Mathematics
Subject Group Overview

Year 1: Math 6	Key Concept Related Concept(s) and Global Context	Statement of Inquiry	Inquiry Questions	ATL Skill(s)	Summative Assessment	MYP Objective	Content MN State Standards
Unit 1: Chapter 1: Numerical Expressions and Factors	Key concept: Relationships Related concept: Simplification Global context :Identities and Relationships	In the natural world numbers can be re-written as parts and there exists a relationship among factors.	Factual: What are the whole number operations and what words are used to represent those operations? What is an exponent and what does it represent? What is a Factor? What is a GCF? What is a Multiple? What is a LCM? Conceptual: When would you use factors? When are the GCF and LCM used? Why do we have an order of operations? Debatable: Would it be better to understand the commutative and associative properties instead of teach a methodical rules for which operation comes first?	Critical-thinking	Chapter 1 Test	A	Whole number operations Powers and Exponents Order of Operations Prime Factorization Greatest Common Factor Least Common Multiple

Unit 2: Chapter 2: Fractions and Decimals	Key concept: Logic Related concept: Simplification Global context: Scientific and technical innovation	In the natural world quantities can be represented in different ways while applying mathematical operations to solve problems.	Factual: What are equivalent fractions? What is a reciprocal? How do you add, subtract, multiply and divide fractions? How do you add, subtract, multiply and divide decimals? Conceptual: Why when dividing fractions, can you multiply by the reciprocal? Why do numbers increase when divided by something less than one? Debatable: Why not just have one method for representing numbers less than one? Fractions or decimals?	Critical-thinking	Skills Assessment Real life problem take home Assessment	A, D	Multiplying Fractions Dividing Fractions Dividing Mixed Numbers Adding and Subtracting Decimals Multiplying Decimals Dividing Decimals
Unit 3: Chapter 3: Algebraic Expressions and Properties	Key concept: Relationships Related concept: Representation Global context: Identities and Relationships	In the natural world we can represent relationships using algebra	Factual: What is a variable? What is an expression? What is a term? What is a coefficient? What is a constant? What operation is always implied in algebra? What are like terms? What are to commutative and associative properties of addition and multiplication? What is the distributive property? Conceptual: How is a variable used to represent missing information? How do you translate word problems to algebra? How do you expand a variable with an exponent? Why can you combine like terms?	Critical-thinking	Chapter 3 test	A	Arithmetic Expressions Algebraic Expressions Writing Expressions Properties of Addition and Multiplication Combining Like Terms The Distributive Property Simplifying Algebraic Expressions

			How do you evaluate an expression? Why do the commutative and associative properties work for addition and multiplication but not subtraction and division? Why does the distributive property work? Debatable: Why should students learn algebra?				
Unit 4: Chapter 4: Areas of Polygons	Key concept: Logic Related concept: Space Global context: Scientific and technical innovation	In the natural world we can use dimensions of a shape to determine characteristics of that shape	Factual: How do I find the area of a triangle and different parallelograms? Conceptual: How does the area of a parallelogram relate to the area of a rectangle? How is the area of rectangles related to the area of a triangle? How does the area of a trapezoid relate to the area of a triangle? Debatable: Should the world be using one standard measurement system?	Critical-thinking creative thinking	Design our own floor plan project	D	Areas of Parallelograms Areas of Triangles Areas of Trapezoids Polygons in the Coordinate Plane
Unit 5: Chapter 5: Ratios and Percents	Key concept: Relationships Related concept: Representation Global context: Scientific and technical innovation	Ratios and percents represent relationships between different quantities in the real world	Factual: What is a ratio? How do I solve for larger quantities given a ratio? How do I turn a ratio into a percent? Conceptual: Why are ratios useful? How do percentages relate to ratios? Debatable: Is there a benefit to turning a ratio into a percent?	Critical-thinking	Create a presentation that shows how to convert a ratio into a percent or a ratio into a unit ratio Highway robbery - solving a robbery with clues of equivalent ratios	A, D	Ratios Ratio Tables Percents Solving Percent Problems

Unit 6: Chapter 5: Rates, Unit Rate & Conversions	Key concept: Relationships Related concept: Equivalence Measurement Global context: Identities and Relationships	Rates express relationships between two quantities where the quantities could be from units of measurement from different systems need conversions in the real world.	Factual: Rates express relationships between two quantities where the quantities could be from units of measurement from different systems need conversions in the real world. Conceptual: What is a rate? What is a unit rate? How can I represent a relationship of a ratio with a graph? Debatable: When do I use a unit rate? Why would I represent a comparison between two quantities with a graph?	Critical-thinking Organizational Skills	Chapter 5 Ratio & Percent Unit Test	C, A	Comparing and Graphing relationships Unit rate Converting Measures
Unit 7: Chapter 6: Integers and the Coordinate Plane	Key concept: Relationships Related concept: Representation Global context: Scientific and technical innovation	Relationships can be represented by pictures universally in the world	Factual: When are negative numbers used and how are they graphed on a coordinate plane? What is a opposite? Conceptual: When do we use negative numbers? What kind of relationships do negative numbers represent? Debatable: How much should people be allowed to go in debt? How could a bank responsibly determine how much money an individual should be allowed to borrow? What characteristics would you consider?	Transfer	No summative - No state standards in this chapter.	C	Integers Comparing and Ordering Integers Fractions and Decimals on the Number Line Absolute Value The Coordinate Plane
Unit 8: Chapter 7: Equations and Inequalities	Key concept: Relationships Related concept: Simplification	Solutions remain constant when relationships are simplified with properties of equalities.	Factual: What is a an equation? What properties of equality can you use to help solve equations and inequalities?	Critical-thinking	Knowing and Understanding - questions to show evidence of learning.	A, D	Writing Equations in One Variable Solving Equations Using Addition or Subtraction Solving Equations Using Multiplication or Division

