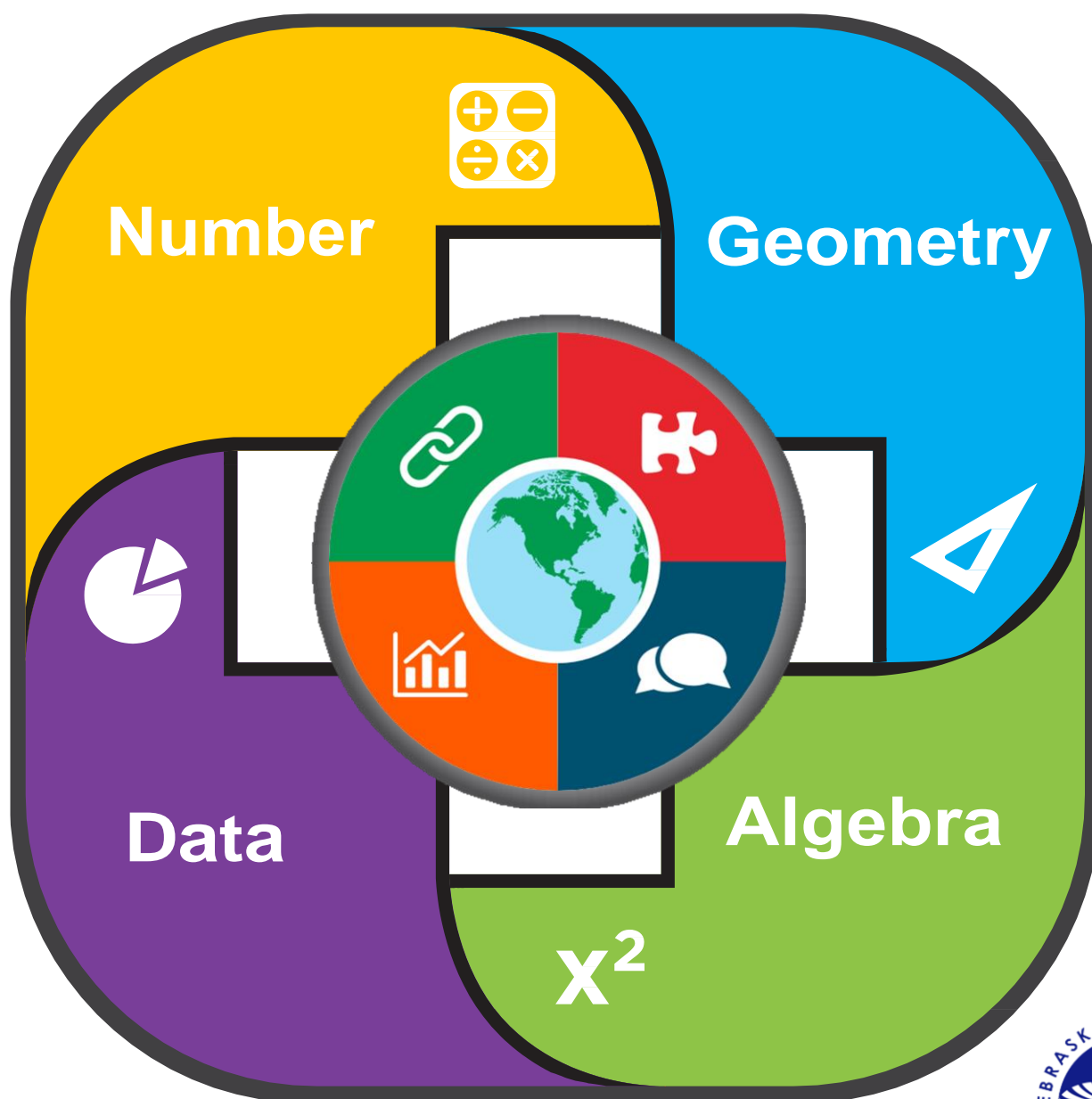


# NEBRASKA MATHEMATICS STANDARDS

---



PROBLEM SOLVING

REPRESENTATIONS

COMMUNICATION

CONNECTIONS

Approved by the Nebraska State Board of Education 9/4/15



# Nebraska’s College and Career Ready Standards for Mathematics

## Table of Contents

Categories for Mathematics Standards .....	1
Mathematical Processes .....	2
Kindergarten Standards .....	3-4
Grade 1 Standards.....	5-7
Grade 2 Standards.....	8-10
Grade 3 Standards.....	11-13
Grade 4 Standards.....	14-16
Grade 5 Standards.....	17-19
Grade 6 Standards.....	20-22
Grade 7 Standards.....	23-25
Grade 8 Standards.....	26-27
Grades 9 – 11 Standards .....	28-31
Grade 12 Advanced Topics.....	32-34

It is the policy of the Nebraska Department of Education not to discriminate on the basis of gender, disability, race, color, religion, marital status, age, national origin or genetic information in its education programs, administration, policies, employment or other agency programs.

# Categories for Mathematics Standards

**NUMBER:** Students will communicate number concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.

**Numeric Relationships**  
**Operations**

**ALGEBRA:** Students will communicate algebraic concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.

**Algebraic Relationships**  
**Algebraic Processes**  
**Applications**

**GEOMETRY:** Students will communicate geometric concepts and measurement concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.

**Characteristics**  
**Coordinate Geometry**  
**Measurement**

**DATA:** Students will communicate data analysis/probability concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.

**Representations**  
**Analysis & Applications**  
**Probability**

# NEBRASKA MATHEMATICAL PROCESSES

The Nebraska Mathematical Processes reflect overarching processes that students should master as they work towards college and career readiness. The Nebraska Mathematical Processes reflect the interaction of skills necessary for success in math coursework as well as the ability to apply math knowledge and processes within real-world contexts. The processes highlight the applied nature of math within the workforce and clarify the expectations held for the use of mathematics in and outside of the classroom.

