Summer New Curriculum Institute
Math Grade 4-6

Day 4

Alberta Regional Professional Development Consortia

Adult learning for students' sake

We acknowledge that we, here in Alberta, are on the traditional territories of many First Nations, Métis, and Inuit peoples who have lived and gathered on these lands for centuries.

We are grateful for the opportunity to live, work, and create on this land.

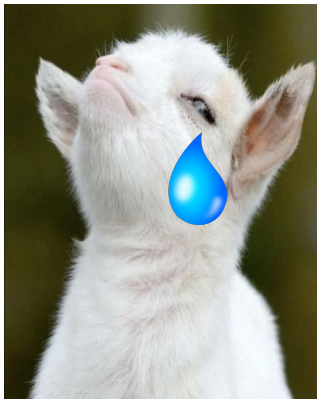
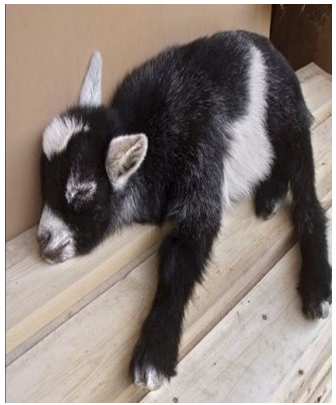
Agenda for Day Four

1. Order of Operations
2. Use of manipulatives
3. Fraction support using manipulatives

Alberta Regional Professional Development Consortia
Adult learning for students' sake

When you think of teaching math in the fall, where would you place yourself?

1 2 3 4 5

To Think About…

When we read our curriculum, we read it through the lens of what we value, what we understand, and our own personal experiences!
What we may end up valuing is the skill… or the procedure… or the knowledge…
We must also remember to value the understanding… and thinking… and reasoning…"

One of the most important things we can do as math teachers is to constantly deepen our understanding of the concepts our students are learning.

Mark Chubb, Thinking Mathematically
Learning Coach, Niagara School District

Organizing Idea:
Algebra: Equations express relationships between quantities.

Grade 4

LEARNING OUTCOME

Students represent and apply equality in multiple ways.

KNOWLEDGE	UNDERSTANDING	SKILLS & PROCEDURES
An expression can include multiple operations. The conventional order of operations provides a set of rules for evaluating expressions, including the following: • Multiplication and division are performed before addition and subtraction. • Multiplication and division are performed in order from left to right. • Addition and subtraction are performed in order from left to right.	There are infinitely many expressions that represent the same number. The order in which operations are performed can affect the value of an expression.	Evaluate expressions according to the order of operations. Create various expressions of the same number using one or more operations.

Grade 5

LEARNING OUTCOME

Students interpret numerical and algebraic expressions.

KNOWLEDGE	UNDERSTANDING	SKILLS & PROCEDURES
Numerical expressions with multiple operations may include parentheses to group numbers and operations. The conventional order of operations includes performing operations in parentheses before other operations.	Numerical expressions represent a quantity of known value. Parentheses change the order of operations in a numerical expression.	Evaluate numerical expressions involving addition or subtraction in parentheses according to the order of operations.

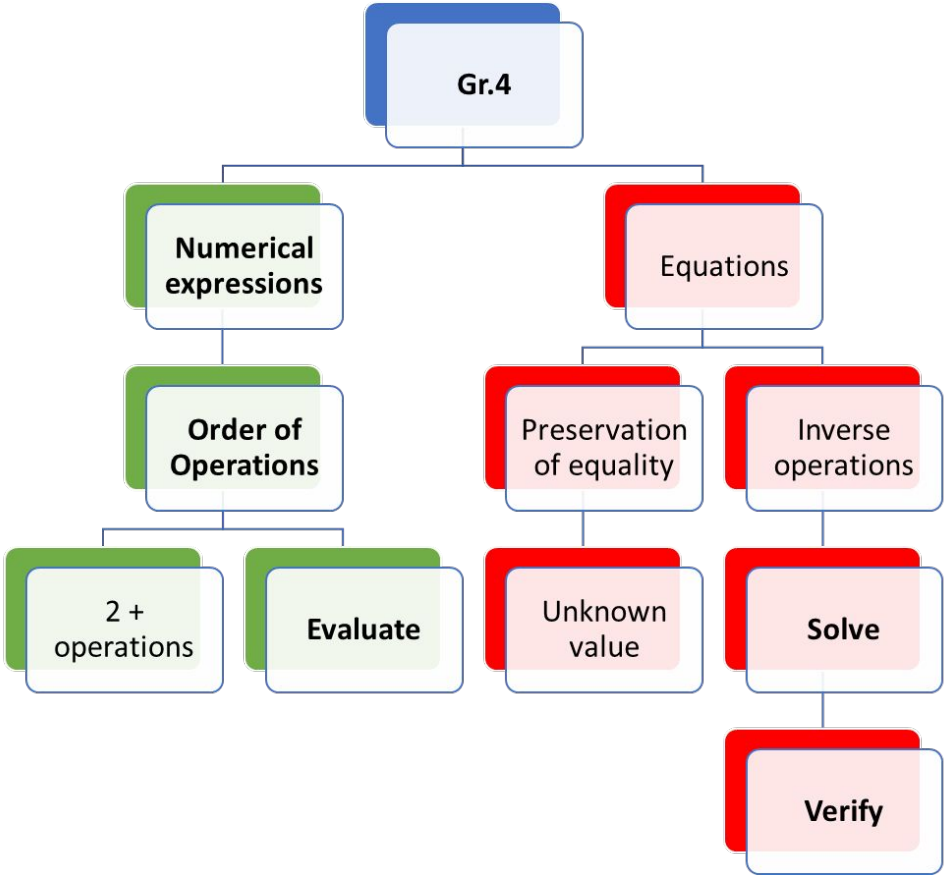
Grade 6

LEARNING OUTCOME

Students analyze expressions and solve algebraic equations.

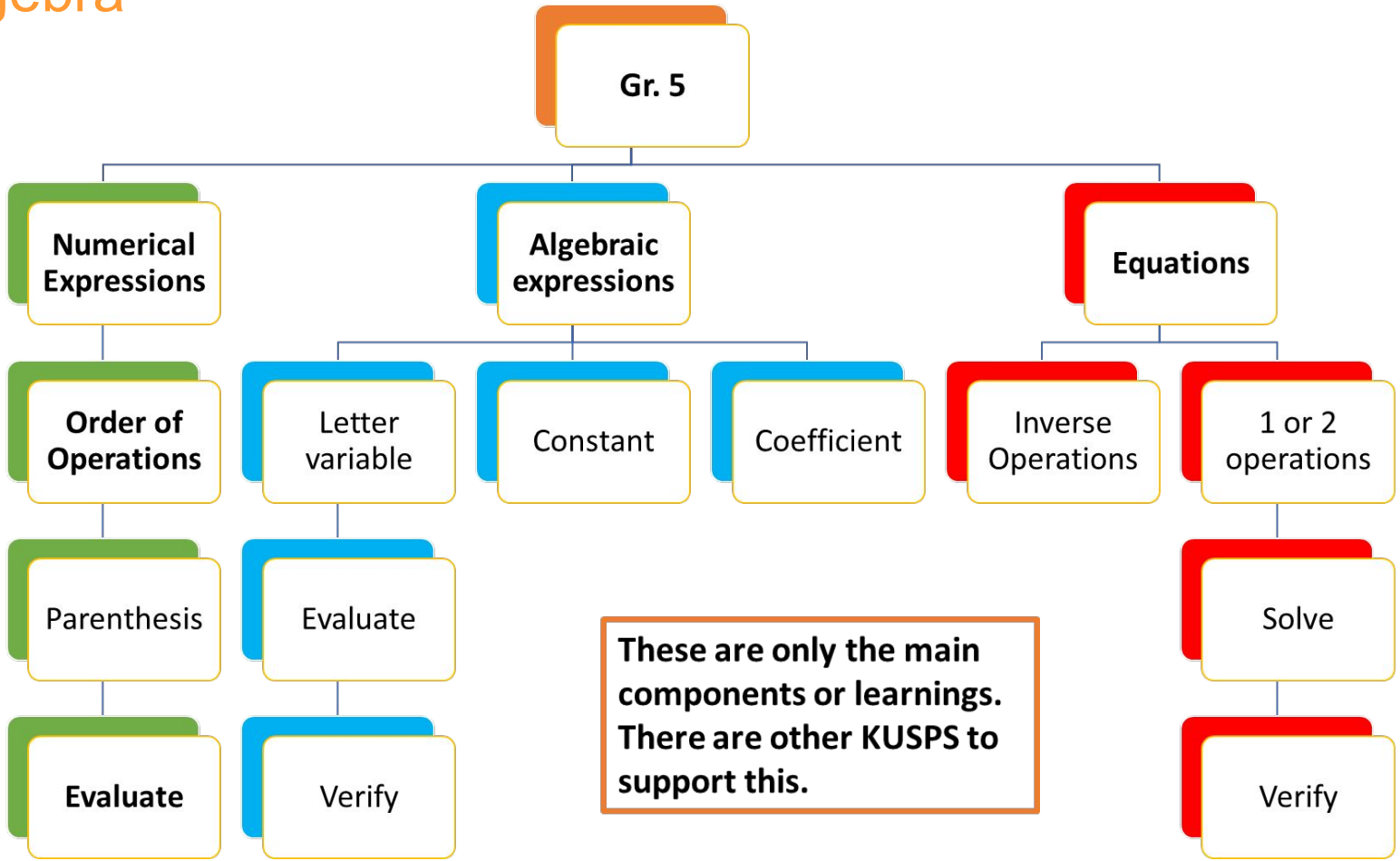
KNOWLEDGE	UNDERSTANDING	SKILLS & PROCEDURES
Numerical expressions can include powers. The conventional order of operations includes performing operations in parentheses, followed by evaluating powers before other operations.	The conventional order of operations can be applied to simplify or evaluate expressions.	Evaluate numerical expressions involving operations in parentheses and powers according to the order of operations.

