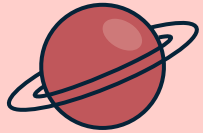
Lunch & Learn

Reframing Mathematical Mindsets

April 2023

Agenda



01

Myths in Mathematics

02

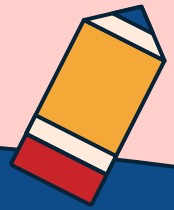
What is inquiry-based math?

03

What our students say

04

Questions



01

Myths in Mathematics

Counting on your fingers is not a successful math strategy.

MYTH!

"...the better students' knowledge of their fingers was in the first grade, the higher they scored on number comparison and estimation in the second grade. Even university students' finger perception predicted their calculation scores."

Boaler, J. (2016, April 14). *Why kids should use their fingers in math class (commentary by Jo Boaler)*. Stanford Graduate School of Education. Retrieved December 5, 2022, from https://ed.stanford.edu/in-the-media/why-kids-should-use-their-fingers-math-class-commentary-jo-boaler#:~:text=Other%20researchers%20have%20found%20that,perception%20predicted%20their%20calculation%20scores.

Being comfortable with making mistakes is an important state of mind for developing creativity, entrepreneurship, and originality.

FACT!

Peter Sims, a writer for the *New York Times*, has written widely about the importance of mistakes for creative, entrepreneurial thinking. He points out: “Imperfection is a part of any creative process and of life, yet for some reason we live in a culture that has a paralyzing fear of failure, which prevents action and hardens a rigid perfectionism. It's the single most disempowering state of mind you can have if you'd like to be more creative, inventive, or entrepreneurial" (Boaler, 2016 p.2, as cited in Sims, 2011)

To be good or fluent at math, you need to be able to calculate quickly.

MYTH!

"The powerful thinkers in today's world are not those who can calculate fast, as used to be true; fast calculations are now fully automated, routine, and uninspiring. The powerful thinkers are those who make connections, think logically, and use space, data, and numbers creatively" (Boaler, 2016, p.64)

The left and right side of the brain handle different functions. Some people have a stronger side than the other, which helps people who are good at math.

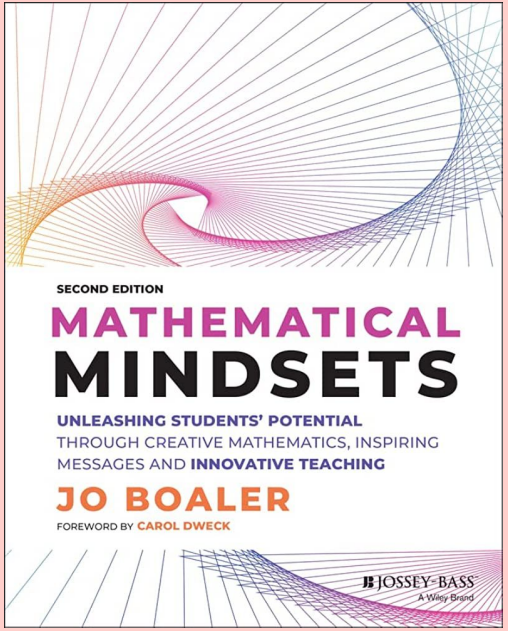
MYTH!

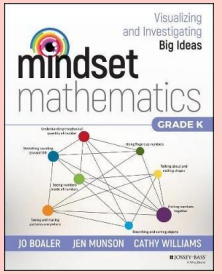
Research has found that the most powerful learning occurs when we use different pathways in the brain. (Park & Brannon, 2013)

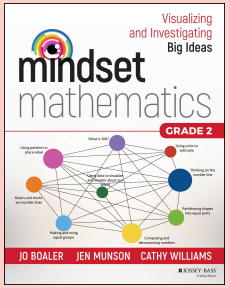
The left side handles factual and technical information. The right side handles spatial and visual information. Research is showing that the highest achievers in math exhibit the strongest connections between both sides of the brain.

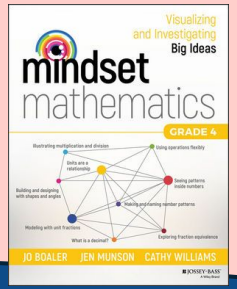
Professor Jo Boaler

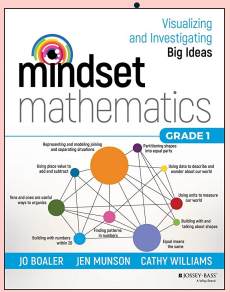
Stanford University

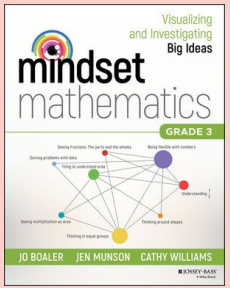








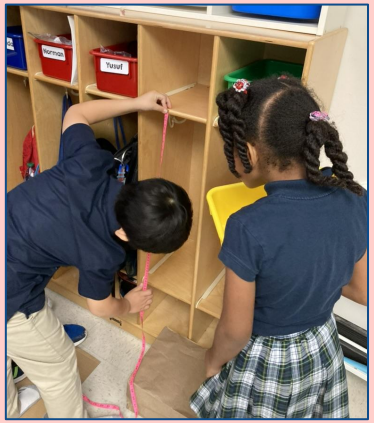




02

What is inquiry-based math?

