

CORRELATION
of
the 10 UNDERSTANDING MATH PLUS PROGRAMS
with
New Jersey Mathematics Curriculum Content Standards for Mathematics
Grade 8

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

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 teacher 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

4.1. Number and Numerical Operations

A. Number Sense

1. Extend understanding of the number system by constructing meanings for the following (unless otherwise noted, all indicators for grade 8 pertain to these sets of numbers as well):

Standard	Understanding Math PLUS Program and Lesson
<ul style="list-style-type: none"> Rational numbers 	<p>MAT+ Understanding Fractions Topic 1: The Meaning of Fractions Word Problems Fruit Basket: Questions 1,2,3,4 School Supplies Practice Questions Topic Test</p> <p>Topic 3: Equivalent Fractions Introduction Square Triangle Pattern Blocks Hexagon 1,2 Fractions Strips Concepts 1,2 The Clock Introduction 1,2 Examples Equivalent Fractions on a Number Line Comparison of Fractions Equivalent Fractions in a Multiplication Table</p>
<ul style="list-style-type: none"> Percents 	<p>MAT+ Understanding Percent Topic 1: The Meaning of Percent Making Sense of Percent 1. Weather 2. Squares 3. Election 4. Photocopier 5. Car Trip Estimating Percent Practice Questions; Topic Test</p>

<ul style="list-style-type: none"> • Exponents 	<p>MAT+ <u>Understanding Exponents</u> Topic 1: The Meaning of Exponents Introduction... The Money Game Money Grab Game Show Graphs – Game Show Results Graphs – Comparing the Two Results Introduction ... Bacteria Doubling Introduction ... Paper Folding Experiment Pattern Exponents, Powers, Bases Powerful Explosions Introductory Examples Examples 1,2,3,4,5 Examples – Substitution Examples 1,2,3,4</p>
<ul style="list-style-type: none"> • Roots 	<p>MAT+ <u>Understanding Exponents</u> Topic 5: Square Root Squaring Numbers Square Roots Radical Signs Square Roots of Negative Numbers Examples Questions 1. Radicals First 2. The Four Equations 3. Lawn Question 4. Make a Square</p>
<ul style="list-style-type: none"> • Absolute values 	<p>MAT+ <u>Understanding Equations</u> Topic 8: Solving Absolute Value Equations Absolute Value... What is it? Concept Examples 1,2 Summary</p>
<ul style="list-style-type: none"> • Numbers represented in scientific notation 	<p>MAT+ <u>Understanding Exponents</u> Topic 4: Scientific Notation Why Use Scientific Notation? Scientific Notation for Large Numbers Introduction Chart The Rule The Rule</p>

	<p>The Steps</p> <p>Scientific Notation for Small Numbers</p> <p>Introduction</p> <p>Chart</p> <p>The Steps</p> <p>Examples</p> <ol style="list-style-type: none"> 1. Number Question 2. Park Question 3. Sun Question 4. Kitchen Question
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2. Demonstrate a sense of the relative magnitudes of numbers.

3. Understand and use ratios, proportions, and percents (including percents greater than 100 and less than 1) in a variety of situations.

<p>MAAT+ Understanding Percent</p> <p>Topic 4: Ratios and Proportions</p> <p>Writing Ratios</p> <p>Concept</p> <p>Examples 1,2,3,4</p> <p>What is Proportion?</p> <p>Proportions</p> <p>Example 1</p> <p>Example 2- Lemonade</p> <p>Example 3 – Marbles</p> <p>Example 4 – Trout</p> <p>Example 5 – Tree Height</p> <p>Example 6 – Map</p> <p>Example 7 – Scale Drawing</p> <p>Ratios and Your Body</p> <p>Golden Ratios</p> <p>Measuring Your Body</p> <p>Topic 6: Problems Involving Percent</p> <p>In This Topic</p> <p>Steps in Solving Problems</p> <p>Finding the Whole</p> <p>Recall Proportion</p> <p>School Population: Method 1 – Using Proportion; Method 2 –</p> <p>Grades Problem: Method 1 – Using Proportion; Method 2</p> <p>Bike Sale: Method 1 – Using Proportion; Method 2</p> <p>Finding the Percent</p> <p>Theatre problem</p>

Car problem
Percent of a Number
Earnings Problem
Nickel Ore
Percents Greater than 100%
Number problem
Pencil Problem