Algebra

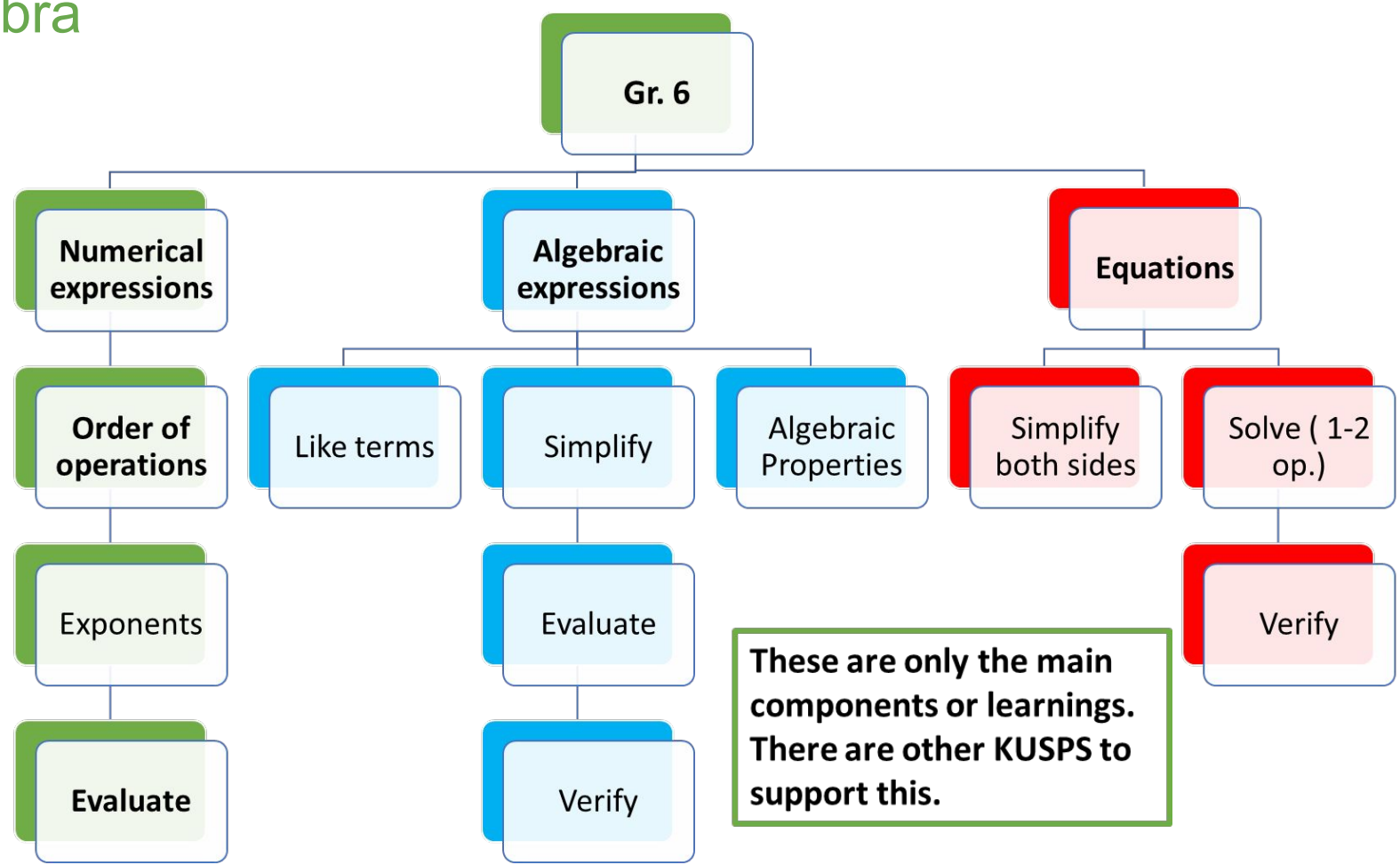


These are only the main components or learnings. There are other KUSPS to support this.

Algebra


Gr. 5
Numerical Expressions
Algebraic expressions
Equations
Order of Operations
Letter variable
Constant
Coefficient
Inverse Operations
1 or 2 operations
Parenthesis
Evaluate
Solve
Evaluate
Verify
Verify
These are only the main components or learnings. There are other KUSPS to support this.

Algebra

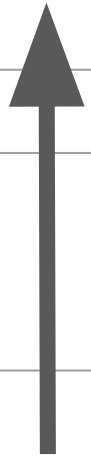

Gr. 6
Numerical expressions
Order of operations
Exponents
Evaluate
Algebraic expressions
Like terms
Simplify
Evaluate
Verify
Algebraic Properties
Equations
Simplify both sides
Solve (1-2 op.)
Verify
These are only the main components or learnings. There are other KUSPS to support this.

This next slide is similar to the previous slides. The organization is a bit different. I put it in table format with examples as it may be easier for some to see the progression. The coloured dots represent the learnings for:

- Order of Operations and Numerical expressions
- Algebraic expressions
- Equations

Grade 3	Grade 4	Grade 5	Grade 6
Knowledge of basic fact 10 x 10	**Order of operations (no parenthesis)** **x, ÷, +, -**	Evaluate numerical expressions with multiple operations (with addition and subtraction in parenthesis)	Evaluate numerical expressions using order of operations and powers
Equality between a number and an **expression** **7 has the same value as 4 + 3** **7 = 4 + 3**	Create **numerical expressions** with multiple operations **3 x 6 +2**	Work with algebraic expressions with a variable, constant, and coefficient **3*n* + 2**	Understand and apply algebraic properties:
Equality between 2 expressions of the same number **3 + 3 = 4 + 2**	Evaluate numerical expressions with multiple operations **5 + 4 – 3**	Evaluate algebraic expressions of form x +6, 2x, x/2, 2x + 6 when given the value of the variable	Simplify algebraic expressions by combining like terms **2 x + 3 x**
Equations can have **unknown values** that can be represented by **symbols** **5 - ◯ = 2**	Understand and apply preservation of equality in an **equation** without an unknown value (hands on) **7 = 7 ⟹ 7 + 2 = 6 + 3**	Using inverse operations to solve an equation, limited to 1 or 2 operations	Solve equations with algebraic expressions on both sides of the equations. limited to 1 or 2 operations
Determine an unknown value of an equation (Using manips, balance, reasoning)	Solve an equation with an unknown value, limited to one operation **7 + ? = 13**	Verify solutions to equations through evaluation	Verify solutions to equations through evaluation

ORDER OF OPERATIONS - in order of learning

	Grade 6	**E**xponents	$3 + 5^2$
	Grade 5	**P**arenthesis	( ) - addition and subtraction
	Grade 4	**A**ddition **and** **S**ubtraction	Left to right whichever comes first 
	Grade 4	**M**ultiplication and **D**ivision	Left to right whichever comes first 

Organizing Idea: Algebra: Equations express relationships between quantities.
Guiding Question: How can equality create opportunities to reimagine number?
Learning Outcome: **A41.1** Students **represent** and **apply equality** in multiple ways.

KNOWLEDGE	UNDERSTANDING	SKILLS AND PROCEDURES
An expression can include multiple operations. The conventional order of operations provides a set of rules for evaluating expressions, including the following: • Multiplication and division are performed before addition and subtraction. • Multiplication and division are performed in order from left to right. • Addition and subtraction are performed in order from left to right.	There are infinitely many expressions that represent the same number. The order in which operations are performed can affect the value of an expression.	**Evaluate** expressions according to the order of operations. **Create** various expressions of the same number using one or more operations.

Understanding the vocabulary associated with the learning outcomes and KUSPS will be important.

Students in grade 4 will only work with numerical expressions not algebraic expressions

expression

$6 + 3$

no equal sign

A mathematical phrase without an equal sign.

equation

$9 \times 3 = 20 + 7$

A statement that two mathematical expressions are equal.

numerical expression

$5 + 9$

A mathematical statement including numbers and operations.

evaluate

$19 - 7$

Has a value of 12

To find the value of a mathematical expression.

algebraic expression

$3x + 2$

A group of numbers, symbols, and variables that express an operation or a series of operations.

https://www.graniteschools.org/mathvocabulary/vocabulary-cards

parallelogram

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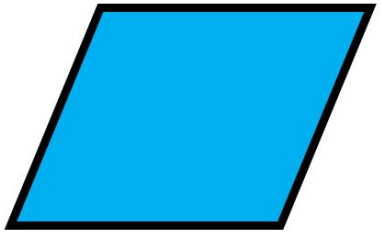
parallelogram



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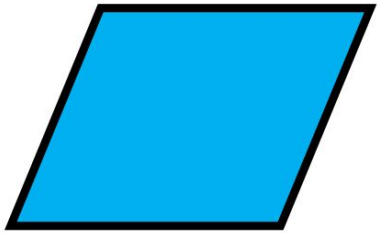
parallelogram



A quadrilateral with 2 pairs of parallel and congruent sides.

https://www.graniteschools.org/mathvocabulary/vocabulary-cards

Students will build on knowledge of properties and operations of whole numbers to begin work with **numerical expressions**

Examples of Numerical expressions

2 + 5
3 + 4 – 2
12 – 5
2 x 3 +1

Skills and Procedures
Create various expressions of the same number using one or more operations.

Evaluating Numerical Expressions

2 + 2	**4**	2 + 2 has a value of 4
3 + 4	**7**	
2 x 3 +2	**8**	

Skills and Procedures
Evaluate expressions according to the order of operations

- **Use anchor charts for vocabulary and provide visual examples.**

19 – 7
Has a value of 12

evaluate

To find the value of a mathematical expression.

https://www.graniteschools.org/mathvocabulary/

Activity.

