Connecting Fundamental Math Concepts with mathies.ca

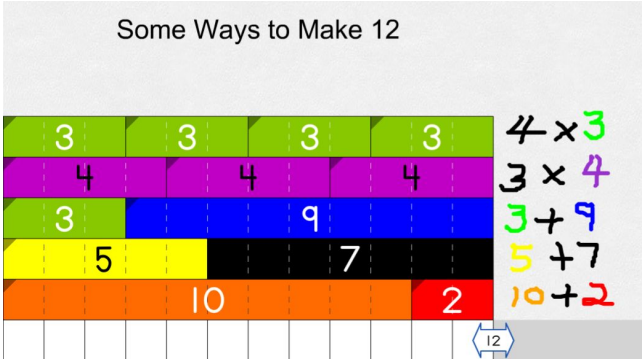
There are five fundamental math skills categories described in Focusing on the Fundamentals of Math - A Teacher's Guide. Several examples of how the mathies tools and games could be used to support each category are provided below.

Working with numbers: Understanding and using numbers
(e.g., being able to read, represent, count, order, estimate, compare, compose, decompose, and recompose numbers).

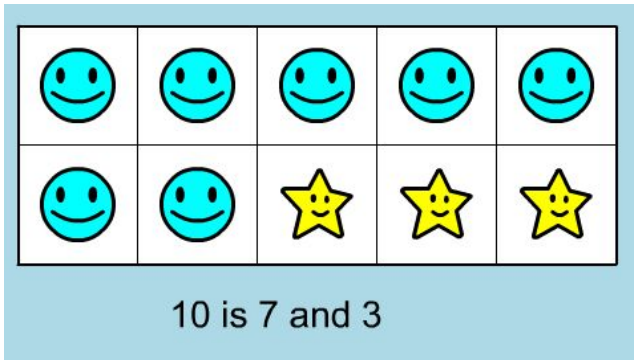
Students can use the *Number Chart* to practise counting and skip-counting.

Ask students to determine missing numbers on the chart.

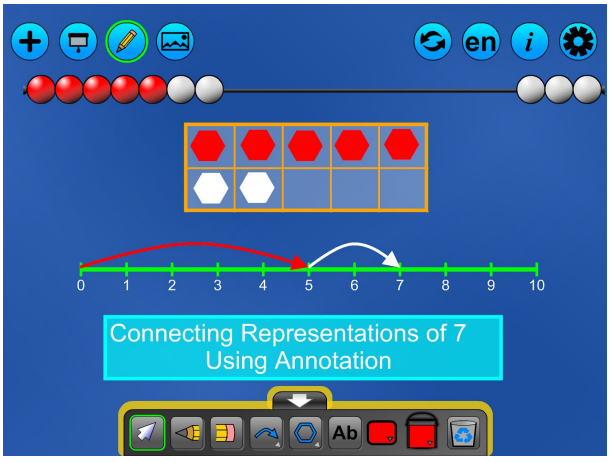
The R*elational Rods+* tool is ideal for decomposing numbers.



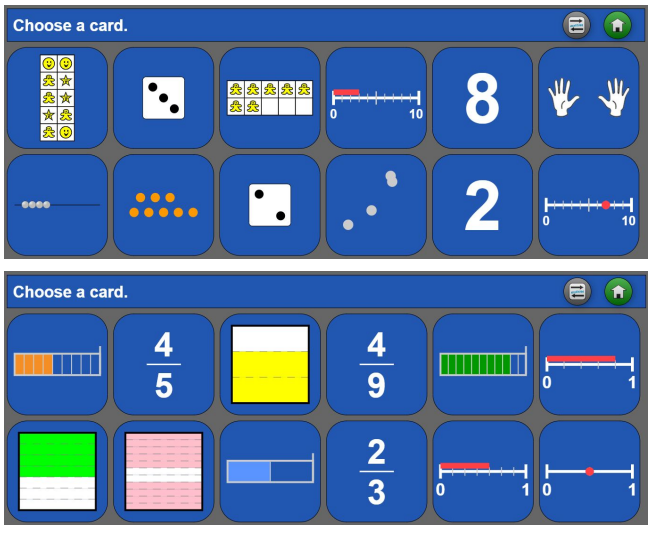
The *Set Tool* can be used to represent and compose numbers.



