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Math News in CTTCS

Number Talks—the most effective way to improve fluency!

We hear it all the time, kids lack basic computation facts—and we hear that not just from teachers, but from students themselves. No paper pencil task, extra practice, flash cards, or games will improve fluency as much as number talks. WHY?

-**Recall:** Memories created through social interaction, and involving as many senses and experiences as possible, are memories that are stored for better retrieval. While practice will always be an important part of math, silent rote practice produces little by way of long term memory.

-Dialog: We consolidate our ideas in math by verbalizing them. We think differently about math when we speak about it. Also, our curriculum and our rubric highlight the necessity of students being able to explain their thinking, so we need to give them opportunities to do that.

-Collaboration: Students learn by hearing others' strategies, and seeing them applied. There are multiple opportunities for "think alouds" during a number talk, which is an essential part of developing the internal dialog necessary to work through procedures in math.

-**Visualizing and Modeling:** During a number talk, the teacher draws many mathematical models and representations, providing the essential visual context we use when we think about numbers.

-**Flexible thinking and developing efficient strategies:** Cohorts of students that have not been exposed to number talks often lack efficient strategies. They will continually use one or two strategies they have learned, even if they're inefficient or cumbersome for the context. It's often said, "if a child is counting on their fingers, and we give them more practice, they will get faster—at counting on their fingers." More practice does not steer students to efficiency. Middle years and high school students will default to an algorithm instead of thinking about the numbers, for instance "stacking" numbers for addition, even if it's problems like 205 +20. Students will "stack" for subtraction, even in cases like 258 – 50 **(that example is from the Key Math assessment). Students that have had number talks through the years can choose strategies that fit the situation.

-Big ideas: One of the essential understandings of mathematics is that we can take numbers apart and put them back together (Compose and decompose number). This is essential from elementary school up into high school. From early years, we want students to break numbers apart: $8 + 6$ is $(8 + 2) + 4$, as we continually reach for "tens" in our base ten system. Another example is 12×15 is $(10 \times 15) + (2 \times 15)$ or $(10 \times 12) + (5 \times 12)$. And $5\ 12$ is half of 10×12. We decompose when we compute mentally, find areas of complex shapes, factor polynomials, complete the square, find roots of a function, or solve trig identities. Decomposing number is part of trigonometry, geometry, and calculus.

***Procedural Fluency* and *Conceptual Understanding* go hand-in-hand. Number talks support both of these!**

Number Talks (Con't)

Everyone is thinking: Because we use hand signals in number talks, rather than raising our hands, all students get the chance to think.
Growth Mindset: Number talk time gives us a great opportunity to continually model and reinforce a growth mindset. Correct answers are clearly seen as less important than reasoning, and self-correction will happen naturally.
Mathematical Processes: The mathematical processes are "how we do math". Embedded in curricular outcomes are letters indicating mathematical processes that should be embedded in the instruction of the outcome. They are:

Communication [**C**]

Visualization Representation[**V**]

Making Mathematical Connections [**CN**]

Reasoning [**R**]

Problem Solving [**PS**]

Mental Math and Estimation [**ME**]

A number talk hits ALL these targets!!

Here's a nice quick-start guide from Shelley Gray
https://shelleygrayteaching.com/do-you-need-help-with-number-talks-heres-the-quick-start-guide/

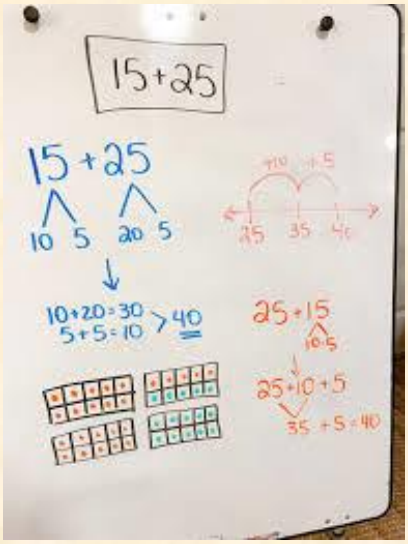
From Sask Curriculum

Communication works together with reflection to produce new relationships and connections. Students who reflect on what they do and communicate with others about it are in the best position to build useful connections in mathematics.
(Hiebert et al., 1997, p. 6)

Because the learner is constantly searching for connections on many levels, educators need to orchestrate the experiences from which learners extract understanding …. Brain research establishes and confirms that multiple complex and concrete experiences are essential for meaningful learning and teaching.
(Caine & Caine, 1991, p.5)

