Summer New Curriculum Institute
Math Grade 4-6

Day 2

Alberta Regional Professional Development Consortia

Adult learning for students' sake

In the spirit of reconciliation, we want to acknowledge that this gathering is taking place on traditional Treaty lands across the province of Alberta - home to many diverse Indigenous, Métis and Inuit peoples.

Let Us Introduce Ourselves

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Agenda for Day Two

1. What is Numeracy and Mathematics?
2. Learning progressions
3. ARPDC resources

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Research says...

- ★ Early literacy success is directly linked to later literacy success.
- ★ Early numeracy success is directly linked to later numeracy AND literacy success.
- ★ Early numeracy is a better predictor of school success than early literacy.

Duncan et al. Study: School Readiness and Later Achievement 2007

Math or Numeracy?

Break Out Groups

Math

Numeracy

Alberta Education defines numeracy as follows: Numeracy involves acquiring and applying the mathematical knowledge and skills needed to engage with *quantitative* and *spatial information* in a variety of situations.

Numeracy is embedded in learning experiences **across all subject areas**. It is foundational, allowing students to make informed decisions as knowledgeable, active participants in our democratic society.

Numeracy

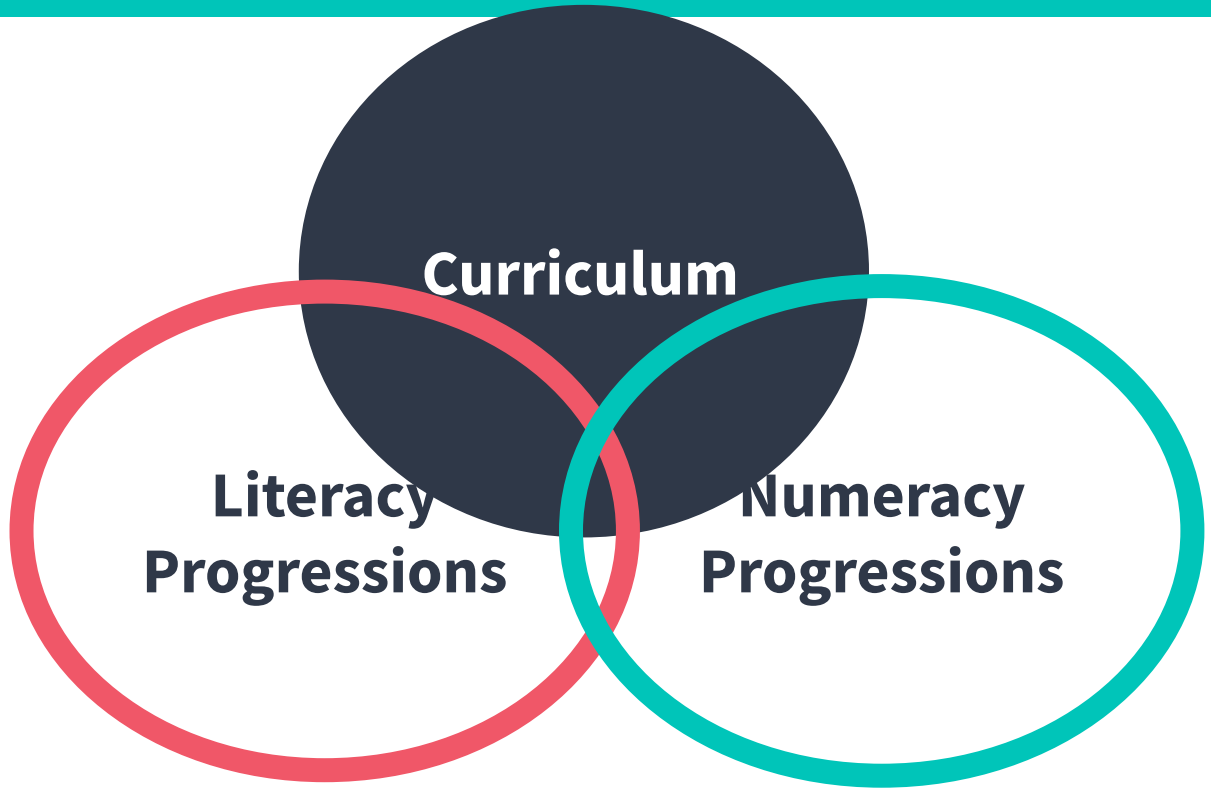
Spatial Information is the physical location of objects or people, or the relationship between objects or people.

- Spatial Visualization
- Management of Space
- Measurement
- Conversion
- Location and Direction
- Time

Quantitative Information is the information that can be measured and expressed as an amount.

