Area of Learning: Mathematics	**STEM/Apprenticeship Math 12**
Big Ideas	Elaborations
Through experiential learning the desire and need to learn mathematical concepts is nurtured.	
Visualization is essential in making sense of contextual problems	• **Visualization:** o Helps process information, make connections and solve problems
Contextual problems are situational and to transfer mathematical skills between problems requires conceptual understanding	
Proportional reasoning enables us to make sense of multiplicative relationships and is frequently utilized when analyzing contextual problems	–
Measuring naturally lends itself to the use of concrete materials and to the use of measurement skills and tools in a contextual way	

Curricular Competencies	Elaborations	Content	Elaborations
Students are expected to do the following: **Reasoning and analyzing in a contextual environment** • Engage in **spatial reasoning** • Use **reasoning and logic** to analyze and apply mathematical ideas • **Estimate** reasonably • Use **tools or technology** to analyze relationships and test conjectures • **Model** mathematics in contextualized experiences **Understanding and solving in a contextual environment** • Develop, demonstrate, and apply **conceptual understanding** of mathematical ideas	Dynamic software (e.g., google sketchup) • **spatial reasoning** o being able to think about shapes (real or imagined) and to mentally transform these shapes to notice relationships • **reasoning and logic**: o inductive and deductive reasoning**,** predicting, generalizing, drawing conclusions through experiences including puzzles, games, and coding • **Estimate:** o being able to defend the reasonableness of an estimate; across mathematical contexts • **tools or technology:** o physical and digital tools including coordinate grids • **Model:** o use concrete materials, dynamic interactive technology,	*Students are expected to know applications of the following:* • **Measuring**: including tools with graduated scales and conversions using metric & imperial • Similar **triangles**, including right angle trigonometry • Pythagorean Theorem • 2D-3D shapes, including area, surface area, volume, and nets • Model & draw **3D objects** and their views (isometric drawing, orthographic projection) • **Relationships** in formulae • Math **research project** • Circle geometry	• **Measuring**: o unit analysis, precision & accuracy, units are broken down into smaller divisions to get more precise measurements • **triangles:** o in contextual examples such as stairs and roofs • **3D objects**: o Creating & reading various types of technical drawing • **Relationships**: o Have students find a formula of interest/choice and explore the relationship between

• **Visualize** to explore and illustrate mathematical concepts and relationships • Apply **flexible strategies** to solve problems in contextualized situations • Engage in problem-solving **experiences** that are connected to place, story, and cultural practices and perspectives relevant to local First Peoples communities, as well as other cultures **Communicating and representing in a contextual environment** • Communicate mathematical thinking • Use mathematical vocabulary and language • **Represent** mathematical ideas in a variety of ways • Explain and justify mathematical ideas **Connecting and reflecting in a contextual environment** • **Reflect** upon mathematical thinking • Use mathematics to support personal choices • Connect mathematical concepts to each other and to **other areas and personal interests** • **Incorporate** First Peoples worldviews and perspectives to **make connections** to mathematical concepts	representing a situation graphically and/or symbolically o http://www.nctm.org/Publications/Teaching-Children-Mathematics/Blog/Modeling-with-Mathematics-through-Three-Act-Tasks/ • **conceptual understanding:** o developed through playing with ideas, inquiry, and problem solving • **Visualize:** o including dynamic visualizations such as graphical relationships, simulations • **flexible strategies:** o from a repertoire of strategies, choose an appropriate strategy to solve problems (e.g., guess and check, model, solve a simpler problem, use a chart, diagrams, role play) • **experiences:** o includes context, strategies and approaches, language across cultures • **many ways:** o oral, written, pictures, use of technology • **discussions:** o developing a mathematical community in the classroom through discourse-partner talks, small group discussions, teacher-student conferences • **Represent:** o concretely, pictorially, symbolically including using models, tables, graphs, words, numbers and symbols		variables. Change (i.e. double) a variable what happens to other variables • **research project**: o Research & give a presentation of the math involved in a trade of choice. Have students create a proportional reasoning example in a trade of choice