Posing conjectures and trying to justify them is an expected part of students' mathematical activity.
(NCTM, 2000, p. 191)

[Visualization] involves thinking in pictures and images, and the ability to perceive, transform and recreate different aspects of the visual-spatial world.
(Armstrong, 1993, p.10)



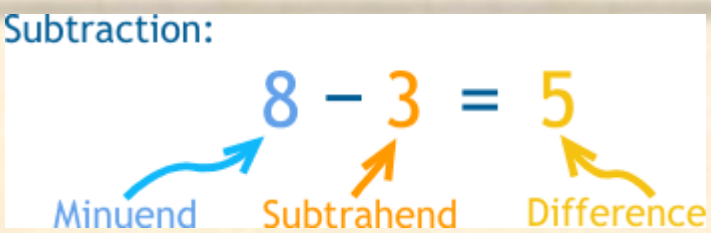
"The person in the room doing the talking is the person doing the learning"

Watch a grade 4 number talk:
https://youtu.be/xKC3eijnUNw?si=TgesiIxnzRh4_3Id

Grade 8 number talk https://youtu.be/fxrvAIZrlAI?si=vIouecCEit0Ev4aM
Grade 2 number talk https://youtu.be/WAhkbSFtvAI?si=v4vPh0riLLWVWetA
Grade 8 number talk https://youtu.be/W0Sxrv3dZJE?si=G2SEirobCbhD0piU
Grade 1 number talk https://youtu.be/6VliMWIi9z0?si=vpfQ21tQZZO7J6Wh

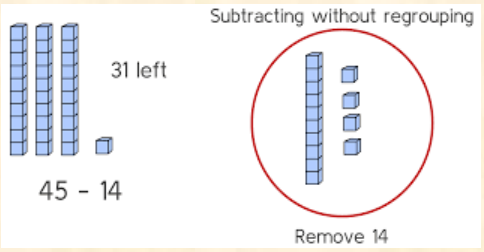
Jo Boaler talks about "Why Number Talks". https://youtu.be/YKegyzRj8-k?si=kq-x7VP9mFfhHgUj

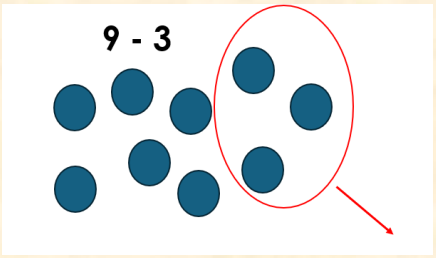
Digging Deeper into Subtraction

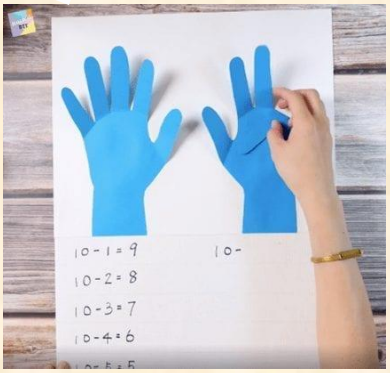


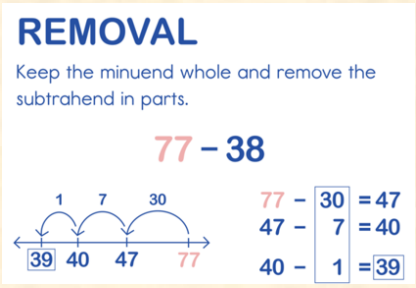
Did you know subtraction means <u>two different things</u>?

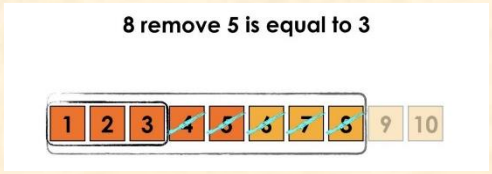
1. We can think of it as "take away", or "removal":



