

**Arkansas State Mathematics Framework Correlations of the
Understanding Numeration (NUM) Programs and the Understanding
Mathematics (MAT) Programs
By Neufeld Learning Systems
Grade 4
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Notes: a. The **Understanding Numeration** software utilizes the following levels of development:

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

- b. Reference to Understanding Numeration ▷ NUM
Reference to Understanding Mathematics ▷ MAT**

STRAND 1: NUMBER SENSE, PROPERTIES, AND OPERATIONS

CONTENT STANDARD 1.

The student will communicate an understanding of the properties of *numbers and operations (add, subtract, multiply, divide).*

Student Learning Expectation 1:

Demonstrate number sense (concepts of counting, grouping, and place value) using manipulatives.

I. Students will write numerical symbols to represent fractions presented with manipulatives.

NUM/Counting/Introduce Common Fractions as parts of a whole C/Write the Fraction # 1, # 2

II. Students will demonstrate the concept of place value up to hundred millions.

NUM/Place Value/ Identify Place Value Patterns (<100 D/2 digit Numbers – Different Ways

NUM/Place Value/Identify Place Value Patterns (<1000) D/Understanding Place Value

Student Learning Expectations 2:

Develop meaning for the operations (e.g., add, subtract, multiply, and divide) by modeling and discussing a variety of problem situations.

I. Students will discuss and model (concretely, pictorially, symbolically) problem situations involving 2- and 3-digit multiplication and long division with dividends up to four digits and divisors of one and two digits.

NUM/Operations/Multiply 2 digit by 1 digit D/Multiply 2 digit by 1 digit

Student Learning Expectation 3:

Apply and master counting, grouping, place value, and estimation.

I. Students will estimate to the nearest tens, hundreds, and thousands using rounding and truncating strategies.

II. Students will apply and master the concept of place value up to hundred millions.

NUM/Place Value/Identify Place Value Patterns (<1000) D/Understanding Place Value

III. Students will estimate to the nearest tens, hundreds, thousands, and millions using rounding and truncating strategies.

Student Learning Expectation 4:

Solve problems using terminology and symbols of operations (e.g., add, subtract, multiply, and divide).

I. Students will concretely, pictorially, and symbolically represent problem solving situations involving basic multiplication and division and will relate mathematical terminology (sum, difference, dividend, divisor, quotient, etc.) to said problem solving situations.

II. Students will relate mathematical terminology and symbols of operations involving multiplication and division (factor, quotient, divisor, dividend, product, multiple, common multiple, common factor, etc.) to problem solving situations.

MAT/Understanding Integers/Topic 4/Word Problems

MAT/Understanding Integers/Topic 5/Word Problems

Student Learning Expectations 5:

Demonstrate competency of operations (e.g. add, subtract, multiply, and divide) using mental math and technology.

I. Students will demonstrate competency with multiplication and division using mental math and technology.

NUM/Operations/Demonstrate Commutative Property C/Multiplication – Any Order

NUM/Operations/Note Patterns in 10 x 10 Multiplication Table D/ X Table-Patterns in Rows

NUM/Operations/Note Patterns in 10 x 10 Multiplication Table D/ X Table-Patterns in Columns

NUM/Operations/Note Patterns in 10 x 10 Multiplication Table D X Table-/Other Patterns

NUM/Operations/Note Patterns in 10 x 10 Multiplication Table D/ X Table-User Picks

NUM/Operations/Note Patterns in 10 x 10 Multiplication Table D/ X Table-/Computer Picks

NUM/Operations/Introduce Division Facts ... 6,7,8,9 D/Division Groups of 6,7,8,9

NUM/Operations/Fact Families .. Multiply and Divide C/Fact Families .. Multiply & Divide

Student Learning Expectation 6:

Use manipulatives to demonstrate and compare rational numbers/fractions (e.g., find simple parts of a whole).

I. Students will concretely, pictorially, and symbolically demonstrate and compare fractions ($n/n = 1$; write mixed numbers; change improper fractions to mixed numbers; write fractions in lowest terms; rename fractions with unlike denominators to fractions with common denominators; write decimals as fractions; perform basic operations with decimals).