What numerical expressions can you make with the numbers 1, 2, 3, 4, and 5?

a. Find two different ways to make 9.

b. Find two different ways to make 7.

c. Find two different ways to make 11.

d. Can you make 26?

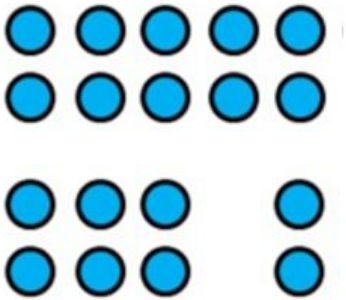
Option:

- Use numbers only once in an expression
- Use numbers more than once in an expression
- Use at least 3 of the numbers
- Use 2 operations in an expression

https://tasks.illustrativemathematics.org/

Example: Evaluate

10 – 4 + 2 subtract 4 from 10 then add 2 or 10 take away 4 then add 2



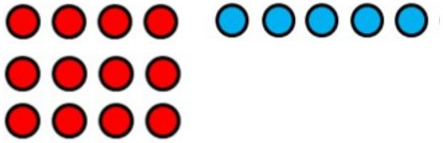
Remember:
In subtraction we start off with the total quantity

The value is **8**

Order of Operations

5 + 4 x 3

add 5 to 4 x 3 multiply 4 x 3 first and then add 5



4 x 3 + 5

The value of 5 + 4 x 3 is **17**

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5 + 4 x 3

Add 5 and 4 then multiply by 3

9
9
9

X

The order in which operations are performed can affect the **value** of an expression.

The value is **27**

Organizing Idea: Algebra: Equations express relationships between quantities.
Guiding Question: How can expressions enhance communication of number?

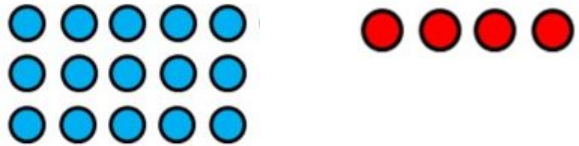
Learning Outcome: A51.1 Students interpret **numerical** and algebraic **expressions**.

KNOWLEDGE	UNDERSTANDING	SKILLS AND PROCEDURES
Numerical expressions with multiple operations may include parenthesis to group numbers and operations. The conventional **order of operations** includes performing operations in parentheses before other operations.	Numerical expressions represent a quantity of known value. **Parentheses** change the order of operations in a numerical expression.	**Evaluate** numerical expressions involving **addition or subtraction in parentheses** according to the order of operations.

Understanding the vocabulary associated with the learning outcomes and KUSPS will be important

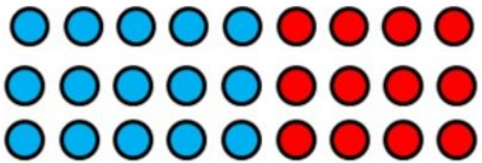
Examples: Evaluate

3 x 5 + 4 multiply 3 times 5 and then add 4 (order of operations)



3 x 5 + 4 = **19**

3 x (5 + 4) add 5 and 4 first and then multiply by 3 (order of operations - parenthesis first)



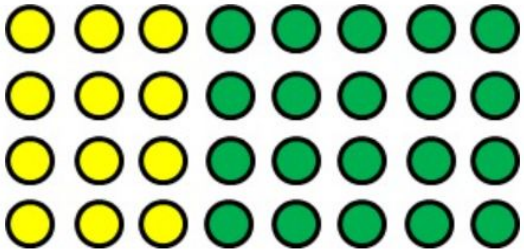
3 x (5 + 4) = **27**

Skills and Procedures
Evaluate numerical expressions **involving addition or subtraction in parentheses** according to the order of operations.

https://tasks.illustrativemathematics.org/

More Examples

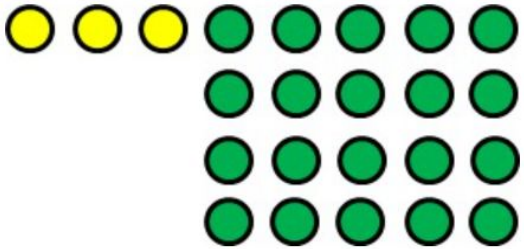
The expression $(3 + 5) \times 4$ means we should add 3 and 5 and then multiply the result by 4. Here is a picture:



Grade 5

Skills and Procedures
Evaluate numerical expressions **involving addition or subtraction in parentheses** according to the order of operations.

The expression $3 + (5 \times 4)$ means we should add 3 to the product of 5 and 4. Here is a picture:



Grade 6

https://tasks.illustrativemathematics.org/

Organizing Idea: Algebra: Equations express relationships between quantities.
Guiding Question: How can expressions support a generalized interpretation of number?

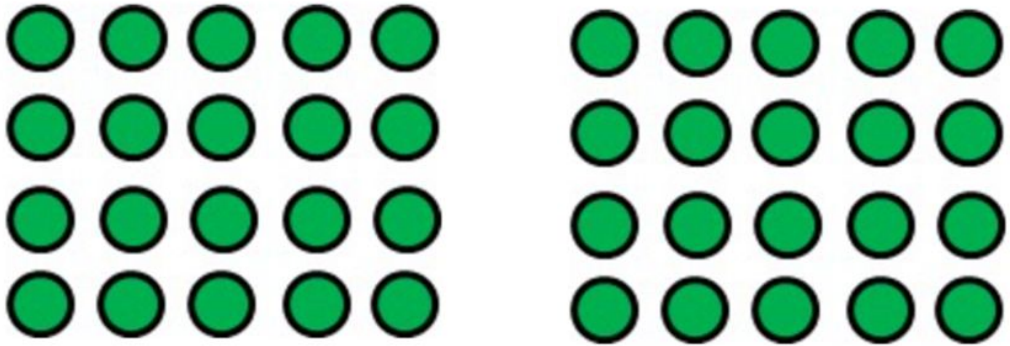
Learning Outcome: A61.1 Students analyze **expressions** and solve algebraic equations.

KNOWLEDGE	UNDERSTANDING	SKILLS AND PROCEDURES
Numerical expressions can include **powers**. The **conventional order of operations** includes performing operations in **parentheses**, followed by **evaluating powers** before other operations.	The conventional order of operations can be applied to **simplify** or **evaluate** expressions.	**Evaluate** numerical expressions involving operations in parentheses and **powers** according to the order of operations.

Understanding the vocabulary associated with the learning outcomes and KUSPS will be important

More Examples

The expression 2 x (5 x 4) : Multiply 5 x 4 first then multiply the product by 2 or 2 times the product of 5 times 4

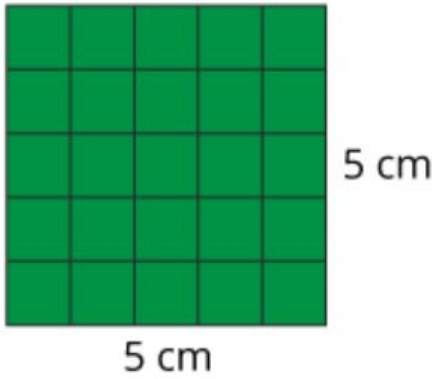


The value of 2 x (5 x 4) is 40

Grade 6: **Numerical Expressions can include powers**

Meaning of Powers/Exponents – repeated multiplication $5^2 = 5 \times 5$

5^2, five squared, 5 to the power 2, 5 to the second power



The square (area model) can provide a visual to help when evaluating a number squared.

exponent: the number of times a number or unit is multiplied by itself; also called a power; it is written as a small, raised number to the right of the base

MATH UP

Grade 6: Evaluating Numerical Expressions

$(6 + 7^2) + 1$ — 7^2 is 49
$(6 + 49) + 1$ — Parentheses
$55 + 1$
56

Add 1 to 6 plus 7 squared

$7 \times (3^2 + 4)$ — 3^2 is 9
$7 \times (9 + 4)$ — Parenthesis
7×13
91

Multiply the sum of 3 squared plus 4 by 7

$8 + 6 \times 2$ — Multiply first
$8 + 12$
20

Add 8 to the product of 6 times 2

Skills and Procedures:
Evaluate numerical expressions involving operations in parentheses and **powers** according to the order of operations.

Activity.

What numerical expressions can you make with the numbers 1, 2, 3, 4, and 5?

a. Find two different ways to make 9.

b. Find two different ways to make 7.

c. Find two different ways to make 11.

d. Can you make 26?