## **1. Solves mathematical problems.**

Through the use of appropriate academic and technical tools, students will make sense of mathematical problems and persevere in solving them. Students will draw upon their prior knowledge in order to employ critical thinking skills, reasoning skills, creativity, and innovative ability. Additionally, students will compute accurately and determine the reasonableness of solutions.

## **2. Models and represents mathematical problems.**

Students will analyze relationships in order to create mathematical models given a real-world situation or scenario. Conversely, students will describe situations or scenarios given a mathematical model.

## **3. Communicates mathematical ideas effectively.**

Students will communicate mathematical ideas effectively and precisely. Students will critique the reasoning of others as well as provide mathematical justifications. Students will utilize appropriate communication approaches individually and collectively and through multiple methods, including writing, speaking, and listening.

## **4. Makes mathematical connections.**

Students will connect mathematical knowledge, ideas, and skills beyond the math classroom. This includes the connection of mathematical ideas to other topics within mathematics and to other content areas. Additionally, students will be able to describe the connection of mathematical knowledge and skills to their career interest as well as within authentic/real-world contexts.

# Nebraska Mathematics Standards Kindergarten

**MA 0.1 NUMBER: Students will communicate number sense concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**

**MA.0.1.1 Numeric Relationships:** Students will demonstrate, represent, and show relationships among whole numbers within the base-ten number system.

MA 0.1.1.a Perform the counting sequence by counting forward from any given number to 100, by ones. Count by tens to 100 starting at any decade number.

MA 0.1.1.b Demonstrate cardinality (i.e. the last number name said indicates the number of objects counted), regardless of the arrangement or order in which the objects were counted.

MA 0.1.1.c Use one-to-one correspondence (pairing each object with one and only one spoken number name, and each spoken number name with one and only one object) when counting objects to show the relationship between numbers and quantities of 0 to 20.

MA 0.1.1.d Demonstrate the relationship between whole numbers, knowing each sequential number name refers to a quantity that is one larger.

