

Impact Mathematics: Algebra and More for the Middle Grades Course 1 Volumes A & B
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Correlations of the TEN UNDERSTANDING MATHEMATICS Programs
By Neufeld Learning Systems
September 2004

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

The 10 programs are:

Understanding Fractions	Understanding 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 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

Chapter 1: All About Patterns

Lesson 1.1: Looking for Patterns

- To create Pascal's triangle and describe patterns that add in the creation
- To develop strategies for identifying and describing patterns
- To identify and extend visual and numeric patterns in geometric and number sequences

MAT / Understanding Algebra / Topic 3 / Introduction... Math is Pattern

- To describe observed patterns using an informal rule
- To determine a missing term in a repeating sequence

MAT / Understanding Algebra / Topic 3 / Introduction... Math is Pattern; Expressions, Terms, Variable Definitions, Summary; Examples – Patterns to Formulas

Lesson 1.2: Following Rules

- To decide whether a rule has one or more possible interpretations
- To apply rules involving two or three different operations
- To apply approximate rules and compare their results to the exact results

MAT / Understanding Algebra / Topic 3 / Introduction... Math is Pattern; Expressions, Terms, Variable: Definitions, Summary; Examples – Patterns to Formulas; Substitution is ... Math Scrabble; Substitution Examples 1 through 4; Practice Questions

MAT / Understanding Equations / Topic 5 / 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; Summary: Problem Solving Using Equations; Practice Questions

- To evaluate and compare expressions using the order of operations

MAT / Understanding Fractions / Topic 11 / Order in Addition; Order in Multiplication; Why Use Order of Operations? BEDMAS; Examples Questions; Practice Questions

Lesson 1.3: Writing Rules for Patterns

- To determine rules for hidden relationship when playing *What's My Rule?*
- To determine a rule when given an input/output table
- To explain how a rule describes a constructed geometric pattern
- To write rules connecting the term number and the total number of objects in a constructed pattern

MAT / Understanding Algebra / Topic 1 / Trick #1; Trick #2; Trick #3; Picture to Words; Summary; Practice Questions

MAT / Understanding Algebra / Topic 3 / Expressions, Terms, Variables; Examples – Patterns to formulas; Substitution is – Math Scrabble; Substitution Examples

MAT / Understanding Equations / Topic 1 / Definitions; The Meaning of "Solving an Equations"; Solve by Systematic Trials; Recall Tile Concepts; Balances... An Introduction; Tiles, Balances and Equations; Practice Questions

MAT / Understanding Equations / Topic 2 / Concepts – Examples with Tiles; Concepts – Examples without Tiles; Practice Questions

Lesson 1.4: Patterns in Geometry

- To name polygons and classify them by regularity, concavity, and line symmetry

MAT / Understanding Measurement and Geometry / Topic 2 / Polygons – What are They? Concept: A Triangle is, A Quadrilateral is, A Pentagon is, A Hexagon is, An Octagon is, Classify Polygons

- To use circle diagrams to classify objects
- To find the measure of identical angles around a vertex summing to 90° , 180° or 360°
- To estimate angle measure
- To determine whether three segments or angles could form a triangle

MAT / Understanding Measurement and Geometry / Topic 5 / In This Topic; Angles – An Introduction; The Degree; Classifying Angles: Classifications, Memory Game; Measuring Angles; Practice Questions

MAT / Understanding Measurement and Geometry / Topic 6 / Parallel Lines; Examples with Parallel Lines; Angles in Triangles: Exploration, An Explanation, Exterior Angles; Angles in Polygons: Methods 1,2, Exterior Angles in Polygon; Practice Questions

Chapter 2: All About Numbers – check internet dictionary for definitions

Lesson 2.1: Factors and Multiples

- To identify all the factors of a given number
- To understand and distinguish prime and composite numbers
- To find prime factorizations
- To find common and greatest common factors, and common and least common multiples
- To see how factors and multiples are related

Lesson 2.2: Patterns in Fractions

- To write a fraction as a mixed number and a mixed number as a fraction

MAT / Understanding Fractions / Topic 12 / The Concept; Improper Fractions and Mixed Numbers – What are They?; Introductory Problem; Mixed to Improper: Methods 1 & 2; Improper to Mixed: Examples 1,2, Practice Questions

