BIG IDEAS

Proportional reasoning is used to make sense of **multiplicative** relationships.	Mathematics informs financial **decision making**.	**3D objects** are often represented and described in 2D space.	Flexibility with number builds meaning, **understanding**, and confidence.	Representing and analyzing data allows us to **notice and wonder** about relationships.

Learning Standards

Curricular Competencies	Content
Students are expected to do the following: **Reasoning and modelling** • Develop **thinking strategies** to solve puzzles and play games • Explore, **analyze**, and apply mathematical ideas using **reason**, **technology**, and **other tools** • **Estimate reasonably** and demonstrate **fluent, flexible, and strategic thinking** about number • **Model** with mathematics in **situational contexts** • **Think creatively** and with **curiosity and wonder** when exploring problems **Understanding and solving** • Develop, demonstrate, and apply conceptual understanding of mathematical ideas through play, story, **inquiry**, and problem solving • **Visualize** to explore and illustrate mathematical concepts and relationships • Apply **flexible and strategic approaches** to **solve problems** • Solve problems with **persistence and a positive disposition** • Engage in problem-solving experiences **connected** with place, story, cultural practices, and perspectives relevant to local First Peoples communities, the local community, and other cultures	*Students are expected to know the following:* • **financial literacy:** personal investments, loans, and budgeting • **rate of change** • how probability and statistics are used in different **contexts** • **interpreting graphs** in society • **3D objects:** angles, views, and scale diagrams

Learning Standards (continued)

Curricular Competencies	Content
Communicating and representing • **Explain and justify** mathematical ideas and **decisions** in **many ways** • **Represent** mathematical ideas in concrete, pictorial, and symbolic forms • Use mathematical vocabulary and language to contribute to **discussions** in the classroom • Take risks when offering ideas in classroom **discourse** **Connecting and reflecting** • **Reflect** on mathematical thinking • **Connect mathematical concepts** with each other, other areas, and personal interests • Use **mistakes** as **opportunities to advance learning** • **Incorporate** First Peoples worldviews, perspectives, **knowledge**, and **practices** to make connections with mathematical concepts	

Big Ideas – Elaborations

- **Proportional reasoning:**
  - reasoning about comparisons of relative size or scale instead of numerical difference
- **multiplicative:**
  - the multiplicative relationship between two numbers or measures is a relationship of scale rather than an additive difference (e.g., “12 is three times the size of 4” is a multiplicative relationship; “12 is 8 more than 4” is an additive relationship)

  Sample questions to support inquiry with students:
  - How are proportions used to describe changes in size?
  - How are proportions used to solve problems in different contexts?
  - How can proportions be used to represent and analyze rates of change?
  - As the proportions of a shape change, what happens to the angles?
- **decision making:**

  Sample questions to support inquiry with students:
  - How do we make informed financial decisions?
  - What factors should be considered when making a large purchase?
  - What are the benefits of making responsible financial decisions?
- **3D objects:**

  Sample questions to support inquiry with students:
  - Why is it important to represent 3D objects on a 2D plane?
  - Where are representations of 3D objects used outside the classroom?
  - Why is accuracy of measurement important when looking at scale diagrams?
  - Can all 3D objects be described using 2D representations?
  - What do we notice about angles in scale diagrams?
- **understanding:**

  Sample questions to support inquiry with students:
  - How does solving puzzles and playing games relate to mathematics?
  - How does experiential learning facilitate deeper understanding?
- **notice and wonder:**

  Sample questions to support inquiry with students:
  - How can statistical analysis help us make inferences about the future?
  - How can a trend be determined from a set of given data?
  - How can mathematics be used to influence our decisions around positive changes in society?

- **thinking strategies:**
  - using reason to determine winning strategies
  - generalizing and extending
- **analyze:**
  - examine the structure of and connections between mathematical ideas (e.g., rate of change, trigonometry calculations)
- **reason:**
  - inductive and deductive reasoning
  - predictions, generalizations, conclusions drawn from experiences (e.g., with puzzles, games, and coding)
- **technology:**
  - graphing technology, dynamic geometry, calculators, virtual manipulatives, concept-based apps
  - can be used for a wide variety of purposes, including:
    - generating and testing inductive conjectures
    - mathematical modelling
- **other tools:**
  - manipulatives such as algebra tiles and other concrete materials
- **Estimate reasonably:**
  - be able to defend the reasonableness of an estimated value or a solution to a problem or equation (e.g., trigonometric angle/side relations and rate of change calculations)
- **fluent, flexible and strategic thinking:**
  - includes:
    - using known facts and benchmarks and partitioning (e.g., creating and interpreting 3D diagrams and making financial decisions based on evidence)
    - choosing from different ways to think of a number or operation (e.g., Which will be the most strategic or efficient?)
- **Model:**
  - use mathematical concepts and tools to solve problems and make decisions (e.g., in real-life and/or abstract scenarios)
  - take a complex, essentially non-mathematical scenario and figure out what mathematical concepts and tools are needed to make sense of it
- **situational contexts:**
  - including real-life scenarios and open-ended challenges that connect mathematics with everyday life
- **Think creatively:**
  - by being open to trying different strategies
  - refers to creative and innovative mathematical thinking rather than to representing math in a creative way, such as through art or music