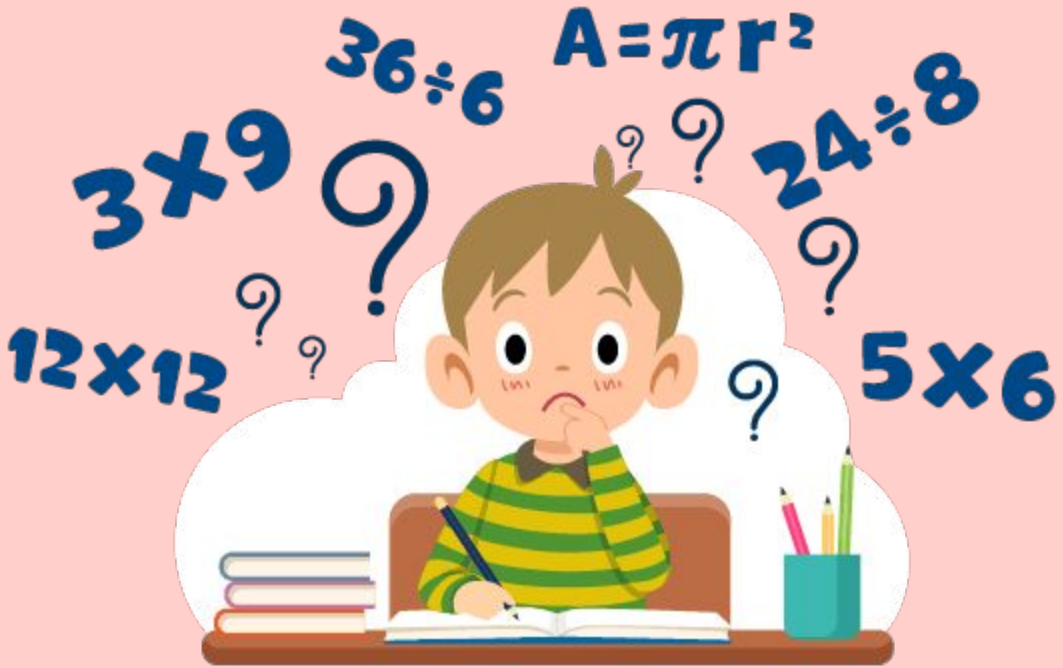
Student Agency



Discussion

Questions

Changing the Mindset



Growth Mindset

Believe In Yourself, It Changes What You Can Do!

Research has shown that if you believe in yourself and you make a mistake your brain responds with more activity and brain growth than if you don't believe in yourself. Always remember you can learn anything!