4. Compare and order numbers of all named types.

MAT+ Understanding Fractions

Topic 3: Equivalent Fractions

Comparison of Fractions

Topic 5: Introduction to Decimals

Comparing Decimals

Examples 1,2,3,4

Ordering Decimals

Introduction

Examples 1,2,3,4

5. Use whole numbers, fractions, decimals, and percents to represent equivalent forms of the same number.

MAT+ Understanding Fractions

Topic 6: Percents...Fractions...Decimals

Expressing a percent as a Fraction

Introduction with/without Graphics

Expressing a Fraction in Simplest Form

Greatest Common Factor

Examples 1,2

Simplifying Fractions

Method 1,2

Examples

Examples 1,2,3,4

The Watering Can

Expressing a Percent as a Decimal

Introduction

Examples 1,2,3

Number Line #1

Decimal Strips

Concepts 1,2,3

Expressing a Decimal as a Percent

Examples 1,2,3

Summary and Pattern

<p>% Nitrogen in the Air Batting Averages Expressing a Fraction as a Percent An Example Method 1 Examples 1,2 Method 2 Examples 1,2</p>
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6. Recognize that repeating decimals correspond to fractions and determine their fractional equivalents.

Standard	Understanding Math PLUS Program and Lesson
<ul style="list-style-type: none"> • $5/7 = 0.714285714285... = 0.$ 	<p>MAT+ Understanding Fractions Topic 15: Fractions and Decimals Compare Fractions...Method 1, Method 2 Fractions to Decimals Repeating Decimals An Example How to Write Them Decimals to Fractions Place Value</p>

7. Construct meanings for common irrational numbers, such as p (pi) and the square root of 2.

<p>MAT+ Understanding Measurement and Geometry Topic 3: The Circle PI...A Special Number Introduction How do we Measure Circumference? Measuring Circles Summary</p>
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B. Numerical Operations

1. Use and explain procedures for performing calculations involving addition, subtraction, multiplication, division, and exponentiation with integers and all number types named above with:

Standard	Understanding Math PLUS Program and Lesson
<ul style="list-style-type: none"> • Pencil-and-paper • Mental math 	<p>MAT+ Understanding Whole Numbers and Integers Topic 5: Adding Integers</p>

- Calculator

Topic 6: Subtracting Integers
 Topic 7: Multiplying Integers
 Topic 8: Dividing Integers
 ALL SECTIONS

MAT+ Understanding Fractions
 Topic 8: Adding Fractions
 Topic 9: Subtracting Fractions
 Topic 10: Multiplying Fractions
 Topic 14: Dividing Fractions
 ALL SECTIONS

MAT+ Understanding Exponents
 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

2. Use exponentiation to find whole number powers of numbers.

MAT+ Understanding Exponents

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

3. Find square and cube roots of numbers and understand the inverse nature of powers and roots.

MAT+ Understanding Exponents

Topic 5: Square Root

Examples Questions

5. Radicals First
6. The Four Equations
7. Lawn Question
8. Make a Square

Practice Questions; Topic Test

4. Solve problems involving proportions and percents.

MAT+ Understanding Percent

Topic 4: Ratios and Proportions

Ratios and Your Body

Golden Ratios

Measuring Your Body

Practice Questions; Topic Test

5. Understand and apply the standard algebraic order of operations, including appropriate use of parentheses.

MAT+ Understanding Whole Numbers and Integers

Topic 9: Order of Operations

Example Questions

Examples 1 through 10

Word Problems

Shipping

Babysitting

Garbage

Practice Questions; Topic Test

C. Estimation

1. Estimate square and cube roots of numbers.

MAT+ Understanding Exponents

Topic 5: Square Root

Examples Questions

9. Radicals First
10. The Four Equations
11. Lawn Question
12. Make a Square

Practice Questions; Topic Test

2. Use equivalent representations of numbers such as fractions, decimals, and percents to facilitate estimation.
3. Recognize the limitations of estimation and assess the amount of error resulting from estimation.