Option:

- Use numbers only once in an expression
- Use numbers more than once in an expression
- Use at least 3 of the numbers
- **Use more than one operation**
- **Use multiplication and one other operation**
- **Use parenthesis**
- **Use a power**

https://tasks.illustrativemathematics.org/

Sites and Information used in this Presentation and Other Presentations

Learn Alberta: https://curriculum.learnalberta.ca/curriculum/en/c/mat5

- Bridging Document for gr. 4
  –https://curriculum.learnalberta.ca/cdn/ciihub/docs/Math_Grade%205_Bridging_Final.pdf

ARPDC documents: https://arpdcresources.ca/

- Numbered outcomes
- Year at a Glance and Interactive Vocabulary
- Comparison Documents

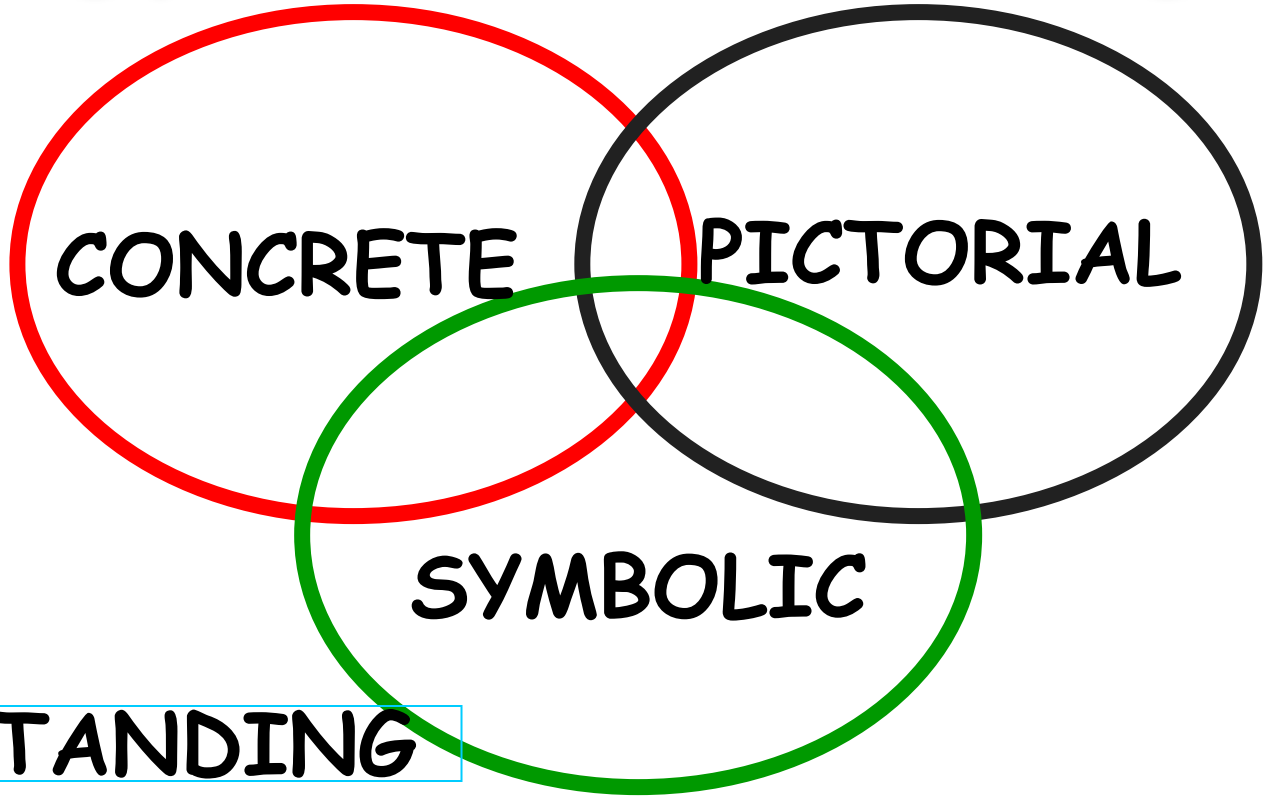
Vocabulary - https://www.graniteschools.org/mathvocabulary/
Building Vocabulary-Marzano: https://www.teachthought.com/literacy/building-academic-vocabulary/
SplashLearn: https://www.splashlearn.com/math-vocabulary/
University of Melbourne: https://extranet.education.unimelb.edu.au/
Edugains: https://www.edugains.ca/newsite/math/index.html
Mathies: https://mathies.ca/games.php#gsc.tab=0
Make Math Moments: https://makemathmoments.com/
Thinking Mathematically: https://buildingmathematicians.wordpress.com/
MashUp Math – Evaluating Expressions using Algebra Tiles: https://www.youtube.com/watch?v=f2o8EI0iOYg

Sites

Marian Small: Open Questions: Patterns (includes algebra)
Gizmos: Check the LearnAlberta site under resources
Mathology Little Books: Check the LearnAlberta site under resources
MathUp: https://nat.mathup.ca/
Mathies Learning Tools: https://mathies.ca/learningTools.php#gsc.tab=0
Desmos: https://www.desmos.com/ -
Steve Wyborney : Which One Doesn't Belong: http://wodb.ca/ K-12
Math Literature and Trade Books: https://bit.ly/3Do8ue8 K-12
Free math APPS: Mathlearningcenter.org K-12
NCTM: https://www.nctm.org/ClassroomResources/Illuminations/Interactives/Algebra-Tiles/
Mathsbot: https://mathsbot.com/manipulatives/tiles
Didax: https://www.didax.com/apps/algebra-tiles/
NCTM: https://www.nctm.org/Classroom-Resources/Illuminations/Interactives/Pan-Balance----Numbers/
Mathigons (algebra): https://mathigon.org/polypad
PBS Learning Material:
https://www.pbslearningmedia.org/resource/mgbh.math.ee.balance/balancing-scales-to-solve-equations/
HoodaMath: https://www.hoodamath.com/games/algebrabalanceequations.html
Geogebra: https://www.geogebra.org/m/MG7eZX3g#material/mMGMgTYb

Using Manipulatives in the Math Classroom

Learning for Understanding



UNDERSTANDING

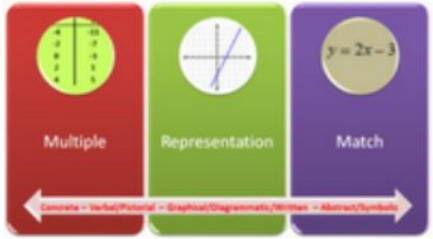
TOP 5 REASONS FOR USING MANIPULATIVES in the Classroom

http://TLJConsultingGroup.com

MANIPULATIVES CAN PROVIDE A BRIDGE BETWEEN THE CONCRETE AND ABSTRACT LEVELS OF MANY MATHEMATICAL TOPICS.

http://TLJConsultingGroup.com

MANIPLUATIVES CAN SERVE AS MODELS THAT SUPPORT STUDENTS' AS THEY THINK ABOUT, REMEMBER ABOUT, AND COMMUNICATE ABOUT THE MATHEMATICS BEING STUDIED.



MANIPULATIVES PROVIDE ANOTHER REPRESENTATION FOR THE MATHEMATICS BEING STUDIED.

http://TLJConsultingGroup.com

MANIPULATIVES SUPPORT STUDENT ENGAGEMENT AND DIFFERENTIATION.

http://TLJConsultingGroup.com

MANIPLUATIVES CAN GIVE STUDENTS OWNERSHIP OF THEIR OWN LEARNING.

http://TLJConsultingGroup.com

Learning Outcome Fractions	1N3 Students examine one-half as a part-whole relationship.	2N3 Students interpret part-whole relationships using unit fractions.	3N4 Students interpret fractions in relation to one whole.	4N5 Students apply equivalence to the interpretation of fractions.	5N5 Students interpret improper fractions.	6N5 Students relate fractions to quotients.
	1N3.1 One-half (2 equal groups)	**2N3.1** Unit fractions limited to 10 or fewer equal parts	**3N4.1** Equivalent Fractions as composition of unit fractions limited to denominators up to 12 in relation to one whole	**4N5.1** Equivalent Fractions created by partitioning each equal part of a fraction the same way. Recognizing simplest form **4N5.2** Decimal Fraction understanding Convert decimal to fraction and fraction to decimal. (only when the denominator is a multiple of 10.	**5N5.1** Fractions greater than one. Improper and Mixed Numbers	**6N5.1** Fractions represent quotients. Convert Fractions to decimals using division.

General Overview of the progression of Fractions in New Curriculum

Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6
½ as part of a set and part of a whole shape.	Understanding **unit fraction**	Compare fractions: Use symbols for comparison 2/4 > 2/10 2/4 < 3/4	**Equivalent fractions** 2/4 and 4/8	Fractions **greater than one.** **Improper fractions** **Mixed numbers**	Determine the **common denominator** of two fractions Express 2 fractions with common denominators
	Partition a **whole region or set** into equal parts	Fractions as part of a **whole(region or area), set, length**	**Simplifying** fractions using **greatest common factor**	**Add and subtract** fractions with **common denominators**	**Add and subtract fractions**
	Compare different unit fractions of the same whole or set (1/4 and 1/2 of the same whole)	**Relate a fraction to its position on a number line**	Relate fractions, **percentages,** and decimals	Relate fractions, decimals, ratios, percentages	**Multiply a fraction by a natural number**
Vocabulary development starts in gr. 1	Compare the same **unit fractions** of different wholes or sets				
	Fractions up to tenths	Fractions to twelfths		Fractions within 100	

ORGANIZING IDEA

Number: Quantity is measured with numbers that enable counting, labelling, comparing, and operating.

GUIDING QUESTION

How can **fractions** be characterized in different ways?

LEARNING OUTCOME

4N5.1 Students apply **equivalence** to the interpretation of fractions.

KNOWLEDGE	UNDERSTANDING	SKILLS AND PROCEDURES
Equivalent fractions are associated with the **same point on the number line**. **Equivalent fractions** can be created by **partitioning each equal part** of a fraction in the same way. **Partitioning a fraction** can be interpreted as multiplying the numerator and denominator of a fraction by the same number. A fraction can be **simplified** to an equivalent form by dividing the numerator and denominator by a **common factor**. The numerator and denominator of a fraction in simplest form have no common factors. Dividing the numerator and denominator of a fraction by their **greatest common factor** will achieve simplest form.	There are **infinitely many equivalent fractions that represent the same number.** Exactly one of infinitely many equivalent fractions is in **simplest form**.	**Model** equivalent fractions by partitioning a whole in multiple ways. **Determine** fractions equivalent to a given fraction. **Relate** the position of equivalent fractions on the number line. **Identify** fractions in which the numerator and denominator have a common factor. **Simplify** a given fraction by dividing the numerator and denominator by a common factor. **Express** a fraction in simplest form. **Compare** and order fractions.