	Equivalence Global context: Identities and Relationships		Conceptual: What are inverse operations? How do you solve an equation or inequality? How does the number of variables in an equation affect the solution to the equation? Debatable: Should multiplication be implied? What is the best way to represent a set of solutions?		Real life situation with unknowns. Students will determine the equation, graph the solution and answer interpret additional information from the graph.		Writing Equations in Two Variables Writing and Graphing Inequalities Write inequalities with a variable and positive numbers Solving Inequalities Using Addition and Subtraction Solving Inequalities Using Multiplication or Division
Unit 9: Chapter 8: Surface Area and Volume	Key concept: Relationships Related concept: Space, Measurement Global context: Orientation in space and time	2 and 3 dimensional shapes hold a relationship in their measurements and the space they contain.	Factual: How can we draw 3-D shapes? What are faces, edges and vertices? How do we find the area and volume of 3-D shapes? Conceptual: Is there a relationship between the base of a 3-D shape and the number of faces, edges and vertices? How do the surface area and volume of a 3-D shape relate? Debatable: Should the formulas use B for are or base, or the actual formula for the shape? What measurement system should we be using?	Critical-thinking	Chapter Assessment (A) Project comparing SA and Volume to determine the most efficient way to package product or maximize volume.	A, D	Three Dimensional Figures Surface Areas of Prisms Surface Area of Pyramids Volumes of Rectangular Prisms
Unit 10: Probability	Key concept: Relationships Related concept: Models, Patterns	We can predict relationships by investigating patterns in different models.	Factual: What is a favorable outcome? What is an unfavorable outcome? How do you represent a probability as a percent, fraction and decimal? What is the probability of an event that is certain to happen?	Information Literacy Skills	Discover the probability when using a weighted dice	A, B	Determine sets of outcomes Perform experiments with known probabilities Determine probability using ratios

	Global context: Identities and Relationships		Conceptual: How can probabilities be used to predict the future? Why do theoretical and experimental probability differ? How can you determine an adequate sample space? Debatable: Is it better to use a theoretical probability or experimental probability to make predictions?				Write probabilities as a fraction and decimals and understand their likelihood Calculate experimental probability and use to make predictions
Unit 11: Intro to Geometry	Key concept: Related concept: Global context:	The visual world contains relationships between the natural and constructed world and we can use geometry to describe and relate the two worlds.	Factual: What are the building blocks of Geometry and how do we notate each? What are parallel, perpendicular and intersecting lines? What measurements can we make in Geometry? How many degrees are in a straight angle? What is the sum of the angles in a triangle? Conceptual: Where do you see Geometry? Why is the sum of all angles in a triangle always equal 180 degrees? How can we find the sum of the angles in any polygon? Debatable: Is it a good practice to base everything in geometry on abstract, undefined building blocks?	Critical Thinking	Solve problems using the relationships between angles formed by intersecting lines. Determine the missing angle measures in a triangle. Find the sum of the exterior angles of a polygon. Students recognize angles in multiple representations to solve for missing measures. Students apply patterns to create an algorithm for finding missing interior angle measures of polygons.	A, D	Introduction to Geometry terms & paris of lines Angles labeling, measuring and categorizing Supplementary angles Using Geogebra - creating points, lines and angles triangles - sum of angles finding the sum of angles for 4 and more sides - discover the pattern create a city project exterior angles of a polygon investigation

Year 1:Pre-Algebra	Key Concept Related Concept(s) and Global Context	Statement of Inquiry	Inquiry Questions	ATL Skill(s)	Summative Assessment	MYP Objective	Content MN State Standards
Unit 1: Integers	Key concept: Logic Related concept: Simplification Quantity Global context: Scientific and technical innovation	In the natural world students will simplify integer based quantities using learned mathematical processes.	Factual: What is a whole number? What is an integer? Conceptual: What does subtracting another number really do? How are addition and subtraction related? How are multiplication and division related? Debatable: Is it better to add a negative number instead of using subtraction?	Organization	Chapter 1 Quiz Chapter 1 Test	Criterion A	Integers and Absolute Value Adding Integers Subtracting Integers Multiplying Integers Dividing Integers
Unit 2: Rational Numbers	Key concept: Form Related concept: Quantity Global context: Scientific and technical innovation	In the natural world students will identify rational numbers and describe characteristics of a rational number using learned mathematical processes.	Factual: What is a rational number? Conceptual: What does subtracting another number really do? How are addition and subtraction related? How are multiplication and division related? Debatable: Would it be better to just have fractions or decimals rather than both?	Transfer	Chapter 2 Test	Criterion A	Rational Numbers Adding Rational Numbers Subtracting Rational Numbers Multiplying and Dividing Rational Numbers