4.2. Geometry and Measurement

A. Geometric Properties

1. Understand and apply concepts involving lines, angles, and planes.

Standard	Understanding Math PLUS Program and Lesson
<ul style="list-style-type: none"> • Complementary and supplementary angles 	MAT+ <u>Understanding Measurement and Geometry</u> Topic 6: Angles and Polygons Topic 6: Angles and Polygons In This Topic Parallel Lines Example with Parallel Lines Examples 1,2
<ul style="list-style-type: none"> • Vertical angles 	
<ul style="list-style-type: none"> • Bisectors and perpendicular bisectors 	MAT+ <u>Understanding Measurement and Geometry</u> Topic 7: Constructions Before You Begin In This Topic Perpendicular Bisector
<ul style="list-style-type: none"> • Parallel, perpendicular, and intersecting planes 	
<ul style="list-style-type: none"> • Intersection of plane with cube, cylinder, cone, and sphere 	

2. Understand and apply the Pythagorean theorem.

MAT+ <u>Understanding Exponents</u> Topic 6: Pythagorean Theorem In This Topic The Right Triangle Math or Magic? Introduction Omar's Rope Trick #1, #2 Our Rope Trick

<p>Squares on a Grid Examples 1-4 Squares on the Sides of a Right Triangle Triangles 1,2,3 The Pythagorean Theorem The Pattern In General Theorem</p>
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3. Understand and apply properties of polygons.

Standard	Understanding Math PLUS Program and Lesson
<ul style="list-style-type: none"> • Quadrilaterals, including squares, rectangles, parallelograms, trapezoids, rhombi • Regular polygons 	<p>MAT+ <u>Understanding Measurement and Geometry</u> Topic 2: Perimeter and Area of Polygons Polygons... What Are They? Concept A Triangle is A Quadrilateral is A Pentagon is A Hexagon is An Octagon is Classify Polygons</p>
<ul style="list-style-type: none"> • Sum of measures of interior angles of a polygon 	<p>MAT+ <u>Understanding Measurement and Geometry</u> Topic 6: Angles and Polygons Angles in Polygons Methods 1,2 Exterior Angles in a Polygon Practice Questions; Topic Test</p>
<ul style="list-style-type: none"> • Which polygons can be used alone to generate a tessellation and why 	<p>MAT+ <u>Understanding Graphing</u> Topic 4: Transformations Tessellations Introduction Examples 1 through 6</p>

4. Understand and apply the concept of similarity.

Standard	Understanding Math PLUS Program and Lesson

<ul style="list-style-type: none"> Using proportions to find missing measures Scale drawings Models of 3D objects 	<p>MAT+ Understanding Measurement and Geometry Topic 8 : Projective Geometry An Introduction Toothpicks on Isometric Dot Paper Toothpicks to Cube The Views Using Isometric Grid Paper Orthographic Projections: Introduction The Cube Tool Introduction Tutorial Play with Tool Given Solid – Build it Examples 1 through 6</p>
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5. Use logic and reasoning to make and support conjectures about geometric objects.

B. Transforming Shapes

1. Understand and apply transformations.

Standard	Understanding Math PLUS Program and Lesson
<ul style="list-style-type: none"> Finding the image, given the pre-image, and vice-versa Sequence of transformations needed to map one figure onto another Reflections, rotations, and translations result in images congruent to the pre-image Dilations (stretching/shrinking) result in images similar to the pre-image 	<p>MAT+ Understanding Graphing Topic 4: Transformations Translations Object to Image We Say, We Write Translation Mapping Rule Examples Reflections Object to Image We Say, We Write Reflection Mapping Rule Rotations Object to Image We Say, We Write Rotation Mapping Rule Examples</p>

	Dilatations Object to Image We Say, We Write Dilatation Mapping Rule Examples
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2. Use iterative procedures to generate geometric patterns.

Standard	Understanding Math PLUS Program and Lesson
<ul style="list-style-type: none"> • Fractals (e.g., the Koch Snowflake) • Self-similarity • Construction of initial stages 	MAT+ Understanding Measurement and Geometry Topic 7: Constructions Before You Begin In This Topic Perpendicular Bisector Circumcircle Centroid Angle Bisector
<ul style="list-style-type: none"> • Patterns in successive stages (e.g., number of triangles in each stage of Sierpinski's Triangle) 	

C. Coordinate Geometry

1. Use coordinates in four quadrants to represent geometric concepts.
2. Use a coordinate grid to model and quantify transformations (e.g., translate right 4 units).

