• Overview of Math-U-See levels

• <u>Primer</u>

- Primer is for students that are just beginning to show interest in math and beginning to count. This book is a non-mastery book. It is not essential that students master everything in this book before moving to the next level. The concepts covered in *Primer* will be covered again in the next levels. This is the only level where we say that mastery is not required. In the *Primer* level children will learn writing numerals, adding and subtracting, basic counting, skip counting, geometric shapes, telling time; also, they will be introduced to the manipulative block system. It's a gentle introduction to "doing math."
- Major concepts and skills include:
 - Counting objects and developing numeracy
 - Understanding place value
 - Recognizing number names and symbols
 - \circ Reading and writing numerals
 - \circ ~ Understanding addition and subtraction with concrete and representational models
 - Understanding and writing the symbols +, -, and =
 - o Addition and subtraction of select numbers
- Additional concepts and skills:
 - Telling and writing time by hours and minutes
 - o Recognizing and drawing rectangles, squares, and circles
 - Measuring length by repeating units
 - Introducing halves and fourths
 - Counting by 2s, 5s, 10s, and 100s
 - Reading, writing and interpreting word problems
- Alpha
 - This is our first formal instruction book. We really want to move at the child's pace. Each book going forward has approximately 30 lessons which generally last one week each, but that doesn't mean that is how long a lesson will take. If a student needs two weeks to master the concepts in the lesson, then the parent should take that much time, but if they master it in 3 days, that is fine, too. *Alpha* focuses on teaching the concepts of single-digit addition and subtraction. We use systematic teaching strategies to help students commit the addition and subtraction facts to memory.

• Major concepts and skills include:

- Understanding place value
- Extending the counting sequence
- Fluently adding all single-digit numbers
- Solving for an unknown addend
- Understanding the relationship between addition and subtraction
- Fluently subtracting all single-digit numbers

• Additional concepts and skills:

- o Telling and writing time by hours and minutes
- Recognizing and drawing rectangles, squares, and circles
- Measuring length by repeating units
- o Introducing halves and fourths
- Counting by 2s, 5s, 10s, and 100s
- Reading, writing, and interpreting word problems

- <u>Beta</u>
 - This level covers addition and subtraction for multiple-digit numbers and other topics.
 Beta builds on the foundation in *Alpha* by applying students' mastery of single-digit addition and subtraction to multiple-digit addition and subtraction. One of the stepping stones between these two levels is the concept of place value, which is an important milestone for truly grasping any multiple-digit operation.
- Major concepts and skills include:
 - o Understanding place value and using it to add or subtract
 - Fluently adding any combination of whole numbers
 - o Solving for an unknown addend
 - Fluently subtracting any combination of whole numbers
 - o Solving abstract and real-world problems involving addition and subtraction

• Additional concepts and skills:

- Telling and writing time by hours and minutes
- Understanding, adding, and subtracting U.S. currency
- o Measuring and estimating length with inches, feet, centimeters, and meters
- Comparing numbers and lengths
- o Expressing differences between numbers as inequalities
- Finding the perimeter of any polygon
- o Representing and interpreting data in plots and graphs
- <u>Gamma</u>
 - This level covers multiplication for single and multiple-digit numbers and other topics. Once students have mastered the concepts of addition and subtraction (covered in *Alpha* and *Beta*), they are ready for multiplication. *Gamma* teaches single-digit facts and multiple-digit multiplication skills.

• Major concepts and skills include:

- o Using strategies based on place value and properties of operations to multiply
- Fluently multiplying any combination of whole numbers
- Solving for an unknown factor
- Solving abstract and real-world problems involving addition, subtraction, and multiplication
- Measuring and computing area
- o Relating concepts of area to addition and multiplication

• Additional concepts and skills:

- Skip counting as a precursor to multiplication
- Adding and subtracting time in hours and minutes
- o Multiplying, adding, and subtracting U.S. currency and standard units of measure
- Representing, recording, and interpreting data
- Understanding of basic fractions
- Estimating and solving measurement problems

- <u>Delta</u>
 - Delta covers division for single and multiple-digit numbers and other topics. Division is presented as the inverse of multiplication. Single-digit division facts are learned, and the concepts of division and place value are applied when solving long division problems.

• Major concepts and skills include:

- o Using strategies based on place value and properties of operations to divide
- Understanding division as solving for an unknown factor
- Fluently dividing any combination of whole numbers
- Solving abstract and real-world problems involving all four operations
- o Interpreting remainders in short and long division
- o Understanding fraction notation in light of division

Additional concepts and skills:

- o Reading and writing Roman numerals
- o Dividing, multiplying, adding, and subtracting U.S. currency and standard units of measure
- Understanding angle measure and geometric shapes including points, segments, rays, and lines
- o Classifying shapes based on defining attributes
- o Understanding and computing area and volume

• Epsilon

 This level covers fractions and other topics. Now that students have learned basic operations with whole numbers, *Epsilon* covers these same operations with fractions. Fractions are presented in an intuitive way with visual explanations of equivalent fractions, common denominators, and fractions and numbers greater than 1. Fractions and operations are illustrated using our proprietary Fraction Overlay manipulatives.

