

BIG IDEAS

Probabilistic thinking informs decision making in situations involving chance and uncertainty.

Modelling data requires an understanding of a variety of functions.

Mathematical analysis informs financial **decisions**.

Through **explorations** of spatial relationships, we can develop a geometrical appreciation of the world around us.

Learning Standards

Curricular Competencies	Content
<i>Students are expected to do the following:</i> 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	<i>Students are expected to know the following:</i> • geometric explorations: – constructions – conics – fractals • graphical representations of polynomial, logarithmic, exponential, and sinusoidal functions • regression analysis • combinatorics • odds, probability, and expected value • financial planning

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

- **Probabilistic thinking:**

Sample questions to support inquiry with students:

- How do we make decisions involving probabilities?
- How reliable is a test that is 98% accurate?
- What is the difference between reliability and accuracy?
- What information is needed when considering the likelihood of an event?

- **Modelling:**

Sample questions to support inquiry with students:

- How do we know what type of regression best models a given set of data?
- What factors would affect the reliability of a regression analysis?
- What are the limitations associated with regression models?

- **decisions:**

Sample questions to support inquiry with students:

- How do we make decisions regarding our financial options?
- What are the repercussions of our financial decisions (e.g., in the short term versus the long term)?
- What factors influence our willingness to take financial risks?

- **explorations:**

Sample questions to support inquiry with students:

- What can we construct using a straightedge and compass?
- What properties change and stay the same when we vary a square, parallelogram, triangle, and so on?
- How are circles, ellipses, parabolas, and hyperbolas related?
- Where are conics found in the world around us?
- How does nature exhibit fractal properties?
- What patterns do we see in fractals?

Curricular Competencies – Elaborations

- **thinking strategies:**
 - using reason to determine winning strategies
 - generalizing and extending
- **analyze:**
 - examine the structure of and connections between mathematical ideas (e.g., conic sections, functions, financial planning)
- **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:
 - exploring and demonstrating mathematical relationships
 - organizing and displaying data
 - 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., regression analysis and combinatorics calculations)
- **fluent, flexible and strategic thinking:**
 - includes using known facts and benchmarks; partitioning; applying whole number strategies to graphing; regression choice; probability
- **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

Curricular Competencies – Elaborations

- **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 effective 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

Curricular Competencies – Elaborations

- **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

- **constructions:**
 - perpendicular bisector, tangents, polygons, tessellations, geometric art
- **conics:**
 - locus definition and constructions, conic sections, applications
- **fractals:**
 - understanding fractals as an iteration of a simple instruction
 - constructing and analyzing models of fractals, such as Cantor’s dust, Sierpinski’s triangle, Koch’s snowflake
 - connecting fractals with nature
- **representations:**
 - using technology only
 - using characteristics of a graph to identify these functions
- **regression analysis:**
 - polynomial, exponential, sinusoidal, logarithmic
 - applying the appropriate regression model
- **combinatorics:**
 - permutations, combinations, pathways, Pascal’s Triangle
- **odds, probability:**
 - mutually exclusive, non–mutually exclusive, conditional probability, binomial probability
 - Venn diagrams
- **financial planning:**
 - developing a personal financial portfolio
 - mortgages
 - risk
 - changing interest rates and/or payments
 - credit cards
 - exploring banking options and financial markets