MAT+ Understanding Graphing Topic 4: Transformations Translations Object to Image We Say, We Write Translation Mapping Rule Examples Reflections Object to Image We Say, We Write Reflection Mapping Rule Examples Rotations Object to Image

We Say, We Write
Rotation Mapping Rule
Examples
Dilations
Object to Image
We Say, We Write
Dilatation Mapping Rule
Examples
Practice Questions; Topic Test

D. Units of Measurement

1. Solve problems requiring calculations that involve different units of measurement within a measurement system (e.g., 4'3" plus 7'10" equals 12'1").
2. Use approximate equivalents between standard and metric systems to estimate measurements (e.g., 5 kilometers is about 3 miles).

MAT+ Understanding Measurement and Geometry

Topic 1: An Introduction to Measurement

Benchmarks

Establishing Benchmarks
Meter Benchmarks
Foot Benchmarks
Centimeter Benchmarks
Inch Benchmarks
Yard Benchmarks
Our Benchmarks
Using Benchmarks
Converting Between Metric Units
My Body
Rudy's Run

3. Recognize that the degree of precision needed in calculations depends on how the results will be used and the instruments used to generate the measurements.
4. Select and use appropriate units and tools to measure quantities to the degree of precision needed in a particular problem-solving situation.
5. Recognize that all measurements of continuous quantities are approximations.

Understanding Math PLUS...Understanding Measurement and Geometry...All Lessons

6. Solve problems that involve compound measurement units, such as speed (miles per hour), air pressure (pounds per square inch), and population density (persons per square mile).

E. Measuring Geometric Objects

1. Develop and apply strategies for finding perimeter and area.

Standard	Understanding Math PLUS Program and Lesson
<ul style="list-style-type: none"> Geometric figures made by combining triangles, rectangles and circles or parts of circles 	<p>MAT+ <u>Understanding Measurement and Geometry</u> Topic 3: The Circle Area of a Circle Recall Area Area Exploration #1, #2 Example 1 – Wheel Example 2 – Pizza Example 3 – The Semi-circle Example 4 – The Dog’s Run Example 5 – The Hockey Rink</p>
<ul style="list-style-type: none"> Estimation of area using grids of various sizes 	<p>MAT+ <u>Understanding Measurement and Geometry</u> Topic 2: Perimeter and Area of Polygons Amount of Surface The Driveway – An Introduction to Area Area – Estimation</p> <p>Topic 3: The Circle Area of a Circle Recall Area Area Exploration #1, #2 Example 1 – Wheel Example 2 – Pizza Example 3 – The Semi-circle Example 4 – The Dog’s Run Example 5 – The Hockey Rink</p>
<ul style="list-style-type: none"> Impact of a dilation on the perimeter and area of a 2-dimensional figure 	<p>MAT+ <u>Understanding Graphing</u> Topic 4: Transformations Dilatations Object to Image We Say, We Write Dilatation Mapping Rule Examples</p>

2. Recognize that the volume of a pyramid or cone is one-third of the volume of the prism or cylinder with the same base and height (e.g., use rice to compare volumes of figures with same base and height).

<p>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</p>

3. Develop and apply strategies and formulas for finding the surface area and volume of a three-dimensional figure.

Standard	Understanding Math PLUS Program and Lesson
<ul style="list-style-type: none"> Volume - prism, cone, pyramid 	<p>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</p>
<ul style="list-style-type: none"> Surface area - prism (triangular or rectangular base), pyramid (triangular or rectangular base) 	<p>MAT+ Understanding Measurement and Geometry Topic 4: Solids: Volume and Surface Area Surface Area of a Solid The Concept Surface Area of a Pyramid Surface Area of a Cylinder Surface Area of a Sphere</p>
<ul style="list-style-type: none"> Impact of a dilation on the surface area and volume of a three-dimensional figure 	

4. Use formulas to find the volume and surface area of a sphere.

<p>MAT+ Understanding Measurement and Geometry Topic 4: Solids: Volume and Surface Area Surface Area of a Solid Surface Area of a Sphere</p>

4.3 Patterns and Algebra

A. Patterns

1. Recognize, describe, extend, and create patterns involving whole numbers and rational numbers, and integers.

Standard	Understanding Math PLUS Program and Lesson
<ul style="list-style-type: none"> • Descriptions using tables, verbal rules, simple equations, and graphs, simple equations or expressions 	MAT+ Understanding Equations 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
<ul style="list-style-type: none"> • Finite and infinite sequences 	
<ul style="list-style-type: none"> • Arithmetic sequences (i.e., sequences generated by repeated addition of a fixed number, positive or negative) 	
<ul style="list-style-type: none"> • Geometric sequences (i.e., sequences generated by repeated multiplication by a fixed positive ratio, greater than 1 or less than 1) 	
<ul style="list-style-type: none"> • Generating sequences by using calculators to repeatedly apply a formula 	