- To find equivalent fractions
- To write fractions in lowest terms
- To compare and order fractions
- To use benchmarks to estimate the value of other fractions

MAT / Understanding Fractions / Topic 3 / Pattern Blocks; Fractions Strips; Equivalent Fractions on a Number Line; Comparison of Fractions; Equivalent Fractions in a Multiplications Table; One; Equivalent Fractions – The Pattern; Example Questions; Greatest Common Factor; Memory Game; Practice Questions

Lesson 2.3: Patterns in Decimals

- To recognize decimal place value

MAT / Understanding Percent / Topic 3 / Decimals to Fractions – Place Value

- To write decimals as fraction whose denominators are powers of 10

MAT / Understanding Fractions / Topic 5 / Expressing a Fraction as a Percent: Introduction with/without Graphics, Expressing a Fraction in Simplest Form – Examples 1 through 5, The Watering Can; Expressing a Percent as a Decimal: Introduction, Number Line #1, Decimal Strips; Expressing a Decimal as a Percent: Examples 1-3, Summary and Patterns, % Nitrogen in the Air, Batting Averages; Expressing a Fraction as a Percent: An Example, Methods 1 & 2; Number Line #2; Chart; Practice Questions

- To multiply and divide numbers by powers of 10 and represent the answers as decimals
- To measure distance in the metric system and to convert among linear

MAT / Understanding Measurement and Geometry / Topic 1 / Metric and U.S.A. Standard Measurement Systems: Related Units from Metric Prefixes, Metric Prefixes at Work, Converting Between Metric Units, The Ruler; Benchmarks; Using Benchmarks; Converting between Metric Units; My Body; Rudy's Run; Practice Questions; Topic Test

- To compare and order decimals

MAT / Understanding Percent / Topic 3 / Decimals to Fractions – Place Value

Lesson 2.4: Fractions and Decimals

- To estimate fraction and decimals equivalents
- To find decimal equivalents to fractions
- To demonstrate an understanding of repeating decimals
- To find patterns in decimal and fraction equivalents
- To order and compare fractions and decimals

MAT / Understanding Percent / Topic 2 / Percent as a Fraction: Introduction with/without Graphics, Expressing a Fraction in Simplest Form, Examples 1,2,3,4, The Watering Can; Percent as a Decimal: Introduction, Examples 1,2,3; Number Line; Practice Questions

MAT / Understanding Percent / Topic 3 / Decimals to Fractions – Place Value; Expressing a Decimal as a Percent: Examples 1,2,3, Summary and Pattern, Percent Nitrogen in Air, Batting Averages; Expressing a Fraction as a Percent: An Example, Methods 1 & 2; Percent Change; Chart; My Day; Fraction to Decimal Division Table

Lesson 2.5: Negative Numbers

- To graph positive and negative numbers on a number line

MAT / Understanding Graphing / Topic 3 / Ordered Pairs: Axis, Quadrants and Cartesian Plane, Find a Point, Order is Important, Examples

- To identify and find absolute values
- To compare and order positive and negative numbers

MAT / Understanding Integers / Topic 1 / Integers Around Us: Temperature, Helicopter, Submarine, Elevator; The Integer Line; Opposite Integers; Comparing Integers: Examples 1,2; Absolute Values: Examples 1,2; Comparing Integers: Examples 1,2,3,4; Examples Questions; Practice Questions

Chapter 3: Working with Fractions and Decimals

Lesson 3.1: Adding and Subtracting Fractions

- To add and subtract fractions using manipulatives
- To find common denominators, add and subtract fractions, and write the answers in lowest terms

MAT / Understanding Fractions / Topic 7 / Pattern Blocks: Hexagons 1,2,3, Summary; Fraction Strips: Concepts 1,2; Percent Strips: Examples 1,2; Decimal Strips: Examples 1,2; The Clock: Examples 1,2; Adding Fractions on a Numbers Line: Examples 1,2,3; Word Problems; Fraction Card Game; Magic Square

MAT / Understanding Fractions / Topic 8 / Pattern Blocks; The Clock; Fraction Strips; Percent Strips; Decimal Strips; Subtracting Fractions on a Number Line; The Lowest Common Denominator; Word Problems; Practice Questions