• Major concepts and skills include:

- Recognizing and generating equivalent fractions
- Understanding addition, subtraction, multiplication, and division of fractions and mixed numbers
- o Fluently adding, subtracting, multiplying, and dividing fractions and mixed numbers

• Additional concepts and skills:

- Using multiple strategies to recognize common factors
- Understanding grouping symbols and their effect on order of operations
- Interpreting and solving word problems
- Comparing, and converting decimal fractions
- Finding the area and circumference of circles
- Classifying quadrilaterals
- o Representing fractions and fractional measurements on line plots and number lines
- o Using coordinates to represent ordered relationships

• <u>Zeta</u>

 Zeta covers decimals, percentages, and other topics. Zeta extends the student's concept of place value to the right of the decimal point. Students learn to complete core operations with decimals. The connection between fractions and decimals is presented.

• Major concepts and skills include:

- Expanding understanding of place value from positive powers of ten to include decimals
- Fluently adding, subtracting, multiplying, and dividing multiple digit decimals using place value strategies
- Solving real-world problems with decimals and percentages
- Understanding the metric system and converting from one unit of measure to another

• Additional concepts and skills:

- Understanding and simplifying exponents
- Understanding negative numbers and representing them on the coordinate plane
- \circ \quad Using properties of operations to simplify and evaluate algebraic expressions
- Interpreting and graphing relationships between dependent and independent variables
- Understanding of plane geometry and geometric symbols
- Using ratio reasoning to solve problems

Pre-Algebra

Pre-Algebra covers negative numbers, the order of operations, solving for the unknown, and 0 other topics. We lay the foundation for success in Algebra 1 and Geometry. One of the concepts covered is negative numbers.

Table of Contents

- **Negative Numbers: Addition**
- Negative Numbers: Subtraction
- Negative Numbers: Multiplication
- Negative Numbers: Division
- Whole Numbers
- Integers
- Number Line
- Exponents
- Place Value
- **Expanded and Exponential Notation**
- **Negative Numbers: Exponents** •
- **Roots and Radicals**
- Solve for an Unknown with Additive Inverse
- Pythagorean Theorem
- Associative Property
- **Commutative Property**
- **Distributive Property**
- Solve for an Unknown with Multiplicative Inverse
- Solve for an Unknown with Order of Operations
- Surface Area of a Solid

- **Convert Celsius to Fahrenheit**
- **Convert Fahrenheit to Celsius**
- Absolute Value
- **Ratio and Proportion**
- Similar Polygons
- **Prime Factorization**
- Least Common Multiple
- Greatest Common Factor
- **Polynomials: Addition**
- Volume of a Cylinder
- Polynomials: Multiplication ٠
- Adding and Subtracting Time
- "Same Difference" Theorem
- Volume of a Cone and a Pyramid
- Military Time: Addition and Subtraction
- Measurement: Addition and Subtraction
- Irrational Numbers
- Square Root Formula
- Real Numbers

Algebra 1

Graphing, simultaneous equations, exponents, polynomials, unit multipliers, and more. 0

Table of contents

- Commutative and Associative Properties
- Order of Operations
- Solving for an Unknown with One Variable
- **Distributive Property**
- **Cartesian Coordinates**
- Graphing a Line
- Slope-Intercept Formula
- Graphing Parallel Lines and the Equation of a Line
- **Graphing Perpendicular Lines**
- Finding the Slope-Intercept Formula with **Different Givens**
- **Graphing Inequalities**
- Solving Simultaneous Equations by Graphing
- Solving Simultaneous Equations by Substitution
- Solving Simultaneous Equations by Elimination
- **Coin Problems**
- **Consecutive Integers**
- Multiplication and Division with Exponents

- Negative Exponents and Raising Exponents to a Power
- Addition and Multiplication of Polynomials
- •
- Factor Trinomials with Coefficients •
- Factor Trinomials with Negative Numbers
- Square Roots and Dividing Polynomials
- Difference of Two Squares and Oriental Squares
- **Repeated Factoring of Polynomials**
- **Unit Multipliers** •
- Square Unit Multipliers •
- **Metric Conversions**
- Fractional Exponents
- Significant Digits and Scientific Notation
- Bases Other Than Ten •
- Graphing a Circle and an Ellipse
- Graphing a Parabola and a Hyperbola •

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- **Factor Polynomials**

- Solving Equations with Factoring

<u>Geometry</u>

 Points, lines, planes, angles, circles, triangles, quadrilaterals, the Pythagorean theorem, conic sections, proofs, and more