ORGANIZING IDEA
Number: Quantity is measured with numbers that enable counting, labelling, comparing, and operating.

GUIDING QUESTION
How can **fractions** be characterized in different ways?

LEARNING OUTCOME
4N5.2 Students apply **equivalence** to the interpretation of fractions.

KNOWLEDGE	UNDERSTANDING	SKILLS AND PROCEDURES
Fractions and decimal numbers can represent the same number.	Decimal numbers that terminate (do not repeat) are fractions with denominators of 10, 100, etc.	**Relate** fractions and equivalent decimal numbers to their positions on the number line.
Decimals can be expressed as fractions with a denominator that is equivalent to the place value of the last non-zero digit of the decimal number.	Fractions and decimal numbers that represent the same number are associated with the same point on the number line.	**Express** fractions as decimal numbers and vice versa, limited to tenths and hundredths.

These KUSPS deal with the relationship between fractions and decimals.

ORGANIZING IDEA

Number: In what ways can fractions communicate numbers greater than one?

GUIDING QUESTION

In what ways can fractions communicate numbers greater than one?

LEARNING OUTCOME

5N5: Students interpret **improper fractions**.

KNOWLEDGE	UNDERSTANDING	SKILLS AND PROCEDURES
A fraction can represent quantities greater than one. An **improper fraction** has a numerator that is greater than its denominator. Natural numbers can be expressed as improper fractions with a denominator of 1. A **mixed number of form *A b/c*,** composed of a number of wholes, *A*, and a fractional part, *b/c*, can represent an improper fraction.	Fractions allow counting and measuring between whole quantities. Improper fractions and mixed numbers that represent the same number are associated with the same point on the number line.	**Relate** fractions, improper fractions, and mixed numbers to their positions on the number line. **Count** beyond 1 using fractions with the same denominator. **Model** fractions, including improper fractions and mixed numbers, using quantities, lengths, and areas. **Express** improper fractions and mixed numbers symbolically. **Express** an improper fraction as a mixed number and vice versa. **Compare** fractions, including improper fractions and mixed numbers, to benchmarks of 0, 1/2, and 1.

ORGANIZING IDEA

Number: In what ways can fractions communicate numbers greater than one?

GUIDING QUESTION

How can the composition of fractions facilitate operating with fractions?

LEARNING OUTCOME

5N6 Students **add and subtract** fractions with common denominators.

KNOWLEDGE	UNDERSTANDING	SKILLS AND PROCEDURES
Fractions with **common denominators** can be composed or decomposed to model the change in a quantity of unit fractions. Addition and subtraction of fractions with common denominators does not change the unit fraction from which they are composed. Fractions greater than one can be added or subtracted as mixed numbers or improper fractions.	Fractions with common denominators are multiples of the same unit fraction. Properties for addition and subtraction of natural numbers apply to fractions	**Investigate** the composition and decomposition of a quantity within 1 using unit fractions. **Express** the composition or decomposition of fractions with common denominators as a sum or difference. **Compare** strategies for adding or subtracting improper fractions to strategies for adding or subtracting mixed numbers. **Add and subtract** fractions with common denominators within 100, including improper fractions and mixed numbers. **Solve** problems requiring addition and subtraction of fractions with common denominators, including improper fractions and mixed numbers.

ORGANIZING IDEA

Number: In what ways can fractions communicate numbers greater than one?

GUIDING QUESTION

How can equal sharing contribute meaning to fractions?

LEARNING OUTCOME

6N5: Students relate fractions to quotients.

KNOWLEDGE	UNDERSTANDING	SKILLS AND PROCEDURES
An equal-sharing situation can be represented by a fraction in which the numerator represents the quantity to be shared and the denominator represents the number of shares.	Fractions represent quotients in equal-sharing situations.	**Model** an equal-sharing situation in more than one way.
Division can be used to determine an equal share.	All equivalent fractions represent the same quotient.	**Describe** an equal-sharing situation using a fraction.
Division of the numerator by the denominator of a fraction provides the equivalent decimal number.		**Express** a fraction as a division statement and vice versa.
		Convert a quotient from fraction to decimal form using division.

ORGANIZING IDEA

Number: In what ways can fractions communicate numbers greater than one?

GUIDING QUESTION

How can the addition and subtraction of fractions be generalized?

LEARNING OUTCOME

6N6: Students add and subtract fractions with denominators within 100

KNOWLEDGE	UNDERSTANDING	SKILLS AND PROCEDURES
Addition and subtraction of fractions is facilitated by representing the fractions with **common denominators.** Denominators are related if one is a **multiple** of the other. Multiplication of one denominator by the **factor** that relates it to another denominator achieves common denominators. The product of the denominators of two fractions provides a common denominator.	Fractions with common denominators have the same units. Any numbers with the same unit can be compared, added, or subtracted.	**Recognize** two fractions with related denominators. **Determine** the **factor** that relates one denominator to another. **Express** two fractions with common denominators. **Add and subtract** fractions. **Solve problems** involving addition and subtraction of fractions.

ORGANIZING IDEA

Number: In what ways can fractions communicate numbers greater than one?

GUIDING QUESTION

How can an understanding of multiplication be extended to fractions?

LEARNING OUTCOME

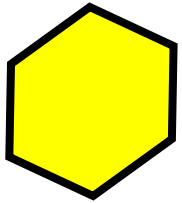
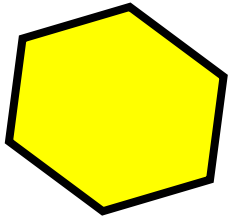
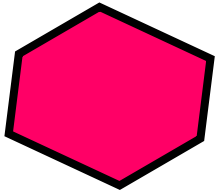
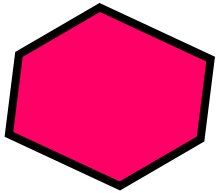
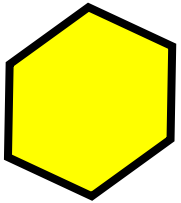
6N7: Students interpret the multiplication of natural numbers by fractions.

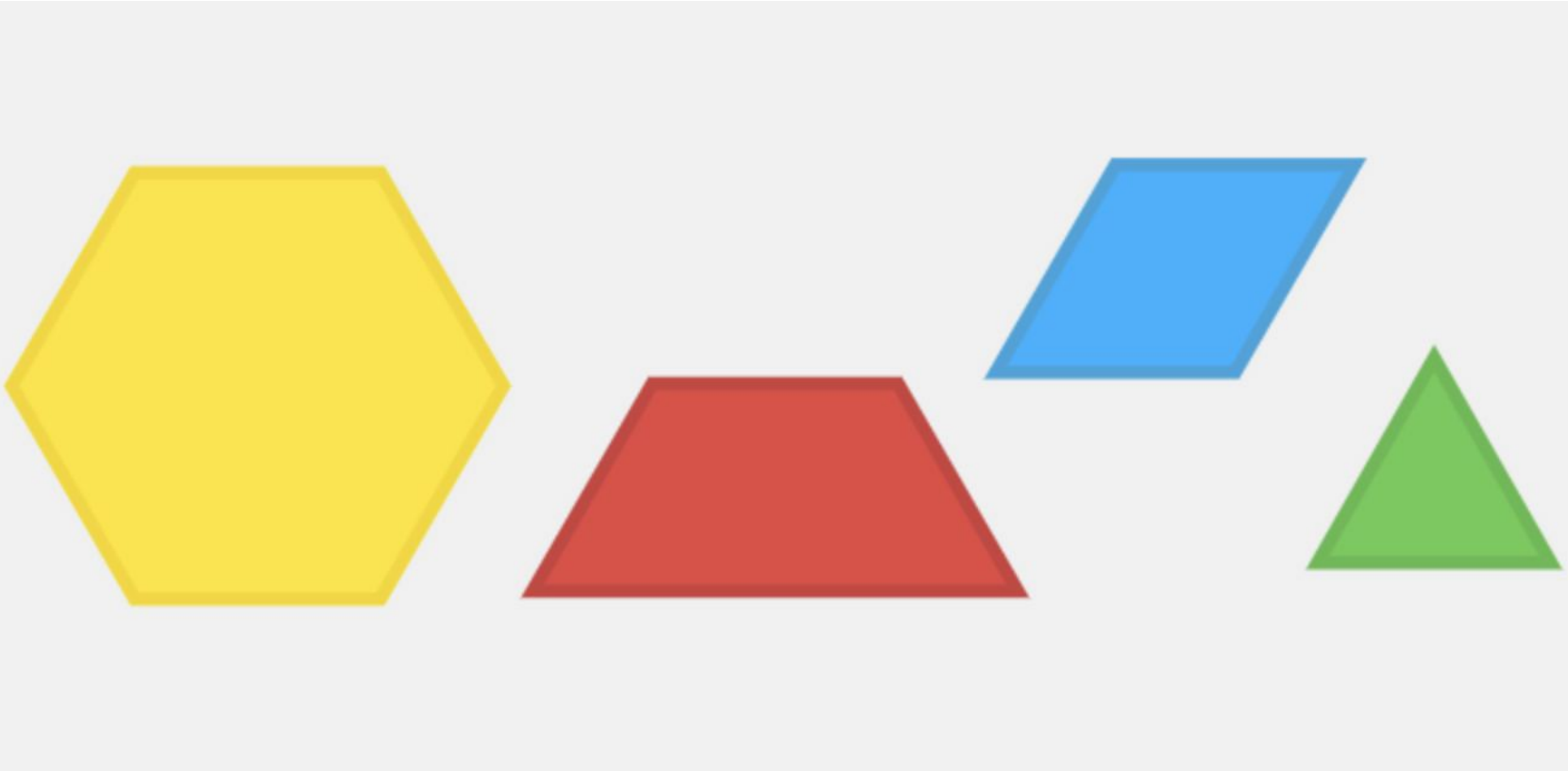
KNOWLEDGE	UNDERSTANDING	SKILLS AND PROCEDURES
Multiplication of a natural number by a fraction is equivalent to multiplication by the fraction's numerator and division by its denominator. $a \times b/c = ab/c$	Multiplication does not always result in a larger number. (Ex 6 x ½ = 3)	**Relate** multiplication of a natural number by a fraction to repeated addition of the fraction. **Multiply** a natural number by a fraction.
Multiplication by a unit fraction is equivalent to division by its denominator. $a \times 1/b = a/b$	Multiplication of a natural number by a fraction can be interpreted as repeated addition of the fraction.	**Relate** multiplication by a unit fraction to division.
The product of a fraction and a natural number is the fraction with • a numerator that is the product of the numerator of the given fraction and the natural number • a denominator that is the denominator of the given fraction $a/b \times c = ac/b$	Multiplication of a fraction by a natural number can be interpreted as taking part of a quantity.	**Multiply** a natural number by a unit fraction. **Model** a fraction of a natural number. **Multiply** a fraction by a natural number. **Solve** problems using multiplication of a fraction and a natural number.

