BIG IDEAS

Proportional reasoning is used to make sense of **multiplicative** relationships.	3D objects can be examined mathematically by **measuring** directly and indirectly length, surface area, and volume.	**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:* • create, interpret, and critique **graphs** • **primary trigonometric ratios** • metric and imperial measurement and **conversions** • **surface area and volume** • **central tendency** • **experimental probability** • **financial literacy:** gross and net pay

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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	

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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:
  - What are the similarities and differences between strategies for solving proportional reasoning problems in different contexts?
  - How does understanding the relationship between multiplication and division help when working with proportions?
  - How are proportions used to describe changes in size?
- **measuring:**

  Sample questions to support inquiry with students:
  - What measurement is the most important for examining 3D objects?
  - Why is it important to understand the components of a formula?
- **Flexibility:**

  Sample questions to support inquiry with students:
  - How does using a measuring tool increase fluency and flexibility with decimals and fractions?
  - How does solving puzzles and playing games help our understanding of number?
  - Why are fractions important for imperial measurements?
  - How does base 10 make the metric system easier to use?
  - How is the order of operations connected to formula calculations?
  - How do we determine which unit is the most appropriate to use?
  - What level of estimation is considered reasonable when purchasing goods?
- **Representing and analyzing data:**

  Sample questions to support inquiry with students:
  - How do we choose the most appropriate graph to represent a set of data?
  - How do graphs help summarize and analyze data?
  - How can simulations help us make inferences?
  - How can investigating trends help us make predictions?
  - Why are graphs used to represent data?
  - Why do we graph data?

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- **thinking strategies:**
  - using reason to determine winning strategies
  - generalizing and extending
- **analyze:**
  - examine the structure of and connections between mathematical ideas (e.g., angle relations, primary trigonometric ratios, measurement calculations)
- **reason:**
  - inductive and deductive reasoning
  - predictions, generalizations, conclusions drawn from experiences (e.g., with puzzles, games, 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., measurement calculations, angle-size reasonableness, primary trigonometric ratio calculations)
- **fluent, flexible, and strategic thinking:**
  - includes:
    - using benchmarks and partitioning for graph creation and analysis
    - 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, 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
- **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, experimental, 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

Curricular Competencies – Elaborations

MATHEMATICS – Workplace Mathematics
Grade 10

- **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

MATHEMATICS – Workplace Mathematics
Grade 10

- **graphs:**
  - including a variety of formats, such as line, bar, and circle graphs, as well as histograms, pictographs, and infographics
- **primary trigonometric ratios:**
  - single right-angle triangles; sine, cosine, and tangent
- **conversions:**
  - with a focus on length as a means to increase computational fluency
  - using tools and appropriate units to measure with accuracy
- **surface area and volume:**
  - including prisms and cylinders, formula manipulation
  - contextualized problems involving 3D shapes
- **central tendency:**
  - analysis of measures and discussion of outliers
  - calculation of mean, median, mode, and range
- **experimental probability:**
  - simulations through playing and creating games and connecting to theoretical probability where possible
- **financial literacy:**
  - types of income; income tax and other deductions