Area of Learning: Mathematics	**Geometry 10 – 12**
Big Ideas:	Elaborations:
• Working with **diagrams** is essential to geometric thinking.	• **Diagrams:** o Diagrams are fundamental in investigating, communicating, and discovering properties within geometry.
• Geometry is about working with **variation** and invariance.	• **Variation:** o Invariance amidst variation can be experienced using current technology and with dynamic diagrams. The sum of the angles in planar triangles being 180° is invariant when you consider all of the various forms of a triangle.
• Working with and on **definitions** is central in geometry.	• **Definitions:** o Definitions are seldom the starting points in geometry, rather we are working with geometry to create, test, and redefine definitions.
• **Geometry** stories and applications vary across cultures and time.	• **Geometry:** o Geometry is more than a list of axioms and deductions. Non-western and modern geometry is concerned about shape and space and is non-axiomatic. It is not about producing a theorem; rather it is about creating or serving a purpose. Today, geometry is experienced in a multitude of disciplines including animation, architecture, biology, carpentry, chemistry, art, and so on.
• A written **proof** is the endpoint to the process of proving.	• **Proof:** o Proof is not confined to axiomatic deduction, but also includes explaining, discovery, systemization, justification and communication.

Curricular Competencies:	Elaborations:	Content:	Elaborations:
Students are expected to do the following: **Reasoning and analyzing** • Engage in **spatial reasoning** in a dynamic environment	• **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	*Students are expected to know the following:* • Geometric **constructions** • **Circle geometry** • **Constructing tangents** • **Transformations** of 2D shapes including the	• **Constructions:** o perpendicular, angles, bisectors, triangles, triangle centres and

• Use **reasoning and logic** to analyze and apply mathematical ideas • **Estimate** reasonably • Demonstrate **fluent and flexible thinking** of number • Use **tools or technology** to analyze relationships and test conjectures • **Model** mathematics in contextualized experiences **Understanding and solving** • Develop, demonstrate, and apply **conceptual understanding** of mathematical ideas • **Visualize** to explore and illustrate mathematical concepts and relationships • Apply **flexible strategies** to solve problems in both abstract and contextualized situations • Engage in problem-solving **experiences** that are connected to place, story, and cultural practices and perspectives	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 • **fluent and flexible thinking:** o this includes using known facts, benchmarks, partitioning, applying whole number strategies to rational numbers and algebraic expressions • **tools or technology:** o physical and digital tools including coordinate grids • **Model:** o use concrete materials, dynamic interactive technology, 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	**isometries** and **affine transformations**. • **Perspective** and **non-Euclidean geometries**	quadrilaterals • **Circle geometry:** o properties of segments, angles, and tangents. • **Constructing tangents:** o lines tangent to circles, circles tangent to circles, circles tangent to three points (PPP), three lines (LLL), etc… • **isometries**: o transformations that maintain congruence (translations, rotations, reflections) • **affine transformations:** o transformations that maintain collinearity of points and proportions (dilations and shear) • **Perspective:** o a type of projective geometry where parallel lines meet at a point. • **Non-Euclidean geometries:** o taxicab, hyperbolic/ellipt

relevant to local First Peoples communities, as well as other cultures **Communicating and representing** • Communicate mathematical thinking in **many ways** • Use mathematical vocabulary and language to contribute to mathematical **discussions** • **Represent** mathematical ideas in a variety of ways • Explain and justify mathematical ideas **Connecting and reflecting** • **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	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 • **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		ical.

	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/		