youcubed

Reviewing the Roles of our Mathematicians

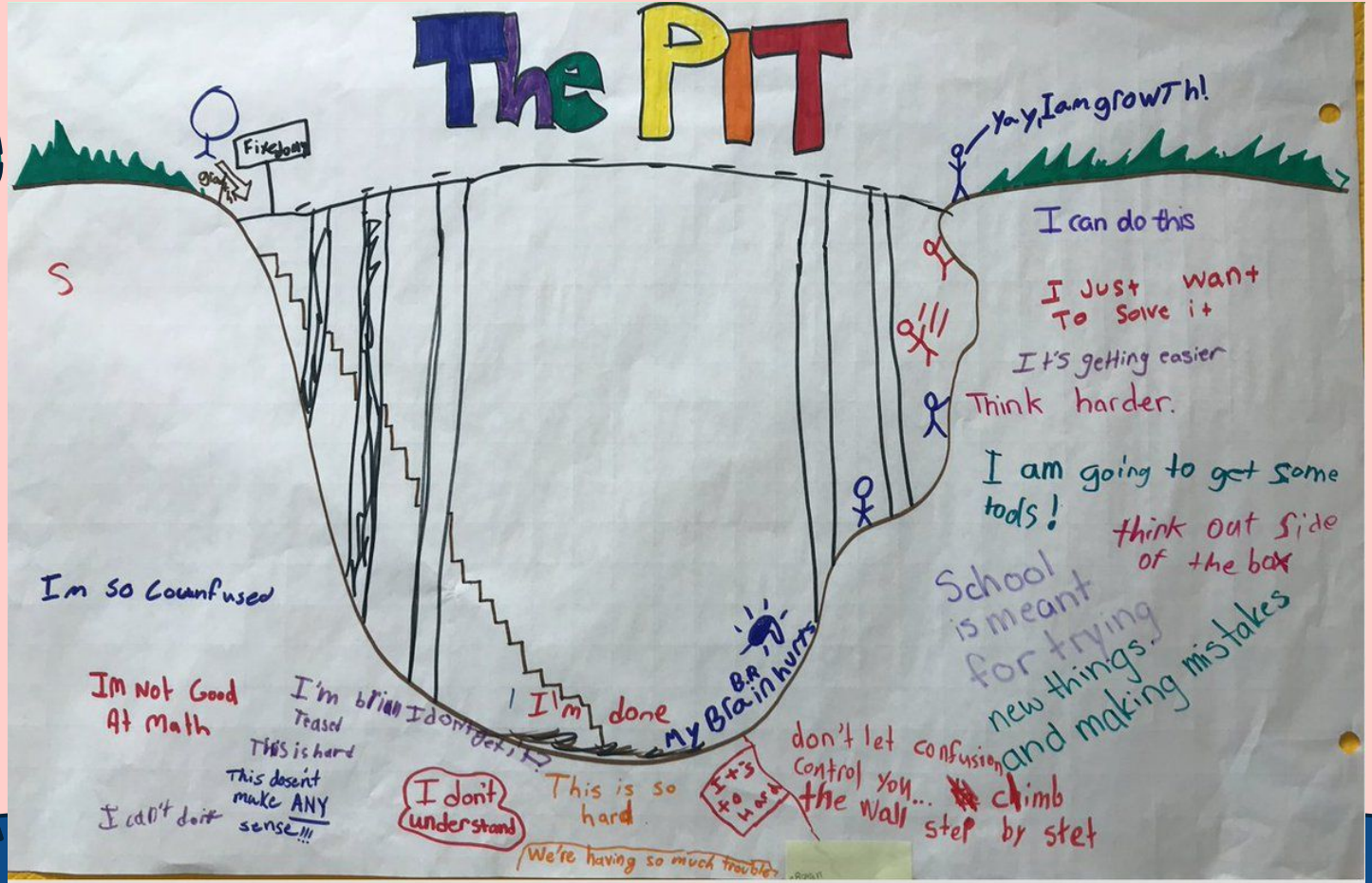
REASONING: To reason and share your thinking with others.

CONVINCING: To explain, show or give evidence to convince others that your thinking makes sense.

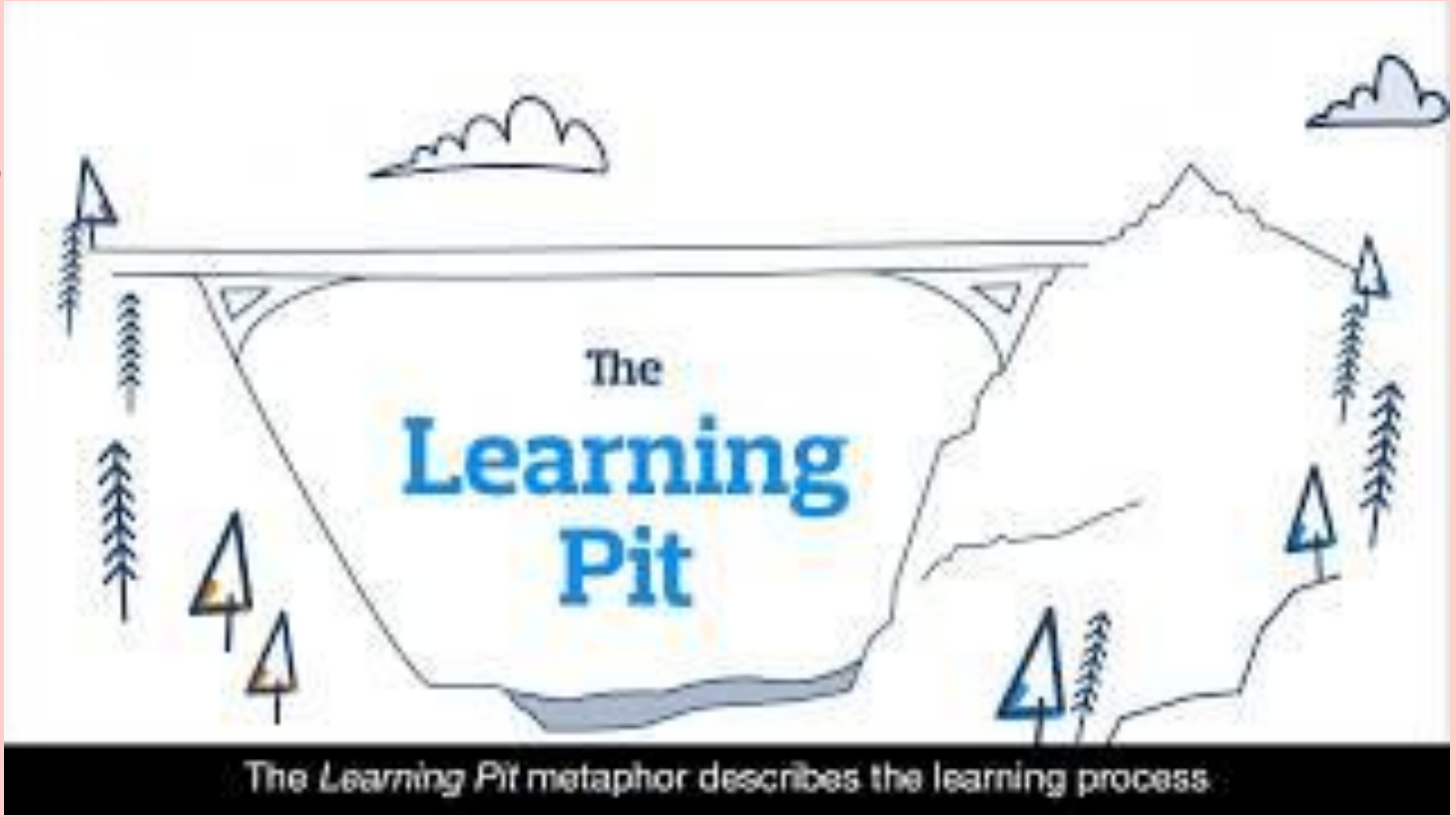
- Convince yourself
- Convince a friend
- Convince a skeptic