MA 0.1.1.e Count up to 20 objects arranged in a line, a rectangular array, or a circle. Count up to 10 objects in a scattered configuration. Count out the number of objects, given a number from 1 to 20.

MA 0.1.1.f Write numbers 0 to 20 and represent a number of objects with a written numeral 0 to 20.

MA 0.1.1.g Compose and decompose numbers from 11 to 19 into ten ones and some more ones by a drawing, model, or equation (e.g.,  $14 = 10 + 4$ ) to record each composition and decomposition.

MA 0.1.1.h Compare the number of objects in two groups by identifying the comparison as greater than, less than, or equal to by using strategies of matching and counting.

MA 0.1.1.i Compare the value of two written numerals between 1 and 10.

**MA 0.1.2 Operations:** Students will demonstrate the meaning of addition and subtraction with whole numbers and compute accurately.

MA 0.1.2.a Fluently (i.e. automatic recall based on understanding) add and subtract within 5.

**MA 0.2 ALGEBRA: Students will communicate algebraic concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**

**MA 0.2.1 Algebraic Relationships:** Students will demonstrate, represent, and show relationships with expressions and equations.

MA 0.2.1.a Decompose numbers less than or equal to 10 into pairs in more than one way, showing each decomposition with a model, drawing, or equation (e.g.,  $7 = 4 + 3$  and  $7 = 1 + 6$ ).

MA 0.2.1.b For any number from 1 to 9, find the number that makes 10 when added to the given number, showing the answer with a model, drawing, or equation.

**MA 0.2.2 Algebraic Processes:** Students will apply the operational properties when adding and subtracting.

No additional indicator(s) at this level.

**MA 0.2.3 Applications:** Students will solve real-world problems involving addition and subtraction.

MA 0.2.3.a Solve real-world problems that involve addition and subtraction within 10 (e.g., by using objects, drawings or equations to represent the problem).

**MA 0.3 GEOMETRY:** Students will communicate geometric concepts and measurement concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.

**MA 0.3.1 Characteristics:** Students will identify and describe geometric characteristics and create two- and three-dimensional shapes.

MA 0.3.1.a Describe real-world objects using names of shapes, regardless of their orientation or size (e.g., squares, circles, triangles, rectangles, hexagons, cubes, cones, spheres, and cylinders).

MA 0.3.1.b Identify shapes as two-dimensional (“flat”) or three-dimensional (“solid”).

MA 0.3.1.c Compare and analyze two- and three-dimensional shapes, with different sizes and orientations to describe their similarities, differences, parts (e.g., number “corners”/vertices), and other attributes (e.g., sides of equal length).

MA 0.3.1.d Model shapes found in the real world by building shapes from materials (e.g., clay and pipe cleaners) and drawing shapes.

MA 0.3.1.e Combine simple shapes to compose larger shapes (e.g., use triangle pattern blocks to build a hexagon).

**MA 0.3.2 Coordinate Geometry:** Students will determine location, orientation, and relationships on the coordinate plane.

MA 0.3.2.a Describe the relative positions of objects (e.g., above, below, beside, in front of, behind, next to, between).

**MA 0.3.3 Measurement:** Students will perform and compare measurements and apply formulas.

MA 0.3.3.a Describe measurable attributes of real-world objects (e.g., length or weight).

MA 0.3.3.b Compare length and weight of two objects (e.g., longer/shorter, heavier/lighter).

**MA 0.4 DATA:** Students will communicate data analysis/probability concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.

**MA 0.4.1 Representations:** Students will create displays that represent data.

No additional indicator(s) at this level.

**MA 0.4.2 Analysis & Applications:** Students will analyze data to address the situation.

MA 0.4.2.a Identify, sort, and classify objects by size, shape, color, and other attributes. Identify objects that do not belong to a particular group and explain the reasoning used.

**MA 0.4.3 Probability:** Students will interpret and apply concepts of probability.

No additional indicator(s) at this level.

