**Area of Learning: MATHEMATICS — Workplace Mathematics Grade 11**

**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 dataallows 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:*   * **financial literacy:** personal investments, loans, and budgeting * **rate of change** * how probability and statistics are used in different **contexts** * **interpreting graphs** in society * **3D objects:** angles, views, and scale diagrams |

**Area of Learning: MATHEMATICS — Workplace Mathematics Grade 11**

**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 11** |
| --- |
| * **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? |

| **MATHEMATICS – Workplace Mathematics  Curricular Competencies – Elaborations Grade 11** |
| --- |
| * **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 deductivereasoning   + 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 * **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, 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](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 11** |
| --- |
| * **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 |