- Magnitude
- Using Numbers
- Calculations
- Patterns and Relations
- Data
- Probability

Putting It All Together



Numeracy Progressions

	Kindergarten (ages 4–5)	Division 1 (ages 6–8)	Division 2 (ages 9–11)
Quantitative Information Students apply knowledge of quantitative information to make an informed decision.			
Magnitude	Children describe the quantity of objects within a group(s) as being more, less, enough, too many, or too few for a variety of purposes (e.g., to share cookies, make teams).	Students interpret and compare quantities expressed as whole numbers in their environment.	Students interpret, compare, and use quantities expressed as whole numbers, percentages, fractions, and decimals that are commonly used in real-life situations.
Using Numbers	Children use numbers to count and label in their environment (e.g., board games, phone numbers, counting rhymes).	Students use numbers to indicate position or value in their environment (e.g., first, second, third, currency, music notes).	Students use negative numbers in real-life situations (e.g., temperature, golf scores, hockey statistics).
Calculations	Children solve basic counting problems informally in familiar situations.	Students use addition and subtraction in familiar situations.	Students calculate using whole numbers and decimals in real-life situations.
Patterns and Relationships	Children recognize and use non-numerical patterns in their environment and daily routines (e.g., days of the week, rhythms).	Students recognize and use patterns in their environment and daily routines (e.g., calendar, seasons).	Students analyze and use patterns, including increasing or decreasing patterns, to make simple predictions in real-life situations.
Organization of Data	Children organize familiar items by sorting according to shared characteristics.	Students organize objects, ideas, or information using a classification system.	Students organize objects, ideas, or information using a variety of classification systems.

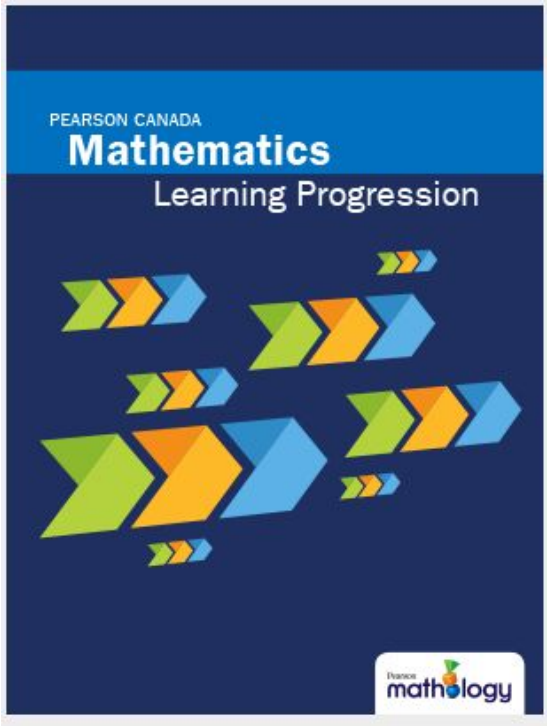
Definition of Mathematics

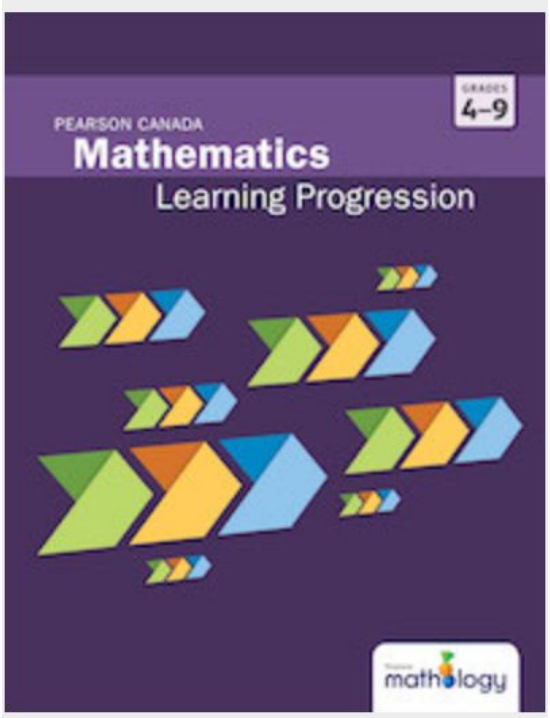
The science of numbers and their operations, interrelations, combinations, generalizations, and abstractions and of space configurations and their structure, measurement, transformations, and generalizations

> Algebra, arithmetic, calculus, geometry, and trigonometry are branches of *mathematics*.