NUM/Comparing and Ordering/ Compare Fractions D/Compare Fractions

MAT/Understanding Fractions/Topic 11/ The Concept/Packages/The Clock

MAT/Understanding Fractions/Topic 11/Improper Fractions .. What are They?

MAT/Understanding Fractions/Topic 11/Mixed to Improper Method 1,2; Example 1,2/Improper to Mixed; Examples 1,2

MAT/Understanding Fractions/Topic 3/All of Topic

NUM/Counting/Introduce Decimals D/Tenths and Decimals; Ones and Tenths

NUM/Operations/Introduce Addition of Decimals D/ Add Decimals #1, b #2

NUM/Operations/Introduce Subtraction of Decimals D/Subtract Decimals #1, #2

Student Learning Expectation 7:

Communicate understanding of number sense, properties, and operations through journal writing, creating problems, constructing mathematical sentences, etc.

I. Students will communicate understanding of number sense, properties, and multiplication and division through journal writing, creating problems, constructing mathematical sentences, etc.

CONTENT STANDARD 2.

The student will demonstrate and apply knowledge of numbers and numerical relationships to real-world situations.

Student Learning Expectation 1:

Represent numbers and operations (add, subtract, multiply, and divide) in a variety of forms using manipulatives, symbols, and graphs (pictographs, etc.).

I. Students will represent numbers, multiplication, and division in a variety of forms using manipulatives, symbols, and graphs.

Student Learning Expectation 2:

Apply elementary number theory (skip counting, patterns, number series, odd and even numbers, multiples, fractions, etc.).

I. Students will apply elementary number theory (skip counting, patterns, number series, odd and even numbers, multiples, fractions, Roman numerals 1-1000, rounding to the nearest ten, hundred, thousand, millions, and cent, etc.).

NUM/Counting/Skip Counting & Patterns C/Skip Counting to 100; Skip Count by 2's, 5's to 100

NUM/Counting/Skip Counting & Patterns C/Next by 2's

NUM/Operations/Demonstrate Addition Facts .. Patterns C/Patterns in Addition

NUM/Operations/Demonstrate Addition Facts .. Patterns D/Decomposition Tree #3

NUM/Operations/Patterns in Multiplication D/X Table – Groups of 6,7,8,9,10

NUM/Comparing and Ordering/Compare Fractions D/Compare Fractions

Student Learning Expectation 3:

Apply computation (add, subtract, multiply, and divide) and estimation to real-world problems.

I. Students will apply multiplication (variety of meanings), division (variety of meanings), and estimation to real-world problems.

MAT/Understanding Integers/Topic 4/Word Problems

MAT/Understanding Integers/Topic 5/Word Problems

Student Learning Expectation 4:

Use mental math, manipulatives, and technology to solve problems.

I. Students will use mental math, manipulatives, and technology to solve multiplication (variety of meanings) and division (variety of meanings) problems.

Student Learning Expectation 5:

Describe and compare quantities by using concrete and real-world models of fractions.

I. Students will describe and compare quantities by using concrete and real-world models of fractions.

NUM/Comparing and Ordering/Compare Fractions D/Compare Fractions

STRAND: 2 GEOMETRY AND SPATIAL SENSE

CONTENT STANDARD 1.

The student will demonstrate, construct, communicate, and apply the properties of geometric shapes and spatial sense to connect geometry with problem solving situations.

Student Learning Expectation 1:

Sort, classify, and construct geometric shapes/figures and objects using a variety of manipulatives.

I. Students will construct three-dimensional shapes using a variety of manipulatives.

II. Students will demonstrate the concept of faces, edges, and vertices of geometric solids and will identify the radius and diameter of a circle.

MAT/Understanding Measurement and Geometry/Topic 4/Classifying Solids

MAT/Understanding Measurement and Geometry/Topic 3/Radius, Circumference, Diameter

Student Learning Expectation 2:

Describe, model, draw, construct, compare and classify shapes in one, two, and three dimensions.

I. Students will describe, classify, construct, model, and compare geometric shapes in one (points, segments, rays, lines, angles), two (polygons and circles), and three (cones, pyramids, cubes, etc.) dimensions.

