CORRELATION
of
the 10 UNDERSTANDING MATH PLUS PROGRAMS & UNDERSTANDING NUMERATION PLUS PROGRAMS
with
Ontario MATHEMATICS CURRICULUM STANDARDS

GRADE 9 Applied

Note: a. The Understanding Math PLUS series of programs consist of 10 programs written for Kindergarten to 10th Grade.

The 10 programs are:

Understanding Fractions	Understanding Whole Numbers and Integers
Understanding Probability	Understanding Percent
Understanding Exponents	Understanding Equations
Understanding Algebra	Understanding Graphing
Understanding Numeration	
Understanding Measurement and Geometry	

Note: b. The Understanding Numeration software for K to 3 is set up so that the teacher selects items in the following order:
Concept .. from 5 concepts .. Counting, Comparing & Ordering, Place Value, Operations and Problem Solving.
Skill .. chosen from the list of specific learning expectations
Level .. indicates the levels of development for Kindergarten to 3rd grade.

Level	Upper Range of Number
A	**10**
B	**20**
C	**100**
D	**1000**

Lesson .. 250 lessons are sequenced to build understanding of concepts.
A detailed Lesson Synopsis on the website www.neufeldmath.com to assist the teacher by stating the lesson contents but also by giving lesson suggestions.
Worksheet .. off computer worksheets are selected from the CD by a code.

Note: c. The remaining 9 Understanding Math programs for 4th to 10th grade are set up so that they can be used in a variety of teaching and learning environments ranging from a teacl centered approach with 1 computer to a student centered lab approach. The lessons can also be used in remediation, tutorial, intervention, resource, fast-tracking.
Each topic has:
..an interactive concept introduction, usually with a variety of graphic approaches.
..a number of particular examples
..practice questions with random questions but particular feedback
..a topic test with random questions and tracking
..off computer worksheets selected from the website .. www.neufeldmath.com

Number Sense and Algebra
Specific Expectations
Solving Problems Involving Proportional Reasoning
By the end of this course, students will:

Expectations	Understanding Math PLUS lessons
–illustrate equivalent ratios, using a variety of tools (e.g., concrete materials, diagrams, dynamic geometry software) (e.g., show that 4:6 represents the same ratio as 2:3 by showing that a ramp with a height of 4 m and a base of 6 m and a ramp with a height of 2 m and a base of 3 m are equally steep);	**MAT+ Understanding Percent** **Topic 4. Ratios and Proportions** Ratios in the News What is a Ratio? Examples 1.Fraction Strip 2.Balls 3.Students 4.Gears Writing Ratios Concept Examples 1, 2, 3, 4
–represent, using equivalent ratios and proportions, directly proportional relationships arising from realistic situations (Sample problem: You are building a skateboard ramp whose ratio of height to base must be 2:3.Write a proportion that could be used to determine the base if the height is 4.5 m.);	**MAT+ Understanding Percent** **Topic 4. Ratios and Proportions** What is a Proportion? Proportions Example 1 Example 2 – Lemonade Example 3 – Marbles Example 4 – Trout Example 5 – Tree Height Example 6 – Map Example 7 – Scale Drawing Ratios and Your Body Golden Ratios Measuring Your Body Practice Questions
–solve for the unknown value in a proportion, using a variety of methods (e.g., concrete materials, algebraic reasoning, equivalent ratios, constant of proportionality) (Sample problem: x/4 = 15/20);	**MAT+ Understanding Percent** **Topic 4. Ratios and Proportions** What is a Proportion? Proportions Example 1 Example 2 – Lemonade Example 3 – Marbles Example 4 – Trout