Unit 3: Expression and Equations	Key concept: Relationships Related concept: Simplification and Quantity Global context: Scientific and technical innovation	We can use mathematical processes based in logic to develop connections to simplify in a variety of expressions and solve linear equations.	Factual: What is an algebraic expression? Conceptual: How does subtracting an expression from another expression affect the terms in either expression? Debatable: Is it possible to apply the division property of equality to a linear equation before using the property of addition or subtraction?	Critical-thinking	Chapter test (Crit A) 3.1-3.3 Poster Problems (Crit D)	Criteria A and D	Algebraic Expressions Adding and Subtracting Linear Expressions Solving Equations Using Addition or Subtraction Solving Equations Using Multiplication or Division Solving Two-Step Equations
Unit 4: Inequalities	Key concept: Logic Related concept:Simplification and Quantity Global context: Scientific and technical innovation	We can use mathematical processes based in logic to solve inequalities and recognize that solutions to solving inequalities represent more than one solution which we can graph on a number line.	Factual: What is a "solution" to an inequality? Conceptual: Where in life could inequalities be useful? Debatable: How many numbers are between 0 and 1? Between 1 and 2? Are there more number between 0 and 2 than there are between 0 and 1?	Critical-thinking	Traditional Test	Criterion A	Writing and Graphing Inequalities Solving Inequalities Using Addition or Subtraction Solving Inequalities Using Multiplication or Division Solving Two-Step Inequalities
Unit 5: Ratios and Proportions	Key concept: Logic Related concept: Equivalence and Patterns Global context: Scientific and technical innovation	There are patterns that determine equivalence and proportionality.	Factual: What are rates, ratios and unit rates Conceptual: What are 3 ways unit rates be useful in real life? Debatable: If society uses unit rates so much, is there a good enough reason to keep using rates?	Critical-thinking	Chapter 5 Test	Criterion A	Ratios and Rates Proportions Writing Proportions Solving Proportions Slope Direct Variation

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Unit 6: Percentages	Key concept: Logic Related concept: Justification Equivalence Global context: Fairness and development	Informed consumers use mathematical logic to calculate fair prices and justify financial decisions.	Factual: How do we calculate discounted prices? Conceptual: How can estimating percentages be useful in shopping? Debatable: What are businesses' strategies when setting discounted prices?	Critical-thinking	Students will create a mini-mall and practice basic consumer skills by identifying the best value. Alternative: Using real world sales prices and comparing with imaginary store and randomly generated % discounts (die roll)	Criteria A, D	Percents and decimals Comparing and ordering fractions, decimals and percents The percent proportion The percent equation Percents of increase and decrease Discounts and markups Simple interest
Unit 7: Graphing Linear Equations	Key concept: Form Related concept: Representation Global context: Identities and Relationships	Analyzing representations of information by graphical form to identify data and relationships.	Factual: What does it mean for a function to be linear? Conceptual: How can you tell if the graph of an equation will be linear? Debatable: Is one linear equation form (i.e. slope-int, standard, point-slope) better to use than another?	Critical-thinking	13.1-13.2 Quiz (Crit B) Chapter 13 Test (Crit A)	Criterion A & Criterion B	Graphing Linear Equations Slope of a Line Graphing Proportional Relationships Graphing Linear Equations in Slope-Intercept Form Graphing Linear Equations in Standard Form Writing Equations in Slope-Intercept Form Writing Equations in Point-Slope Form
Unit 8: Real Numbers and the Pythagorean Theorem Coming Soon!							Finding Square Roots Finding Cube Roots The Pythagorean Theorem Approximating Square Roots Using the Pythagorean Theorem
Unit 9: Volume and Similar Solids Coming Soon!							Volume of Cylinders Volume of Cones Volumes Spheres Surface Areas and Volumes of Similar Solids

Year 2: Algebra 1	Key Concept Related Concept(s) and Global Context	Statement of Inquiry	Inquiry Questions	ATL Skill(s)	Summative Assessment	MYP Objective	Content MN State Standards
Unit 1: **Solving Linear Equations**	Key concept: Relationships Related concept: Pattern, representation Global context: Scientific and technical innovation	Patterns in the natural world can be represented as relationships in order to model and analyze their behavior.	Factual: What is a coefficient? What are like terms? What are the properties of equality? What is the absolute value? Conceptual: Why is checking the solution to your problem important? How do students use the order of operations when solving linear equations? Why are mathematical models useful? Debatable: Does the increase of a shape's perimeter guarantee an increase in its area? To what extent would it benefit the United States if we switched from using the Fahrenheit system to Celsius?	Critical-thinking	Unit 1 Test	Criterion A	Solving Simple Equations Solving Multi-Step Equations Solving Equations with Variables on Both Sides Solving Absolute Value Equations Rewriting Equations and Formulas
Unit 2: **Graphing and Writing Linear Equations**	Key concept: Form Related concept: Representation, Equivalence Global context: Identities and Relationships	Using different forms to represent equivalent equations may be used to model patterns in the world.	Factual: What is the slope of a line? What is the intercept? What are the 3 forms of writing equations? Conceptual: Why are the slope and intercept of an equation useful? How do you convert an equation from one form to another? How do you represent real-world scenarios with equations? Debatable: Should we use linear equations to give others driving instructions? Does each form of	Transfer, Communication	I Want a New Floor!	Criteria A, C, and D	Graphing Linear Equations Slope of a Line Slopes of Parallel and Perpendicular Lines Graphing Linear Equations in Slope-Intercept Form Graphing Linear Equations in Standard Form Writing Equations in Slope-Intercept Form Writing Equations in Point-Slope Form Solving Real-Life Problems