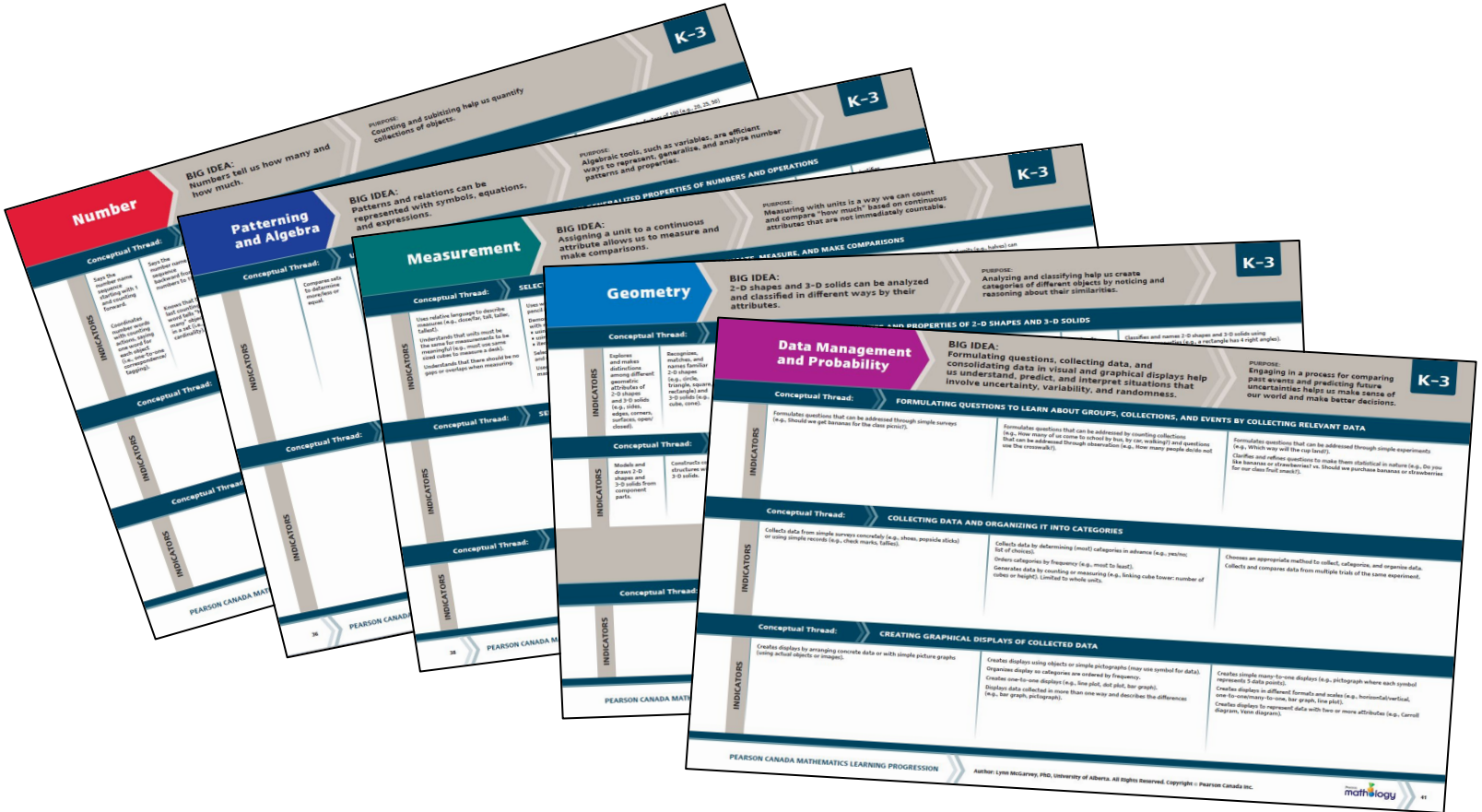
Merriam-webster dictionary

Math Learning Progressions





Math Learning Progression K–9 (Available in French and English)



Number

BIG IDEA:
Quantities and numbers can be grouped by, and partitioned into, units to determine how many or how much.

PURPOSE:
Multiplicative thinking through the operations of multiplication and division extends to problems using proportions, rates, and ratios.