The annotation objects, embedded in many of the mathies tools (e.g., *Rekenrek*), can be used to create additional representations thus allowing students to see multiple representations in the same workspace.



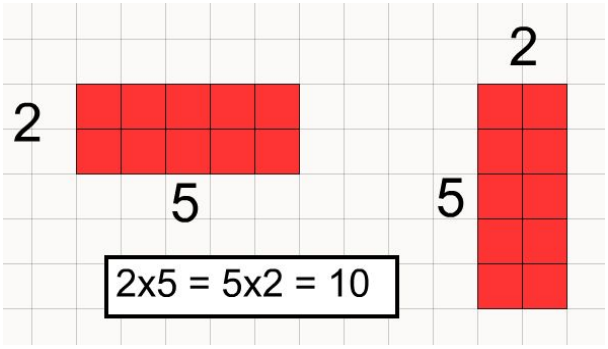
Several games, including *Whole Number Representation Match and Fractions Representation Match* , can be used to practice recognizing and connecting representations.



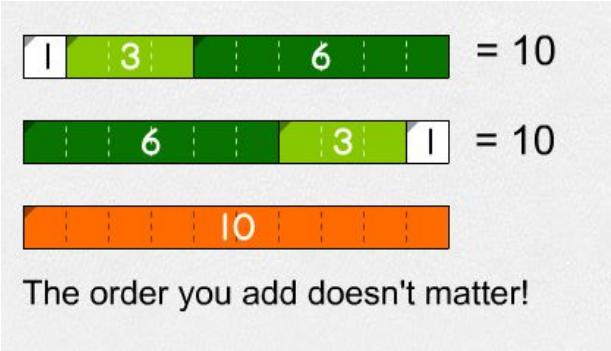
Recognizing and applying understanding of number properties: Understanding how numbers behave in operations and drawing on that understanding to master math facts and perform calculations.

Using tools to create interactive visual representations allows students to better understand number properties.

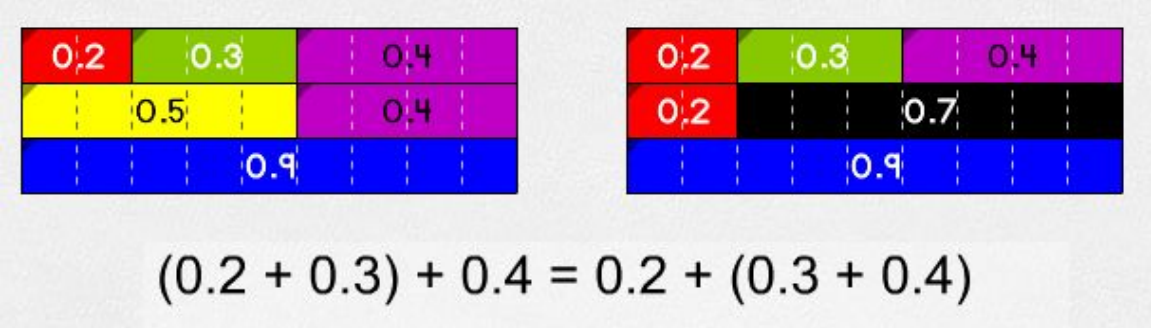
The *Colour Tiles* tool is used to visually represent the commutative property for multiplication.



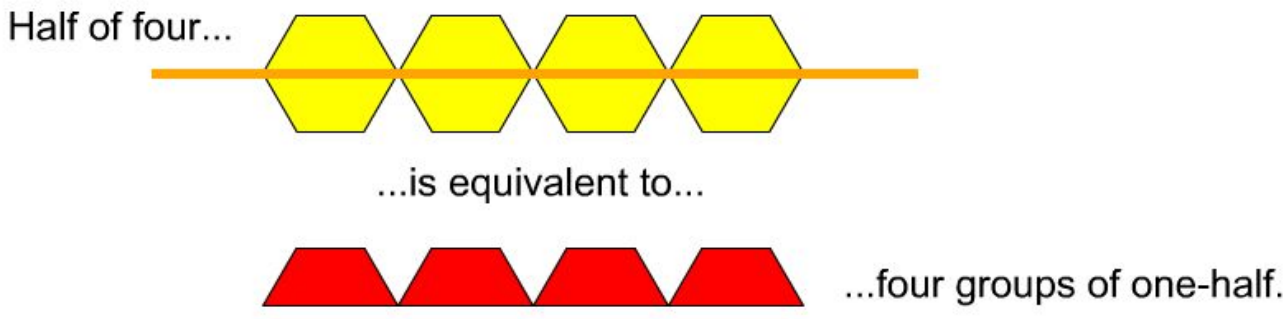
The *Relational Rods+* tool is used to reinforce addition properties.



