BIG IDEAS

The principles and processes underlying operations with **numbers** apply equally to algebraic situations and can be described and analyzed.	Computational fluency and flexibility with numbers extend to operations with rational numbers.	**Continuous linear relationships** can be identified and represented in many connected ways to identify regularities and make generalizations.	Similar shapes have **proportional relationships** that can be described, measured, and compared.	Analyzing the validity, reliability, and representation of **data** enables us to compare and interpret.

Learning Standards

Curricular Competencies	Content
Students are expected to do the following: **Reasoning and analyzing** • Use **logic and patterns** to solve puzzles and play games • Use **reasoning and logic** to explore, analyze, and apply mathematical ideas • **Estimate reasonably** • Demonstrate and **apply** mental math strategies • Use tools or technology to explore and create patterns and relationships, and test conjectures • **Model** mathematics in contextualized experiences **Understanding and solving** • Apply **multiple strategies** to solve problems in both abstract and contextualized situations • Develop, demonstrate, and apply mathematical understanding through play, inquiry, and problem solving • Visualize to explore mathematical concepts • Engage in problem-solving experiences that are **connected** to place, story, cultural practices, and perspectives relevant to local First Peoples communities, the local community, and other cultures **Communicating and representing** • Use mathematical vocabulary and language to contribute to mathematical discussions • **Explain and justify** mathematical ideas and decisions	*Students are expected to know the following:* • **operations** with rational numbers (addition, subtraction, multiplication, division, and order of operations) • **exponents** and exponent laws with whole-number exponents • operations with **polynomials**, of degree less than or equal to 2 • **two-variable linear relations**, using graphing, interpolation, and extrapolation • **multi-step** one-variable linear equations • spatial **proportional reasoning** • **statistics** in society • **financial literacy —** simple budgets and transactions

Learning Standards (continued)

Curricular Competencies	Content
• **Communicate** mathematical thinking in many ways • Represent mathematical ideas in concrete, pictorial, and symbolic forms **Connecting and reflecting** • **Reflect** on mathematical thinking • Connect mathematical concepts to each other and to **other areas and personal interests** • Use mathematical arguments to support **personal choices** • **Incorporate** First Peoples worldviews and perspectives to **make connections** to mathematical concepts	

Big Ideas – Elaborations	MATHEMATICS Grade 9

numbers:

- Number: Number represents and describes quantity.
- Algebraic reasoning enables us to describe and analyze mathematical relationships.

Sample questions to support inquiry with students:

- How does understanding equivalence help us solve algebraic equations?
- How are the operations with polynomials connected to the process of solving equations?
- What patterns are formed when we implement the operations with polynomials?
- How can we analyze bias and reliability of studies in the media?

fluency:

- Computational Fluency: Computational fluency develops from a strong sense of number.

Sample questions to support inquiry with students:

- When we are working with rational numbers, what is the relationship between addition and subtraction?
- When we are working with rational numbers, what is the relationship between multiplication and division?
- When we are working with rational numbers, what is the relationship between addition and multiplication?
- When we are working with rational numbers, what is the relationship between subtraction and division?

Big Ideas – Elaborations

Continuous linear relationships:

- Patterning: We use patterns to represent identified regularities and to make generalizations.

Sample questions to support inquiry with students:

- What is a continuous linear relationship?
- How can continuous linear relationships be represented?
- How do linear relationships help us to make predictions?
- What factors can change a continuous linear relationship?
- How are different graphs and relationships used in a variety of careers?

proportional relationships:

- Geometry and Measurement: We can describe, measure, and compare spatial relationships.
- Proportional reasoning enables us to make sense of multiplicative relationships.

Sample questions to support inquiry with students:

- How are similar shapes related?
- What characteristics make shapes similar?
- What role do similar shapes play in construction and engineering of structures?

data:

- Data and Probability: Analyzing data and chance enables us to compare and interpret.

Sample questions to support inquiry with students:

- What makes data valid and reliable?
- What is the difference between valid data and reliable data?
- What factors influence the validity and reliability of data?