			linear equation apply to real-life contexts?				
Unit 3: **Solving Linear Inequalities**	Key concept: Relationships Related concept: Quantity, Patterns Global context: Scientific and technical innovation	Patterns in the world may be identified when comparing relationships between quantities.	Factual: What are the symbols of inequalities? How do I graph an inequality? Conceptual: Why do you flip the sign for inequalities when you multiply or divide by a negative number? Debatable: Should we eliminate the use of either decimals or fractions for mathematical unity?	Critical-thinking	Unit 3 Test	Criterion B	Writing and Graphing Inequalities Solving Inequalities Using Addition or Subtraction Solving Inequalities Using Multiplication or Division Solving Multi-Step Inequalities Solving Compound Inequalities Graphing Linear Inequalities in Two Variables
Unit 4: **Solving Systems of Linear Equations**	Key concept: Relationships Related concept: Systems Global context: Fairness and development	Relationships between different systems can be modeled by equations to show common characteristics.	Factual: How do I solve by substitution? How do I use elimination? How do I graph systems of equations? Conceptual: In what cases do I have systems of equations with no solutions or infinitely many solutions? Debatable: Which method is more useful in solving systems of linear equations: graphing, substitution, or elimination?	Critical-thinking	Unit 4 Test	Criteria A and D	Solving Systems of Linear Equations by Graphing Solving Systems of Linear Equations by Substitution Solving Systems of Linear Equations by Elimination Solving Special Systems of Linear Equations Solving Linear Equations by Graphing Systems of Linear Inequalities
Unit 5: **Linear Functions**	Key concept: Relationships Related concept: Representation	Functions are used as models to represent the varied characteristics of different relationships.	Factual: What is a function? What are domain and range? What is an independent or dependent variable? What is the difference between a linear and nonlinear function? Conceptual: How am I able to determine whether a function is discrete or continuous? Why are the	Organization	Unit 5 Test	Criterion A	Domain and Range of a Function Relations and Functions Discrete and Continuous Domains Linear Function Patterns Function Notation Special Functions

	Global context: Scientific and technical innovation		variables labeled independent or dependent? Debatable: To what extent is the difference between functions and equations large enough to constitute the new vocabulary?				Comparing Linear and Nonlinear Functions Arithmetic Sequences
Unit 6: **Square Root Functions and Exponential Functions**	Key concept: Relationships Related concept: Models Global context: Scientific and technical innovation	Events in the world can be modeled in several ways to show relationships.	Factual: What are the characteristics of a square root function? What are the characteristics of exponential functions? Conceptual: How do square root functions and exponential functions differ from linear functions? Debatable: To what extent is it necessary for mathematics to give different names to the same thing?	Critical-thinking	Unit 6 Test	Criterion A	Properties of Square Roots Real Number Operations Properties of Exponents Radicals and Rational Exponents Exponential Functions Solving Exponential Equations Exponential Growth Exponential Decay Geometry Sequences Recursively Defined Sequences
Unit 7: **Square Root Functions and Geometry** **Coming Soon!**	Key concept: Form Related concept: Global context:		Factual: Conceptual: Debatable:				8.3.1.1 Use the Pythagorean Theorem to solve problems involving right triangles. 8.1.3.2 Determine the distance between two points on a horizontal or vertical line in a coordinate system. Use the Pythagorean Theorem to find the distance between any two points in a coordinate system. 8.3.1.3 Informally justify the Pythagorean Theorem by using measurements, diagrams and computer software.

Unit 8: **Data Analysis and Displays**	Key concept: Relationships Related concept: Models Global context: Fairness and development: data driven decisions	Relationships may be modeled in a variety of ways to highlight different truths, aiding in data-driven decisions.	Factual: Which models can I use for displaying statistical information? What are the pros and cons to each model? Conceptual: How do you decide which model will best display your information? Debatable: To what extent can mathematics be manipulated by statistical models?	Collaboration	Stats Project	Criterion B	Measures of Central Tendency Measures of Dispersion Box-and-Whisker Plots Shapes of Distributions Scatter Plots and Lines of Fit Analyzing Lines of Fit Two-Way Tables Choosing a Data Display

Year 3/4: Geometry	**Key Concept Related Concept(s) and Global Context**	**Statement of Inquiry**	**Inquiry Questions**	**ATL Skill(s)**	**Summative Assessment**	**MYP Objective**	**Content MN State Standards**
Unit 1: Basics of Geometry	Key concept: Logic Related concept: Measurement Global context: Identities and Relationships	All elements of the world can be logically defined and organized by their given measurements.	Factual: What are points, lines, and angles? How do I measure angles and segments? Conceptual: How do I write a proof? Debatable: To what extent is Geometry a math class? To what extent is Geometry a science class?	Creative-thinking	Unit 1 Test	Criterion A	Points, Lines, and Planes Measuring and Constructing Segments Using Midpoint and Distance Formulas Perimeter and Area in the Coordinate Plane Measuring and Constructing Angles Describing Pairs of Angles