K–3

Conceptual Thread: DEVELOPING CONCEPTUAL MEANING OF MULTIPLICATION AND DIVISION

INDICATORS

	Models and solves equal sharing problems to 10.	Groups objects in 2s, 5s, and 10s.	Models and solves equal sharing problems to 100.	Models and solves equal grouping problems to 100.	Models equal groups and uses multiplication symbol (×) to symbolize operation. Uses repeated addition of groups to solve problems.	Models and symbolizes single-digit multiplication problems involving equal groups or measures (i.e., equal jumps on a number line), and relates them to addition.	Uses properties of multiplication and division to solve problems (e.g., multiplying and dividing by 1, commutativity).	Models and symbolizes equal sharing and grouping division problems, and relates them to subtraction. Begins to model single-digit and multi-digit multiplication and related division situations.

Conceptual Thread: DEVELOPING FLUENCY FOR MULTIPLICATION AND DIVISION COMPUTATION

INDICATORS

								Fluently multiplies and divides to 25.

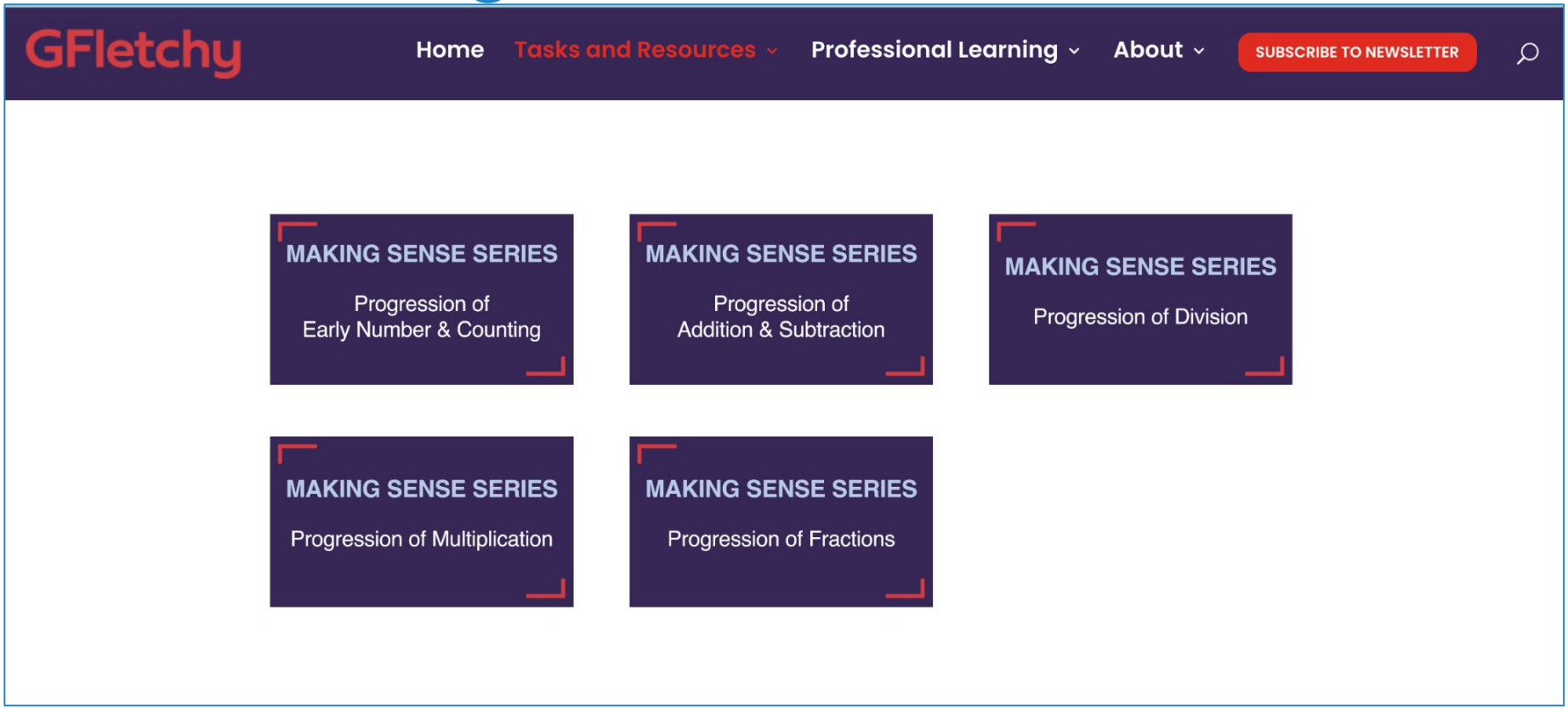
BIG IDEA: (cont'd)
Quantities and numbers can be operated on to determine how many and how much.