MATHEMATICS
Grade 9

Curricular Competencies – Elaborations

logic and patterns:

- including coding

reasoning and logic:

- making connections, using inductive and deductive reasoning, predicting, generalizing, drawing conclusions through experiences

Estimate reasonably:

- estimating using referents, approximation, and rounding strategies (e.g., the distance to the stop sign is approximately 1 km, the width of my finger is about 1 cm)

Curricular Competencies – Elaborations

apply:
- extending whole-number strategies to rational numbers and algebraic expressions
- working toward developing fluent and flexible thinking about number

Model:
- acting it out, using concrete materials (e.g., manipulatives), drawing pictures or diagrams, building, programming

multiple strategies:
- includes familiar, personal, and from other cultures

connected:
- in daily activities, local and traditional practices, the environment, popular media and news events, cross-curricular integration
- Patterns are important in First Peoples technology, architecture, and art.
- Have students pose and solve problems or ask questions connected to place, stories, and cultural practices.

Explain and justify:
- using mathematical arguments

Communicate:
- concretely, pictorially, symbolically, and by using spoken or written language to express, describe, explain, justify, and apply mathematical ideas; may use technology such as screencasting apps, digital photos

Reflect:
- sharing the mathematical thinking of self and others, including evaluating strategies and solutions, extending, and posing new problems and questions

other areas and personal interests:
- to develop a sense of how mathematics helps us understand ourselves and the world around us (e.g., cross-discipline, daily activities, local and traditional practices, the environment, popular media and news events, and social justice)

personal choices:
- including anticipating consequences

Incorporate First Peoples:
- Invite local First Peoples Elders and knowledge keepers to share their knowledge

make connections:
- Bishop's cultural practices: counting, measuring, locating, designing, playing, explaining (http://www.csus.edu/indiv/o/oreyd/ACP.htm_files/abishop.htm)
- www.aboriginaleducation.ca
- Teaching Mathematics in a First Nations Context, FNESC (http://www.fnesc.ca/resources/math-first-peoples/)

operations:
- includes brackets and exponents
- simplifying $(-3/4) \div 1/5 + ((-1/3) \times (-5/2))$
- simplifying $1 - 2 \times (4/5)^2$
- paddle making

exponents:
- includes variable bases
- $2^7 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 128$; $n^4 = n \times n \times n \times n$
- exponent laws (e.g., $6^0 = 1$; $m^1 = m$; $n^5 \times n^3 = n^8$; $y^7/y^3 = y^4$; $(5n)^3 = 5^3 \times n^3 = 125n^3$; $(m/n)^5 = m^5/n^5$; and $(3^2)^4 = 3^8$)
- limited to whole-number exponents and whole-number exponent outcomes when simplified
- $(-3)^2$ does not equal -3^2
- $3x(x - 4) = 3x^2 - 12x$

polynomials:
- variables, degree, number of terms, and coefficients, including the constant term
- $(x^2 + 2x - 4) + (2x^2 - 3x - 4)$
- $(5x - 7) - (2x + 3)$
- $2n(n + 7)$
- $(15k^2 - 10k) \div (5k)$
- using algebra tiles

two-variable linear relations:
- two-variable continuous linear relations; includes rational coordinates
- horizontal and vertical lines
- graphing relation and analyzing
- interpolating and extrapolating approximate values
- spirit canoe journey predictions and daily checks

multi-step:
- includes distribution, variables on both sides of the equation, and collecting like terms
- includes rational coefficients, constants, and solutions
- solving and verifying $1 + 2x = 3 - 2/3(x + 6)$
- solving symbolically and pictorially

Content – Elaborations

proportional reasoning:

- scale diagrams, similar triangles and polygons, linear unit conversions
- limited to metric units
- drawing a diagram to scale that represents an enlargement or reduction of a given 2D shape
- solving a scale diagram problem by applying the properties of similar triangles, including measurements
- integration of scale for First Peoples mural work, use of traditional design in current First Peoples fashion design, use of similar triangles to create longhouses/models

statistics:

- population versus sample, bias, ethics, sampling techniques, misleading stats
- analyzing a given set of data (and/or its representation) and identifying potential problems related to bias, use of language, ethics, cost, time and timing, privacy, or cultural sensitivity
- using First Peoples data on water quality, Statistics Canada data on income, health, housing, population

financial literacy:

- banking, simple interest, savings, planned purchases
- creating a budget/plan to host a First Peoples event