POSING QUESTIONS: To listen to the thinking of others and ask questions to make sense of their ideas.

Celebrating Struggle!



Celebrating Struggle!



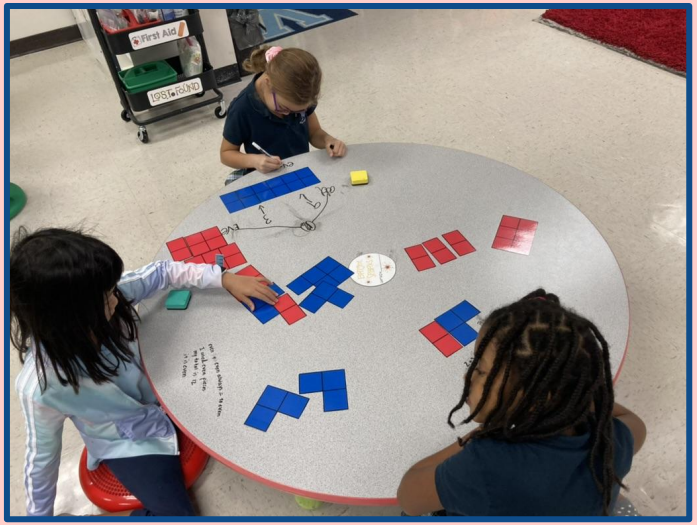
The *Learning Pit* metaphor describes the learning process

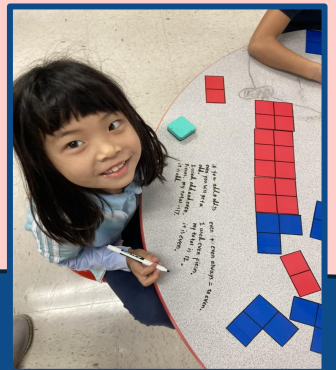
Encourage Problem Solving

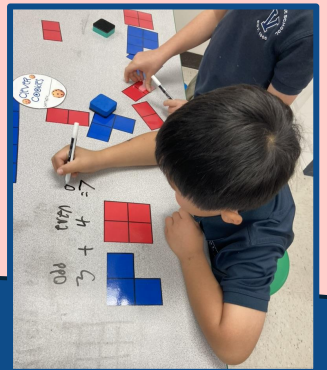
Even or Odd Number

16	Even	7	Odd
23		87	
5		13	
168		409	
235		882	
550		411	
745		344	

LIVEWORKSHEETS

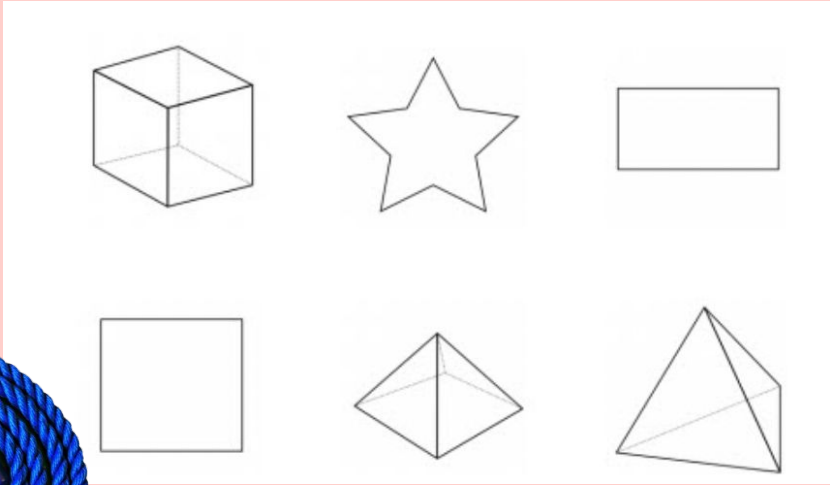






Let's give it a try!