Unit 2: Reasoning and Proofs	Key concept: Logic Related concept: Justification Global context: Scientific and technical innovation	Logic and justification are used to present a valid argument.	Factual: What components are included in a proof? What different formats are there for presenting proofs? Conceptual: How do I write a proof? Debatable: Is it necessary to prove everything we do in math?	Critical-thinking	Unit 2 Summative Assessment	Criterion A	Conditional Statements Inductive and Deductive Reasoning Postulates and Diagrams Algebraic Reasoning Proving Statements about Segments and Angles Proving Geometric Relationships
Unit 3: Transformations	Key concept:Relationships Related concept: Patterns Global context: Identities and Relationships	There exist patterns in the relationships between objects and their transformations.	Factual: What is a dilation? What is a translation? What is a reflection? What is a rotation? Conceptual: How can I determine if a transformation is rigid? Debatable: To what extent should technology be used in our learning?	Reflection	Transformations Packet	Criterion B	Reflections Rotations Translations Dilations
Unit 4: Parallel and Perpendicular Lines	Key concept: Relationships Related concept: Patterns Global context: Scientific and technical innovation	Patterns are found in nature that may be examined to identify relationships between objects.	Factual: What are the angle pairs the are congruent when parallel lines are crossed by a transversal? What is a transversal? Conceptual: How can perpendicular and parallel line properties by applied to real life events? Debatable: Is mathematics discovered or invented?	Critical-thinking	Unit 3 Test Math Debate Poster	Criteria A And C	Pairs of Lines and Angles Parallel Lines and Transversals Proofs with Parallel Lines Proofs and Perpendicular Lines Equations of Parallel and Perpendicular Lines

Unit 5: Similarity	Key concept: Relationships Related concept: Change Global context: Identities and Relationships	Relationships of change can be represented proportionally.	Factual: What are corresponding parts? What is a scale factor? What theorems prove triangles similar? Conceptual: How can you find missing sides and angles in similar triangles? How do I use theorems and definitions to write proofs about similarity? Debatable: To what extent can any two objects ever truly be similar?	Critical-thinking	Unit 8 Test	Criterion A	Similar Polygons Proving Triangles Similarity by AA Proving Triangle Similarity by SSS and SAS Proportionality Theorems
Unit 6: Congruent Triangles	Key concept: Logic Related concept: Justification Global context: Identities and Relationships	To justify triangular relationships we can use logical reasoning to arrive at general conclusions.	Factual: What are congruent triangles? What is a similarity statement? What are corresponding parts? What is an included side? What is an included angle? Conceptual: How do you prove triangles congruent? How is proving triangles helpful in solving problems? Debatable:	Critical-thinking	Unit 5 Test, Performance Task (logo project)	Criteria A and D	Angles of Triangles Congruent Polygons Proving Triangle Congruence by SAS Equilateral and Isosceles Triangles Proving Triangle Congruence by SSS Proving Triangle Congruence by ASA and AAS Using Congruent Triangles Coordinate Proofs
Unit 7: Relationships Within Triangles	Key concept: Form Related concept: Models	As the times change, alternate forms and models for representing rules are discovered.	Factual: What are the points of concurrency? How do you make constructions? How do you find a midsegment? Conceptual: What do Euclid's constructions tell us about the period in history he was from?	Media literacy	WebQuest/Construction Booklet	Criterion A	Perpendicular and Angle Bisectors Bisectors of Triangles Medians and Altitudes of Triangles The Triangle Midsegment Theorem Hinge's Theorem

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	Global context: Orientation in space and time		How can the different points of concurrency in triangles be used in real life? Debatable: To what extent does it benefit students to memorize theorems, properties, definitions, etc. when they can use technology as a resource so readily?				The Triangle Inequality Theorem
Unit 8: Quadrilaterals and Other Polygons	Key concept: Form Related concept: Patterns Global context: Orientation in space and time	Patterns can be found between shapes relating to angles and segment lengths.	Factual: What is a parallelogram? What are the properties of a parallelogram? Conceptual: What are the properties of a parallelogram? What is the relationship between interior and exterior angles of a polygon. How does the sum of the interior angles change as the number of sides change? Debatable: To what extent are knowing the reasons for proofs necessary if you can use logic to come up with conclusions?	Critical-thinking	Performance Task	Criterion B	Angles of Polygons Properties of Parallelograms Proving That a Quadrilateral is a Parallelogram Properties of Special Parallelograms Properties of Trapezoids and Kites
Unit 9: Right Triangles and Trigonometry	Key concept:Relationships Related concept: Measurement Global context: Identities and Relationships:	Measurements in the unit circle may be used to identify specific relationships.	Factual: What is the pythagorean theorem? What are the formulas for trig relationships? Conceptual: How is the pythagorean theorem used in the real world? How do the trig functions relate to each other?	Organization	Pythagorean Proof Project, Unit 9 Test	Criterion C, Criterion A, Criterion B	The Pythagorean Theorem Special Right Triangles Similar Right Triangles The Tangent Ratio The Sine and Cosine Ratios Solving Right Triangles Law of Sines and Law of Cosines