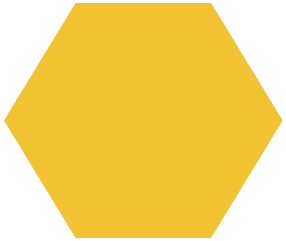
FRACTIONS:

WITH

FRACTION BLOCKS



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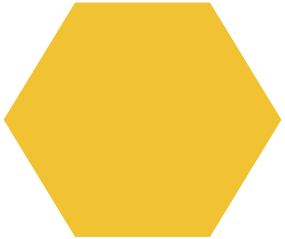

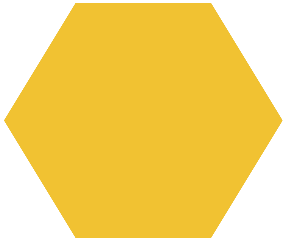

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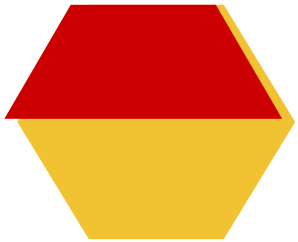

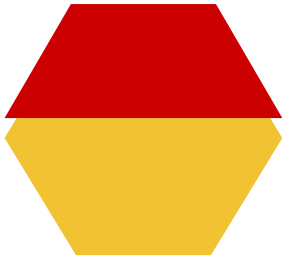

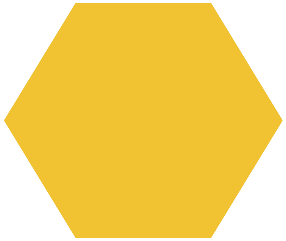

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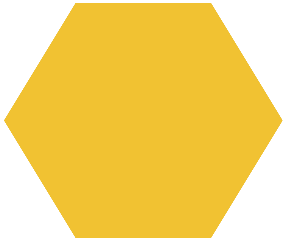

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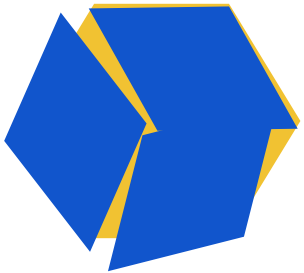
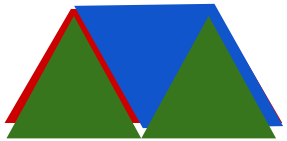
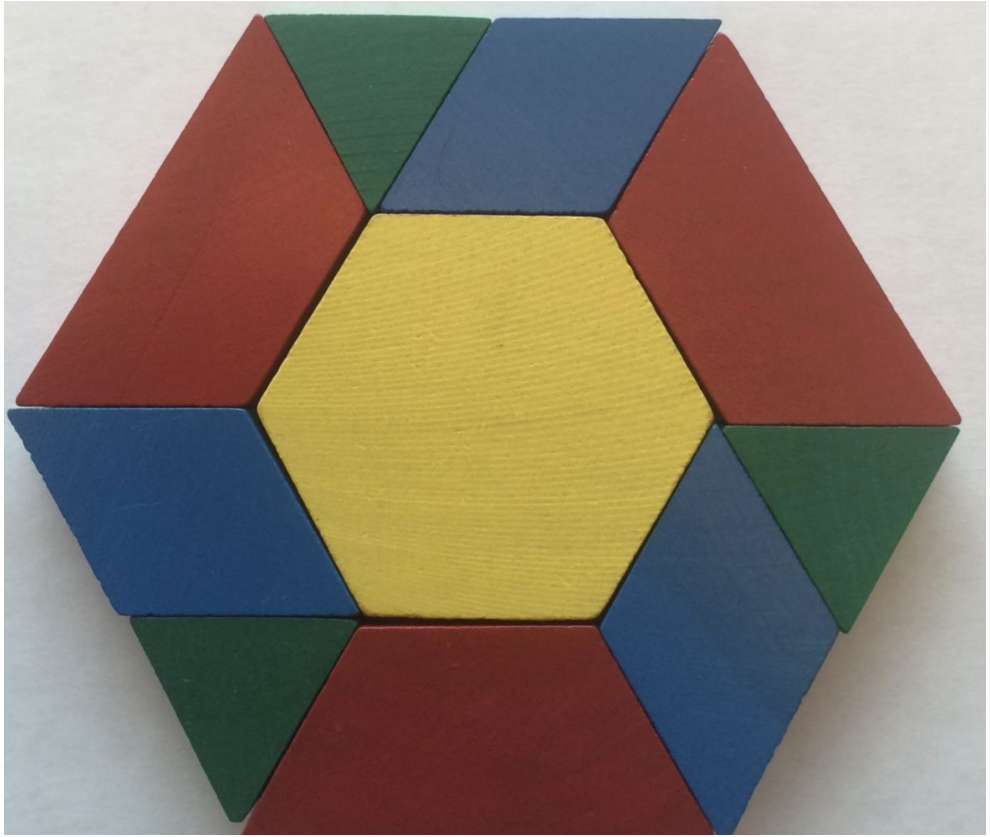




Fraction Talks



Fractions

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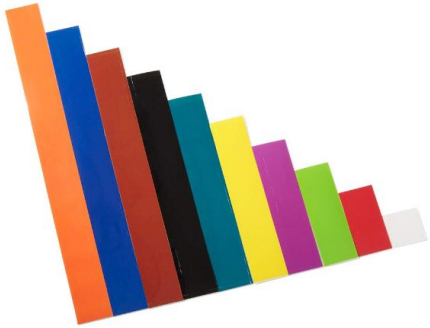
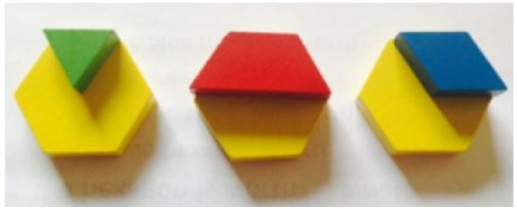
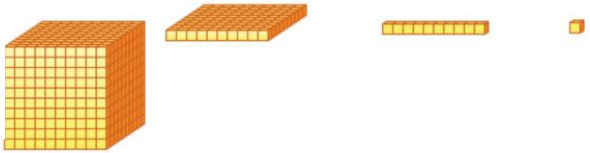
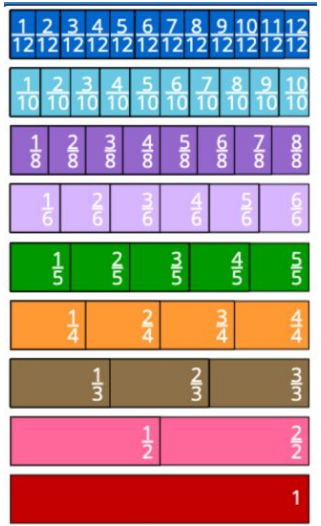
Fractions and Manipulatives