MAT/Understanding Measurement and Geometry/Topic 2/Polygons .. What are They?

MAT/Understanding Measurement and Geometry/Topic 4/Classifying Solids

MAT/Understanding Measurement and Geometry/Topic 5/Lines and Rays; Angles

Student Learning Expectation 3:

Determine the relationship between shapes/figures using congruence and similarity, and using transformations (flips, slides, and rotations).

I. Students will classify figures in terms of similar and congruent.

II. Students will predict results of slides, flips, and turns.

MAT/Understanding Graphing/Topic 4/What is a Transformation?; Introduction to Common Transformations; Translations

III. Students will create similar and congruent shapes.

IV. Students will recognize the slides, flips, and turns they have made.

MAT/Understanding Graphing/Topic 4/What is a Transformation?; Introduction to Common Transformations; Translations

Student Learning Expectation 4:

Predict and determine the results of combining, dividing, and subdividing shapes/figures.

- I. Students will predict and determine the results of combining, dividing, and subdividing shape/figures to form a new shape.

Student Learning Expectation 5:

Demonstrate spatial awareness positional relationship, size, direction, area, volume, etc.).

- I. Students will demonstrate spatial awareness (positional relationship, size, direction, area, volume, diameter, etc.).

MAT/Understanding Measurement and Geometry/Topic 2/Amount of Surface

MAT/Understanding Measurement and Geometry/Topic 2/Area – Estimation; Area of a Rectangle; Area of a Parallelogram; Area of a Triangle

MAT/Understanding Algebra/Topic 2/Area

MAT/Understanding Measurement and Geometry/Topic 4/Volume of a Solid

MAT/Understanding Measurement and Geometry/Topic 3/Radius, Circumference, Diameter

Student Learning Expectation 6:

Use manipulatives and technology to demonstrate geometric concepts (positional relationship, size, direction, area, volume, etc.).

- I. Students will use manipulatives and technology to demonstrate geometric concepts (positional relationship, size, direction, area, volume, distance, etc.).

MAT/Understanding Measurement and Geometry/Topic 2/Amount of Surface

MAT/Understanding Measurement and Geometry/Topic 2/Area – Estimation; Area of a Rectangle; Area of a Parallelogram; Area of a Triangle

MAT/Understanding Algebra/Topic 2/Area

MAT/Understanding Measurement and Geometry/Topic 4/Volume of a Solid

MAT/Understanding Algebra/Topic 2/Walk Around a Polygon

Student Learning Expectation 7:

Demonstrate geometric and spatial sense through written and oral communication (e.g., draw and describe a color cube model using isometric dot paper).

- II. Students will demonstrate geometric and spatial sense through pictorial, oral and written communication.

CONTENT STANDARD 2.

The student will solve problems that connect geometric applications to other topics in mathematics and other fields.

Student Learning Expectation 1:

Estimate and measure the size of geometric figures/shapes in the real world (length, width, perimeter, area, volume, etc.).

I. Students will estimate and measure the size of geometric figures/shapes in the real world using standard units (length, perimeter, width, area, volume, etc.).

MAT/Understanding Measurement and Geometry/Topic 2/Walk Around a Polygon

MAT/Understanding Measurement and Geometry/Topic 2/Amount of Surface Area

MAT/Understanding Measurement and Geometry/Topic 4/Surface Area of a Solid

MAT/Understanding Measurement and Geometry/Topic 4/Volume of a Solid

Student Learning Expectation 2:

Construct and explain geometric patterns using concrete and pictorial models with one or more attributes (color, shape, size, etc.).

I. Students will replicate, construct and explain geometric patterns using concrete and pictorial models, with three or more attributes.

MAT/Understanding Measurement and Geometry/Topic 8/ An Introduction

Student Learning Expectation 3:

Use manipulatives and technology to solve problems involving perimeter, area, volume, etc.

I. Students will use manipulatives and technology to solve problems (perimeter, area, volume, etc.)

MAT/Understanding Measurement and Geometry/Topic 2/Problems Section

MAT/Understanding Measurement and Geometry/Topic 2/Practice Questions

Student Learning Expectation 4:

Illustrate geometric concepts through written and oral communication. (For example, I am a rectangular house. My windows are squares. My door is a rectangle. My roof is a triangle).