	• **Reflect:** o share the mathematical thinking of self and others, including evaluating strategies and solutions, extending, posing new problems and questions • **other areas and personal interests:** o to develop a sense of how mathematics helps us understand ourselves and the world around us (e.g., daily activities, local and traditional practices, the environment, popular media and news events, social justice, and cross-curricular integration) • **Incorporate:** o Invite local First Peoples Elders and knowledge keepers to share their knowledge • **make connections:** o Bishop's cultural practices: counting, measuring, locating, designing, playing, explaining (http://www.csus.edu/indiv/o/oreyd/ACP.htm_files/abishop.htm) o FNESC Place-Based Themes and Topics: family & ancestry; travel & navigation; games; land, environment & resource management; community profiles; artwork; nutrition; dwellings o http://www.fnesc.ca/resources/math-first-peoples/		

Area of Learning: Mathematics	**History of Mathematics**
Big Ideas:	Elaborations:
• Mathematics has developed over many centuries and continues to evolve.	
• Contributions to mathematics have come from a variety of cultures all around the world.	
• Important mathematical discoveries happened over time and not all at the time	
The timeline of mathematics connects directly to the timeline of humanity	
Play Affected by technology/current use Math builds upon itself often much later than anticipated (unanticipated	

Curricular Competencies:	Elaborations:	Content:	Elaborations:
Students are expected to do the following: **Reasoning and Analyzing** Inductively and deductively reason and use logic to explore, make connections, predict, analyze, generalize, and make conclusions		*Students are expected to know the following:* • **Number & Number Systems** including writing and oral numbers, zero, infinity, rational numbers, pi, irrational numbers,	• **Number & Number Systems:** such as Egyptian, Babylonian, Roman, Greek, Arabic, Mayan, Indian, Chinese, First Peoples, exploring the idea of different bases, different

Use tools and appropriate technology to explore and create patterns, find invariance amidst variance, examine relationships, and test conjectures **Understanding and Solving** Explore multiple strategies used to solve problems throughout history Develop, construct, and apply mathematical understanding through play, inquiry and problem solving Engage in problem-solving experiences that are connected to place, story and cultural practices relevant to the historical context **Communicating and Representing** Communicate in a variety of ways including written and oral language Explain, clarify, and justify mathematical ideas use appropriate symbols, pictures and logical explanations Develop mathematical understanding through concrete, pictorial, and symbolic representations **Connecting and Reflecting** Explore the role of women in mathematics Explore, apply and connect concepts to each other and make connections to other disciplines and current methods of doing mathematics Use mathematical arguments to support personal choice and recognize the consequences including social and personal responsibility Incorporate First Peoples principles of learning for example storytelling, learning takes patience and time		prime numbers etc. • **Patterns & Algebra**, early algebraic thinking, variables, early uses of algebra, Cartesian plane, notation, patterns in art etc. • **Geometry** of lines, angles, triangles, geometric constructions, developments though time, • **Probability and Statistics,** Pascal's Triangle, games, forms of tabulating information,	forms of arithmetic, problems from The Rhind Papyrus, Eratosthenes • **Patterns & Algebra:** Al-Khwarizmi's Algebra, the zero, Indian mathematics, Islamic mathematics, Fibonacci, Golden Ratio, Decartes • **Geometry:** Problems from the Rhind Papyrus, Mosco Papyrus, Pythagorus, Hippocrates and construction problems of Antiquity, geometry in Euclid's *Elements*, Archimedes, Appollonius, Pappus's Book III, Indian and Arabic contributions, Descartes and Fermat. • **Probability:** Pascal, Cardano, Fermat, Bernoulli, ancient games such dice and the Egyptian game called Hounds and Jackals, Egyptian record keeping,