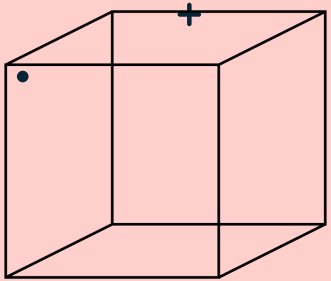
Big Idea Exploration: Building Shapes

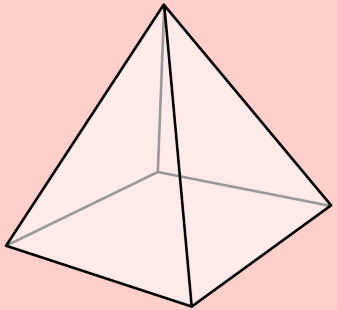


As you work through the task, think about:

- How could you convince a friend that your ideas and suggestions could work?
- How could you convince a skeptic that your ideas and suggestions could work?

Debrief





During this task did you:

Explore?
Find yourself in the learning pit?
Problem solve?
Ask questions?
Collaborate?
Explain your reasoning?
Convince a skeptic?
Make connections?

02

What will Math look like at Village ES?

The Skills of a Viking

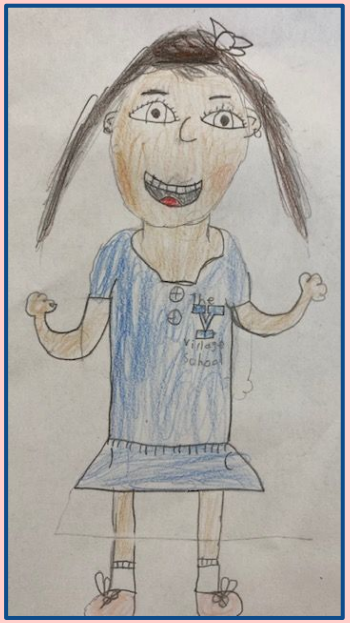
Resilient

Independent

Creative

Confident

Risk-taker



Persevere

Communicator

Inquirer

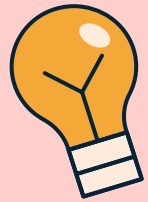
Collaborator

Explorer

Innovative

Connection Builder

Spiral: Foundations to Mastery



Discovering Shape & Space

Partitioning Shapes into Equal Parts

W2 (W3 - 2-G3 again)

ADDED: 2-G.1 - Recognize and draw shapes having specified attributes, such as a given number of angles or a given number of equal faces.1 Identify triangles, quadrilaterals, pentagons, hexagons, and cubes.

2-G.3 - Partition circles and rectangles into two, three, or four equal shares, describe the shares using the words halves, thirds, half of, a third of, etc., and describe the whole as two halves, three thirds, four fourths. Recognize that equal shares of identical wholes need not have the same shape.

2-OA.4 - Use addition to find the total number of objects arranged in rectangular arrays with up to 5 rows and up to 5 columns; write an equation to express the total as a sum of equal addends.

2-G.2 - Partition a rectangle into rows and columns of same-size squares and count to find the total number of them.

Making and Using Equal Groups

W5

2-OA.4 - Use addition to find the total number of objects arranged in rectangular arrays with up to 5 rows and up to 5 columns; write an equation to express the total as a sum of equal addends.

2-NBT.2 - Count within 1000; skip-count by 5s, 10s, and 100s.

2-G.2 - Partition a rectangle into rows and columns of same-size squares and count to find the total number of them.

Taking Wholes Apart, Putting Parts Together

What is 100?

W6

2-NBT.1a - Understand that the three digits of a three-digit number represent amounts of hundreds, tens, and ones; e.g., 706 equals 7 hundreds, 0 tens, and 6 ones.

2-OA.4 - Use addition to find the total number of objects arranged in rectangular arrays with up to 5 rows and up to 5 columns; write an equation to express the total as a sum of equal addends.

2-NBT.5 - Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.

2-NBT-7 - Add and subtract within 1000, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method. Understand that in adding or subtracting three-digit numbers, one adds or subtracts hundreds and hundreds, tens and tens, ones and ones; and sometimes it is necessary to compose or decompose tens or hundreds.

2-G.2 - Partition a rectangle into rows and columns of same-size squares and count to find the total number of them.

Composing and Decomposing Numbers

W9

2.OA.1 - Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.