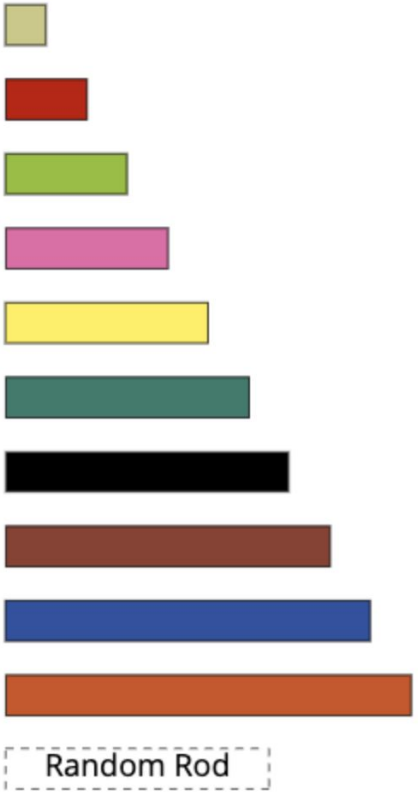


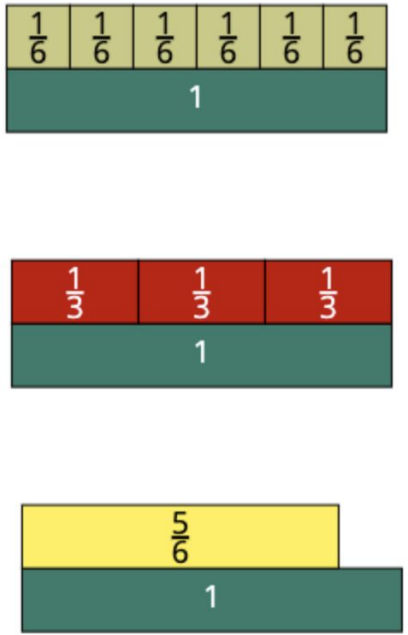




Relational Rods

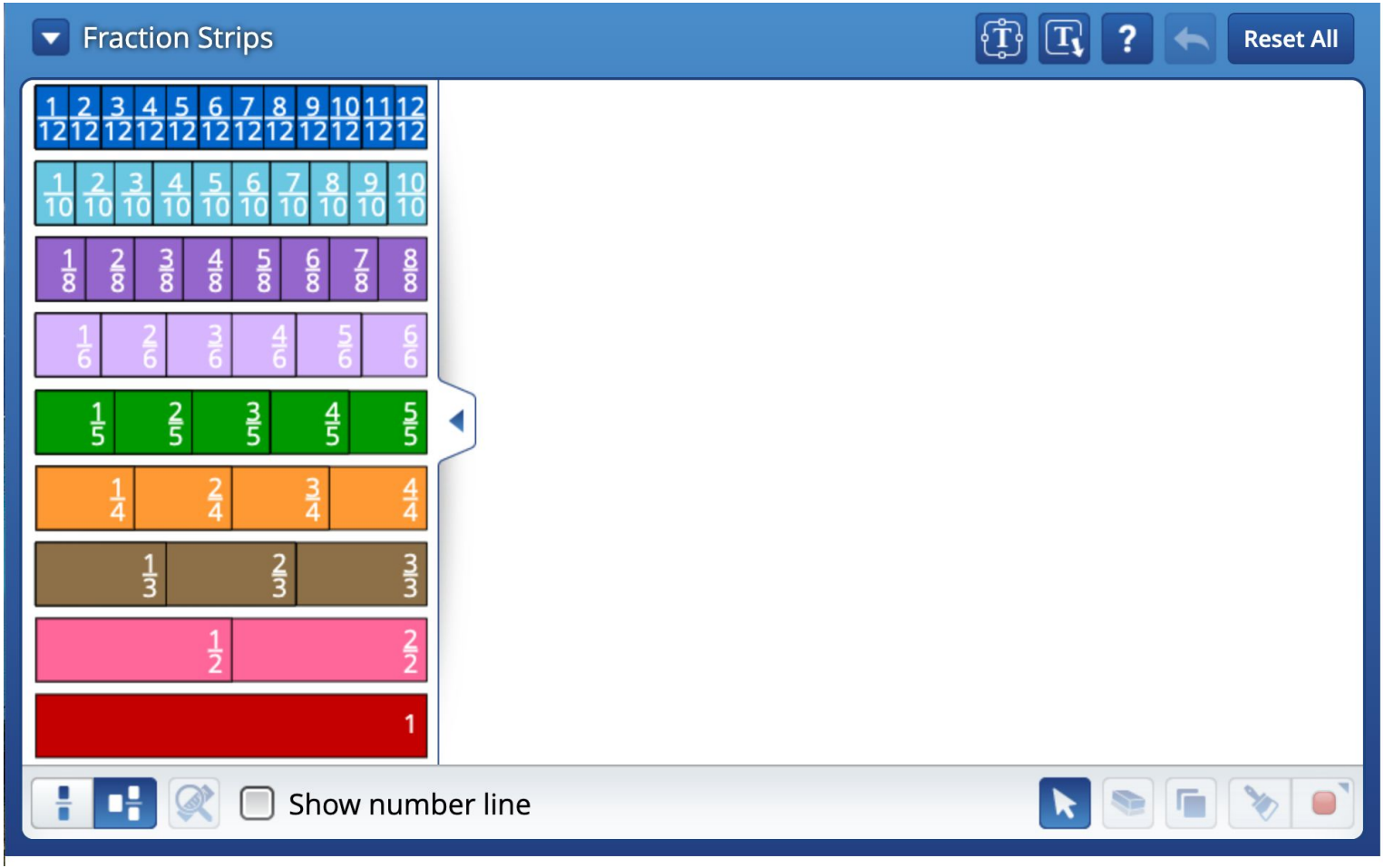
Reset All





Set Whole

Horizontal Vertical


Fraction Strips
Reset All
1/12 2/12 3/12 4/12 5/12 6/12 7/12 8/12 9/12 10/12 11/12 12/12
1/10 2/10 3/10 4/10 5/10 6/10 7/10 8/10 9/10 10/10
1/8 2/8 3/8 4/8 5/8 6/8 7/8 8/8
1/6 2/6 3/6 4/6 5/6 6/6
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1/3 2/3 3/3
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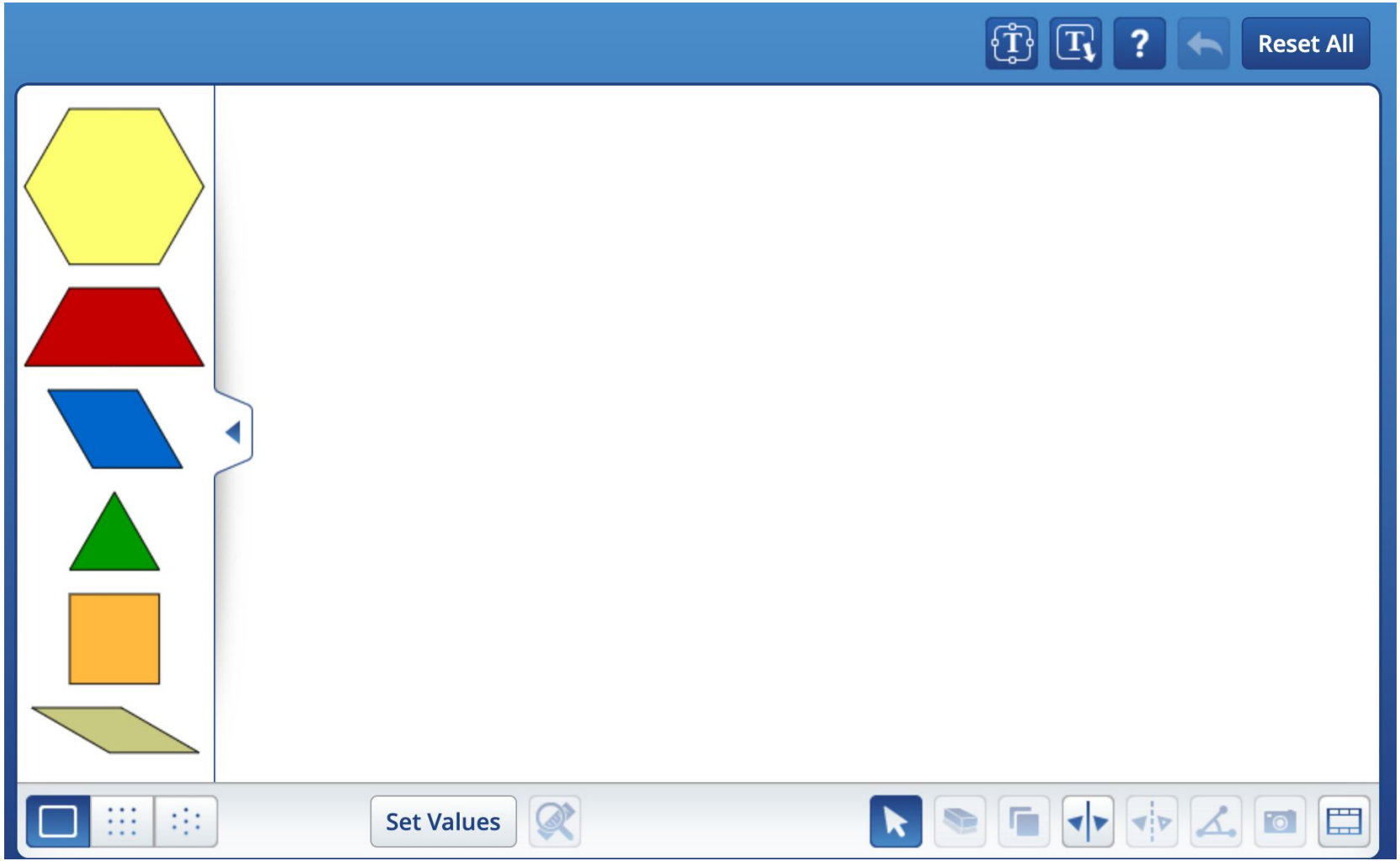
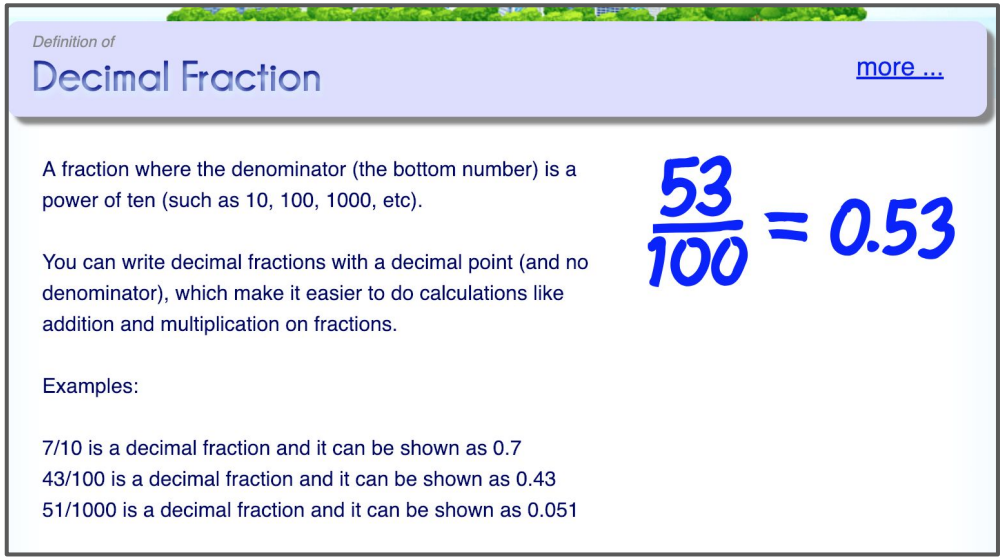
Show number line