# Nebraska Mathematics Standards

## Grade 1

**MA 1.1 NUMBER: Students will communicate number sense concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**

**MA.1.1.1 Numeric Relationships:** Students will demonstrate, represent, and show relationships among whole numbers within the base-ten number system.

MA 1.1.1.a Count to 120 by ones and tens, starting at any given number.

MA 1.1.1.b Read and write numerals within the range of 0 – 120.

MA 1.1.1.c Write numerals to match a representation of a given set of objects for numbers up to 120.

MA 1.1.1.d Demonstrate that each digit of a two-digit number represents amounts of tens and ones, knowing 10 can be considered as one unit made of ten ones which is called a “ten” and any two-digit number can be composed of some tens and some ones (e.g., 19 is one ten and nine ones, 83 is eight tens and three ones) and can be recorded as an equation (e.g.,  $19 = 10 + 9$ ).

MA 1.1.1.e Demonstrate that decade numbers represent a number of tens and 0 ones (e.g.,  $50 = 5$  tens and 0 ones).

MA 1.1.1.f Compare two two-digit numbers by using symbols  $<$ ,  $=$ , and  $>$  and justify the comparison based on the number of tens and ones.

**MA 1.1.2 Operations:** Students will demonstrate the meaning of addition and subtraction with whole numbers and compute accurately.

MA 1.1.2.a Fluently (i.e., automatic recall based on understanding) add and subtract within 10.

MA 1.1.2.b Add and subtract within 20, using a variety of strategies (e.g., count on to make a ten).

MA 1.1.2.c Find the difference between two numbers that are multiples of 10, ranging from 10 – 90 using concrete models, drawings or strategies, and write the corresponding equation (e.g.,  $90 - 70 = 20$ ).

MA 1.1.2.d Mentally find 10 more or 10 less than a two-digit number without having to count and explain the reasoning used (e.g., 33 is 10 less than 43).

MA 1.1.2.e Add within 100, which may include adding a two-digit number and a one-digit number, and adding a two-digit number and a multiple of ten using concrete models, drawings, and strategies which reflect understanding of place value.

**MA 1.2 ALGEBRA: Students will communicate algebraic concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**

**MA 1.2.1 Algebraic Relationships:** Students will demonstrate, represent, and show relationships with expressions and equations.

MA 1.2.1.a Use the meaning of the equal sign to determine if equations are true and give examples of equations that are true (e.g.,  $4 = 4$ ,  $6 = 7 - 1$ ,  $6 + 3 = 3 + 6$ , and  $7 + 2 = 5 + 4$ ).

MA 1.2.1.b Use the relationship of addition and subtraction to solve subtraction problems (e.g., find  $12 - 9 = \underline{\quad}$ , using the addition fact  $9 + 3 = 12$ ).

MA 1.2.1.c Find numerical patterns to make connections between counting and addition and subtraction (e.g., adding two is the same as counting on two).

MA 1.2.1.d Determine the unknown whole number in an addition or subtraction equation (e.g.  $7 + ? = 13$ ).

**MA 1.2.2 Algebraic Processes:** Students will apply the operational properties when adding and subtracting.

MA 1.2.2.a Decompose numbers and use the commutative and associative properties of addition to develop addition and subtraction strategies including (making 10's and counting on from the larger number) to add and subtract basic facts within 20 (e.g., decomposing to make 10,  $7 + 5 = 7 + 3 + 2 = 10 + 2 = 12$ ; using the commutative property to count on  $2 + 6 = 6 + 2$ ; and using the associative property to make 10,  $5 + 3 + 7 = 5 + (3 + 7) = 5 + 10$ ).

**MA 1.2.3 Applications:** Students will solve real-world problems involving addition and subtraction.

MA 1.2.3.a Solve real-world problems involving addition and subtraction within 20 in situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all parts of the addition or subtraction problem (e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem).