	Example 5 – Tree Height Example 6 – Map Example 7 – Scale Drawing **MAT+ <u>Understanding Algebra</u>** **Topic 4. Patterns, Formulas, Substitution** Substitution is... Math Scrabble Scrabble 1, 2, 3 Challenge Substitution Examples Examples 1, 2, 3, 4 Practice Questions Topic Test
–make comparisons using unit rates (e.g., if 500 mL of juice costs $2.29, the unit rate is 0.458¢/mL; this unit rate is less than for 750 mL of juice at $3.59, which has a unit rate of 0.479¢/mL);	
–solve problems involving ratios, rates,and directly proportional relationships in various contexts (e.g., currency conversions, scale drawings, measurement),using a variety of methods (e.g., using algebraic reasoning, equivalent ratios, a constant of proportionality; using dynamic geometry software to construct and measure scale drawings) (Sample problem: Simple interest is directly proportional to the amount invested. If Luis invests $84 for one year and earns $1.26 in interest, how much would he earn in interest if he invested $235 for one year?);	**MAT+ <u>Understanding Percent</u>** **Topic 6. Problems Involving Percent** Finding the Whole Recall Proportion School Population: Method 1... Using Proportions School Population: Method 2 Grades Problem: Method 1... Using Proportions Grades Problem: Method 2 **Topic 7. Percent in Business** Simple Interest What is it? Complete the Table Bank Interest Credit Card Bill
–solve problems requiring the expression of percents, fractions, and decimals in their equivalent forms (e.g., calculating simple interest and sales tax; analysing data) (Sample problem: Of the 29 students in a Grade 9 math class,13 are taking science this semester. If this class is representative of all the Grade 9 students in the school, estimate and calculate the percent of the 236 Grade 9 students who are taking science this semester. Estimate and calculate the number of Grade 9 students this percent represents.).	**MAT+ <u>Understanding Percent</u>** **Topic 7. Percent in Business** In This Topic Sales Tax Bicycle Question Coat Question Restaurant Tipping Simple Interest What is it? Complete the Table Bank Interest Credit Card Bill

Simplifying Expressions and Solving Equations

By the end of this course, students will:

Expectations	Understanding Math PLUS lessons
–simplify numerical expressions involving integers and rational numbers, with and without the use of technology;*	**MAT+ <u>Understanding Whole Numbers and Integers</u>** **Topic 5. Adding Integers** Word Problems Temperature Money Car Practice Questions **Topic 6. Subtracting Integers** Word Problems The Sailboat The Bank Practice Questions **Topic 7. Multiplying Expressions** Word Problems Washing Cars The Helicopter Construction Practice Questions **Topic 8. Dividing Expressions** Word Problems Casino Plant Graham's Walk Practice Questions **MAT+ <u>Understanding Fractions</u>** **Topic 8. Adding Fractions** Word Problems Alexander's Friends Eating Candy Goal Scoring Taking a Walk Fraction Card Game **Topic 9. Subtracting Fractions** Word Problems Pedro and Alex Race Washing the Cars

	Planting a Garden Practice Questions **Topic 10. Multiplying Fractions** Word Problems Boris' Money Maria's Trip Developing the Rule Example 1 Example 2 A Summary **Topic 11. Dividing Fractions** Examples without Diagrams Numerical Examples 1, 2 Central High School Practice Questions
–relate their understanding of inverse operations to squaring and taking the square root, and apply inverse operations to simplify expressions and solve equations;	**MAT+ <u>Understanding</u>** **MAT+ <u>Understanding Exponents</u>** **Topic 5. Square Roots** Squaring Numbers Square Roots Radical Signs Square Roots of Negative Numbers Example Questions 1. Radicals First 2. The Four Equations 3. Lawn Question 4. Make a Square **MAT+ <u>Understanding Equations</u>** **Topic 2. Solving One-Step Equations** Our Problem Concepts – Examples with Tiles Examples 1, 2, 3, 4 Concepts – Examples without Tiles Practice Questions Topic Test **Topic 3. Solving Two-Step Equations** Our Problem Concepts – Examples with Tiles Examples 1, 2, 3, 4 Concepts – Examples without Tiles