ADDED: 2.OA.2 - Fluently add and subtract within 20 using mental strategies. By end of Grade 2, know from memory all sums of two one-digit numbers.

2-OA.4 - Use addition to find the total number of objects arranged in rectangular arrays with up to 5 rows and up to 5 columns; write an equation to express the total as a sum of equal addends.

ADDED: 2.NBT.8 - Mentally add 10 or 100 to a given number 100-900, and mentally subtract 10 or 100 from a given number 100-900.

2-NBT.5 - Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.

Using Patterns in Place Value

W12

2.NBT.1 (a, b & c) - a.Understand that the three digits of a three-digit number represent amounts of hundreds, tens, and ones; e.g., 706 equals 7 hundreds, 0 tens, and 6 ones. b.Understand the following as special cases: 100 can be thought of as a bundle of ten tens — called a "hundred." c. The numbers 100, 200, 300, 400, 500, 600, 700, 800, 900 refer to one, two, three, four, five, six, seven, eight, or nine hundreds (and 0 tens and 0 ones).

2-NBT.2 - Count within 1000; skip-count by 5s, 10s, and 100s.

2.NBT.3 - Read and write numbers to 1000 using base-ten numerals, number names, and expanded form.

2.OA.3 - Determine whether a group of objects (up to 20) has an odd or even number of members, e.g., by pairing objects or counting them by 2s; write an equation to express an even number as a sum of two equal addends.

ADDED: 2.NBT.4 - Compare two three-digit numbers based on meanings of the hundreds, tens, and ones digits, using >, =, and < symbols to record the results of comparisons.

Exploring Changing Quantities

Thinking on the Number Line

W14

2.MD.6 - Represent whole numbers as lengths from 0 on a number line diagram with equally spaced points corresponding to the numbers 0, 1, 2, ..., and represent whole-number sums and differences within 100 on a number line diagram.

2.MD.7 - Tell and write time from analog and digital clocks to the nearest five minutes, using a.m. and p.m.

2.OA.1 - Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.

2-NBT.5 - Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.

2-G.2 - Partition a rectangle into rows and columns of same-size squares and count to find the total number of them.

Rulers and Clocks are Number Lines

W15

2.MD.1 - Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.

2.MD.7 - Tell and write time from analog and digital clocks to the nearest five minutes, using a.m. and p.m.

2.MD.6 - Represent whole numbers as lengths from 0 on a number line diagram with equally spaced points corresponding to the numbers 0, 1, 2, ..., and represent whole-number sums and differences within 100 on a number line diagram.

2.MD.2 - Measure the length of an object twice, using length units of different lengths for the two measurements; describe how the two measurements relate to the size of the unit chosen.

Communicating Stories with Data

Using Units to Estimate

W16

2.MD.3 - Estimate lengths using units of inches, feet, centimeters, and meters.

2.MD.1 - Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.

2.MD.4 - Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard length unit.

2.MD.5 - Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units, e.g., by using drawings (such as drawings of rulers) and equations with a symbol for the unknown number to represent the problem.

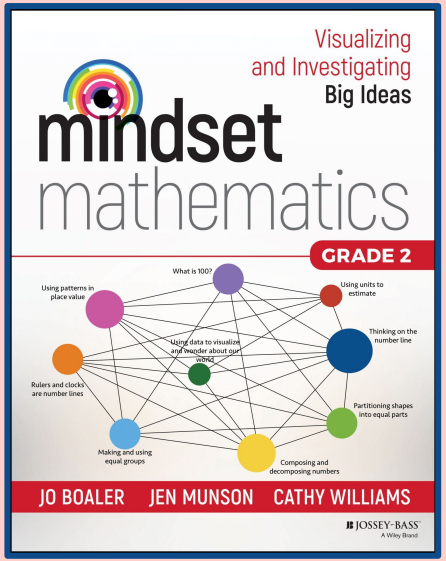
Using Data to Visualize and Wonder about our World