MA 1.2.3.b Solve real-world problems that include addition of three whole numbers whose sum is less than or equal to 20 by using objects, drawings, and equations with a symbol to represent the unknown number in the problem.

MA 1.2.3.c Create a real-world problem to represent a given equation involving addition and subtraction within 20.

**MA 1.3 GEOMETRY:** Students will communicate geometric concepts and measurement concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.

**MA 1.3.1 Characteristics:** Students will identify and describe geometric characteristics and create two- and three-dimensional shapes.

MA 1.3.1.a Determine defining and non-defining attributes of two-dimensional shapes; build and draw shapes that match the given definition.

MA 1.3.1.b Decompose circles and rectangles into two and four equal parts, using the terms “halves”, “fourths” and “quarters”, and use the phrases “half of”, “fourths of”, and “quarter of”.

MA 1.3.1.c Use two-dimensional shapes (e.g., rectangles, squares, trapezoids, triangles, half-circles, and quarter-circles) and three-dimensional shapes (e.g., cubes, rectangular prisms, cones, and cylinders) to compose and describe new shapes.

**MA 1.3.2 Coordinate Geometry:** Students will determine location, orientation, and relationships on the coordinate plane.

No additional indicator(s) at this level. Mastery is expected at previous grade levels.

**MA 1.3.3 Measurement:** Students will perform and compare measurements and apply formulas.

MA 1.3.3.a Identify, name, and understand the value of dimes and pennies (e.g., a dime is equal to ten pennies) relating to tens and ones, and solve real-world problems involving dimes and pennies, using ¢ symbol appropriately (e.g., If you have four dimes and two pennies, how many cents do you have?).

MA 1.3.3.b Tell and write time to the half hour and hour using analog and digital clocks.

MA 1.3.3.c Measure objects by using a shorter object end-to-end and know that the length of the object is the amount of same-size objects that span it lined up end-to-end.

MA 1.3.3.d Order three objects by directly comparing their lengths, or indirectly by using a third object.



**MA 1.4 DATA: Students will communicate data analysis/probability concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**

**MA 1.4.1 Representations:** Students will create displays that represent data.

MA 1.4.1.a Organize and represent a data set with up to three categories using a picture graph.

**MA 1.4.2 Analysis & Applications:** Students will analyze data to address the situation.

MA 1.4.2.a Ask and answer questions about the total number of data points, how many in each category, and compare categories by identifying how many more or less are in a particular category using a picture graph.

**MA 1.4.3 Probability:** Students will interpret and apply concepts of probability.

No additional indicator(s) at this level.

# Nebraska Mathematics Standards

## Grade 2

**MA 2.1 NUMBER: Students will communicate number sense concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**

**MA.2.1.1 Numeric Relationships:** Students will demonstrate, represent, and show relationships among whole numbers within the base-ten number system.

MA 2.1.1.a Count within 1000, including skip-counting by 5s, 10s, and 100s starting at a variety of multiples of 5, 10 or 100.

MA 2.1.1.b Read and write numbers within the range of 0 – 1,000 using standard, word, and expanded forms.

MA 2.1.1.c Demonstrate that each digit of a three-digit number represents amounts of hundreds, tens and ones (e.g., 387 is 3 hundreds, 8 tens, 7 ones).

MA 2.1.1.d Demonstrate that 100 represents a group of ten tens.

MA 2.1.1.e Compare two three-digit numbers by using symbols  $<$ ,  $=$ , and  $>$  and justify the comparison based on the meanings of the hundreds, tens, and ones.

**MA 2.1.2 Operations:** Students will demonstrate the meaning of addition and subtraction with whole numbers and compute accurately.

MA 2.1.2.a Fluently (i.e. automatic recall based on understanding) add and subtract within 20.

MA 2.1.2.b Add and subtract within 100 using strategies based on place value, including the standard algorithm, properties of operations, and/or the relationship between addition and subtraction.

MA 2.1.2.c Mentally add or subtract 10 or 100 to/from a given number 100-900.