	Mathematical Identities		Debatable: To what extent is it necessary to round, and to what decimal place should rounding take place so as to not impact the accuracy of an answer?				
Unit 10: Circumference, Area, and Volume	Key concept:Relationships Related concept: Space Global context: Scientific and technical innovation: models	There exists relationships between the space occupied by shapes in varying dimensions.	Factual: How do you calculate circumference, area and volume? What relationships are present in circles? Conceptual: How are the values of length, area, and volume related? (Similarities and differences) Debatable: To what extent does an increase in a length affect an increase in area or volume?	Creative Thinking	Unit 11 Test, Dog House Design Summative	Criteria A and D	Lines and Segments That Intersect Circles Finding Arc Measures Using Chords Inscribed Angles and polygons Angle Relationships in Circles Segment Relationships in Circles Circles in the Coordinate Plane Circumference and Arc Length Areas of Circles and Sectors Areas of Polygons Three-Dimensional Figures Volumes of Prisms and Cylinders Volumes of Pyramids Surface Areas and Volumes of Cones Surface Areas and Volumes of Spheres
Unit 11: Probability	Key concept:Relationships Related concept: Models	The representation of data may be manipulated through the use of models of relationships to seemingly alter their reality.	Factual: What are statistics useful for? How do you calculate probability? Conceptual: How can probability affect our views of reality?	Critical Thinking	Presentation - How to Lie with Statistics	Criterion D	Sample Spaces and Probability Independent and Dependent Events Two-Way Tables and Probability Probability of Disjoint and Overlapping Events

	Global context: Identities and Relationships: modeling versus reality		Debatable: To what extent are you able to manipulate data through statistics to show what you want the outcome to be?				Permutations and Combinations Binomial Distributions

Year 5: Algebra 2	Key Concept Related Concept(s) and Global Context	Statement of Inquiry	Inquiry Questions	ATL Skill(s)	Summative Assessment	MYP Objective	Content MN State Standards
Unit 1: Linear Functions and Translations of Parent Functions	Key concept: Form Related concept: Generalization Patterns Global context: Identities and Relationships	As the general form of different functions change, generalizations can be made about the translation/transformation of the solution sets	Factual: What is a Function? What is a linear function equation and graph look like? What is slope? What is a x & y intercept? How can we use a line of regression to make predictions with data sets? What are parent functions? Conceptual: What is needed to derive the equation from a linear graph? How does the graph/solutions change as the function changes? What is modeling with linear regression and how can it be used? Debatable: What things should/shouldn't you use a calculator to do?	Transfer	Standard Math Test - A Visual representation of how graph shift as equations change.	Criterion A	Review of Functions Modeling with Linear Functions Solving Linear Systems Parent function and Transformation Transformations of Linear and Absolute Value Functions MN State Standards: 9.2.1.1 Understand the definition of a function. Use functional notation and evaluate a function at a given point in its notation and evaluate a function at a given point in its domain. 9.2.2.1 "Represent and solve problems in various contexts using linear and quadratic functions. For example: Write a function that represents the area of a rectangular garden that can be surrounded with 32 feet of fencing, and use the function to determine the possible dimensions of such a garden if the area must be at least 50 square feet." 9.4.1.3 Use scatter plots to analyze patterns and describe relationships between two variables. Using

							technology, determine regression lines (line of best fit) and correlation coefficients; use regression lines to make predictions and correlation coefficients to assess the reliability of those predictions. 9.2.4.5 Solve linear programming problems in two variables using graphical methods.
Unit 2: Quadratic Functions	Key concept: Relationships Related concept: Models Generalization Global context: Scientific and technical innovation	Relationships can be generalized and modeled using quadratic functions.	Factual: What is standard form of a quadratic equation? What is vertex form of a quadratic equation? What are the characteristics of a quadratic equation? What is quadratic regression? Conceptual: How can I write a quadratic equation in vertex form from standard (vise versa)? How can I use a quadratic function to model relationships? Debatable: How much should technology be used to model quadratic functions in a high school classroom?	Critical-thinking	Create a video explaining how to shift a parabola on the coordinate plane by changing the equation. Chapter test.	Criterion C Criterion A	"Transformations of Quadratic Functions Characteristics of Quadratic Functions Modeling with Quadratic Functions 9.2.1.9 Determine how translations affect the symbolic and graphical forms of a function. Know how to use graphing technology to examine translations 9.2.2.6 Sketch the graphs of common nonlinear functions such as f(x) = √x, f (x) = /x/, f(x) = 1/x, f(x) = x3, and translations of these functions, such as f(x) = √x-2+4. Know how to use graphing technology to graph these functions. 9.2.1.5 Identify the vertex, line of symmetry and intercepts of the parabola corresponding to a quadratic function, using symbolic and graphical methods, when the function is expressed in the form f (x) = ax2 + bx + c, in the form f(x) = a(x – h)2 + k , or in factored form. 9.2.1.6 Identify intercepts, zeros, maxima, minima and intervals of increase and decrease from the graph

							of a function. 9.2.1.4 Obtain information and draw conclusions from graphs of functions and other relations. 9.2.4.1 Represent relationships in various contexts using quadratic equations and inequalities. Solve quadratic equations and inequalities by appropriate methods including factoring, completing the square, graphing and the quadratic formula. Find non-real complex roots when they exist. Recognize that a particular solution may not be applicable in the original context. Know how to use calculators, graphing utilities or other technology to solve quadratic equations and inequalities.
Unit 3: Solving quadratic equations and inequalities	Key concept:Logic Related concept: Simplification Global context: Scientific and technical innovation	The solutions of quadratic equations can be found with different strategies using logic and simplification.	Factual: What is the root of quadratic equations? What are imaginary number? What are the solutions of quadratic inequalities? How many solutions do quadratic equations have? Conceptual: How are solutions of a quadratic equation and inequality related? How has the discovery of imaginary number change the history of mathematics? Debatable: Should the name of imaginary numbers be changed?	Critical-thinking	Students will be asked to solve quadratic equations using 4 different methods, add, subtract, and multIply complex numbers, graph and find solutions of quadratic inequalities and solve a real life problem.	Criterion A Criterion B	