- **curiosity and wonder:**
  - asking questions to further understanding or to open other avenues of investigation
- **inquiry:**
  - includes structured, guided, and open inquiry
  - noticing and wondering
  - determining what is needed to make sense of and solve problems
- **Visualize:**
  - create and use mental images to support understanding
  - Visualization can be supported using dynamic materials (e.g., graphical relationships and simulations), concrete materials, drawings, and diagrams.
- **flexible and strategic approaches:**
  - deciding which mathematical tools to use to solve a problem
  - choosing an appropriate strategy to solve a problem (e.g., guess and check, model, solve a simpler problem, use a chart, use diagrams, role-play)
- **solve problems:**
  - interpret a situation to identify a problem
  - apply mathematics to solve the problem
  - analyze and evaluate the solution in terms of the initial context
  - repeat this cycle until a solution makes sense
- **persistence and a positive disposition:**
  - not giving up when facing a challenge
  - problem solving with vigour and determination
- **connected:**
  - through daily activities, local and traditional practices, popular media and news events, cross-curricular integration
  - by posing and solving problems or asking questions about place, stories, and cultural practices
- **Explain and justify:**
  - use mathematical arguments to convince
  - includes anticipating consequences
- **decisions:**
  - Have students explore which of two scenarios they would choose and then defend their choice.
- **many ways:**
  - including oral, written, visual, use of technology
  - communicating effectively according to what is being communicated and to whom

- **Represent:**
  - using models, tables, graphs, words, numbers, symbols
  - connecting meanings among various representations
- **discussions:**
  - partner talks, small-group discussions, teacher-student conferences
- **discourse:**
  - is valuable for deepening understanding of concepts
  - can help clarify students' thinking, even if they are not sure about an idea or have misconceptions
- **Reflect:**
  - share the mathematical thinking of self and others, including evaluating strategies and solutions, extending, posing new problems and questions
- **Connect mathematical concepts:**
  - to develop a sense of how mathematics helps us understand ourselves and the world around us (e.g., daily activities, local and traditional practices, popular media and news events, social justice, cross-curricular integration)
- **mistakes:**
  - range from calculation errors to misconceptions
- **opportunities to advance learning:**
  - by:
    - analyzing errors to discover misunderstandings
    - making adjustments in further attempts
    - identifying not only mistakes but also parts of a solution that are correct
- **Incorporate:**
  - by:
    - collaborating with Elders and knowledge keepers among local First Peoples
    - exploring the First Peoples Principles of Learning (e.g., Learning is holistic, reflexive, reflective, experiential, and relational [focused on connectedness, on reciprocal relationships, and a sense of place]; Learning involves patience and time)
    - making explicit connections with learning mathematics
    - exploring cultural practices and knowledge of local First Peoples and identifying mathematical connections
- **knowledge:**
  - local knowledge and cultural practices that are appropriate to share and that are non-appropriated
- **practices:**
  - Bishop's cultural practices: counting, measuring, locating, designing, playing, explaining
  - Aboriginal Education Resources
  - *Teaching Mathematics in a First Nations Context*, FNESC

Content – Elaborations

- **financial literacy:**
  - personal investments, loans (lease versus buy), credit cards, mortgages, graphical representations of financial growth
  - to purchase, own, or lease and to operate and maintain a vehicle
  - banking services
  - other significant purchases
- **rate of change:**
  - slope of 3D objects, angle of elevation
  - interest rates
- **contexts:**
  - exploring games of chance and insurance payout likelihood
  - reading about and interpreting surveys and information in the media to make informed decisions
  - understanding statistical vocabulary
- **interpreting graphs:**
  - investigating graphs in the media (e.g., news articles, blogs, social media, websites, advertisements)
  - how data and media influence social justice issues and personal decisions
- **3D objects:**
  - creating and interpreting exploded diagrams and perspective diagrams
  - drawing and constructing 3D objects