Arkansas State Mathematics Framework Correlations of the UNDERSTANDING NUMERATION (NUM) Programs and the UNDERSTANDING MATHEMATICS (MAT) Programs By Neufeld Learning Systems Kindergarten July 2003

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 construct sets to represent numbers using manipulatives.

NUM/Counting/Reading and Printing Numerals A/Introduction : Counting 1 to 10
NUM/Counting/Reading and Printing Numerals A/Things in a Square – (1 to 10)
NUM/Counting/Reading and Printing Numerals A/Joining up to 10 Dots
NUM/Counting/1 to 1 Correspondence of # to Objects A/Keep Track by Marking

II. Students will count forward from 1-31 and backward from 10 by 1's through one to one correspondence.

NUM/Counting/Reading and Printing Numerals B/Introduction: Counting 1 to 20
NUM/Counting/Counting Backwards A/Counting Backwards from 10 to 1
NUM/Counting/Counting Backwards A/Counting Up & Down

III. Students will count from 1 to 10 by twos; and to 50 by fives and tens.

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

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

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 use manipulatives to add and subtract to ten, and will orally give an example of a problem situation involving basic addition and subtraction.

NUM/Operations/Introduce Addition .. Concretely .. "in all" & "together" A/Addition Using Gumballs #1/Addition Using Beans #1
NUM/Operations/Introduce Addition .. Concretely .. "and" A/ Addition Using Gumballs #3/Addition Using Beans #3
NUM/Operations/Demonstrate Addition A/ Ways to Make 5,6,7,8,9,10
NUM/Operations/Introduce Subtraction .. Concretely … "take away" A/Introduction to Subtraction #1,2

Student Learning Expectation 3:
Apply and master counting, grouping, place value, and estimation.

I. Students will apply and master counting forward from 1-31 and backward from 10 by 1's through one to one correspondence.
NUM/Counting/Reading and Printing Numerals B/Introduction: Counting 1 to 20

II. Students will apply and master counting from 1 to 10 by twos; and to 50 by fives and tens.
NUM/Counting/Skip Counting & Patterns C/Skip Counting to 100
NUM/Counting/Skip Counting & Patterns C/Skip Count by 2's to 100
NUM/Counting/Skip Counting & Patterns C/Skip Count by 5's to 100

III. Students will estimate the number of objects in a set of less than 50 items.

NUM/Counting/Estimating the Number of Objects & Reasonableness B/ Estimating & Counting

Student Learning Expectation 4:
Solve problems using terminology and symbols of operations (e.g., add, subtract, multiply, and divide).

I. Students will learn the meaning of the operations (addition and subtraction), will determine the operation (addition or subtraction) of a problem solving situation, and will communicate the determined operation orally.

NUM/Operations/Introduce Addition .. Concretely .. "in all" & "together" A/Addition Using Gumballs #1/Addition Using Beans #1
NUM/Operations/Introduce Addition .. Concretely .. "and" A/ Addition Using Gumballs #2/Addition Using Beans #2
NUM/Operations/Introduce the Symbolism .. # + # = # A/Addition Using Gumballs #3/Addition Using Beans #3

NUM/ Operations/Intoduce the Words .. "plus" and "equals"A/ Addition Using Gumballs #4/Addition Using Beans #4

NUM/Operations/Demonstrate Addition A/ Ways to Make 5,6,7,8,9,10
NUM/Operations/Introduce Subtraction .. Concretely .. "take away" A/Introduction to Subtraction # 1,2
NUM/Operations/Introduce Subtractions – Symbolism .. # - # = # A/Introductions to Subtraction #3,4
NUM/Operations/Introduce Subtractions - Symbolism .. # - # = # A/Introduce Vertical Subtraction
NUM/Operations/Introduce Subtractions- Symbolism .. # - # = # A/Subtraction Sentences

Student Learning Expectations 5:
Demonstrate competency of operations (e.g. add, subtract, multiply, and divide) using mental math and technology.