- To add and subtract mixed numbers

MAT / Understanding Fractions / Topic 12 / Adding Mixed Numbers

Lesson 3.2: Multiplying and Dividing with Fractions

- To multiply fractions by whole numbers
- To use an area model to conceptualize multiplying a fraction by a fraction
- To multiply two fractions using the conventional algorithm $a/b \times c/d = axb/cxd$

MAT / Understanding Fractions / Topic 9 / Pattern Blocks; Fraction Strips; Word Problems; A Summary; The Meaning of “OF”; Order in Multiplying; Multiplying Fractions with Large Numbers; Practice Questions

- To divide a whole number by a fraction by finding a missing factor
- To divide a fraction by a fraction by multiplying by its reciprocal

MAT / Understanding Fractions / Topic 10 / Understanding Division; Examples with Diagrams; Patterns from Examples; Another Example; Examples without Diagrams; Practice Questions

Lesson 3.3: Multiplying and Dividing with Decimals

- To estimate the product of a whole number and a decimal
- To determine the number of decimal places when multiplying two decimals
- To multiply and divide any number by powers of 10
- To estimate the quotient when dividing by a decimal
- To determine whether to multiply or divide given a real-world problem involving decimals

Chapter 4: Making Sense of Percents

Lesson 4.1: Using Percents

- Students write percents, decimals, and fractions for shaded parts of 100-grids. Estimate what percent of a square is shaded.
- Students collect data and use them to estimate and calculate percents. They use their results to construct a circle graph.
- Students use fractions and percents to compare different-sized groups.
- Students focus on equivalent fractions, decimals, and percents. They use number lines to record equivalent ways of writing the same number.

MAT / Understanding Percent / Topic 2 / Percent as a Fraction: Introduction with/without Graphics, Expressing a Fraction in Simplest Form, Examples 1,2,3,4, The Watering Can; Percent as a Decimal: Introduction, Examples 1,2,3; Number Line; Practice Questions

MAT / Understanding Percent / Topic 3 / Decimals to Fractions – Place Value; Expressing a Decimal as a Percent: Examples 1,2,3, Summary and Pattern, Percent Nitrogen in Air, Batting Averages; Expressing a Fraction as a Percent: An Example, Methods 1 & 2; Percent Change; Chart; My Day; Fraction to Decimal Division Table; Practice Questions

MAT / Understanding Graphing / Topic 2 / Circle or Pie Graphs : Examples 1,2

Lesson 4.2: Finding Percent of a Quantity

- Students practice finding 1% of a quantity and using that information to calculate another percent of the same quantity.

MAT / Understanding Percent / Topic 5 / In This Topic; The Concept; Examples

- Students use benchmarks to estimate a percent of a quantity and calculate percents in real-world contexts.

MAT / Understanding Percent / Topic 6 / In This Topic; Steps in Solving Problems; Finding the Percent; Percent of a Number

Lesson 4.3: Percents and Wholes

- Finding the Percent
- Finding the Whole

MAT / Understanding Percent / Topic 6 / Finding the Whole: Recall Proportion, School Population – Methods 1 & 2, Grades Problem 1 & 2, Bike Sale – Methods 1 & 2; Percent of a Number: Earnings Problem, Nickel Ore

Chapter 5: Exploring Graphs

Lesson 5.1: Interpreting Graphs

- To interpret points on a qualitative graph
- To understand the meaning of *variable* as it relates to graphing with horizontal and vertical axes
- To analyze the relationship between the variables on a graph

MAT / Understanding Graphing / Topic 1 / Graphs without a Scale: Concept...Age and Weight: Examples 1 through 12; Graphs with a Scale: Concept...Distance and Time, Examples 1 through 9; Discrete Data; Continuous Data; Extrapolation; Practice Questions

- To understand the difference between line and point graphs

MAT / Understanding Graphing / Topic 2 / Line Graph: Examples 1,2

Lesson 5.2: Drawing and Labelling Graphs

- To create graphs that describe a story relating two variables that change over time
- To plot points in the first quadrant of a coordinate grid

MAT / Understanding Graphing / Topic 3 / In This Topic; Josh's Neighborhood; Grids on Maps; Ordered Pairs: Axis, Quadrants and Cartesian Plane, Find a Point, Order is Important, Examples; Shapes, Battleship