B. Functions and Relationships

1. Graph functions, and understand and describe their general behavior.

Standard	Understanding Math PLUS Program and Lesson
<ul style="list-style-type: none"> • Equations involving two variables 	MAT+ Understanding Equations Topic 3: Solving Two-step Equations Our Problem Concepts – Examples with Tiles Examples 1 through 4 Concepts – Examples without Tiles Practice Questions; Topic Test
<ul style="list-style-type: none"> • Rates of change (informal notion of slope) 	MAT+ Understanding Graphing Topic 7: Slope of a Line

	<p>In This Topic</p> <p>Introduction to Slope Slope when Driving A Ski Slope Slope of Roof</p> <p>Slope: Order, Steepness Factor, Definition Introductory Examples Examples 1,2,3,4</p>
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2. Recognize and describe the difference between linear and exponential growth, using tables, graphs, and equations.

C. Modeling

1. Analyze functional relationships to explain how a change in one quantity can result in a change in another, using pictures, graphs, charts, and equations.

<p><u>MAT+ Understanding Graphing</u></p> <p>Topic 5: Relations, Equations, and Functions</p> <p>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</p>	
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2. Use patterns, relations, symbolic algebra, and linear functions to model situations.

<p>Standard</p> <ul style="list-style-type: none"> Using manipulatives, tables, graphs, verbal rules, algebraic expressions/equations/inequalities 	<p>Understanding Math PLUS Program and Lesson</p> <p><u>MAT+ Understanding Equations</u></p> <p>Topic 7: Solving Inequalities</p> <p>Comparing Integers The Integer Line Example 1 ... Great Than; Example 2 ... Less Than Explanation Example 3 ... Greater Than; Example 4 ... Less Than Greater Than or Less Than Inequalities</p>
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<ul style="list-style-type: none"> • Growth situations, such as population growth and compound interest, using recursive (e.g., NOW-NEXT) formulas (cf. science standard 5.5 and social studies standard 6.6) 	<p>What are They? Inequality vs. Equation Summary of Relationships Inequality on the Number Line Examples 1-4</p>
	<p>MAT+ <u>Understanding Percent</u> Topic 7: Percent in Business Compound Interest What is it? Complete the Table Formula Spreadsheet Interest Calculator Bank Interest</p>

D. Procedures

1. Use graphing techniques on a number line.

	<p>Understanding Math PLUS Program and Lesson</p>
<ul style="list-style-type: none"> • Absolute value 	<p>MAT+ <u>Understanding Equations</u> Topic 8: Solving Absolute Value Equations Absolute Value... What is it? Concept Examples 1,2 Summary Absolute Value Equations in 1 Variable Examples 1,2</p>
<ul style="list-style-type: none"> • Arithmetic operations represented by vectors (arrows) (e.g., "$-3 + 6$" is "left 3, right 6") 	

2. Solve simple linear equations informally and graphically, and using formal algebraic methods.

	<p>Understanding Math PLUS Program and Lesson</p>
<ul style="list-style-type: none"> • Multi-step, integer coefficients only (although answers may not be integers) 	<p>MAT+ <u>Understanding Algebra</u> Topic 4: Patterns, Formulas, Substitution Patterns to Formulas Example... Hockey Standings Example... Counting Money Example... Angles in a Polygon</p>

<ul style="list-style-type: none"> Using paper-and-pencil, calculators, graphing calculators, spreadsheets, and other technology 	Substitution is...Math Scrabble Scrabble 1,2,3 Challenge
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3. Create, evaluate, and simplify algebraic expressions involving variables.

