Subject-Group Overviews: Mathematics

Created in the Late Fall of 2014 at Rochester Montessori School; updated spring of 2017

Year One, Grade 6

Unit Name	Key Concept	Related Concepts	Global Context	Statement of Inquiry	Objectives	ATL Skills	Content
Galileo	Relationships	Measurement, Representation	Orientation in Time and Space	Relationships between scientific ideas over time leads to new ways to represent measurements of space and time.	A, C	Thinking, Research, Communication	The learner will "become" an astronaut and calculate the weight/force of a pet or object they are sending to space. They will then present their findings to the class.
Gravitational Acceleration	Logic	Measurement, Representation	Orientation in Time and Space	Using measurements and logic an individual may solve a problem by sharing a representation of data collected.	A, D	Thinking	The learner will conduct a vector analysis and gravitational acceleration study in the real life context of a plane during WWII on a supply mission.
*Pythagoras	Relationships	Measurement, Pattern	Scientific and Technical Innovation	Relationships in measurement often lead to patterns which may lead to scientific and	B, D	Thinking, Self-Management, Social, Communication	The learner will use their knowledge of the Pythagorean theorem to solve critical thinking word problems.

				technical innovations.			
Must the Past Always Haunt Us? (Timeline of Mathematicians)	Relationships	Representation	Scientific and Technical Innovation	By understanding important mathematical ideas from the past our lives today can be significantly enhanced through the creation of new technologies.	B, C	Social, Communication, Research	The learner will will create a slide show about a famous mathematician (individual work) and as a group, will create a paper timeline of famous mathematicians to share with other students.
*Geometry in Space	Form	Change and Space	Personal and Cultural Expression: Creation	Form adapts with change and space which allow for personal and cultural expression.	B, D	Thinking, skill cluster: transfer Communication, skill cluster: communication	Use the teaching and learning activities and problems presented in chapter 11 of the University of Chicago School Mathematics Project: Transition Mathematics book. Final Project: Assign the summative assessment.

*Lessons take place in a 3 year rotation

Years Two/Three, Grades ⅞: Algebra

Unit Name	Key Concept	Related Concepts	Global Context	Statement of Inquiry	Objectives	ATL Skills	Content

Architectural Insight	Relationships	Equivalence and Patterns	Scientific and Technical Innovation	Relationships between architectural designs can be compared through equivalence and patterns using a variety of methods.	A D	Communication Skills and Research Skills	-Evaluating expressions -Order of operations -Use of graphing calculators and spreadsheets -Patterns -Distributive property -Data and spread -Solving linear equations and inequalities
Famous Mathematicians	Form	Justification, Patterns, and Representation	Orientation in Space and Time	Landmark discoveries in mathematics led to the development of expressions, patterns, and relationships that are used to justify solutions to real-world problems today.	A C	Communication and Research Skills	-Solving percent problems using equations -Tables and graphs -Rates and ratios -Proportions -Similar figures -Compound inequalities -Slope intercept equations -People who advanced mathematics

Quadratics Galore	Form	Patterns, Space, and Systems	Orientation in Space and Time	Explore the applications of different forms of the quadratic equation in everyday life and its relationship to patterns and variability.	B D	Research and Communication Skills	-Multiplication -Uses of exponents -Products and powers of powers -Powers of products and quotients -Square and cube roots -Function notation -Uses of quadratic equations -The function with the equation $y=ax^2$
Polynomial Power	Relationships	Pattern and Representation	Fairness and Development	Relationships exist between polynomials and their real-life applications, and these patterns and representations lead to increased development of our global capability.	B C	Communication skills and thinking skills	-Applications of polynomials -Classifying polynomials -Completing the square -Monomial factoring -Rational and irrational numbers -Factored form of the quadratic equation -Multiplying polynomials

							-If-then statements

Years Two/Three, Grades ⅞: Geometry

Unit Name	Key Concept	Related Concepts	Global Context	Statement of Inquiry	Objectives	ATL Skills	Content
What's the point?	Logic	Generalization, justification, representation	Identities and Relationships: reasoning and judgements	Logic is a powerful tool used for justifying and simplifying statements, along with reasoning and judgement.	A: Knowing and Understanding C: Communicating	Thinking, skill cluster: creative thinking skills Research, skill cluster: information literacy skills Self-management, skill cluster: organization skills	Essential components of Euclidean geometry, postulates and theorems, properties of congruence, classification of polygons, inductive and deductive reasoning, conditional statements, proving algebraic and geometric statements, properties of parallel and perpendicular lines, compass constructions, geometry in nature, and famous geometers.
Shape up!	Form	Equivalence, pattern, system	Orientation in space and time	Understanding underlying structures and patterns is essential for identifying forms and their locations in space and time.	B: Investigating Patterns D: Applying Mathematics in Real-Life Contexts	Thinking, skill cluster: transfer skills Thinking, skill cluster: creative-thinking skills Self-management, skill cluster: organization skills	Rules for triangle classification (sides and angles) Definition of congruent figures (corresponding sides and angles are congruent) Proofs of triangle congruency (SSS, SAS, HL, ASA, AAS) Transformations and rigid motions – translations, reflections, and rotations

							Coordinate notation for translations Rigid motions and triangle congruency Using coordinate geometry to investigate patterns of triangle congruence Real-life applications of congruent triangle – measurement, distance, architectural design Properties of congruent isosceles triangles Definition of concurrency and circumcenter, incenter, centroid, orthocenter Analysis of the properties of special segments in triangles: midsegment, perpendicular bisector, angle bisectors, medians, altitudes Triangle angle inequalities and side lengths Dilation and scale factor Fractals and dynamic systems including recursion and iteration Identify fractals in nature and in art Mathematicians: Mandelbrot, Sierpinski. Gaston Julia, Helge von Koch Construct types of triangle fractals: Sierpinski triangle, Koch snowflake

							Sierpinski gasket
Fee Fi Fo Fum	Relationships	Patterns, Generalizations	Personal and Cultural Expression	Understanding relationships and patterns in the natural world enhances creativity.	A B	Transfer Research Thinking	Quadratics The quadratic equation. The quadratic formula and its relationship to the quadratic equation. Ø, the golden rule Fibonacci numbers Sin, cosine, and tangent
Mars Beef	Logic	Measurement, Quantity	Globalization and Sustainability	Logical choice is dependent upon knowledge of accurate realities.	C D	Thinking	