**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**

|  |  |
| --- | --- |
| **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 |

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

**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 makeconnections with mathematical concepts |  |

| **MATHEMATICS – Workplace Mathematics  Big Ideas – Elaborations Grade 10** |
| --- |
| * **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? |

| **MATHEMATICS – Workplace Mathematics  Curricular Competencies – Elaborations Grade 10** |
| --- |
| * **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 |

| **MATHEMATICS – Workplace Mathematics  Content – Elaborations 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 |