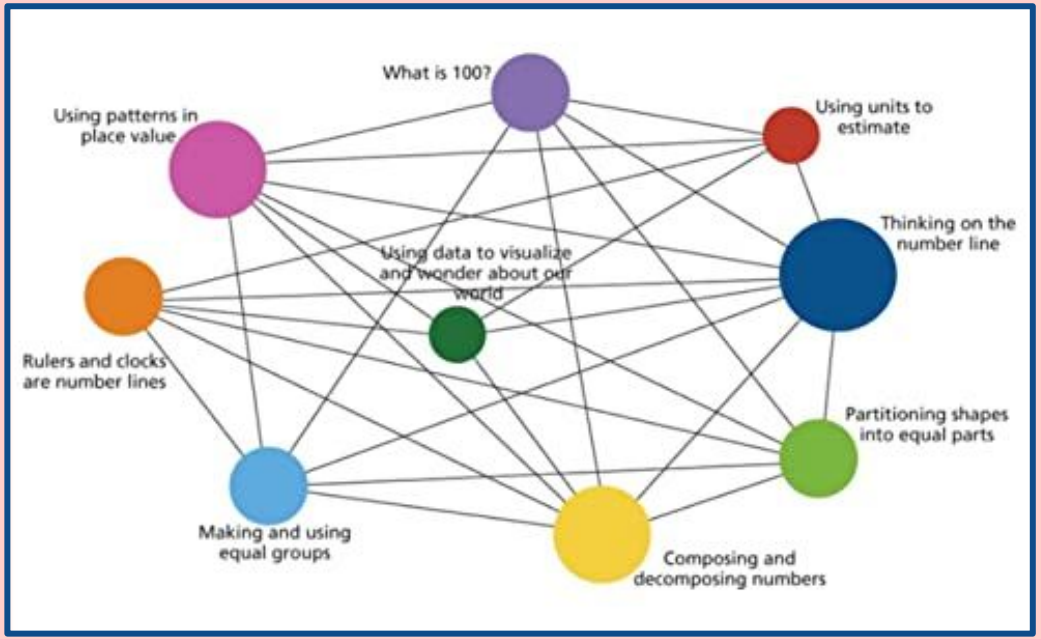
Semester 2

MOVED TO S2: 2.MD.10 - Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph.

ADDED: 2-MD.9 - Generate measurement data by measuring lengths of several objects to the nearest whole unit, or by making repeated measurements of the same object. Show the measurements by making a line plot, where the horizontal scale is marked off in whole- number units.

Big Ideas


Visualizing
and Investigating
Big Ideas
mindset
mathematics
GRADE 2
What is 100?
Using patterns in place value
Using units to estimate
Using data to visualize and wonder about our world
Thinking on the number line
Rulers and clocks are number lines
Partitioning shapes into equal parts
Making and using equal groups
Composing and decomposing numbers
JO BOALER JEN MUNSON CATHY WILLIAMS
JOSSEY-BASS
A Wiley Brand


What is 100?
Using patterns in place value
Using units to estimate
Using data to visualize and wonder about our world
Thinking on the number line
Rulers and clocks are number lines
Partitioning shapes into equal parts
Making and using equal groups
Composing and decomposing numbers