I. Students will demonstrate geometric and spatial sense through pictorial, oral and written communication as represented in real life.

STRAND: 3 MEASUREMENT

CONTENT STANDARD 1.

The student will use measurement attributes (length, capacity, weight, mass, area, volume, time, money, temperature, scale, and angle) to describe and compare mathematical and real-world objects.

Student Learning Expectation 1:

Demonstrate and apply the concept of comparison (large, small, long, short, etc.) according to given attributes (length, capacity, weight, mass, etc.).

I. Students will demonstrate and apply the concept of comparison (thicker, at a greater angle, longer period of time, cheaper) according to given attributes.

Student Learning Expectation 2:

Select, demonstrate, and defend the use of appropriate units of measure.

I. Students will select, demonstrate, and defend the use of appropriate units of measure for length (1/2 miles, inches, feet, yards, miles, meters, centimeters, millimeters), time (seconds), capacity (cup, fluid ounces, pint, quart, gallon, liter, etc.), area (square units), volume (cubic units), and weight (pounds, tons, ounces, grams, etc.).

MAT/Understanding Measurement and Geometry/Topic 1/Metric and U.S.A.

Standard Measurement Units

MAT/Understanding Measurement and Geometry/Topic 2/Amount of Surface Area

MAT/Understanding Measurement and Geometry/Topic 4/Volume of a Solid

NUM/Comparing and Ordering/Describe Elapsed Time .. minutes D/Elapsed Time ..

Minutes #1, #2

Student Learning Expectation 3:

Convert from one measurement to another within the same system (feet to yards, centimeters to meters, etc.).

I. Students will convert from one unit of measurement to another using the attached equivalences

MAT/Understanding Measurement and Geometry/Topic 1/Converting Between Metric Units

CONTENT STANDARD 2.

The student will demonstrate the appropriate use of measuring instruments.

Student Learning Expectation 1:

Select and use appropriate standard (inches, feet), non-standard (paper clip, thumbnail), and metric (centimeter, meter) measuring instruments (e.g., rulers, scales, measuring tape, yard stick, meter stick, thermometer, etc.).

I. Students will select and use appropriate standard and metric measuring instruments (meter stick for length; balance/scale for mass; protractor for angles).

attached equivalences

MAT/Understanding Measurement and Geometry/Topic 1/Metric Benchmarks

MAT/Understanding Measurement and Geometry/Topic 5/Measuring Angles

CONTENT STANDARD 3.

The student will apply measurement concepts to solve problems inside and outside the field of mathematics.

Student Learning Expectation 1:

Estimate and measure quantities such as weight, length, area, volume, money, time, and temperature.

I. Students will estimate and measure quantities in standard units (Fahrenheit, Celsius, degrees, grams, pounds, etc.).

Student Learning Expectation 2:

Solve problems using measuring instruments and technology.

II. Students will solve problems using standard measuring instruments and technology (meter stick, balance/scale, protractor, computer, calculator, etc.).

MAT/Understanding Measurement and Geometry/Topic 1/My Body; Rudy's Run

Student Learning Expectation 3:

Pose problems using customary (inches, feet, etc.), non-standard (paper clip, thumbnail, etc.), and metric measurements (centimeters, meters, etc.) in real-world situations.

II. Students will in written form pose problems using standard and metric measurements in real-world situations.

MAT/Understanding Measurement and Geometry/Topic 1/My Body;

STRAND: 4 DATA ANALYSIS, STATISTICS AND PROBABILITY

CONTENT STANDARD 1.

The student will perform the steps that comprise data analysis, from gathering information to communicate results.

Student Learning Expectation 1:

Utilize the scientific method for data analysis.

I. Students will identify the purpose (problem statement) for data collection (find a pattern, etc.).

NUM/Problem Solving

II. Students will analyze, interpret, pose new questions, and test predictions about the final results of data collection (the pattern will be/was, what will happen next/what happened next was, etc.)

MAT/Understanding Graphing/Topic 2/Collecting Data

III. Students will collect, organize and display (bar graphs, line graphs, circle graphs, stem and leaf plots, etc.) data in a variety of interdisciplinary sources.

