more details and context: https://www.cmec.ca/Publications/Lists/Publications/Attachments/438/PISA-2022_Canadian_Report_EN.pdf



Click the image to access the online version of this graphic that has working links to all these manipulatives! https://docs.google.com/presentation/d/1jadlg9nk64U9gWtj4QEbd-AEzVtCXQeH-y44LPXlF3M/present?slide=id.g27b693dca5_0_261

Name Date

CLIMB THE CHRISTMAS TREE



CLIMB THE CHRISTMAS TREE

INSTRUCTIONS

Age Range: Kindergarten +
Number of players: 2
Learning: strategy, counting
You will need:
- 4 Counters in 2 different colors

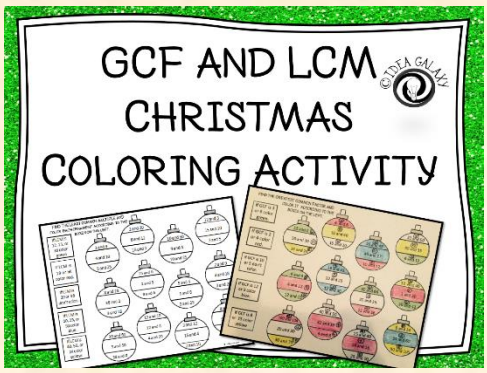
Instructions:
- One player puts their 4 counters on the yellow hexagons.
- One player puts their 4 counters on the blue hexagons.
- Each player has 2 moves when it is their turn. Each move must be upwards either diagonally or straight up. You cannot move down the tree.
- They can choose to move one counter two spaces or they can move two counters one space each.
- If you land on one of the other player's counters, then you either:
  - Send it back to the start if it is below the red dotted line
  - Send it to one of the red hexagons if it is above the red dotted line
- Once a counter reaches the top of the tree it is 'home' and it is taken out of play.
- The first player to get all of their counters home wins the game.

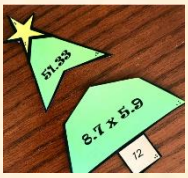
Variations:
- Play a shorter game by only having two or three counters each to start.
- Play a game by rolling the dice, and having that many moves. E.g. if you roll a 5 then you can have five moves for your counters.
- Choose to have 3,4 or 5 moves each turn instead of just two.

https://drive.google.com/file/d/1OKJLtzJY5TpADY4a8FnHB8zvQD0OC7Wu/view?usp=sharing

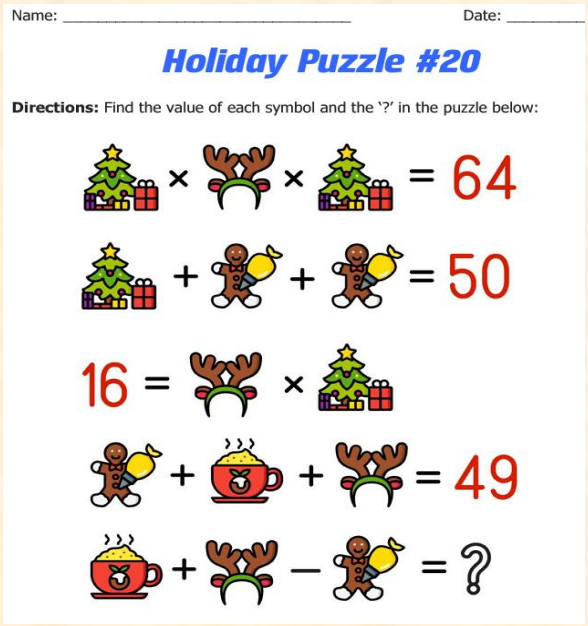
More Christmas Math Games: https://www.math-salamanders.com/christmas-math-games.html

Factors and Multiples Color the Christmas Ornaments





35 Free Christmas math games and activites, K -6 https://youvegotthismath.com/christmas-math-games/



https://drive.google.com/file/d/1OkO66mYrbVYEoSEodtmkRhI2Yg6NFaDl/view?usp=sharing

I wish you a very merry, restful, and restorative Christmas break!