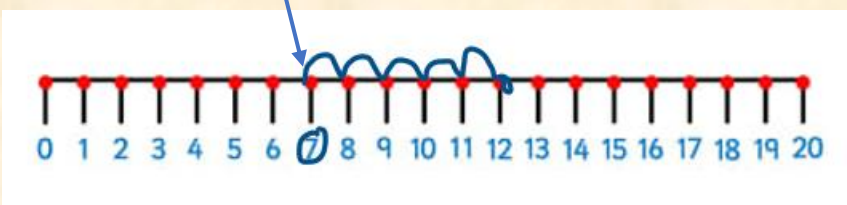






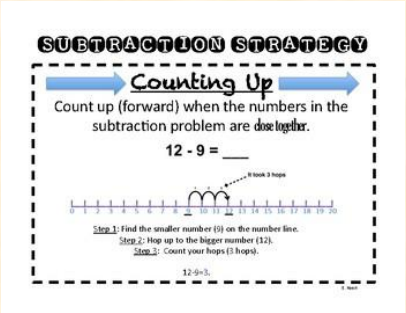


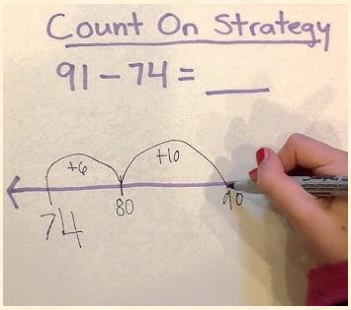
Subtraction in this sense means removing objects from a set. We show a number of fingers and *put them down* as we *count back*. On a number line, we are *counting back*.
If we start at the minuend, we count backwards the number of times equal to the subtrahend.
Example: **12 – 5** We say the minuend, "twelve", then we count back FIVE TIMES (the amount of times equal to the subtrahend):
"Eleven, ten, nine, eight, seven", and generally students track this on fingers.
This is harder for students than we realize! Often they continue to count back past seven, because not only are they thinking of saying the words of the numbers, backwards in sequence, but also remembering to do that *five times*.
The answer is the last number we say—in this case, *seven*.
It is easier to track on a number line: We start at 12 and jump backwards (left) five times.
The answer is the number we land on.

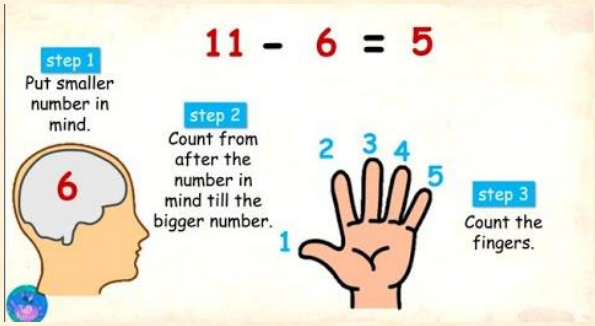


2. Subtraction is also the *distance* between two number on the number line. In this sense the word "difference" makes more sense.

This is how we conceptualize subtraction when we use the "counting on" or "counting up" strategy.



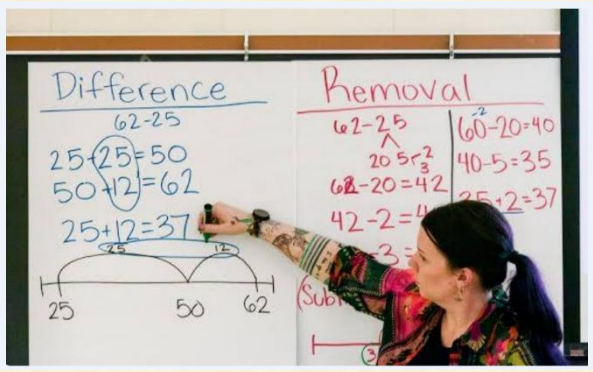


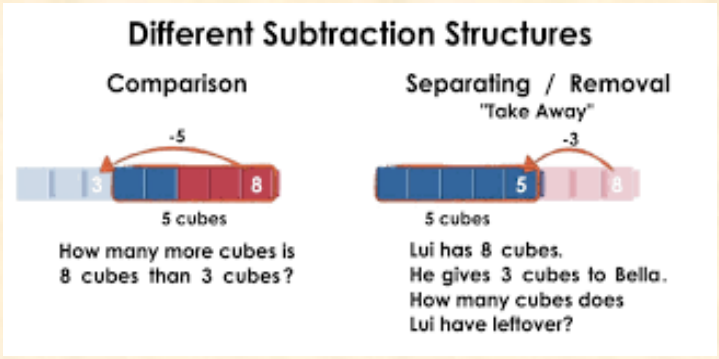


Counting on our fingers, we start with the subtrahend, and count up till we land on the minuend. The **answer is the number of fingers we are holding up.**

