**Area of Learning: MATHEMATICS — Workplace Mathematics Grade 10**

**BIG IDEAS**

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| **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**

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| **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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**Area of Learning: MATHEMATICS — Workplace Mathematics Grade 10**

**Learning Standards (continued)**

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| **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 makeconnections with mathematical concepts
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|  **MATHEMATICS – Workplace Mathematics Big Ideas – Elaborations Grade 10** |
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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:** + 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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|  **MATHEMATICS – Workplace Mathematics Curricular Competencies – Elaborations Grade 10** |
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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 deductivereasoning
	+ 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](http://www.fnesc.ca/wp/wp-content/uploads/2015/09/PUB-LFP-POSTER-Principles-of-Learning-First-Peoples-poster-11x17.pdf) (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
* **knowledge:**
	+ local knowledge and cultural practices that are appropriate to share and that are non-appropriated
* **practices:**
	+ [Bishop’s cultural practices](http://www.csus.edu/indiv/o/oreyd/ACP.htm_files/abishop.htm): counting, measuring, locating, designing, playing, explaining
	+ [Aboriginal Education Resources](http://www.aboriginaleducation.ca/)
	+ [*Teaching Mathematics in a First Nations Context*,](http://www.fnesc.ca/resources/math-first-peoples/)FNESC
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|  **MATHEMATICS – Workplace Mathematics Content – Elaborations Grade 10** |
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| * **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
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