- To observe any patterns, or trends, in data and use them to make predictions
- To determine an appropriate scale for a set of data

MAT / Understanding Graphing / Topic 2 / Data...What is it?; An Introduction – Examples of Data 1 through 6; Statistics – What is it?; Collecting Data: Throw a Die, Throw 2 Dice, Voting, Primary Data, Secondary Data – Gathering Methods

Lesson 5.3: Using Graphs to Find Relationships

- To collect, graph, and interpret data
- To analyze and describe trends in data
- To use graphs to make predictions
- To describe graphs that show growth over time
- To determine whether points on a graph should be connected with a solid line, a dashed line, or not at all

MAT / Understanding Graphing / Topic 2 / Data...What is it?; An Introduction – Examples of Data 1 through 6; Collecting Data: Throw a Die, Throw 2 Dice, Voting, Primary Data, Secondary Data – Gathering Methods; Presenting Data: Stem-and-Leaf Diagram; Bar Graph; Histogram; Line Graph; Circle or Pie Graphs; Scatter Plots; Measures of Central Tendency: The Mean Average, The Median Average, The Mode, Summary, Another Example, Adding Data Points

Chapter 6: Analyzing Data

Lesson 6.1: Using Graphs to Understand Data

- Students use unlabelled line graphs and other clues to solve a mystery
- Students use information from multiple bar graphs to analyze trends in vehicle emissions
- Students make histograms to display and interpret frequency data

MAT / Understanding Graphing / Topic 2 / Bar Graph; Histogram; Line Graph

Lesson 6.2: What is Typical?

- Mode and Median
- Stem-and-Leaf Plots
- The Meaning of Mean
- Mean or Median?
- Analyzing Data

MAT / Understanding Graphing / Topic 2 / Presenting Data: Stem-and-Leaf Diagram; Measures of Central Tendency: The Mean Average, The Median Average, The Mode, Summary, Another Example, Adding Data Points

Lesson 6.3: Collecting and Analyzing Data

- Planning your analysis
- Carrying out your Analysis

MAT / Understanding Graphing / Topic 2 / Data...What is it?; An Introduction...Examples of Data: Examples 1 through 6; Collecting Data

Chapter 7: Variables and Rules

Lesson 7.1: Patterns and Variables

- Students learn that a sequence is an ordered list of items. They identify variables in various sequences and use symbols to write rules that describe how the variables are related to the term number
- Equivalent rules are introduced as different rules that describe the same relationship or pattern. Students use diagrams and reasoning to explain how they know whether two rules are equivalent
- Students use symbols to describe rules for games of *What's My Rule?* They use tables to help decide whether different rules correctly describe the relationship between input and output values

MAT / Understanding Graphing / Topic 5 / In This Topic; Relations: What is a Relation? Domain and Range, Examples 1-5; Functions; Vertical Line Test; Function Notation; Patterns to Words to Equations; Practice Questions

Lesson 7.3: Explaining Number Relationships

- Think of a Number
- Consecutive Numbers

Chapter 8: Geometry and Measurement

Lesson 8.1: Angles

- Measuring Angles
- Investigating Angles

MAT / Understanding Measurement and Geometry / Topic 5 / In This Topic; Angles – An Introduction; The Degree; Classifying Angles: Classifications, Memory Game; Measuring Angles; Practice Questions

Lesson 8.2: Measuring Around

- Finding Perimeter

MAT / Understanding Measurement and Geometry / Topic 2 / Walk Around a Polygon: Joan Walks, Length of the Metal Strip, Find the Perimeter

- Approximating π

MAT / Understanding Measurement and Geometry / Topic 3 / PI...A Special Number: Introduction, How do we Measure Circumference? Measuring Circles, Summary

Lesson 8.3: Areas and Squares

- Counting Square Units

MAT / Understanding Measurement and Geometry / Topic 2 / Amount of Surface: The Driveway, 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

- Squaring
- More about Squaring
- Taking Square Roots

MAT / Understanding Exponents / Topic 5 / Squaring Numbers; Square Roots

Lesson 8.4: Calculating Areas

- Students develop a formula for the area of a parallelogram by using the fact that every parallelogram can be cut into two pieces and reassembled into a triangle