The *Relational Rods+ Tool* is used to illustrate the associative property for addition.

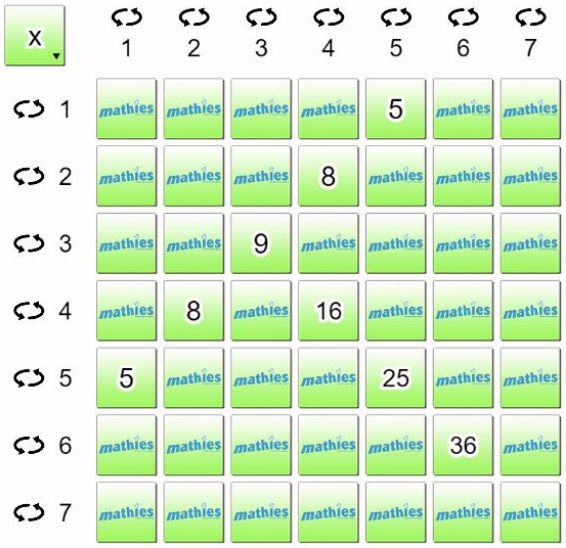


The *Pattern Blocks+* tool is used to demonstrate the commutative property (e.g., $\frac{1}{2} \times 4 = 4 \times \frac{1}{2}$).

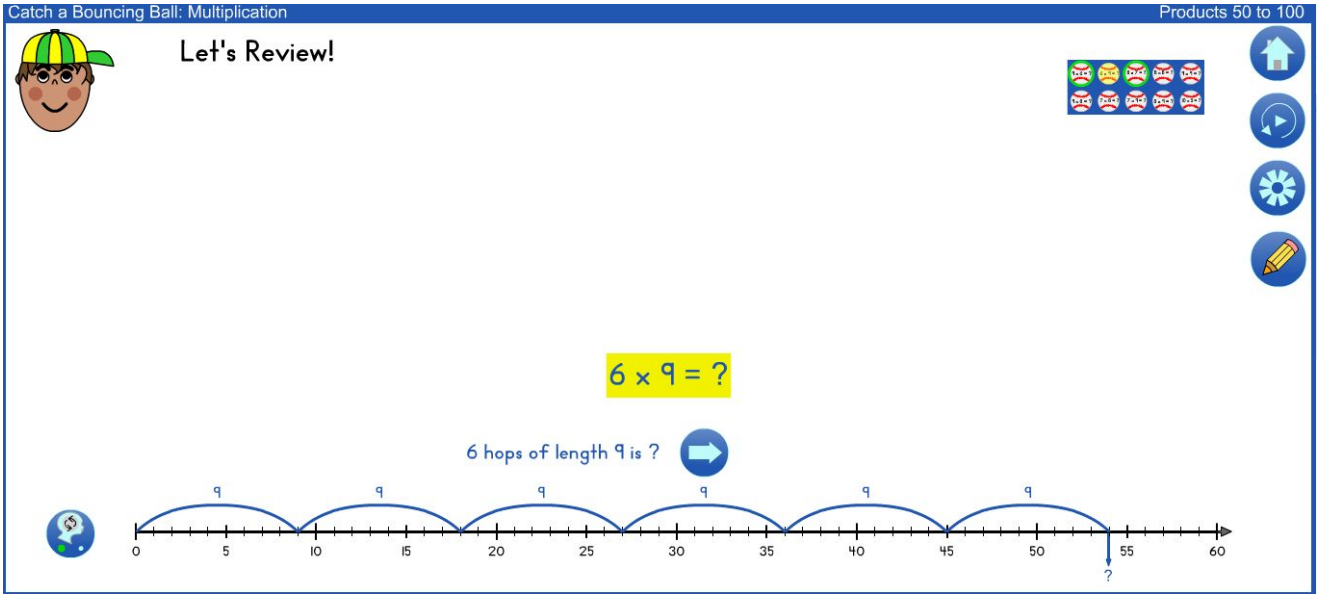


Mastering math facts: Understanding and recalling math facts, using a variety of strategies.