MA 2.1.2.d Add up to three two-digit numbers using strategies based on place value and understanding of properties.

MA 2.1.2.e Add and subtract within 1000, using concrete models, drawings, and strategies, which reflect understanding of place value and properties of operations.

MA 2.1.2.f Use addition to find the total number of objects arranged in an array no larger than five rows and five columns and write an equation to express the total (e.g.,  $3 + 3 + 3 = 9$ ).

**MA 2.2 ALGEBRA: Students will communicate algebraic concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**

**MA 2.2.1 Algebraic Relationships:** Students will demonstrate, represent, and show relationships with expressions and equations.

MA 2.2.1.a Identify a group of objects from 0-20 as even or odd by counting by 2's or by showing even numbers as a sum of two equal parts.

**MA 2.2.2 Algebraic Processes:** Students will apply the operational properties when adding and subtracting.

No additional indicator(s) at this level. Mastery is expected at previous grade levels.

**MA 2.2.3 Applications:** Students will solve real-world problems involving addition and subtraction.

MA 2.2.3.a Solve real-world problems involving addition and subtraction within 100 in situations of addition and subtraction, including adding to, subtracting from, joining and separating, and comparing situations with unknowns in all positions using objects, models, drawings, verbal explanations, expressions and equations.

MA 2.2.3.b Create real-world problems to represent one- and two-step addition and subtraction within 100, with unknowns in all positions.

**MA 2.3 GEOMETRY:** Students will communicate geometric concepts and measurement concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.

**MA 2.3.1 Characteristics:** Students will identify and describe geometric characteristics and create two- and three-dimensional shapes.

MA 2.3.1.a Recognize and draw shapes having a specific number of angles, faces, or other attributes, including triangles, quadrilaterals, pentagons, and hexagons.

MA 2.3.1.b Partition a rectangle into rows and columns of equal sized squares. Count to find the total.

MA 2.3.1.c Divide circles and rectangles into two, three, or four equal parts. Describe the parts using the language of halves, thirds, fourths, half of, a third of, a fourth of.

MA 2.3.1.d Recognize that equal shares of identical wholes need not have the same shape.

**MA 2.3.2 Coordinate Geometry:** Students will determine location, orientation, and relationships on the coordinate plane.

No additional indicator(s) at this level. Mastery is expected at previous grade levels.

**MA 2.3.3 Measurement:** Students will perform and compare measurements and apply formulas.

MA 2.3.3.a Solve real-world problems involving dollar bills, quarters, dimes, nickels, and pennies, using \$ and ¢ symbols appropriately.

MA 2.3.3.b Identify and write time to five-minute intervals using analog and digital clocks and both a.m. and p.m.

MA 2.3.3.c Identify and use appropriate tools for measuring length (e.g., ruler, yardstick, meter stick, and measuring tape).

MA 2.3.3.d Measure the length of an object using two different length units and describe how the measurements relate to the size of the specific unit.

MA 2.3.3.e Measure and estimate lengths using inches, feet, centimeters, and meters.

MA 2.3.3.f Compare the difference in length of objects using inches and feet or centimeters and meters.

MA 2.3.3.g Represent whole numbers as lengths from 0 on a number line diagram with equally spaced points corresponding to the numbers 0, 1, 2, etc., and represent whole number sums and differences within 100 on a number line.

MA 2.3.3.h Use measurement lengths and addition and subtraction within 100 to solve real-world problems.

**MA 2.4 DATA: Students will communicate data analysis/probability concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**

**MA 2.4.1 Representations:** Students will create displays that represent data.

MA 2.4.1.a Create and represent a data set using pictographs and bar graphs to represent a data set with up to four categories.

MA 2.4.1.b Create and represent a data set by making a line plot.

**MA 2.4.2 Analysis & Applications:** Students will analyze data to address the situation.

MA 2.4.2.a Interpret data using bar graphs with up to four categories. Solve simple comparison problems using information from the graphs.