Conceptual Thread: DEVELOPING CONCEPTUAL MEANING OF OPERATIONS

INDICATORS

Gr 4							Gr 6
Models and develops meaning for whole number computation to four digits.	Understands and explains the effect of multiplying and dividing whole numbers by powers of 10.	Extends whole number computation models to larger numbers. Multiplies and divides decimals by powers of 10 and explains the effect.	Demonstrates an understanding of decimal number computation through modelling and flexible strategies.	Models and develops meanings for division of whole numbers that result in fractions.	Understands and explains the effect of multiplying and dividing decimal numbers by powers of 10 less than zero (i.e., 0.1, 0.001, etc.).	Explores multiplication as scaling and estimates the resulting product when scaling a given number by a number less than, equal to, or greater than 1 (e.g., $\frac{1}{2} \times 12$; 5.2×12; 0.3×12).	Models and symbolizes fraction addition and subtraction with like denominators (e.g., $\frac{2}{5} + \frac{1}{5}$) and where one denominator is a multiple of the other (e.g., $\frac{2}{5} + \frac{3}{10}$).

Math Progressions



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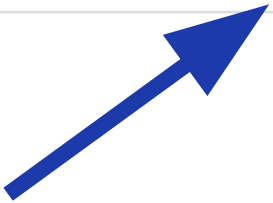
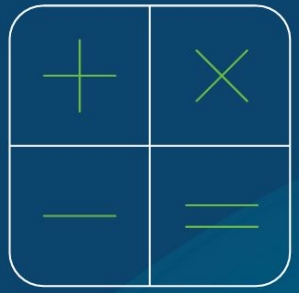


Access the New LEARNALBERTA website

GRADES 4-6

Mathematics & Numeracy



NEW CURRICULUM IMPLEMENTATION TOOLKIT

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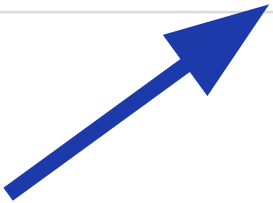
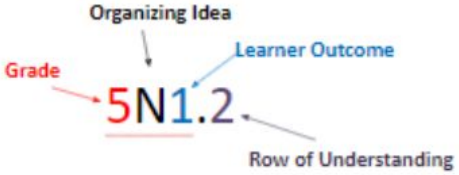
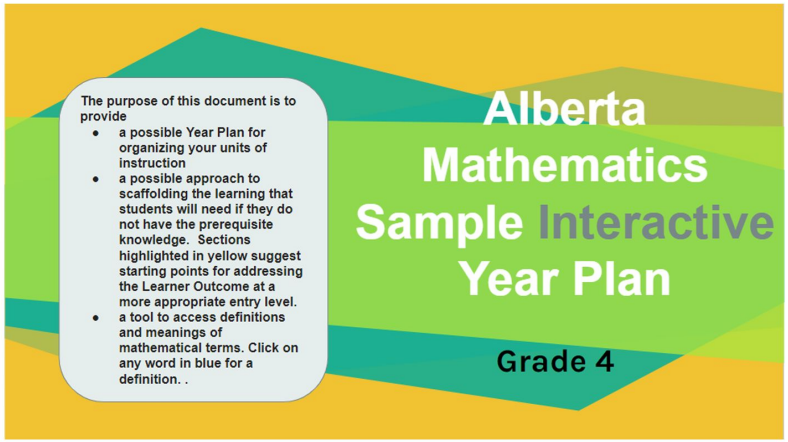