Understanding and recalling math facts can be bolstered by using tools such as the *Number Chart* to practise. Have students start by hiding all the cards in the chart. Choose a multiplication fact. Determine the product. Flip the corresponding card to check.



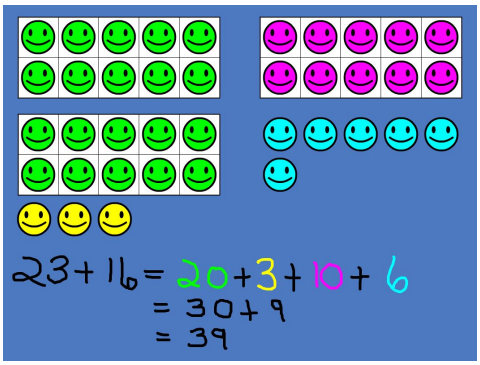
Games can also be used to engage students and provide opportunities for practice. *Catch a Bouncing Ball - Operations* provides immediate feedback, incorporates the annotation tool so students can illustrate the strategy they used and, once the game is over, provides visual representations that support understanding the operations.



Developing mental math skills: Doing calculations in the mind, with little or no use of paper and pencil or calculator.

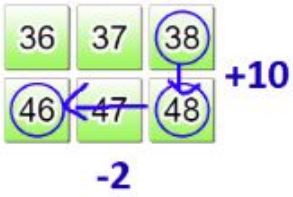
Using visual tools when learning to perform mathematical operations allows students to draw on these mental models and visualizations to perform mental calculations.

One useful mental math strategy is to decompose values into friendly numbers then use the associative property to add the values in a different order. The *Set* tool uses colour coding to help students see the decomposition.

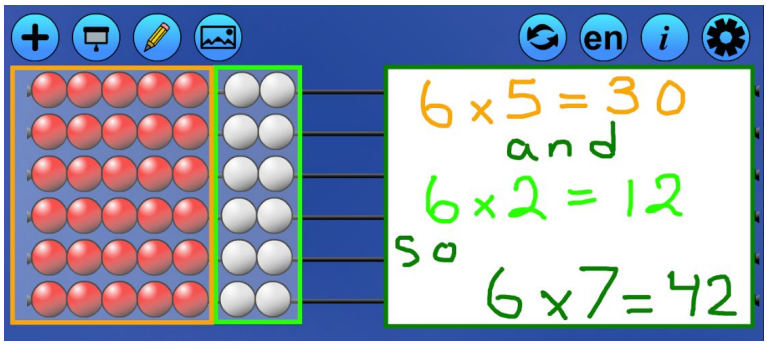


Another useful strategy is compensation (adding and then subtracting the same amount). The *Number Chart* is used to illustrate this strategy.

Think of 38 + 8
as 38 + (8 + 2) - 2
or 38 + 10 - 2.



The distributive property is useful to calculate 6 x 7, which can be thought of as 6 groups of 7. The *Rekenrek* naturally displays the 7 as 5 + 2, allowing the calculation to be broken up as 6 x 5 plus 6 x 2. This is a strategy that is useful for many products.

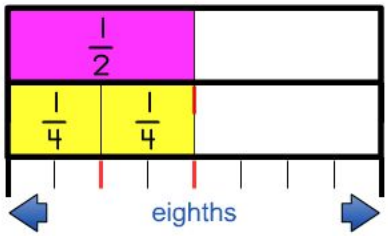


Developing proficiency with operations: Performing calculations with ease, precision, and consistency and with a general understanding of number and operations, number properties, and their appropriate application in problem solving.

The mathies tools provide interactive work spaces where students can represent and solve problems which require them to apply their number sense skills and provide opportunities to develop proficiency with operations.

The *Money* tool can be used to simulate purchases, determine change and compare amounts.

Proficiency with fraction operations can be bolstered using the *Fraction Strips* tool. The visual models also build an intuitive understanding of equivalence.



Opportunities to practise multiplication facts occur when solving ratio and proportion problems such as:

> Paul's grandmother is making a quilt. For every 2 yellow pieces in the quilt, there are 3 green pieces. If there are 60 pieces in the quilt, how many are yellow and how many are green?

The *Relational Rods*+ Tool is used to represent and solve this problem.