MAT/Understanding Graphing/Topic 2/Presenting Data; Stem and Leaf Diagram; Bar Graph, Line Graph, Circle or Pie Graphs

Student Learning Expectation 2:

Explain the results of data collection using oral and written communication.

I. Students will orally, pictorially, and in written format explain the results of data collection.

MAT/Understanding Graphing/Topic 2/Presenting Data; Stem and Leaf Diagram; Bar Graph, Line Graph, Circle or Pie Graphs

CONTENT STANDARD 2.

The student will use probability models to perform experiments and simulations.

Student Learning Expectation 1:

Predict the results of data collection and demonstrate the concept of chance through the use of manipulatives. (For example: What is the probability of drawing one red marble from a bag of multicolored marbles?)

I. Students will apply the concept of chance using manipulatives.

MAT/Understanding Probability/Topic 1/ALL SECTIONS

Student Learning Expectation 2:

Record the results of data collection with a variety of formats that could include charts, graphs, tables, and technology, using oral and/or written communication.

I. Students will record the results of data collection with a variety of symbolic formats including graphs and/or tables using technology, oral and/or written communication.

MAT/Understanding Graphing/Topic 1/ Graphs without a Scale : Concept .. Age and Weight; Examples 1 through 12

MAT/Understanding Graphing/Topic/Graphs with a Scale : Concept .. Distance and Time; Examples 1 through 9

MAT/Understanding Graphing/Topic 2/Presenting Data

CONTENT STANDARD 3.

The student will apply probability and statistical concepts in problem-solving and decision-making situations.

Student Learning Expectation 1:

Predict results, analyze data, and find out why some results are more likely, less likely, or equally likely.

I. Students will predict, analyze, and determine the likeliness of an outcome.

MAT/Understanding Probability/Topic 1/ALL SECTIONS

Student Learning Expectation 2.

Make a true statement based on a simple concept of average (median, mean, mode, and range) for a small sample size.

I. Students will, in written form, make a true statement based on the concepts of mode, median, range, and mean.

MAT/Understanding Graphing/Topic 2/Measures of Central Tendency

Student Learning Expectation 3:

Use the tools of technology to assist in gathering, organizing, and presenting information.

I. Students will use the tools of technology to assist in gathering, organizing, and presenting information.

STRAND: 5 PATTERNS, ALGEBRA AND FUNCTION

CONTENT STANDARD 1.

The student will use the language/symbols of algebra to represent patterns.

Student Learning Expectation 1:

Sort and classify a wide variety of materials.

I. Students will sort and classify a wide variety of materials.

Student Learning Expectation 2:

Describe, extend, and create a wide variety of patterns using concrete models.

I. Students will describe, extend, and create a wide variety of patterns using a wide variety of materials (transfer from concrete to symbols).

Student Learning Expectation 3:

Demonstrate equality (=) and inequality (<, >) using manipulatives and symbols.

I. Students will demonstrate equality and inequality using symbols <, >, =.

NUM/Comparing and Ordering/Working with Whole Numbers <, >, = D/Compare Numbers to 999; Find the Greatest .. < 999

Student Learning Expectation 4 :

Demonstrate the beginning concept of a variable. (Use boxes, letters, or other symbols to stand for any number or object in simple situations, with or without concrete material, such as $6 + \underline{\quad} = 8$ or $3 + B = 4$, etc.).

I. Students will represent variables concretely and symbolically. (e.g., $B \times 9 = 63$; $81 \div \underline{\quad} = 9$; $(72 \div 9) \times (144 \div 12) = \underline{\quad}$)

MAT/Understanding Algebra/Topic 2/ALL SECTIONS

Student Learning Expectation 5:

Express mathematical relationships in one and two dimensions. (Length x Width = Area, $L \times W = A$, etc.).

I. Students will express mathematical relationships in one and two dimensions e.g., length x width = area, $L \times W = A$; etc.).

MAT/Understanding Measurement and Geometry/Topic 2/Amount of Surface Area

Student Learning Expectation 6 :

Use oral and/or written communication to interpret created patterns.

I. Students will pictorially, orally, and in written format communicate to interpret a wide variety of created patterns.