I. Students will demonstrate the concept of addition and subtraction with technology.

NUM/Operations/Addition & Subtraction Section A

Student Learning Expectation 6:
Use manipulatives to demonstrate and compare rational numbers/fractions (e.g., find simple parts of a whole).

I. Students will use manipulatives to demonstrate the concept of the fraction 2 as one of two equal parts of a region or object, and will find 2 of a set with an even number of concrete objects.

NUM/Counting/Introduce Fractions .. Equal Parts B/Two Equal Parts, Three Equal Parts, Four Equal Parts
NUM/Counting/Introduce Fractions .. Parts of a Whole B/One Half

Student Learning Expectation 7:
Communicate understanding of number sense, properties, and operations through journal writing, creating problems, constructing mathematical sentences, etc.

I. Students will concretely, pictorially, and orally demonstrate number sense (one to one correspondence, skip counting, grouping, etc.).

NUM/Counting/1 to 1 Correspondence of # to Objects A/Keep Track by Marking
NUM/Counting/Skip Counting & Patterns/Skip Counting to 100
NUM/Break Numbers Into Groups B/Making Groups

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 and operations (addition and subtraction to ten) in a variety of forms using manipulatives and graphs.

NUM/Operations/Demonstrate Addition Facts A/ Ways to Make 5,6,7,8,9,10
NUM/Operations/Demonstrate Addition Facts .. Patterns A/Bar Matching, Decomposition Tree

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, sets, etc.).

NUM/Counting/Skip Counting & Patterns C/Patterns in Rows

Student Learning Expectation 3:
Apply computation (add, subtract, multiply, and divide) and estimation to real-world problems.
I. Students will apply estimation to real-world problems.
NUM/Counting/Estimating the Number of Objects & Reasonableness B/Estimating

Student Learning Expectation 4:
Use mental math, manipulatives, and technology to solve problems.

I. Students will use manipulatives to solve problems.
NUM/Problem Solving

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 the fraction 2 and a whole.
NUM/Counting/Introduce Fractions .. Parts of a Whole A/One Half

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 sort geometric shapes/figures and objects using a variety of manipulatives.

II. Students will sort and classify geometric shapes/figures using a variety of manipulatives.

Student Learning Expectation 2:

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

I. Students will construct, model, and compare shapes in two dimensions.

II. Students will describe three dimensional shapes using two dimensional shapes (squares, triangles, circles, etc.)

III. Students will identify lines in the real world.

Student Learning Expectation 3:

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

I. Students will develop the concept of likenesses and differences with regular and irregular shapes.

II. Students will manipulate familiar objects through slides, flips, and turns.

Student Learning Expectation 4:

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

I. Students will combine shapes/figures.

Student Learning Expectation 5:

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

I. Students will demonstrate spatial awareness (positional relationship such as closed/open, over/under, above/below, right/left, top/bottom, size, etc.).

Student Learning Expectation 6:

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

I. Students will use manipulatives to demonstrate geometric concepts (positional relationship, size, etc.).

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).

I. Students will orally describe three-dimensional objects in terms of two-dimensional shapes.

CONTENT STANDARD 2.
The student will solve problems that connect geometric applications to other topics in mathematics and other fields.
NUM/Counting/Reading and Printing Numerals A/Joining up to 10 Dots

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 develop the concept of the size (length and width) of geometric figures/shapes in the real world using non-standard units.

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 and explain geometric patterns using concrete models, with one attribute.

Student Learning Expectation 3:
Use manipulatives and technology to solve problems involving perimeter, area, volume, etc.
I. Students will use manipulatives to solve problems involving perimeter and area.

Student Learning Expectation 4:
Illustrate geometric concepts through written and oral communication. (For example, AI am a rectangular house. My windows are squares. My door is a rectangle. My roof is a triangle).