MAT / Understanding Measurement and Geometry / Topic 2 / Area of a Parallelogram: Concept, Example

- Students develop a formula for the area of a triangle by using the fact that two identical triangles can be put together to form a parallelogram

MAT / Understanding Measurement and Geometry / Topic 2 / Area of a Triangle: Concept, Example 1/ 2

- Students estimate areas of circles drawn on grids and use their results at the formula for the area of a circle

MAT / Understanding Measurement and Geometry / Topic 3 / Area of a Circle: Recall Area, Area Explorations 1 &2, Examples 1 through 5

- Students use spreadsheets software to discover that a square is the rectangle of greatest area for a given perimeter and that a circle with the same perimeter has an even greater area

Lesson 8.5: The Pythagorean Theorem

- Right Triangles and Squares
- Using the Pythagorean

MAT / Understanding Exponents / Topic 6 / The Right Triangle; Math or Magic?; Squares on a Grid; Squares on the Sides of a Right Triangle; The Pythagorean Theorem; Examples Questions; Practice Questions

Chapter 9: Solving Equations

Lesson 9.1: Understanding Equations

- Students learn to use inequality symbols to tell how two unequal numbers are related

MAT / Understanding Equations / Topic 7 / Comparing Integers: The Integer Line, Examples 1,2 – Explanation, Example 3; Inequalities – What are They?; Inequality on the Number Line; Solving Inequalities

- Students use trial-and-error to find solutions of equations that contain variables
- Students use the idea of undoing instructions in preparation for their study of the backtracking method for solving equations

MAT / Understanding Equations / Topic 1 / Definitions; The Meaning of “Solving an Equations”; Solve by Systematic Trials; Recall Tile Concepts; Balances...An Introduction; Tiles, Balances and Equations; Practice Questions

MAT / Understanding Equations / Topic 2 / Concepts – Examples with Tiles; Concepts – Examples without Tiles; Practice Questions

MAT / Understanding Equations / Topic 3 / Concepts – Examples with Tiles; Concepts – Examples without Tiles; Practice Questions

MAT / Understanding Equations / Topic 4 / Our Problem; Concepts – Examples with Tiles; Concepts – Examples without Tiles: Examples 1 through 5; Summary; Literal Equations: What are they? How do you solve them? Why solve literal equations? A perimeter example, A temperature example; Practice Questions

Lesson 9.2: Backtracking

- Students make and use flowcharts to represent rules, to find the output for a given input, and to find the input for a given output
- Students make and use flowcharts to solve equations by backtracking
- Students write equations for real-life situations and use backtracking to solve the equations

Lesson 9.3: Guess-Check-and-Improve

- Using Guess-Check-and-Improve
- Solving Problems Using Guess-Check-and-Improve
- Choosing a Method

MAT / Understanding Equations / Topic 5 / 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; Summary: Problem Solving Using Equations; Practice Questions

Chapter 10: Understanding Probability

Lesson 10.1: the Language of Chance

- Students use intuition to plot the likelihood of certain events on a number line from 0 to 1. They also use data about simple situations to find experimental probabilities for given events
- Students learn to recognize situations in which individual outcomes are equally likely. They find the probability of simple events in such situations
- Students play a game of chance involving a dreidel and use ideas about experimental and theoretical probability to analyze the game

MAT / Understanding Probability / Topic 1 / The Language of Chance; Possible Outcomes – What are They? Possible Outcome – Examples 1 through 8; Practice Questions

MAT / Understanding Probability / Topic 2 / Probability: What is it? Introduction 1, 2; Probability Examples 1 through 9; The Probability Scale: Examples, Summary, Follow Up, Soccer Example; Experimental Probability: Introduction, Examples 1, 2; Practice Questions

Lesson 10.2: Analyzing Games

- Who's Greater?
- Dice Sums
- Rolling Difference

MAT / Understanding Probability / Topic 3 / 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

- Geometric Probability

MAT / Understanding Probability / Topic 5 / In This Topic; Introduction; The Parachutist; Dartboard; Win a Prize; The Fly; Baby Walk; Practice Questions; Topic Test

Lesson 10.3: Making Matches

- Matching Colors
- Matching Cards