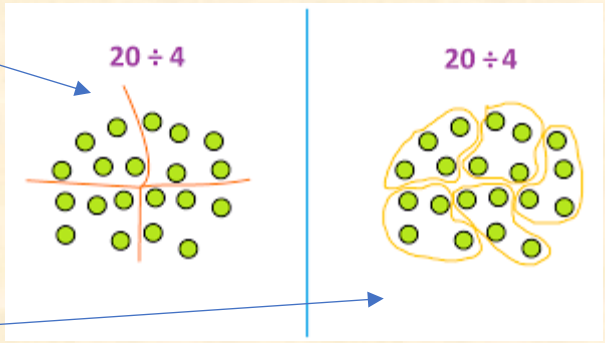
When we conceptualize subtraction this way on a number line, the **answer is not where we land, it's the number of jumps we took (the distance between the two numbers).**

Confusing, right? No wonder our students sometimes struggle! Our screener data shows that kids can generally add quite successfully, and then struggle with subtraction. If we are teaching these two conceptualizations interchangeably, without denoting the difference, we may add to the confusion.



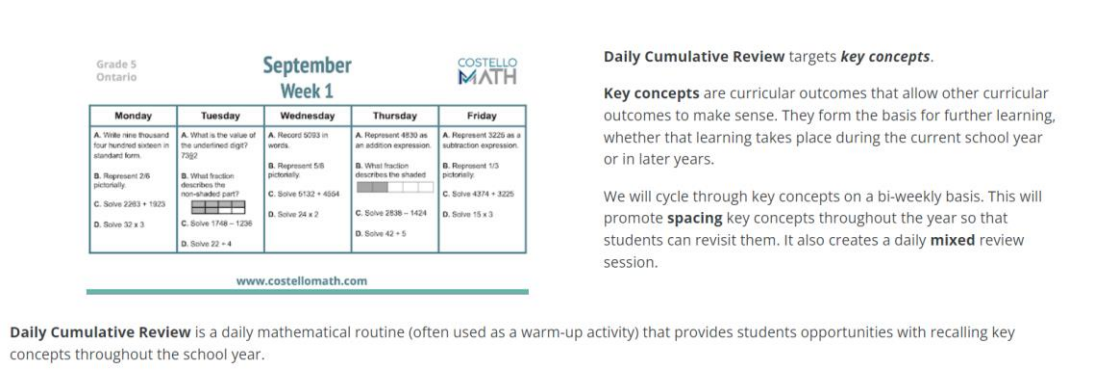


Note that division is similar—it can be *quotative* division (hence the word quotient) or *partitive* division. Here's a quick definition: In partitive division, we equally distribute ("partition") or **share** a quantity into a number of groups, and our goal is to determine how many objects each (equal) group can receive. In the quotative approach to division, we know the number of items assigned for each group and we find the number of groups.



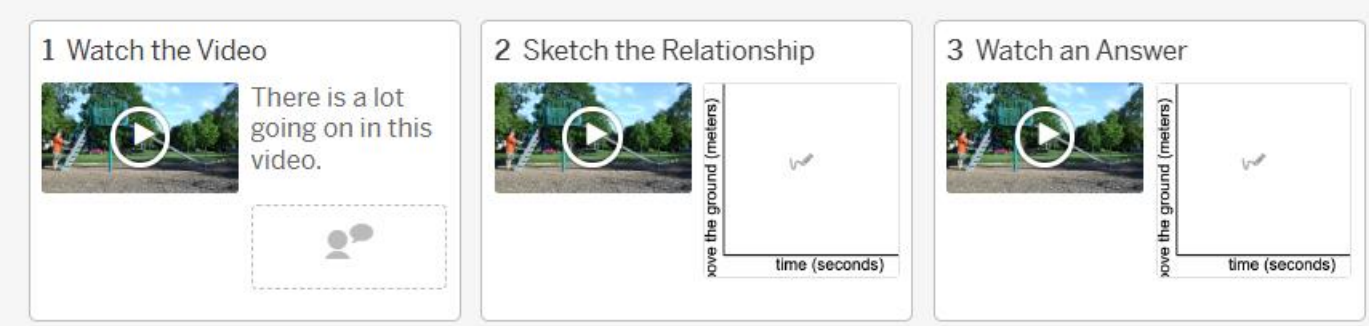
Gems from the Web:

Looking for a source of spaced practice or bell work? Check out David Costello's Math Warm Ups. Select "Canada" to get material that aligns with our WNCP curriculum. https://costellomath.com/daily-cumulative-review-math-warm-up/?utm_source=newsletter&utm_medium=email&utm_term=2024-09-26&utm_campaign=+the+subscript+bite-sized+ideas+for+your+math+classroom



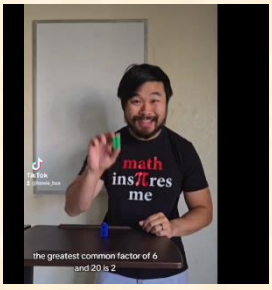
Please though, ***never time math work.*** Math anxiety is real! We need kids to know "fast" at math doesn't necessarily mean "good" at math.