<p><u>MAT+ Understanding Algebra</u> <i>All Topics</i></p>

**4. Create, evaluate, and simplify algebraic expressions involving variables.
 Standard**

	Understanding Math PLUS Program and Lesson
<ul style="list-style-type: none"> Order of operations, including appropriate use of parentheses 	<p><u>MAT+ Understanding Whole Numbers and Integers</u> Topic 9: Order of Operations BEDMAS Example Questions Examples 1 through 10 Word Problems Shipping Babysitting Garbage Practice Questions; Topic Test</p>
<ul style="list-style-type: none"> Distributive property 	
<ul style="list-style-type: none"> Substitution of a number for a variable 	<p><u>MAT+ Understanding Algebra</u> Topic 4: Patterns, Formulas, Substitution Patterns to Formulas Example...Hockey Standings Example...Counting Money Example...Angles in a Polygon Substitution is...Math Scrabble Scrabble 1,2,3 Challenge</p>
<ul style="list-style-type: none"> Translation of a verbal phrase or sentence into an algebraic expression, equation, or inequality, and vice versa 	<p><u>MAT+ Understanding Algebra</u> Topic 2: Tiles and Algebra Pictures to Words to Algebraic Expressions Examples 1,2 Algebraic Expressions to Tiles</p>

	Examples 1,2,3
5. Understand and apply the properties of operations, numbers, equations, and inequalities.	
Standard	Understanding Math PLUS Program and Lesson
<ul style="list-style-type: none"> Additive inverse Multiplicative inverse Addition and multiplication properties of equality Addition and multiplication properties of inequalities 	MAT+ <u>Understanding Equations</u> Topic 7: <u>Solving Inequalities</u> Solving Inequalities Examples 1-6

Data Analysis, Probability, and Discrete Mathematics

A. Data Analysis

1. Select and use appropriate representations for sets of data, and measures of central tendency (mean, median, and mode).	
Standard	Understanding Math PLUS Program and Lesson
<ul style="list-style-type: none"> Type of display most appropriate for given data Box-and-whisker plot, upper quartile, lower quartile Scatter plot 	MAT+ <u>Understanding Graphing</u> Topic 2: <u>Statistics</u> Presenting Data Scatter Plot Examples 1 & 2 Box and Whisker Plots Concepts Examples 1, 2
<ul style="list-style-type: none"> Calculators and computer used to record and process information Finding the median and mean (weighted average) using frequency data. Effect of additional data on measures of central tendency 	MAT+ <u>Understanding Graphing</u> Topic 2: <u>Statistics</u> Measures of Central Tendency Introduction The Mean Average

	<p>The Median Average The Mode Summary Another Example Adding Data Points</p>
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2. Make inferences and formulate and evaluate arguments based on displays and analysis of data.

3. Estimate lines of best fit and use them to interpolate within the range of the data.

MAT+ Understanding Graphing

Topic 6: Linear Relations

Line of Best Fit

Examples 1, 2

4. Use surveys and sampling techniques to generate data and draw conclusions about large groups.

B. Probability

1. Interpret probabilities as ratios, percents, and decimals.

MAT+ Understanding Probability

All Topics

2. Determine probabilities of compound events.

MAT+ Understanding Probability

Topic 3: Dice Probabilities

Roll One Die

Your Experiment

Computer's Experiment

Theoretical Experiment

Patterns

Summary

Roll Two Dice

Your Experiment

Computer's Experiment

Theoretical Experiment

Patterns

Summary

Practice Questions; Topic Test

3. Explore the probabilities of conditional events (e.g., if there are seven marbles in a bag, three red and four green, what is the probability that two marbles picked from the bag, without replacement, are both red).
4. Model situations involving probability with simulations (using spinners, dice, calculators and computers) and theoretical models.
5. Estimate probabilities and make predictions based on experimental and theoretical probabilities.

<p><u>MAT+ Understanding Probability</u> Topic 2: What's the Chance Experimental Probability Introduction Examples 1,2 Practice Questions; Topic Test</p>

6. Play and analyze probability-based games, and discuss the concepts of fairness and expected value.

C. Discrete Mathematics—Systematic Listing and Counting

1. Apply the multiplication principle of counting.

Standard	Understanding Math PLUS Program and Lesson
<ul style="list-style-type: none"> • Permutations: ordered situations with replacement (e.g., number of possible license plates) vs. ordered situations without replacement (e.g., number of possible slates of 3 class officers from a 23 student class) • Factorial notation • Concept of combinations (e.g., number of possible delegations of 3 out of 23 students) 	

2. Explore counting problems involving Venn diagrams with three attributes (e.g., there are 15, 20, and 25 students respectively in the chess club, the debating team, and the engineering society; how many different students belong to the three clubs if there are 6 students in chess and debating, 7 students in chess and engineering, 8 students in debating and engineering, and 2 students in all three?).
3. Apply techniques of systematic listing, counting, and reasoning in a variety of different contexts.