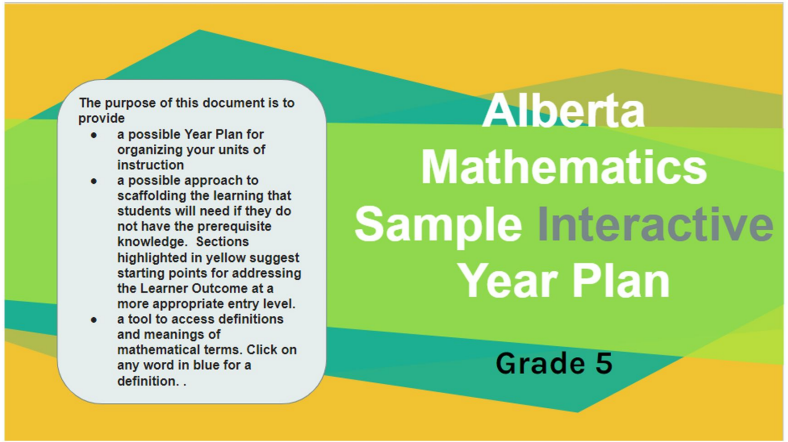
Access the New LEARNALBERTA website

Numbered Outcomes Document



	Grade 5			Grade 6		
Organizing Idea	Algebra: Equations express relationships between quantities.					
Guiding Question	How can expressions enhance communication of number?			How can expressions support a generalized interpretation of number?		
Learning Outcome	5A1.1 Students interpret numerical and algebraic expressions.			6A1.1 Students analyze expressions and solve algebraic equations.		
	Knowledge	Understanding	Skills & Procedures	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.	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.
	5A1.2 Students interpret numerical and algebraic expressions.			6A1.2 Students analyze expressions and solve algebraic equations.		
	Knowledge	Understanding	Skills & Procedures	Knowledge	Understanding	Skills & Procedures
	Expressions that include variables are called algebraic expressions. A variable can be interpreted as a specific unknown value and is represented symbolically with a letter. Products with variables are expressed without the multiplication sign. Quotients with variables are expressed using fraction notation. An algebraic term is the product of a number, called a coefficient, and a variable. A constant term is a number. A variable can be replaced by a given number in order to evaluate an expression.	Algebraic expressions use variables to represent quantities of unknown value. Algebraic expressions may be composed of one algebraic term or the sum of algebraic and constant terms.	Relate repeated addition of a variable to the product of a number and a variable. Express the product of a number and a variable using a coefficient. Express the quotient of a variable and a number as a fraction. Recognize a product with a variable, a quotient with a variable, or a number as a single term. Write an algebraic expression involving one or two terms to describe an unknown value. Evaluate an algebraic expression by substituting a given number for the variable.	Algebraic terms with exactly the same variable are like terms. Constant terms are like terms. Like terms can be combined through addition or subtraction. The terms of an algebraic expression can be rearranged according to algebraic properties. Algebraic properties include ◦ commutative property of addition: $a + b = b + a$, for any two numbers a and b ◦ commutative property of multiplication: $ab = ba$ for any two numbers a and b ◦ associative property of addition: $(a + b) + c = a + (b + c)$ associative property of multiplication: $a(bc) = b(ac)$ distributive property: $a(b + c) = ab + ac$	Algebraic properties ensure equivalence of algebraic expressions.	Investigate like terms by modeling an algebraic expression. Simplify algebraic expressions by combining like terms. Express the terms of an algebraic expression in a different order in accordance with algebraic properties.


The purpose of this document is to provide
• a possible Year Plan for organizing your units of instruction
• a possible approach to scaffolding the learning that students will need if they do not have the prerequisite knowledge. Sections highlighted in yellow suggest starting points for addressing the Learner Outcome at a more appropriate entry level.
• a tool to access definitions and meanings of mathematical terms. Click on any word in blue for a definition. .
Alberta Mathematics Sample Interactive Year Plan
Grade 4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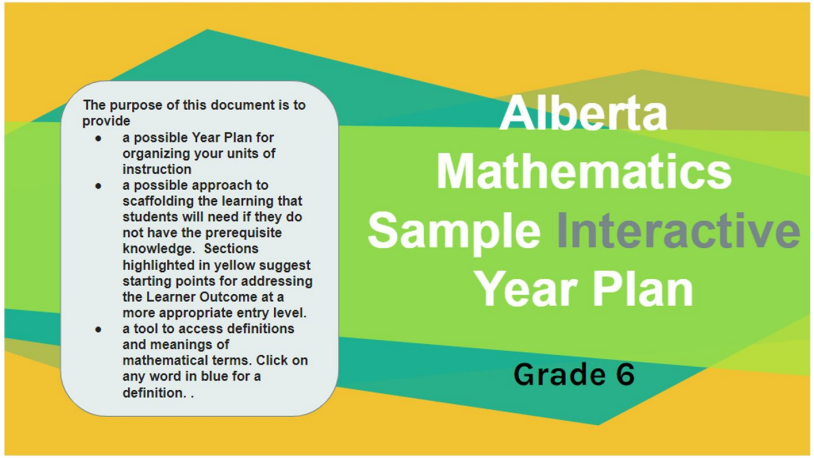
Alberta Mathematics Sample Interactive Year Plan
Grade 5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Alberta Mathematics Sample Interactive Year Plan
Grade 6