Table of Contents

- Points, Lines, Rays, and Line Segments
- Planes and Sets
- Angles
- Types of Angles
- Parallel and Perpendicular Lines with Midpoints and Bisectors
- Supplementary and Complementary Angles
- Transversals with Interior and Exterior Angles
- Perimeter of a Rectangle, Triangle, Parallelogram, and Trapezoid
- Area of a Rectangle, Triangle, Parallelogram, and Trapezoid
- Constructing and Identifying Triangles
- Regular Polygons
- Geometry of a Circle, Sphere, and Ellipse
- Inscribed and Circumscribed Figures
- Area and Circumference of a Circle
- Area of an Ellipse
- Latitude and Longitude
- Volume of Rectangular Solid and Cylinder
- Volume of Pyramid, Cone, Prism, and Sphere

- Surface Area of Solids
- Radicals
- Pythagorean Theorem
- More on Radicals
- Special Triangles: 45°-45°-90°
- Special Triangles: 30°-60°-90°
- Axioms and Postulates
- Corresponding Parts of Triangles and Remote Interior Angles
- Proving Triangles Congruent with SSS and SAS
- Proving Triangles Congruent with ASA and AAS
- Proving Triangles Congruent with HL, LL, HA, and LA
- Proving Triangles Similar with AA and Proportion or Ratio
- Transformational Geometry
- Trigonometric Functions: Sine, Cosine, and Tangent
- Inverse Trigonometric Functions: Secant, Cosecant, and Cotangent
- $Sin^2 + Cos^2 = 1$

Algebra 2

 Factoring polynomials, the quadratic formula, graphing conic sections, and other advanced algebra topics

Table of Contents

- Exponents
- Rational Expressions
- Scientific Notation
- Combining Like Terms
- Radicals: Basic Operations and Simplifying
- Factoring Polynomials
- Fractional Exponents
- Solving Equations with Rational Expressions
- Imaginary and Complex Numbers
- Conjugate Numbers
- Cubes and Pascal's Triangle
- Binomial Theorem
- Completing the Square
- Quadratic Formula
- Discriminants
- Applications Using Percent
- Isolating a Variable
- Ratios
- Unit Multipliers and Metric Conversions

- Distance = Rate x Time
- Motion Problems
- Graphing Lines
- Graphing Parallel and Perpendicular Lines
- Graphing Inequalities
- Distance Formula and Midpoint Formula
- Conic Sections: Circle and Ellipse
- Conic Sections: Parabola
- Parabola: Maxima and Minima
- Conic Sections: Hyperbola
- Solving Systems of Equations: Lines and Conic Sections
- Coin Problems
- Consecutive Integers
- Chemical Mixtures
- Age and Boat in the Current Problems
- Solving Equations with Three Variables
- Vectors

• <u>Pre-Calculus</u>

• Trigonometry, identities, polar equations, logarithms, sequences, limits and other topics to prepare for calculus

Table of contents

- Pythagorean Theorem
- Special Right Triangles: 30°- 60°- 90° and 45°- 45°- 90°
- Trigonometric Ratios
- Inverse Trigonometric Ratios
- Interpreting the Trigonometry Tables
- Using the Trig. Table to Solve for the Unknown
- Using a Calculator and Arc Functions
- Angles of Elevation and Depression
- Angles Less than 0°
- Angles Greater than 360°
- Reference Angles
- Cofunctions
- Negative Angle Relationships
- Proving Trigonometric Identities
- Sum and Difference Identities
- Double-Angle and Half-Angle Identities
- Law of Sines
- Law of Cosines
- Ambiguity in the Law of Sines
- Radian Measure
- Polar Coordinates and Rectangular Coordinates
- Polar Equations and Polar Graphs
- Vectors
- Functions: Relation, Domain, and Range
- Graphing the Sine and Cosine Functions
- Graphing the Secant and Cosecant Functions
- Graphing the Tangent and Cotangent Functions
- Logarithms
- Arithmetic Sequences and Series
- Geometric Sequences and Series
- Proof of Cos (A B) = Cos A Cos B + Sin A Sin B
- Finding the Area of a Triangle Trigonometrically
- Interpolation
- Navigation
- Natural Logarithms
- Equations with Absolute Value
- Equations with Radicals
- Inequalities with Absolute Value
- Inequalities with Radicals
- Limits

Calculus

o Derivatives, integrals, calculus applications, differential equations, and more

Table of Contents

- Terminology and Graphing
- Quadratic Equations
- Review of Conic Sections
- Review of Systems of Equations
- Functions
- Review of Trigonometry
- Review of Exponents and Logarithms
- Limits
- Continuity in Limits
- Definition of a Derivative
- Derivative Rules
- Chain Rule
- Derivatives of Trigonometric Functions
- Derivatives of e^x and ln x
- Implicit Differentiation
- Graphing with the First Derivative
- Graphing with the Second Derivative
- Mean Value Theorem
- L'Hopital's Rule
- Physics Applications
- Economics Applications
- Optimization Applications
- Related Rates
- Antiderivatives
- Integration Formulas
- Area Under a Curve
- Definite Integrals
- Area Between Two Curves
- Inverse Trigonometric Functions
- Integration Using Tables
- Differential Equations
- Differential Equation Applications