	Examples 1, 2, 3, 4, 5, 6 Practice Questions Topic Test **Topic 4. Solving Multi-Step Equations** Our Problem Concepts – Examples with Tiles Concepts – Examples without Tiles Examples 1, 2, 3, 4, 5 Summary Literal Equations What Are They? How do you solve them? Why Solve the Literal Equations? A Perimeter Example A Temperature Example
–describe the relationship between the algebraic and geometric representations of a single-variable term up to degree three [i.e., length, which is one dimensional, can be represented by x; area, which is two dimensional, can be represented by (x)(x) or x^2; volume, which is three dimensional, can be represented by (x)(x)(x),(x^2)(x), or x^3];	**MAT+ <u>Understanding Exponents</u>** **Topic 2. Exponents in Formulas** The Power Key An Introduction Power with a Positive Base Power with a Negative Base Adding Two Powers: Long Way Adding Two Powers: Short Way An Introduction to Formulas Area Formulas Involving Exponents Volume Formulas Involving Exponents Examples with Area Formulas Examples 1, 2, 3 Practice Questions
–substitute into and evaluate algebraic expressions involving exponents (i.e., evaluate expressions involving natural-number exponents with rational-number bases) [e.g., $(3/2)^3$ by hand and 9.8^3 by calculator]) (Sample problem: A movie theatre wants to compare the volumes of popcorn in two containers, a cube with edge length 8.1 cm and a cylinder with radius 4.5 cm and height 8.0 cm. Which container holds more popcorn?);*	**MAT+ <u>Understanding Algebra</u>** **Topic 4. Patterns, Formulas, Substitution** Substitution is... Math Scrabble Scrabble 1, 2, 3 Challenge Substitution Examples Examples 1, 2, 3, 4 Practice Questions Topic Test

–add and subtract polynomials involving the same variable up to degree three [e.g., $(2x+1)+(x^2-3x+4)$],using a variety of tools (e.g.,algebra tiles,computer algebra systems,paper and pencil);	**MAT+ <u>Understanding Algebra</u>** **Topic 5. Adding Expressions** Our Problem Adding Expressions with X and Y Tiles Examples 1, 2, 3 Adding Expressions with X-Squared Tiles Examples 1, 2, 3 Adding Expressions without Tiles Examples 1, 2 Practice Questions with Tiles Practice Questions without Tiles Topic Test **Topic 6. Subtracting Expressions** Our Problem Subtracting Expressions with X and Y Tiles Concept Examples 1, 2 Subtracting Expressions with X-Squared Tiles Examples 1, 2 Subtracting Expressions without Tiles Practice Questions with Tiles
–multiply a polynomial by a monomial involving the same variable to give results up to degree three [e.g.,(2x)(3x),2x(x+ 3)], using a variety of tools (e.g., algebra tiles, drawings, computer algebra systems, paper and pencil);	**MAT+ <u>Understanding Algebra</u>** **Topic 7. Multiplying Expressions** Our Problem Recall Tile Concepts Multiplying Monomials Like Terms With Tiles Without Tiles Multiplying Monomials and Polynomials With Tiles… Examples 1, 2, 3, 4 Without Tiles
–solve first-degree equations with non-fractional coefficients, using a variety of tools (e.g., computer algebra systems, paper and pencil) and strategies (e.g., the balance analogy, algebraic strategies) (Sample problem: Solve $2x+7=6x-1$ using the balance analogy.); –substitute into algebraic equations and solve for one variable in the first degree (e.g., in relationships, in measurement) (Sample problem: The perimeter of a rectangle can be represented as $P=2l+2w$. If the perimeter of a rectangle is 59 cm and the width is 12 cm, determine the length.).	**MAT+ <u>Understanding Equations</u>** **Topic 4. Solving Multi-Step Equations** Our Problem Concepts – Examples with Tiles Concepts – Examples without Tiles Examples 1, 2, 3, 4, 5 Summary Literal Equations What Are They?

	How do you solve them? Why Solve the Literal Equations? A Perimeter Example A Temperature Example

Linear Relations
Specific Expectations
Using Data Management to Investigate Relationships

By the end of this course, students will:

Expectations	Understanding Math PLUS lessons
–interpret the meanings of points on scatter plots or graphs that represent linear relations, including scatter plots or graphs in more than one quadrant [e.g., on a scatter plot of height versus age, interpret the point (13,150) as representing a student who is 13 years old and 150 cm tall; identify points on the graph that represent students who are taller and younger than this student] (Sample problem: Given a graph that represents the relationship of the Celsius scale and the Fahrenheit scale, determine the Celsius equivalent of –5°F.);	**MAT+ Understanding Graphing** **Topic 2. Statistics** Scatter Plot Example 1… The T-Shirt Tailor Example 2… Matching
–pose problems, identify variables, and formulate hypotheses associated with relationships between two variables (Sample problem: Does the rebound height of a ball depend on the height from which it was dropped?); –carry out an investigation or experiment involving relationships between two variables, including the collection and organization of data, using appropriate methods, equipment, and/or technology (e.g., surveying; using measuring tools, scientific probes the Internet) and techniques (e.g., making tables, drawing graphs) (Sample problem: Perform an experiment to measure and record the temperature of ice water in a plastic cup and ice water in a thermal mug over a 30 min period, for the purpose of comparison. What factors might affect the outcome of this experiment? How could you change the experiment to account for them?); –describe trends and relationships observed in data, make inferences from data, compare the inferences with hypotheses about the data, and explain any differences between the inferences and the hypotheses (e.g., describe the trend observed in the data. Does a relationship seem to exist? Of what sort? Is the outcome consistent with your hypothesis? Identify and explain any outlying pieces of data. Suggest a formula that relates the variables. How might you vary this experiment to examine other relationships?) (Sample problem: Hypothesize the effect of the length of a pendulum on the time required for the pendulum to make five full swings. Use data to make an inference. Compare the inference with the hypothesis. Are there other relationships you might investigate involving pendulums?).	**MAT+ Understanding Graphing** **Topic 2. Statistics** Data... What is it? Examples of Data Example 1... Fast Food Earnings Example 2... Infant's Walk Example 3... Canada and U.S.A. Forecast Example 4... King of the Strike Out Example 5... U.S.A. Stake in India Example 6... Allergy Troubles A Summary: Examples Statistics... What is it? Collecting Data Throw a Die Throw 2 Dice Voting Primary Data - Gathering Methods Secondary Data - Gathering Methods

Determining Characteristics of Linear Relations

By the end of this course, students will:

Expectations	Understanding Math PLUS lessons
–construct tables of values and graphs, using a variety of tools (e.g., graphing calculators, spreadsheets, graphing software, paper and pencil),to represent linear relations derived from descriptions of realistic situations (Sample problem: Construct a table of values and a graph to represent a monthly cell phone plan that costs $25, plus $0.10 per minute of airtime.); –construct tables of values, scatter plots, and lines or curves of best fit as appropriate, using a variety of tools (e.g., spreadsheets, graphing software, graphing calculators, paper and pencil),for linearly related and non-linearly related data collected from a variety of sources (e.g., experiments, electronic secondary sources, patterning with concrete materials) (Sample problem: Collect data, using concrete materials or dynamic geometry software, and construct a table of values, a scatter plot, and a line or curve of best fit to represent the following relationships: the volume and the height for a square-based prism with a fixed base; the volume and the side length of the base for a square-based prism with a fixed height.); –identify, through investigation, some properties of linear relations (i.e., numerically, the first difference is a constant, which represents a constant rate of change; graphically, a straight line represents the relation),and apply these properties to determine whether a relation is linear or non-linear.	**MAT+ Understanding Graphing** **Topic 6. Linear Relations** What is a Linear Relation? Graphs of Linear Relations Concept Examples 1, 2, 3, 4, 5, 6 The Taxi Example – Setup Equation – Graph Equation The Elastic Example – Setup Equation – Graph Equation Lightning Example – Setup Equation – Graph Equation Line of Best Fit Examples 1, 2 Practice Questions

Investigating Constant Rate of Change

By the end of this course, students will:

Expectations	Understanding Math PLUS lessons
–determine, through investigation, that the rate of change of a linear relation can be found by choosing any two points on the line that represents the relation, finding the vertical change between the points (i.e., the rise) and the horizontal change between the points (i.e., the run),and writing the ratio rise/run (i.e. rate of change = rise/run) –determine, through investigation, connections among the representations of a constant rate of change of a linear relation (e.g., the cost of producing a book of photographs is $50,plus $5 per book, so an equation is C=50 + 5p; a table of values provides the first difference of 5; the rate of change has a value of 5; and 5 is the coefficient of the independent variable, p, in this equation); –express a linear relation as an equation in two variables, using the rate of change and the initial value (e.g., Mei is raising funds in a charity walkathon; the course measures	**MAT+ Understanding Graphing** **Topic 5. Relations, Equations, and Functions** In This Topic Relations What is a Relation? Domain and Range Example 1 – Triangles Example 2 – Tiles, Part 1 Example 3 – Tiles, Part 2 Example 4 – Running Example 5 – Hit the Ball Functions What is a Function? – Examples 1, 2, 3 Vertical Line Test