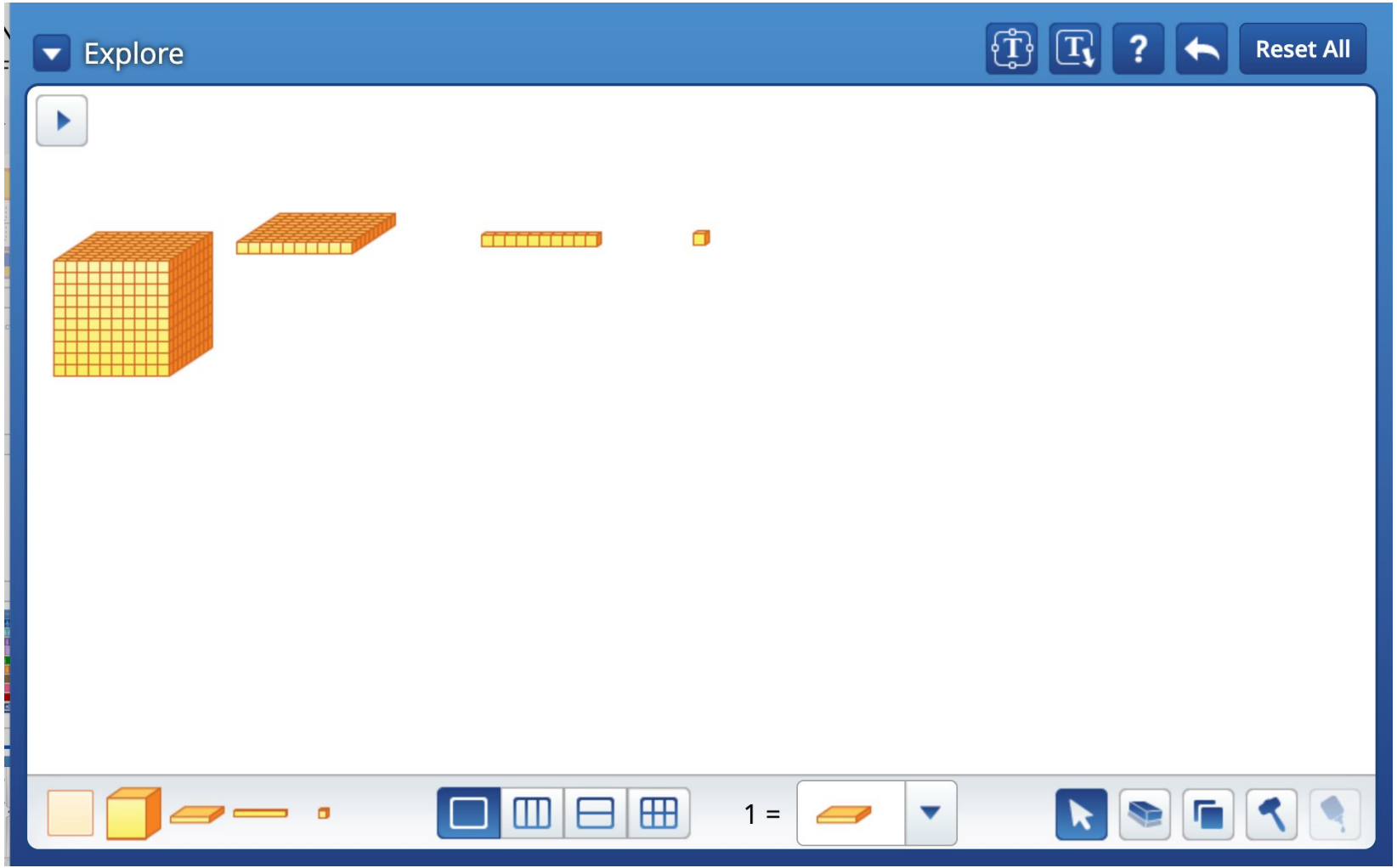

Reset All
Set Values

Terminology

Decimal Fraction



Decimal	Words	Fraction
0.1	1 tenth	$\frac{1}{10}$
0.01	1 hundredth	$\frac{1}{100}$
0.001	1 thousandth	$\frac{1}{1000}$


Explore
Reset All
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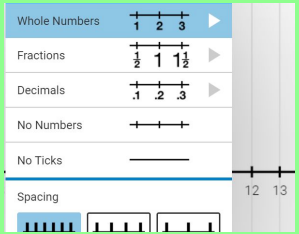
Number line Manipulatives



Interactive Number Line

Ability to "hop" on a linear model

Sessions to Watch for

August 21-24 **Summer New Curriculum Institute Math Grade 4-6**

September 26 **Grade 4 - A Guide to Planning and Assessing Student Actions in Math**

September 27 **Grade 5 - A Guide to Planning and Assessing Student Actions in Math**

September 28 **Grade 6 - A Guide to Planning and Assessing Student Actions in Math**

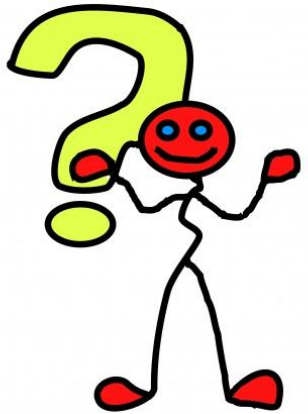
Sessions to Watch for

September -November: Unpacking the curriculum

- Grade 4, 5, and 6 will have separate sessions
- Each session will deal with an Organizing Idea and the Learning Outcomes
- Focus will be on teacher understanding of the learning outcome, concept, vocabulary

Sessions for Gr. 4, 5, 6 Number and Algebra will be repeated from spring

To Think About!



What session topics would help support you on your math journey?

Thank you

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Math Learning Consultant
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Sites and Resources

Learn Alberta: https://curriculum.learnalberta.ca/curriculum/en/c/mat5
ARPDC website: https://arpdcresources.ca/
NCTM: https://www.nctm.org/Classroom-Resources/Illuminations/Interactives/Fraction-Game/
Vocabulary - https://www.graniteschools.org/mathvocabulary/
Building Vocabulary-Marzano: https://www.teachthought.com/literacy/building-academic-vocabulary/
SplashLearn: https://www.splashlearn.com/math-vocabulary/
University of Melbourne: https://extranet.education.unimelb.edu.au/
Edugains: https://www.edugains.ca/newsite/math/index.html
Edugains Fraction Learning Pathway:
https://www.edugains.ca/newsite/DigitalPapers/FractionsLearningPathway/index.html
Mathies: https://mathies.ca/tools/FractionStrips/index.html?title=Fraction%20Strips;
Mathies: https://mathies.ca/games.php#gsc.tab=0
Math Learning Centre: https://apps.mathlearningcenter.org/fractions/
Thinking Mathematically: https://buildingmathematicians.wordpress.com/
University of Cambridge Nrich(virtual manip): https://nrich.maths.org/4348
Mathigon polypad(virtual manips): https://mathigon.org/

Dr. Catherine Bruce: Fractions Learning and Teaching:

Catherine Bruce: Rethinking Fractions

Marian Small: Open Questions, Number K-3

Marian Small: Understanding the Math we Teach and How to Teach It. (K-8)

Graham Fletcher: https://gfletchy.com/

The Teaching Channel: https://www.teachingchannel.com/ K-12

Fraction Talks: http://fractiontalks.com/

Desmos: https://www.desmos.com/

Steve Wyborney Fraction Splats:
https://stevewyborney.com/2017/03/the-fraction-splat-series/

Which One Doesn't Belong: http://wodb.ca/ K-12

Nat Banting: http://natbanting.com/oops-i-forgot/

Math Literature and Trade Books: https://bit.ly/3Do8ue8 K-12

Free math APPS: Mathlearningcenter.org K-12

Pearson Mathology Little Books: Gr. 3 can be found on the newLearnAlberta site

Sites and Information used in this Presentation and Other Presentations

Building Vocabulary-Marzano: https://www.teachthought.com/literacy/building-academic-vocabulary/
SplashLearn: https://www.splashlearn.com/math-vocabulary/
University of Melbourne: https://extranet.education.unimelb.edu.au/
Edugains: https://www.edugains.ca/newsite/math/index.html
Mathies: https://mathies.ca/games.php#gsc.tab=0
Make Math Moments: https://makemathmoments.com/
Thinking Mathematically: https://buildingmathematicians.wordpress.com/
MashUp Math – Evaluating Expressions using Algebra Tiles:
https://www.youtube.com/watch?v=f2o8EI0iOYg

Sites and Resources

Marian Small: Open Questions: Patterns (includes algebra)

Gizmos: Check the LearnAlberta site under resources

MathUp: https://nat.mathup.ca/

NCTM: https://www.nctm.org/ClassroomResources/Illuminations/Interactives/Algebra-Tiles/

Mathsbot: https://mathsbot.com/manipulatives/tiles

Didax: https://www.didax.com/apps/algebra-tiles/

NCTM: https://www.nctm.org/Classroom-Resources/Illuminations/Interactives/Pan-Balance----Numbers/

Mathigons (algebra): https://mathigon.org/polypad

PBS Learning Material: https://www.pbslearningmedia.org/resource/mgbh.math.ee.balance/balancing-scales-to-solve-equations/

HoodaMath: https://www.hoodamath.com/games/algebrabalanceequations.html

Geogebra: https://www.geogebra.org/m/MG7eZX3g#material/mMGMgTYb