Sample Year at a Glance: Mathematics - Grade 4

September 2023 ---------- November 2023

September	October	November
Number: Quantity is measured with numbers that enable counting, labelling, comparing and operating.		
4N1 Students apply place value to decimal numbers, (within 100) • Decimal numbers are numbers between natural numbers • Decimal numbers are fractions with denominators of 10, 100, etc. (introduce with basic money skills/fractions initially - unit fractions of denominator 10 & 100, n number lines) • The separation between wholes and parts, including dollars and cents, can be represented using decimal notation.(introduce with basic money skills fractions initially) • Patterns in place value are used to read and write numbers, including wholes and parts.(relate to money initially) 4N2 Students add and subtract within 10 000, including decimal numbers to hundredths. • Standard algorithms for addition and subtraction may be used for any decimal numbers (initially whole numbers to 1000) 4N4 Students multiply and divide natural numbers within 10 000.(ongoing review of facts to 100 10x10) • Multiplication and division strategies can be chosen based on the nature of the numbers 4N5.1 Students apply equivalence to the interpretation of fractions • There are infinitely many Equivalent fractions that	4N1 Students apply place value to decimal numbers (within 100) • Decimal numbers are numbers between natural numbers • Decimal numbers are fractions with denominators of 10, 100, etc. • The separation between wholes and parts, including dollars and cents, can be represented using decimal notation. • Patterns in place value are used to read and write numbers, including wholes and parts.(relate to money) 4N2 Students add and subtract within 10 000, including decimal numbers to hundredths. • Standard algorithms for addition and subtraction may be used for any decimal numbers (whole numbers to 1000 - 5000, dollar amounts < $100) 4N4 Students multiply and divide natural numbers within 10 000.(facts 12 x 12) • Multiplication and division strategies can be chosen based on the nature of the numbers *this should be ongoing throughout the year 4N3 Students explain properties of prime and composite numbers using multiplication and division • Different factors can compose the same product. • Different products can share factors • A number divided by one of its factors will result in	4N2 Students add and subtract within 10 000, including decimal numbers to hundredths. • Standard algorithms for addition and subtraction may be used for any decimal numbers (move towards 10 000) 4N3 Students explain properties of prime and composite numbers using multiplication and division • Different factors can compose the same product. • Different products can share factors • A number divided by one of its factors will result in a remainder of 0. 4N4 Students multiply and divide natural numbers within 10 000.(facts 12 x 12) • Multiplication and division strategies can be chosen based on the nature of the numbers *this should be ongoing throughout the year

Alberta Grade 6 Mathematics Curriculum on Google Slides – Printable

Watch the attached video, starting at the 30 second mark, to learn how to print this resource. This resource was designed to help you sort outcomes for your planning, while ensuring that the KUSPs remain connected to the outcome. You will need to upload this

Organizing Idea

Algebra: Equations express relationships between quantities.

Learning Outcome

Students interpret numerical and algebraic expressions.

Understanding

Equality is preserved by applying inverse operations to algebraic expressions on each side of an equation.
The expressions on each side of an equation will be equal when evaluated using the correct solution.

Skills and Procedures	
Write equations involving one or two operations to represent a situation. Investigate order of operations when performing inverse operations on both sides of an equation. Apply inverse operations to solve an equation, limited to equations with one or two operations.	Verify the solution to an equation by evaluating expressions on each side of the equation. Solve problems using equations, limited to equations with one or two operations.

GRADE LEVEL - SUBJECT

UPDATED APRIL 2022

These printable cards will be helpful in your planning.