25 km, and Mei walks at a steady pace of 4 km/h; the distance she has left to walk can be expressed as d=25 – 4t, where t is the number of hours since she started the walk); –describe the meaning of the rate of change and the initial value for a linear relation arising from a realistic situation (e.g., the cost to rent the community gym is $40 per evening, plus $2 per person for equipment rental; the vertical intercept, 40,represents the $40 cost of renting the gym; the value of the rate of change,2, represents the $2 cost per person),and describe a situation that could be modeled by a given linear equation (e.g., the linear equation M=50 + 6dcould model the mass of a shipping package, including 50 g for the packaging material, plus 6 g per flyer added to the package).	Examples 1, 2, 3 Function Notation Examples 1, 2 Patterns to Words to Equations Examples 1, 2, 3, 4 Practice Questions **MAT+ <u>Understanding Graphing</u>** **Topic 6. Linear Relations** What is a Linear Relation? Graphs of Linear Relations Concept Examples 1, 2, 3, 4, 5, 6 The Taxi Example – Setup Equation – Graph Equation The Elastic Example – Setup Equation – Graph Equation Lightning Example – Setup Equation – Graph Equation Line of Best Fit Examples 1, 2 Practice Questions
–compare the properties of direct variation and partial variation in applications, and identify the initial value (e.g., for a relation described in words, or represented as a graph or an equation) (Sample problem: Yoga costs $20 for registration, plus $8 per class. Tai chi costs $12 per class. Which situation represents a direct variation, and which represents a partial variation? For each relation, what is the initial value? Explain your answers.);	

Connecting Various Representations of Linear Relations and Solving Problems Using the Representations

By the end of this course, students will:

Expectations	Understanding Math PLUS lessons
–determine values of a linear relation by using a table of values, by using the equation of the relation, and by interpolating or extrapolating from the graph of the relation (Sample problem: The equation H=300 – 60t represents the height of a hot air balloon that is initially at 300 m and is descending at a constant rate of 60 m/min. Determine algebraically and graphically its height after 3.5 min.)	**MAT+ <u>Understanding Graphing</u>** **Topic 6. Linear Relations** What is a Linear Relation? Graphs of Linear Relations Concept Examples 1, 2, 3, 4, 5, 6 The Taxi Example – Setup Equation – Graph Equation The Elastic Example – Setup Equation – Graph Equation Lightning Example – Setup Equation – Graph Equation Line of Best Fit Examples 1, 2 Practice Questions

–describe a situation that would explain the events illustrated by a given graph of a relationship between two variables (Sample problem: The walk of an individual is illustrated in the given graph, produced by a motion detector and a graphing calculator. Describe the walk [e.g. the initial distance from the motion detector, the rate of walk].);	**MAT+ Understanding Graphing** **Topic 5. Relations, Equations, and Functions** In This Topic Relations What is a Relation? Domain and Range Example 1 – Triangles Example 2 – Tiles, Part 1 Example 3 – Tiles, Part 2 Example 4 – Running Example 5 – Hit the Ball Functions What is a Function? – Examples 1, 2, 3 Vertical Line Test Examples 1, 2, 3 Function Notation Examples 1, 2 Patterns to Words to Equations Examples 1, 2, 3, 4 Practice Questions
–determine other representations of a linear relation arising from a realistic situation, given one representation (e.g., given a numeric model, determine a graphical model and an algebraic model; given a graph, determine some points on the graph and determine an algebraic model);	
–solve problems that can be modeled with first-degree equations, and compare the algebraic method to other solution methods (e.g., graphing) (Sample problem: Bill noticed it snowing and measured that 5 cm of snow had already fallen. During the next hour, an additional 1.5 cm of snow fell. If it continues to snow at this rate, how many more hours will it take until a total of 12.5 cm of snow has accusmulated?);	**MAT+ Understanding Equations** **Topic 5. Problem Solving** Words and Symbols The Translation Machine Examples 1, 2, 3, 4 The Trick Machine Instructions The Machine Explanation with Pictures Explanation with Symbols Area of Walls Chemistry Pool Puzzler – The First Problem Perimeter Problem with Diagram Money Problem with Chart Age Problem with Chart Buying CDs Meat Mixture Coffee Mixture Rate of Work

