### 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

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<th>Curricular Competencies</th>
<th>Content</th>
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<tr>
<td><strong>Reasoning and modelling</strong></td>
<td>Students are expected to do the following:</td>
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<tr>
<td>- Develop thinking strategies to solve puzzles and play games</td>
<td>Students are expected to know the following:</td>
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<tr>
<td>- Explore, analyze, and apply mathematical ideas using reason, technology, and other tools</td>
<td>- financial literacy: personal investments, loans, and budgeting</td>
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<tr>
<td>- Estimate reasonably and demonstrate fluent, flexible, and strategic thinking about number</td>
<td>- rate of change</td>
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<td>- Model with mathematics in situational contexts</td>
<td>- how probability and statistics are used in different contexts</td>
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<tr>
<td>- Think creatively and with curiosity and wonder when exploring problems</td>
<td>- interpreting graphs in society</td>
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<tr>
<td><strong>Understanding and solving</strong></td>
<td>- 3D objects: angles, views, and scale diagrams</td>
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<tr>
<td>- Develop, demonstrate, and apply conceptual understanding of mathematical ideas through play, story, inquiry, and problem solving</td>
<td>- Visualize to explore and illustrate mathematical concepts and relationships</td>
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<td>- Visualize to explore and illustrate mathematical concepts and relationships</td>
<td>- Apply flexible and strategic approaches to solve problems</td>
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<tr>
<td>- Solve problems with persistence and a positive disposition</td>
<td>- 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</td>
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### Area of Learning: MATHEMATICS — Workplace Mathematics

#### Grade 11

### Learning Standards (continued)

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

<table>
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<th>Description</th>
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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., 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
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

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- **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