From Desmos: Graphing Stories
https://teacher.desmos.com/activitybuilder/custom/58797d35d81a612605304b1f?collections=651ca31cf69ee59aa9e3818a%2C5da6476150c0c36a0caf8ffb



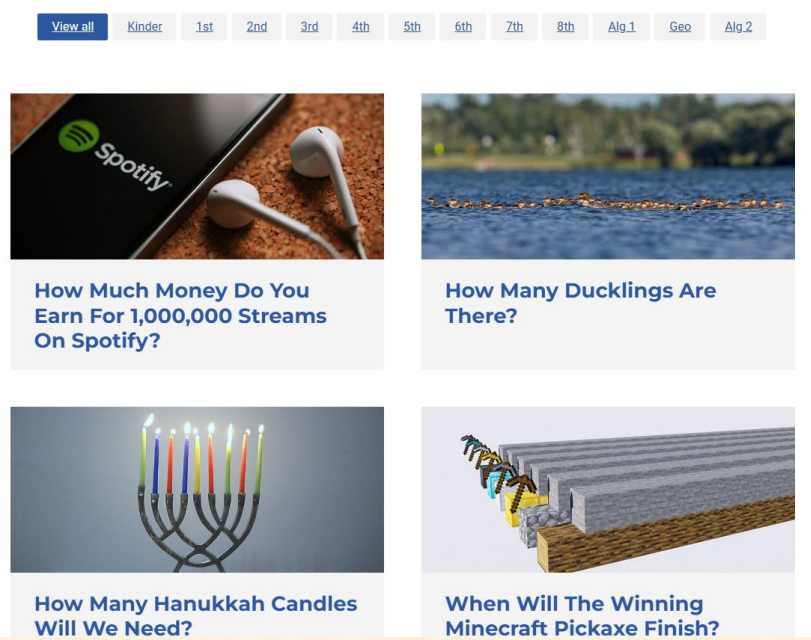
These are ideal for outcomes that involve understanding and interpreting graphs of movement over time, like P9.1 Analyze and Interpret Graphs, or FP10.6 Functions and Relations.

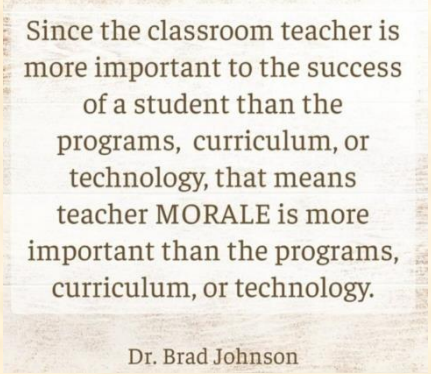
Donna Boucher, Math Coach's Corner
Donna posts a new free game every week. Her games are simple, easy to set up, and work great for elementary/middle years practice. Check out the "freebies" here: https://www.mathcoachscorner.com/category/freebie/



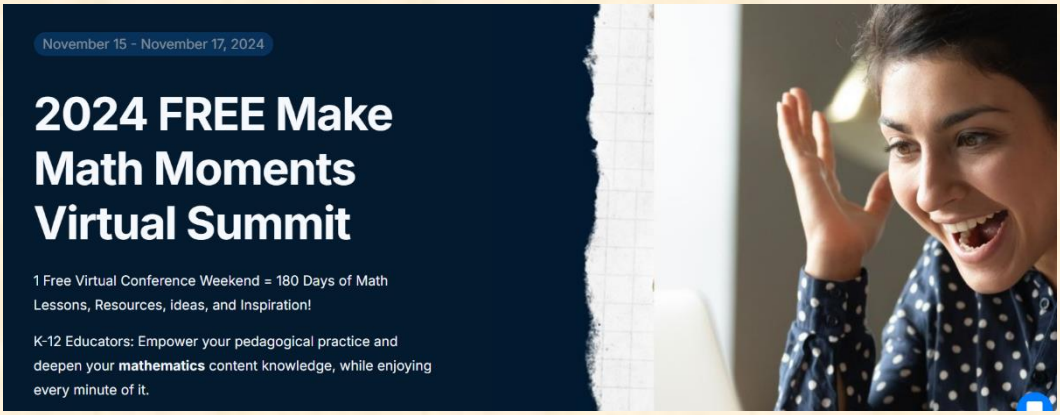
If you're not following Howie Hua on Instagram or Twitter (X), START NOW! Howie provides awesome ways to explain math relationships, making us wonder why someone ever thought these things were hard! Howie was our Keynote last year at the SUM conference.