–describe the effects on a linear graph and make the corresponding changes to the linear equation when the conditions of the situation they represent are varied (e.g., given a partial variation graph and an equation representing the cost of producing a yearbook, describe how the graph changes if the cost per book is altered, describe how the graph changes if the fixed costs are altered, and make the corresponding changes to the equation);	**MAT+ <u>Understanding Graphing</u>** **Topic 8. Equation of a Straight Line** Graph y = mx + b Examples 1, 2, 3, 4 Patterns to Summary Examples 5, 6, 7
–determine graphically the point of intersection of two linear relations, and interpret the intersection point in the context of an application (Sample problem: A video rental company has two monthly plans. Plan A charges a flat fee of $30 for unlimited rentals; Plan B charges $9,plus $3 per video. Use a graphical model to determine the conditions under which you should choose Plan A or Plan B.);	**MAT+ <u>Understanding Equations</u>** **Topic 6. Solving Linear Systems** In This Topic The Meaning of a Linear System The Meaning of Solving a Linear System Solve a Linear System by Graphing Examples 1, 2 – Intersecting Lines Examples 3, 4 – Intersecting Lines Involving Fractions Example 5 – Parallel Lines Example 6 – Coincidental Lines
–select a topic involving a two-variable relationship (e.g., the amount of your pay cheque and the number of hours you work; trends in sports salaries over time; the time required to cool a cup of coffee), pose a question on the topic, collect data to answer the question, and present its solution using appropriate representations of the data (Sample problem: Individually or in a small group, collect data on the cost compared to the capacity of computer hard drives. Present the data numerically, graphically, and [if linear] algebraically. Describe the results and any trends orally or by making a poster display or by using presentation software.).	

Measurement and Geometry
Specific Expectations
Investigating the Optimal Values of Measurements of Rectangles
By the end of this course, students will:

Expectations	Understanding Math PLUS lessons
–determine the maximum area of a rectangle with a given perimeter by constructing a variety of rectangles, using a variety of tools (e.g., geoboards, graph paper, toothpicks, a pre-made dynamic geometry sketch),and by examining various values of the area as the side lengths change and the perimeter remains constant; –determine the minimum perimeter of a rectangle with a given area by constructing a variety of rectangles, using a variety of tools (e.g., geoboards, graph paper, a pre-made dynamic geometry sketch),and by examining various values of the side lengths and the perimeter as the area stays constant;	**MAT+ Understanding Measurement and Geometry** **Topic 2. Perimeter and Area of Polygons** Amount of Surface The Driveway... An Introduction to Area Area – Estimation Area of a Rectangle Concept Examples 1, 2 Area of a Parallelogram Concept Examples 1, 2 Area of a Triangle Concept Examples 1, 2 Relationship – Area and Perimeter The Information The Graph Given Area and Perimeter – Create Shape Example 1 Example 2 Example 3 Example 4
–solve problems that require maximizing the area of a rectangle for a fixed perimeter or minimizing the perimeter of a rectangle for a fixed area (Sample problem: You have 100 m of fence to enclose a rectangular area to be used for a snow sculpture competition. One side of the area is bounded by the school, so the fence is required for only three sides of the rectangle. Determine the dimensions of the maximum area that can be enclosed.).	**MAT+ Understanding Measurement and Geometry** **Topic 2. Perimeter and Area of Polygons** Problems Section Length of Fence Area of a Wall The Tablecloth Practice Questions Topic Test

Solving Problems Involving Perimeter, Area, and Volume

By the end of this course, students will:

Expectations	Understanding Math PLUS lessons
–relate the geometric representation of the Pythagorean theorem to the algebraic representation $a^2+ b^2=c^2$;	**MAT+ Understanding Exponents** **Topic 6. Pythagorean Theorem** In This Topic The Right Triangle Math or Magic? Introduction Omar's Rope Trick #1, #2 Our Rope Trick Squares on a Grid Examples 1, 2, 3, 4 Squares on the Sides of a Right Triangle Triangles 1, 2, 3 The Pythagorean Theorem The Pattern In General Theorem
–solve problems using the Pythagorean theorem, as required in applications (e.g., calculate the height of a cone, given the radius and the slant height, in order to determine the volume of the cone);	**MAT+ Understanding Exponents** **Topic 6. Pythagorean Theorem** Example Questions Example 1… Pole Example Example 2… Tower Example Example 3… Walking Example Example 4… Lake Example Example 5… Geometric Example
–solve problems involving the areas and perimeters of composite two-dimensional shapes (i.e., combinations of rectangles, triangles, parallelograms, trapezoids, and circles) (Sample problem: A new park is in the shape of an isosceles trapezoid with a square attached to the shortest side. The side lengths of the trapezoidal section are 200 m,500 m, 500 m, and 800 m, and the side length of the square section is 200 m. If the park is to be fully fenced and sodded, how much fencing and sod are required?);	**MAT+ Understanding Measurement and Geometry** **Topic 2. Perimeter and Area of Polygons** Relationship – Area and Perimeter The Information The Graph Given Area and Perimeter – Create Shape Example 1 Example 2 Example 3 Example 4 Problems Section Length of Fence Area of a Wall The Tablecloth Practice Questions Topic Test

–develop, through investigation (e.g., using concrete materials),the formulas for the volume of a pyramid, a cone, and a sphere (e.g., use three-dimensional figures to show that the volume of a pyramid [or cone] is 1/3 the volume of a prism [or cylinder] with the same base and height,and therefore that Vpyramid = Vprism/3 or Vpyramid= (area of base)(height)/3;	**MAT+ Understanding Measurement and Geometry** **Topic 4. Solids…Volume and Surface Area** Volume of a Solid The Concept Volume of a Prism: Examples 1, 2 Volume of a Cylinder Volume of a Pyramid Volume of a Cone Volume of a Sphere
–solve problems involving the volumes of prisms, pyramids, cylinders, cones, and spheres (Sample problem: Break-bit Cereal is sold in a single-serving size,in a box in the shape of a rectangular prism of dimensions 5 cm by 4 cm by 10 cm. The manu-facturer also sells the cereal in a larger size, in a box with dimensions double those of the smaller box. Make a hypothesis about the effect on the volume of doubling the dimensions.Test your hypothesis using the volumes of the two boxes, and discuss the result.).	**MAT+ Understanding Measurement and Geometry** **Topic 4. Solids…Volume and Surface Area** Summary Practice Questions

Investigating and Applying Geometric Relationships

By the end of this course, students will:

Expectations	Understanding Math PLUS lessons
–determine, through investigation using a variety of tools (e.g., dynamic geometry software, concrete materials), and describe the properties and relationships of the interior and exterior angles of triangles, quadrilaterals, and other polygons, and apply the results to problems involving the angles of polygons (Sample problem: With the assistance of dynamic geometry soft-ware, determine the relationship between the sum of the interior angles of a polygon and the number of sides. Use your conclusion to determine the sum of the interior angles of a 20-sided polygon.); –determine, through investigation using a variety of tools (e.g., dynamic geometry software, concrete materials),and describe the properties and relationships of the angles formed by parallel lines cut by a transversal, and apply the results to problems involving parallel lines (e.g., given a diagram of a rectangular gate with a supporting diagonal beam, and given the measure of one angle in the diagram, use the angle properties of triangles and parallel lines to determine the measures of the other angles in the diagram);	**MAT+ Understanding Measurement and Geometry** **Topic 6. Angles and Polygons** Angles in Triangles Exploration An Explanation Exterior Angles – Example Angles in Polygons Methods 1, 2 Exterior Angles in a Polygon Practice Questions
–create an original dynamic sketch, paper-folding design, or other illustration that incorporates some of the geometric properties from this section, or find and report on some real-life application(s) (e.g., in carpentry, sports, architecture) of the geometric properties.	**MAT+ Understanding Measurement and Geometry** **Topic 7. Constructions** Before You Begin In This Topic Perpendicular Bisector Circumcircle Centroid Angle Bisector