Unit 4: Polynomial Functions	Key concept: Relationships Related concept: Change Models Global context: Scientific and technical innovation	A polynomial function models relationships and how they change.	Factual: How do I add, subtract, multiply and divide polynomials? What is the fundamental theorem of Algebra? Conceptual: How is dividing a polynomial is related to factoring? How can you find a solution to a polynomial function? When do polynomial functions have complex roots? Debatable: Should complex roots be examined in a high school math class?	Critical -thinking	Standard math test.	Criterion A	Graphing Polynomial Functions Adding, Subtracting, and Multiplying Polynomials Dividing Polynomials Solving Polynomials Equations Fundamental Theorem of Algebra Transformations of Polynomials Functions Analyzing Graphs of Polynomials Functions Modeling with Polynomials Functions 9.2.3.3 "Factor common monomial factors from polynomials, factor quadratic polynomials, and factor the difference of two squares. For example: 9x^6– x^4= (3x^3– x^2)(3x^3+ x^2)." 9.2.3.4 "Add, subtract, multiply, divide and simplify algebraic fractions. For example: 1/1-x = x/1+x is equivalent to 1+2x-x^2/ 1-x^2."
Unit 5: Rational Exponents and Radical Functions	Key concept: Form Related concept: Simplification and Pattern Global context: Scientific and technical innovation	There are patterns to how we simplify rational exponents that can be expressed in different forms.	Factual: How do I convert rational exponents to radicals? What is the laws of exponents? How do I solve radical equations and inequalities? How can I perform function operations? What is an inverse function? Conceptual: How to select the appropriate law of exponents to simplify expressions? What's the evidence of selecting a certain law of exponent? What is the relationship	Critical -thinking	The summative requires students to: -simplify radicals -apply the laws of exponents -solve radical equations.	Criterion A	nth Roots and Rational Exponents Properties of Rational Exponents and Radicals Graphing Radical Functions Solving Radical Equations and Inequalities Performing Function Operations Inverse of a Function 9.2.3.6 "Apply the properties of positive and negative rational exponents to generate equivalent algebraic expressions, including those involving nth roots. For example: √2 x √7 = 2 . x 7 . = 14 . = √14. Rules for computing directly with radicals may also be used: 3√2 x 3√ x =3√2x."

			between functions on their inverses? When would you need to perform function operations? Debatable: Should we solve equations in a way that produces extraneous solutions?				9.2.4.7 "Solve equations that contain radical expressions. Recognize that extraneous solutions may arise when using symbolic methods. For example: The equation √x− 9 = 9√x may be solved by squaring both sides to obtain x– 9 = 81x, which has the solution x = -9/80. However, this is not a solution of the original equation, so it is an extraneous solution that should be discarded. The original equation has no solution in this case. Another example: Solve 3√−x+1 = −5."
Unit 6: Exponential and Logarithmic Functions	Key concept: Relationships Related concept: Pattern and Representation Global context: Globalization and Sustainability	Mathematical representations of patterns inform decisions in real word. (for example: growth or decay of animal population)	Factual: What is population growth? How can we model population growth? What situation would represent exponential growth? What situation would represent exponential decay? Conceptual: Why might an exponential model be useful in making long-term predictions? Debatable: Does mathematical modeling reduce or increase decision making capacity?	Transfer	The summative requires student to: Graph exponential functions. Solve exponential growth and decay situations. Compare exponential with linear and quadratic functions. Solve two stage exponential functions. Find the domain and range of exponential functions.	Criterion D	Exponential Growth and Decay The Natural Base e Logarithms and Logarithmic Functions Transformations of Exponential and Logarithmic Functions Properties of Logarithms Solving Exponential and Logarithmic Equations Modeling with Exponential and Logarithmic Functions 9.2.2.2 Represent and solve problems in various contexts using exponential functions, such as investment growth, depreciation and population growth. 9.2.1.7 Understand the concept of an asymptote and identify asymptotes for exponential functions and reciprocals of linear functions, using symbolic and graphical methods. 9.2.4.2 Represent relationships in various contexts using equations involving exponential functions; solve these equations graphically or numerically. Know how to use

							calculators, graphing utilities or other technology to solve these equations. 9.2.2.1 Represent and solve problems in various contexts using exponential functions, such as investment growth, depreciation and population growth.
Unit 7: Rational Functions **Coming soon!**	Key concept: Relationships Related concept: Models and Representation Global context: Identities and relationships	Decision making can be improved when using models to represent relationship	Factual: How to solve rational equations? What are the vertical and horizontal asymptote of rational functions? Conceptual: How to understand vertical and horizontal asymptote of rational functions algebraically and graphically Debatable: Can the graph of rational functions cross vertical and or horizontal asymptote?				Inverse Variation Graphing Rational Functions Multiplying and Dividing Rational Expressions Solving Rational Equations
Unit 8: Sequence and Series **Coming soon!**							Defining and Using Sequences and Series Analyzing Arithmetic Sequences and Series Analyzing Geometric Sequences and Series Finding Sums of Infinite Geometric Series Using Recursive Rules with Sequences 9.2.2.4 Express the terms in a geometric sequence recursively and by giving an explicit (closed form) formula,

							and express the partial sums of a geometric series recursively 9.2.2.5 Recognize and solve problems that can be modeled using finite geometric sequences and series, such as home mortgage and other compound interest examples. Know how to use spreadsheets and calculators to explore geometric sequences and series in various contexts.