Looking for more "real world" math prompts? Check out Robert Kaplinsky's Lessons https://robertkaplinsky.com/lessons/



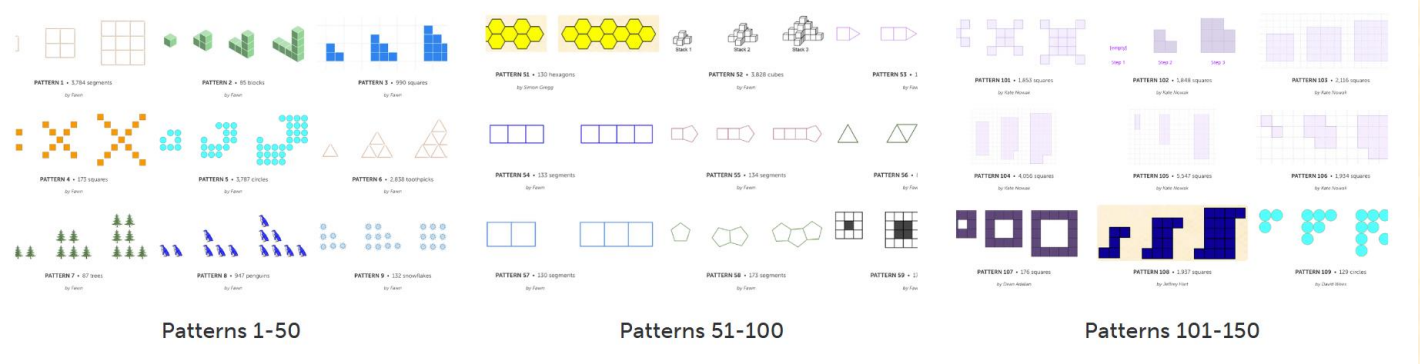


Make Math Moments Matter: https://makemathmoments.com/ Kyle Pearce and Jon Orr continually work to improve math instruction and classroom experiences for kids. Their podcast features conversations around math classrooms and often includes conversations with Math Education specialists like Jo Boaler (Mathematical Mindsets), John Hattie (Visible Learning), Dr. Nikki Newton and Dan Meyer (Three Act Maths, Math Needs a Makeover). They have videos for teaching graphing, ways of explaining, Math is Visual conceptual videos, and much more! They are a strong voice in encouraging great math teaching. Best of all, they have an annual FREE conference, coming up on Nov 15! These online sessions are worth attending! For $40 you get access to the recordings of their sessions for a month. I've attended this summit before, as well as many math consultants I work with, and it is definitely worth your time!



https://summit.makemathmoments.com/

Visual Patterns is useful for teaching the linear relation content in Grade 7,8, and 9, as well as patterning in elementary grades. They copy or snip easily to put in your own handouts or assessments, and can be shown on SMARTboard/Viewboard for instructing and modeling

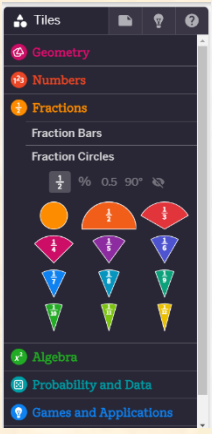


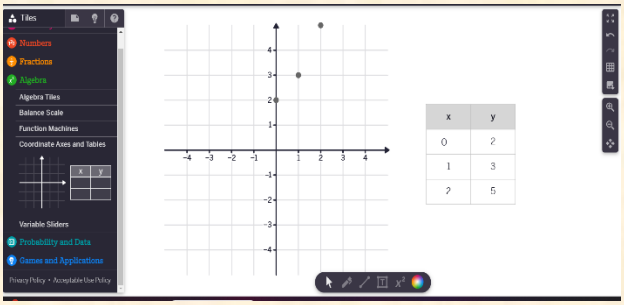
https://www.visualpatterns.org/

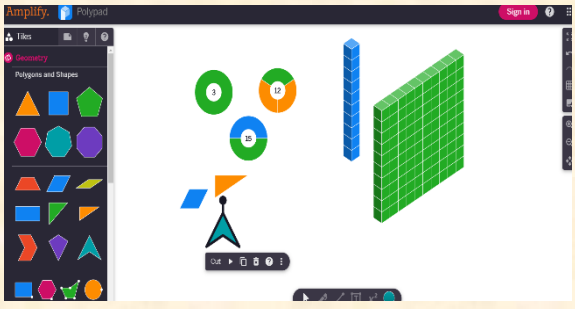
Math = Love This website has great teaching ideas, classroom posters and visuals, and excellent tasks! https://mathequalslove.net/

