Area of Learning: MATHEMATICS — Workplace Mathematics  

Grade 10

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

<table>
<thead>
<tr>
<th>Curricular Competencies</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reasoning and modelling</strong></td>
<td>Students are expected to do the following:</td>
</tr>
<tr>
<td>• Develop thinking strategies to solve puzzles and play games</td>
<td>Students are expected to know the following:</td>
</tr>
<tr>
<td>• Explore, analyze, and apply mathematical ideas using reason, technology, and other tools</td>
<td>• create, interpret, and critique graphs</td>
</tr>
<tr>
<td>• Estimate reasonably and demonstrate fluent, flexible, and strategic thinking about number</td>
<td>• primary trigonometric ratios</td>
</tr>
<tr>
<td>• Model with mathematics in situational contexts</td>
<td>• metric and imperial measurement and conversions</td>
</tr>
<tr>
<td>• Think creatively and with curiosity and wonder when exploring problems</td>
<td>• surface area and volume</td>
</tr>
</tbody>
</table>

| Understanding and solving | |
| • Develop, demonstrate, and apply conceptual understanding of mathematical ideas through play, story, inquiry, and problem solving | • central tendency |
| • Visualize to explore and illustrate mathematical concepts and relationships | • experimental probability |
| • Apply flexible and strategic approaches to solve problems | • financial literacy: gross and net pay |
| • 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 | |
## Learning Standards (continued)

<table>
<thead>
<tr>
<th>Curricular Competencies</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Communicating and representing</strong></td>
<td></td>
</tr>
<tr>
<td>• Explain and justify mathematical ideas and decisions in many ways</td>
<td></td>
</tr>
<tr>
<td>• Represent mathematical ideas in concrete, pictorial, and symbolic forms</td>
<td></td>
</tr>
<tr>
<td>• Use mathematical vocabulary and language to contribute to discussions in the classroom</td>
<td></td>
</tr>
<tr>
<td>• Take risks when offering ideas in classroom discourse</td>
<td></td>
</tr>
<tr>
<td><strong>Connecting and reflecting</strong></td>
<td></td>
</tr>
<tr>
<td>• Reflect on mathematical thinking</td>
<td></td>
</tr>
<tr>
<td>• Connect mathematical concepts with each other, other areas, and personal interests</td>
<td></td>
</tr>
<tr>
<td>• Use mistakes as opportunities to advance learning</td>
<td></td>
</tr>
<tr>
<td>• Incorporate First Peoples worldviews, perspectives, knowledge, and practices to make connections with mathematical concepts</td>
<td></td>
</tr>
</tbody>
</table>
### 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?
  - Why are fractions important for imperial measurements?
  - How does base 10 make the metric system easier to use?
  - 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 can 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?
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., 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
Curricular Competencies – Elaborations

- **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

#### 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

#### 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