https://arpdc.ab.ca

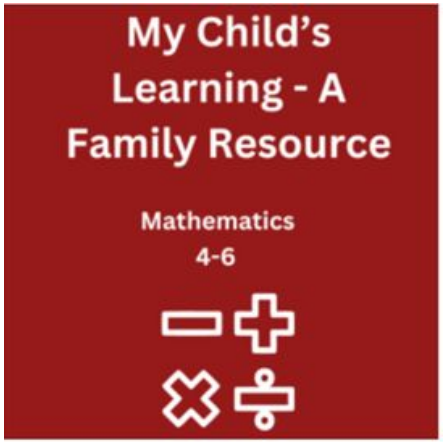
Mathematics Tasks | Grade 6

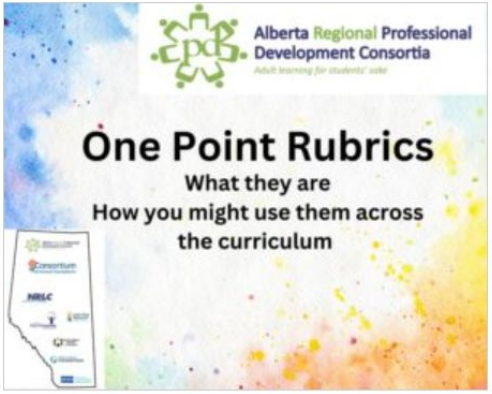
Algebra Organizing Idea: Equations express relationships between quantities.				
Learning Outcome: Analyze expressions and solve algebraic equations				
Solving Equations	Solve Me Puzzles (Mobiles) Provides students the opportunity to explore and play with equations. These problems can also be used to discuss like terms and simplify algebraic expressions by combining like terms. Note | This is an internet-based activity which can be done as individuals and/or as a whole class.	Solving One Step Equations An *Open Middle* task that explores solving multiple one step equations that interconnected equations. This task can help support different strategies for solving equations. Additional Problem	Sven's Gym Cans (p.68) This problem provides an opportunity to explore solving equations with unknown variables.	Fruity Totals Students practice solving simultaneous equations and develop reasoning skills through manipulating algebraic expressions. Note | A digital resource which allows for multiple questions of similar nature.
	What's It Worth This problem provides a challenge in reasoning. Students work with multiple unknowns and sort through an abundance of information.	Two Step Equations An *Open Middle* task that explores solving two-step equations.	Border Problem This lesson provides the opportunity for students to explore personal strategies related to algebraic properties. The problem provides the opportunity to discuss the associative property of addition and the distributive property. Note | Square tile manipulatives could be used when engaging with this task.	
Order of Operations	Commit and Capture (p.20) A partner or small group activity/game that explores the role of number placement within an order of operations equation.	100 Board Wipe Out (p. 7-8) An activity that challenges thinking and procedural understanding when using order of operations.	Make 24 A task that provides four numerical values along with addition, subtraction, multiplication and division in order to create 24 as a final total.	Albert's Insomnia A task that allows for learners to choose four numerical values along with addition, subtraction, multiplication and division in order to create the largest value possible.

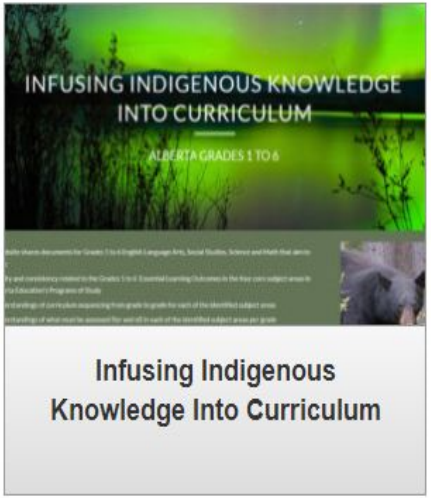
You can click on the blue hyperlinked titles to go to the activity.

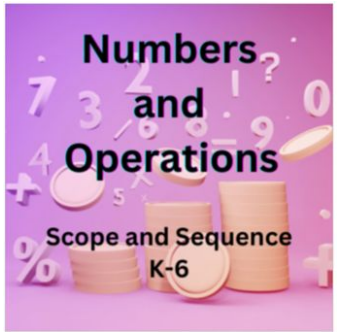
Calgary Board of Education

https://arpdc.ab.ca/pd-resource/calgary-board-of-education-grade-6-mathematics-tasks/









https://arpdc.ab.ca/focuses/math/

A Recipe for Success!

Imagine having an example lesson with all the "ingredients" included: outcomes, instruction, student demonstration of learning, assessments, resources and templates. Similar to the meals plans such as Hello Fresh and Chef's Plate, these lessons are easy to prepare, yet still allow educators to "spice it up" with ingredients from their own pedagogical pantry!

- An example lesson plan based on new curriculum

- Student activity ideas and demonstration of learning

- Pro pedagogical tips and tricks

- Videos from consultants to support teachers

- Classroom "in action" videos showcasing the possibilities

- Assessment examples and considerations

https://curriculum.ecsd.net/curriculum-crates

A curriculum crate allows for a "teacher to apply a current and comprehensive repertoire of effective planning , instruction, and assessment practices to meet the learning needs of every student"(TQS 3). We start by dissecting a learning outcome to examine what students need to know, experience, and demonstrate in their learning journey for that outcome during this timeframe. We then use this to plan an appropriate lesson(s). These crates are an example moment in time that can showcase possibility to educators. Ideally you will customize this lesson to meet the needs of your students and know that learning outcomes are returned to many times throughout the year as we layer on our knowledge, understandings, skills, and procedures of each learner outcome. Thank you to teacher working groups who worked side by side with consultants to create these.

Taking a Deeper Dive into the Curriculum

Reminder for Day Three

1. Unpacking student actions (verbs) in the new curriculum

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Thank you for your time today!

We will see you tomorrow!