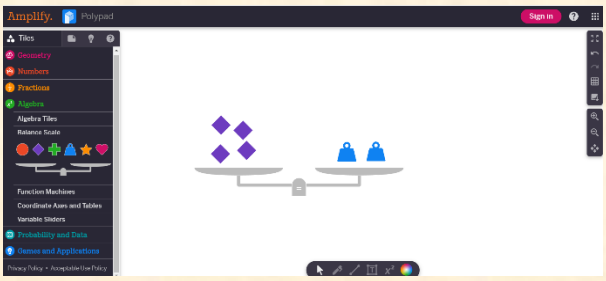
Best sources of Virtual Manipulatives:

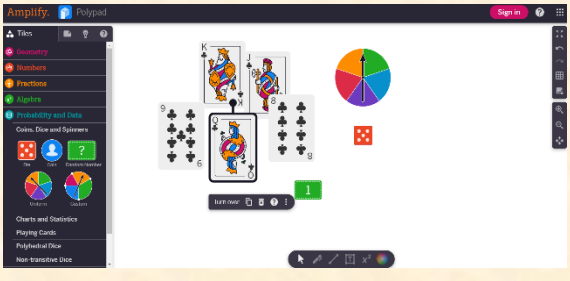
https://polypad.amplify.com/p Has EVERYTHING including a stash of demos and lessons premade by other teachers. A+ for ease of use



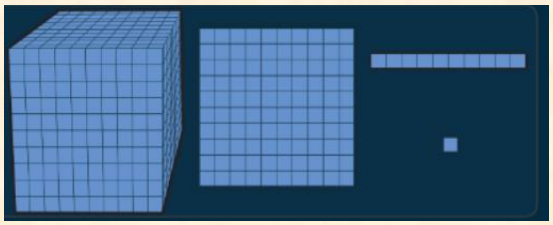






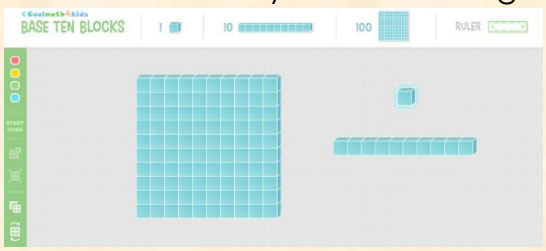


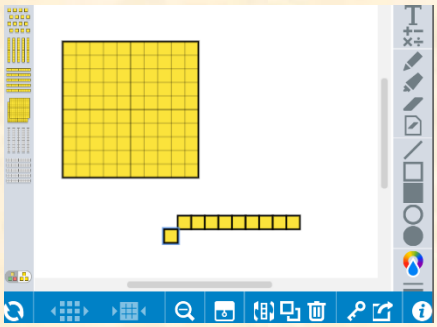
Base Ten Blocks



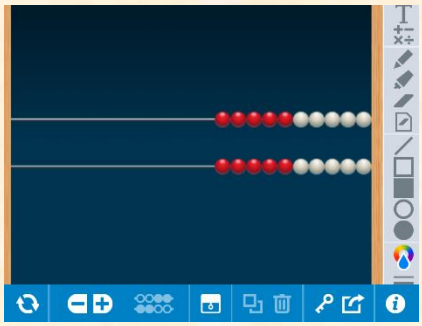
Didax https://www.didax.com/apps/base-ten-blocks/ includes a place value chart to slide the blocks on. Cool Math for Kids https://www.coolmath4kids.com/manipulatives/base-ten-blocks are nice clear base ten blocks. They are not ungrouping properly lately, especially on a Viewboard/SMARTboard.

Number Pieces by Math Learning





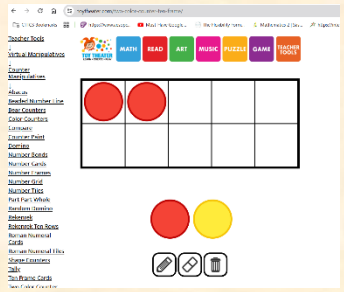
Centre ungroup—be sure to deselect them before going back to pull them apart.