D. Discrete Mathematics—Vertex-Edge Graphs and Algorithms

1. Use vertex-edge graphs and algorithmic thinking to represent and find solutions to practical problems.

Standard	Understanding Math PLUS Program and
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	Lesson
<ul style="list-style-type: none"> Finding the shortest network connecting specified sites 	
<ul style="list-style-type: none"> Finding the shortest route on a map from one site to another 	
<ul style="list-style-type: none"> Finding the shortest circuit on a map that makes a tour of specified sites 	
<ul style="list-style-type: none"> Limitations of computers (e.g., the number of routes for a delivery truck visiting n sites is $n!$, so finding the shortest circuit by examining all circuits would overwhelm the capacity of any computer, now or in the future, even if n is less than 100) 	

4.5 Mathematical Processes

A. Problem Solving

- Learn mathematics through problem solving, inquiry, and discovery.
Understanding Math PLUS ... *All Programs*

- Solve problems that arise in mathematics and in other contexts (cf. workplace readiness standard 8.3).

Standard	Lesson
<ul style="list-style-type: none"> Open-ended problems Non-routine problems Problems with multiple solutions Problems that can be solved in several ways 	<p style="text-align: center;">Understanding Math PLUS Program and Lesson</p> <p>MAT+ Understanding Equations Topic 5: Word Problems Words and Symbols The Translation Machine Examples 1,2,3,4 The Trick Machine Instructions The Machine Explanation with Picture; with Symbols Area of Walls Chemistry Pools 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 Summary: Problem Solving Using Equations Practice Questions; Topic Test</p>

3. Select and apply a variety of appropriate problem-solving strategies (e.g., "try a simpler problem" or "make a diagram") to solve problems.

4. Pose problems of various types and levels of difficulty.

5. Monitor their progress and reflect on the process of their problem solving activity.

Standard	Understanding Math PLUS Program and Lesson
MAT+ <u>Understanding Equations</u> Topic 5: Word Problems ALL SECTIONS	

B. Communication

1. Use communication to organize and clarify their mathematical thinking.

Standard	Understanding Math PLUS Program and Lesson
<ul style="list-style-type: none"> • Reading and writing 	
<ul style="list-style-type: none"> • Discussion, listening, and questioning 	

2. Communicate their mathematical thinking coherently and clearly to peers, teachers, and others, both orally and in writing.

3. Analyze and evaluate the mathematical thinking and strategies of others.

4. Apply mathematics in practical situations and in other disciplines.

5. Trace the development of mathematical concepts over time and across cultures (cf. world languages and social studies standards).

6. Understand how mathematical ideas interconnect and build on one another to produce a coherent whole.

D. Reasoning

1. Recognize that mathematical facts, procedures, and claims must be justified.

2. Use reasoning to support their mathematical conclusions and problem solutions.

3. Select and use various types of reasoning and methods of proof.

4. Rely on reasoning, rather than answer keys, teachers, or peers, to check the correctness of their problem solutions.

2. Make and investigate mathematical conjectures.

Standard	Understanding Math PLUS Program and Lesson
<ul style="list-style-type: none"> • Counterexamples as a means of disproving conjectures • Verifying conjectures using informal reasoning or proofs. 	

6. Evaluate examples of mathematical reasoning and determine whether they are valid.

E. Representations

1. Create and use representations to organize, record, and communicate mathematical ideas.

Standard	Understanding Math PLUS Program and Lesson
<ul style="list-style-type: none"> • Concrete representations (e.g., base-ten blocks or algebra tiles) 	
<ul style="list-style-type: none"> • Pictorial representations (e.g., diagrams, charts, or tables) 	
<ul style="list-style-type: none"> • Symbolic representations (e.g., a formula) 	
<ul style="list-style-type: none"> • Graphical representations (e.g., a line graph) 	

2. Select, apply, and translate among mathematical representations to solve problems.

3. Use representations to model and interpret physical, social, and mathematical phenomena.

F. Technology

1. Use technology to gather, analyze, and communicate mathematical information.

2. Use computer spreadsheets, software, and graphing utilities to organize and display quantitative information.

3. Use graphing calculators and computer software to investigate properties of functions and their graphs.

4. Use calculators as problem-solving tools (e.g., to explore patterns, to validate solutions).

5. Use computer software to make and verify conjectures about geometric objects.

6. Use computer-based laboratory technology for mathematical applications in the sciences.

Understanding Math PLUS...All Sections and Programs

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