Year 5: Pre-Calculus	Key Concept Related Concept(s) and Global Context	Statement of Inquiry	Inquiry Questions	ATL Skill(s)	Summative Assessment	MYP Objective	Content MN State Standards
Unit 1: Functions and Their Graphs	Key concept: Relationships Related concept: Models and Representation Global context: Identities and relationships	Mathematical models can be used to represent relationship when we are make decisions.	Factual: What are the characteristics of functions and their graphs? Conceptual: How to determine whether relations between two variables are functions? Debatable: What is the best method to determine a function? Using vertical line test or solving for y?	Transfer	The summative requires students: Graphing different types of functions and understanding their characteristics, Addition and subtraction of functions, Determining inverse and composite functions and their graphs, and Solving equations algebraically and graphically	Criterion A	sketch graphs of equations, find the slope of a line given two points on the line, write linear equations in two variables and use slope to identify parallel and perpendicular lines, determine whether relations between two variables are functions and use function notation, and find the domains of functions, use vertical and horizontal shifts, reflections, and nonrigid transformations to sketch graphs of functions, add, subtract, multiply, and divide functions and compositions of functions, find inverse functions

Unit 2: Polynomial and Logarithmic Functions	Key concept: Relationships Related concept: Change and Models Global context: Scientific and technical innovation	Polynomial functions and Rational functions can model relationships and how they change.	Factual: What is the remainder theorem? What is the factor theorem? What is the fundamental theorem of Algebra? Conceptual: How to find all zeros of polynomial functions? When do polynomial equations have complex roots? Which function has vertical or horizontal asymptote? Debatable: Should complex roots be examined in a high school math class?	Critical-thinking	The summative assessment require students to:Understand and apply knowledge of beginning and end behavior of polynomial functions, Understand and apply the Factor Theorem, the Remainder Theorem, and the Fundamental Theorem of Algebra. Factor polynomial functions and use that information to determine how a polynomial function's graph will behave. Use synthetic division to validate factors of polynomial functions and Use synthetic division to validate factors of polynomial functions.	Criterion A	Quadratic Functions and Models Polynomial Functions of Higher Degree Polynomial and Synthetic Division Complex Numbers Zeros of Polynomial Functions Rational Functions Nonlinear Inequalities
Unit 3: Exponential and Logarithmic Functions	Key concept: Relationships Related concept: Equivalence and Representation Global context: Scientific and	Inverse functions help us better understand functions, how to solve them, and why they are useful	Factual: What is an inverse? Conceptual: How are exponential and logarithmic functions related? Debatable: Why was the concepts of logarithms developed?	Critical-thinking	The summative assessment requires students to: recognize and evaluate exponential functions with base a, graph exponential functions and use a One-to-One Property, recognize,	Criterion D	Exponential Functions and Their Graphs Logarithmic Functions and Their Graphs Properties of Logarithms Exponential and Logarithmic Equations Exponential and Logarithmic Models

	Technical Innovation				evaluate, and graph exponential functions with base e, use exponential functions to model and solve real-life problems		
Unit 4: Trigonometry **Coming soon!**							
Unit 5: Analytic Trigonometry **Coming soon!**							
Unit 6: Additional Topics in Trigonometry **Coming soon!**							
Unit 7: Systems of Equations and Inequalities	Key concept: Relationships Related concept: Systems Global context: Fairness and Development	Relationships between different systems can be modeled by equations to show common characteristics.	Factual: What are the three method of solving system of equations Conceptual: In what cases do I have systems of equations with no solutions or infinitely many solutions? Debatable: Which method of solving system of equations or helpful?	Organization	The summative assessment requires students to: use the method of elimination to solve systems of linear equations in two variables, use a graphical method to solve systems of equations in two variable, solve	Criterion A	Linear and Nonlinear Systems of Equations Two-Variable Linear Systems Multivariable Linear Systems Partial Fractions System of Inequalities Linear Programming

					system by the method of substitution (nonlinear), solve system by the method of substitution (nonlinear), Recognize partial fraction decompositions of rational expressions, Recognize partial fraction decompositions of rational expressions, Find partial fraction decompositions of rational expression, and Find partial fraction decompositions of rational expression.		
Unit 8: Matrices and Determinants	Key concept: Relationships Related concept:System and Representation Global context: Fairness and Development	Relationships between different systems can be represented by matrices	Factual: How to solve systems of equations using matrix equations Conceptual: Why do we need to know the inverse of a matrix Debatable: Are elimination method and matrix method the same?	Communication	The criterion C summative assessment focuses on solving system of equations by matrix method. Students need to find the determinant and inverse of a matrix in order to solve the system of equations	Criterion C	Matrices and System of Equation Operations with Matrices The determinant of a square matrix Application of matrices and determinants
Unit 9: Sequences, Series, and Probability **Coming soon!**	Key concept: Relationships Related concept: Patterns	Establishing patterns in the natural world can help in understanding relationships.					

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	Global context: Scientific and Science Innovation						