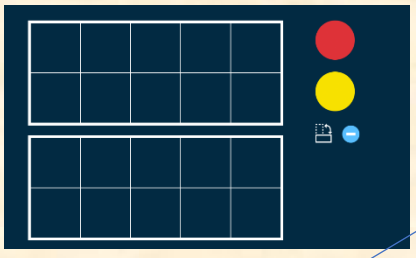


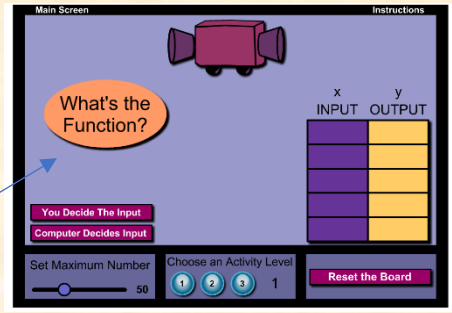
Virtual Rekenrek (Math Rack)
https://apps.mathlearningcenter.org/number-rack/

Single **ten frame** with 2-colour counters
https://toytheater.com/two-color-counter-ten-frame/

With Didax you can create two frames for addition within 20
https://www.didax.com/apps/ten-frame/



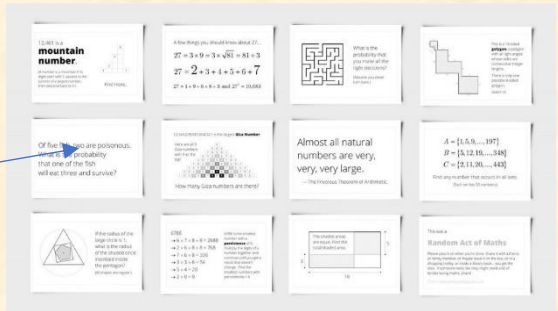




For teaching linear patterns in Gr 7 and 8 (Finding pattern rule), this **linear function machine** works great!
https://www.mathplayground.com/functionmachine.html

http://www.shodor.org/interactivate/activities/FunctionMachine/

Great ways to add inspiration to your math class, including "Random Acts of Maths", which can be used many ways!

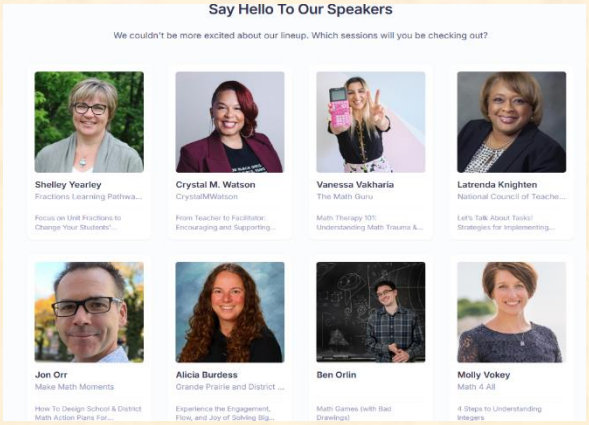


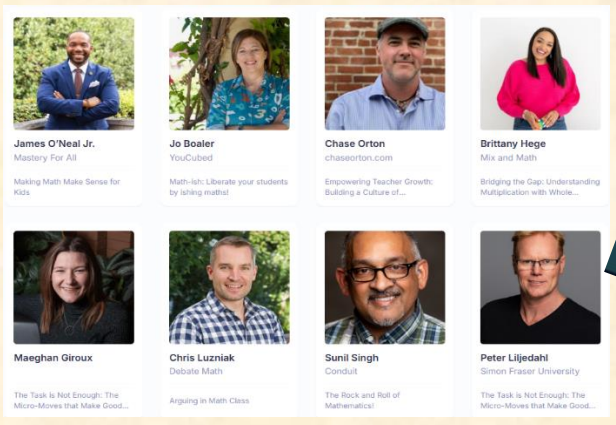
https://mathsedideas.blogspot.com/p/resources.html#RAMs

Upcoming Professional Development

STF Professional Learning has 4 more of these 2 day workshops this year, at various locations through the province. Read more here: https://www.stf.sk.ca/professional-resources/events-calendar/#events

Saskatchewan Math Conference 2025, Saskatoon. Register here: https://www.smts.ca/sum-2025/registration/





These are only some of the presenters you can hear at the Math Summit—FOR FREE!
Nov 15 – 17. Register Here: https://summit.makemathmoments.com/