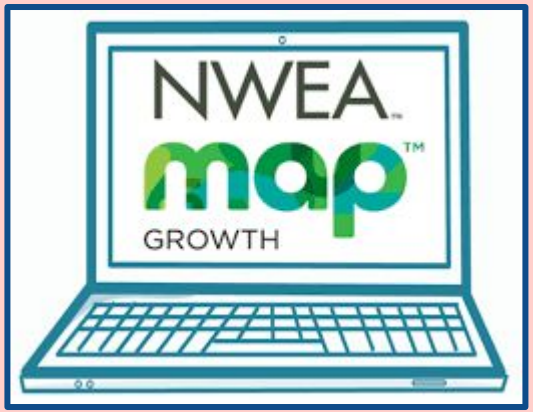
How We Assess

Name:_____ March 2023

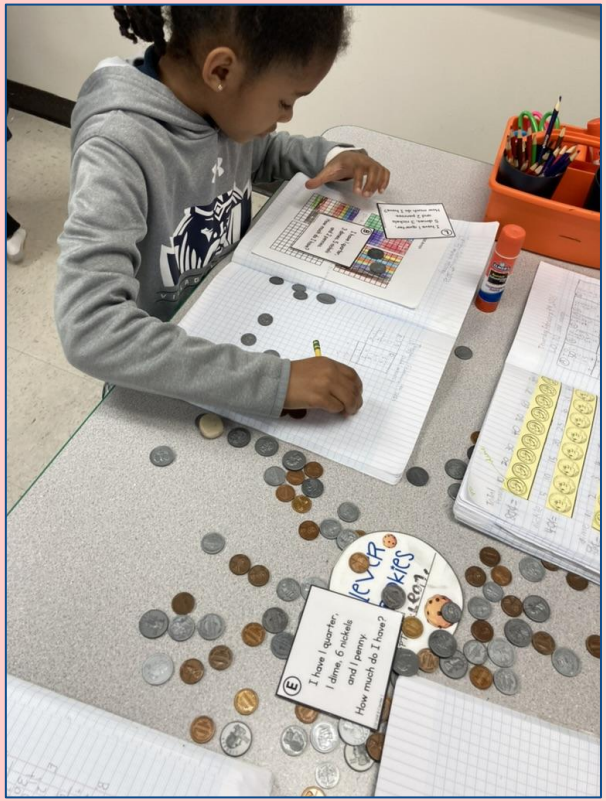
Quarter 3 Math: What I Know

Standard	Trying hard but not yet	Almost	Got it!	What's next?	How do you feel?
Recognize and draw shapes and their attributes, such as number of angles and equal faces. Identify triangles, quadrilaterals, pentagons, hexagons, and cubes.	I am able to recognize and create some 2D and 3D shapes with support.	I am able to recognize and create most 2D and 3D shapes and identify some of their attributes.	I am able to recognize and create 2D and 3D shapes and can describe their attributes accurately.	I am able to recognize and create 2D and 3D shapes accurately and can describe their attributes. I am able to apply this knowledge to solve a variety of problems.	☺ 😐 ☹
Partition circles and rectangles into two, three, or four equal shares, describe the shares using the words halves, thirds, half of, a third of, etc., and describe the whole as two halves, three thirds, four fourths. Recognize that equal shares of identical wholes need not have the same shape.	I am able to partition circles and rectangles into two, three or four equal parts with support.	I am able to partition circles and rectangles into _____ equal parts, describing them with fraction words.	I am able to partition circles and rectangles into two, three or four equal parts, can accurately describe the fraction and identify wholes, accurately.	I am able to partition a range of shapes into two, three or four equal parts, can accurately describe the fraction and identify wholes, accurately. I am able to apply my knowledge of these fractions to solve a variety of problems.	☺ 😐 ☹
Add up to four two-digit numbers using strategies based on place value and properties of operations.	I am able to add up to four two-digit numbers, with support.	I am able to add up to ____ two-digit numbers	I am able to accurately add up to four two-digit numbers, using strategies based on place value.	I am able to accurately add up to four two-digit numbers, using strategies based on place value and order of operations. I am able to apply this knowledge to solve a variety of problems.	☺ 😐 ☹
Explain why addition and subtraction strategies work, using place value and the properties of operations.	I am able to explain why addition and subtraction strategies work with support.	I am able to explain why some addition and subtraction strategies work.	I am able to accurately explain why addition and subtraction strategies work, using place value and order of operations.	I am able to accurately explain why addition and subtraction strategies work, using place value and order of operations. I am able to apply this knowledge to solve different types of	☺ 😐 ☹

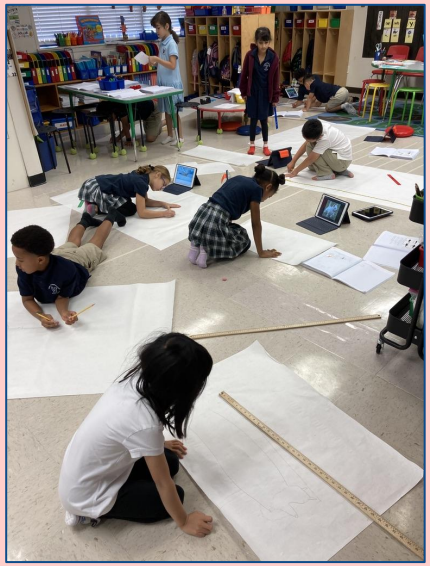
- Student Journals
- Observations
- Conferencing
- Application
- Student reflection videos



Explorative



Problem Solving & Connection Building



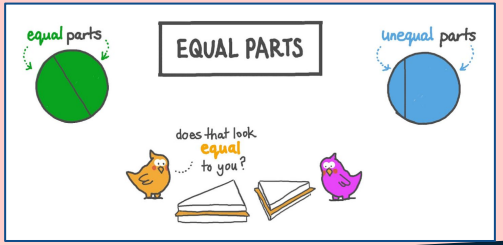
Real World Application

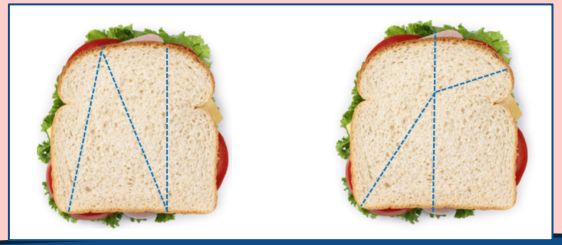
Thursday, August 25th.
LO: To understand what it means for parts of a whole to be equal.

Missions

Challenge	Super Challenge	Mega Challenge	Golden Challenge
Pizza Fractions: Halves	Investigating Equal Parts	Fraction Wall	Matching Game
Everyone start here.			

PLEASE WORK ON PRESENTATION





03

What our students say

Our Grade 2 Mathematicians!

"It made myself proud because I could work together and learn math. The explorations are a lot of fun! I feel brave with math now."

"I feel like it improved my math skills because I get to practice what we learn in a fun way, like when we shopped for the chili recipe."

"Math this year made me build connections and explore better. It taught me to do math in different ways. I feel very open about learning math now."

"When we discovered that a number line was connected to a clock...I was like 'Woah, I didn't know that!' Now I know that I can skip count to tell time. It's been super fun doing math this year!"

"Our Big Ideas made me feel excited and made math more exciting to learn! I feel prepared for 3rd grade."

04 Questions