I. Students will orally describe three-dimensional objects in terms of two-dimensional shapes 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 the concept of comparison (more/less, larger/smaller, shorter/longer, heavier/lighter, etc.) according to a given attribute (shape, size, etc.).

NUM/Comparing and Ordering/Introduce .."Greater Than" "Less Than" A/ Greater Than
NUM/Comparing and Ordering/Introduce .."Greater Than" "Less Than" A/Less Than
NUM/Comparing and Ordering/Introduce .."Greater Than" "Less Than" A/Greater Than, Less Than
NUM/Comparing and Ordering/Introduce .."Greater Than" "Less Than" A/ Greater Than, Less Than, Equal To

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 (nonstandard units).

Student Learning Expectation 3:
Convert from one measurement to another within the same system (feet to yards, centimeters to meters, etc.).
N/A

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 use a variety of objects to measure length, weight, and capacity.

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 in non-standard units area, weight, length, and capacity.

II. Students will identify individual coins and one-dollar bill and identify the dollar sign ($) and cent sign.

NUM/Counting/Counting Using Money B/Pennies, Nickels, Dimes
NUM/Counting/Counting Using Money C/Quarters
NUM/Counting/Counting Using Money D/Dollars

Student Learning Expectation 2:
Solve problems using measuring instruments and technology.

I. Students will discuss and solve problems using non-standard measuring instruments.

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.

I. Students will orally pose problems using non-standard measurements in real-world situations.

NUM/Problem Solving

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.

A. Identify the purpose (problem statement) for data collection.

B. Make a prediction about the final results of data collected.

C. Collect and organize data **(tables, graphs, etc.).**

D. Analyze and interpret data (prediction, inference, conclusion, etc.).

E. Display data using appropriate bar graphs, line graphs, tables, pie graphs, etc., with and without technology.

I. Students will identify the purpose (problem statement) for data collection (likenesses, differences, most, least, etc.).

NUM/Problem Solving

II. Students will make a prediction about the final results of data collection (alike, different, more, etc.) and analyze the data (biggest, smallest, least, most, etc.).

NUM/Problem Solving

III. Students will collect, organize, and display (both physically and pictorially) data in a variety of formats including bar graphs, Venn diagrams, etc.

Student Learning Expectation 2:
Explain the results of data collection using oral and written communication.

I. Students will orally explain the results of data collection.

NUM/Problem Solving

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?)
NA

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 bar graphs, Venn diagrams, etc. using oral communication.

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.
NA

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 orally make a true statement based on the simple concepts of mode (occurs most often) and range (the smallest and largest).

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 experience gathering, organizing, and presenting information.

NUM/Problem Solving

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 a wide variety of materials using one attribute (color, shape, size, etc.).

NUM/Place Value/Break Numbers into Groups B/Making Groups

Student Learning Expectation 2:

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

I. Students will describe and extend (through motion, color, sound, position, shape, size, and quantity) repeating and growing patterns.

Student Learning Expectation 3:

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

I. Students will compare sets represented with manipulatives using the terms greater than, less than, and equal to (no symbols at this level).

NUM/Comparing and Ordering/Introduce .. "greater than" "less than" A/Greater Than

NUM/Comparing and Ordering/Introduce .. "greater than" "less than" A/Less Than

NUM/Comparing and Ordering/Introduce .. "greater than" "less than" A/Greater Than, Less Than

NUM/Comparing and Ordering/Introduce .. "greater than" "less than" A/Greater Than, Less Than, Equal To

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 + ___ = 8 or 3 + B = 4, etc.).

I. Students will orally furnish an answer for an unknown that will make a true mathematical statement. (e.g., The teacher asks, What plus three makes four?)

NUM/Operations/Demonstrate Addition A /Ways to Make…

Student Learning Expectation 5:

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

N/A

Student Learning Expectation 6 :

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

I. Students will pictorially and orally communicate to interpret created repeating and growing patterns.