**MA 2.4.3 Probability:** Students will interpret and apply concepts of probability.

No additional indicator(s) at this level.

# Nebraska Mathematics Standards

## Grade 3

**MA 3.1 NUMBER: Students will communicate number sense concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**

**MA.3.1.1 Numeric Relationships:** Students will demonstrate, represent, and show relationships among whole numbers and simple fractions within the base-ten number system.

MA 3.1.1.a Read, write and demonstrate multiple equivalent representations for numbers up to 100,000 using objects, visual representations, including standard form, word form, expanded form, and expanded notation.

MA 3.1.1.b Compare whole numbers through the hundred thousands and represent the comparisons using the symbols  $>$ ,  $<$  or  $=$ .

MA 3.1.1.c Round a whole number to the tens or hundreds place, using place value understanding or a visual representation.

MA 3.1.1.d Represent and understand a fraction as a number on a number line.

MA 3.1.1.e Express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers.

MA 3.1.1.f Show and identify equivalent fractions using visual representations including pictures, manipulatives, and number lines.

MA 3.1.1.g Find parts of a whole and parts of a set using visual representations.

MA 3.1.1.h Explain and demonstrate how fractions  $\frac{1}{4}$ ,  $\frac{1}{2}$ ,  $\frac{3}{4}$  and a whole relate to time, measurement, and money, and demonstrate using visual representation.

MA 3.1.1.i Compare and order fractions having the same numerators or denominators using visual representations, comparison symbols, and verbal reasoning.

**MA 3.1.2 Operations:** Students will demonstrate the meaning of multiplication and division with whole numbers and compute accurately.

MA 3.1.2.a Add and subtract within 1,000 with or without regrouping.

MA 3.1.2.b Select and apply the appropriate methods of computation when solving one- and two- step addition and subtraction problems with four-digit whole numbers through the thousands (e.g., visual representations, mental computation, paper-pencil).

MA 3.1.2.c Use drawings, words, arrays, symbols, repeated addition, equal groups, and number lines to explain the meaning of multiplication.

MA 3.1.2.d Use words and symbols to explain the meaning of the Zero Property and Identity Property of multiplication.

MA 3.1.2.e Multiply one digit whole numbers by multiples of 10 in the range of 10 to 90.

MA 3.1.2.f Use objects, drawings, arrays, words and symbols to explain the relationship between multiplication and division (e.g., if  $3 \times 4 = 12$  then  $12 \div 3 = 4$ ).

MA 3.1.2.g Fluently (i.e. automatic recall based on understanding) multiply and divide within 100.

MA 3.1.2.h Determine the reasonableness of whole number sums and differences in real-world problems using estimation, compatible numbers, mental computations, or other strategies.

**MA 3.2 ALGEBRA: Students will communicate algebraic concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**

**MA 3.2.1 Algebraic Relationships:** Students will demonstrate, represent, and show relationships with expressions and equations.

MA 3.2.1.a Identify arithmetic patterns (including patterns in the addition or multiplication tables) using properties of operations.

MA 3.2.1.b Interpret a multiplication equation as equal groups (e.g., interpret  $4 \times 6$  as the total number of objects in four groups of six objects each). Represent verbal statements of equal groups as multiplication equations.

**MA 3.2.2 Algebraic Processes:** Student will apply the operational properties when multiplying and dividing.

MA 3.2.2.a Apply the commutative, associative, and distributive properties as strategies to multiply and divide.

MA 3.2.2.b Solve one-step whole number equations involving addition, subtraction, multiplication, or division, including the use of a letter to represent the unknown quantity.

**MA 3.2.3 Applications:** Students will solve real-world problems involving equations with whole numbers.

MA 3.2.3.a Solve real-world problems involving two-step equations (involving two operations) involving whole numbers using addition and subtraction.

MA 3.2.3.b Write an equation (e.g., one operation, one variable) to represent real-world problems involving whole numbers.

**MA 3.3 GEOMETRY: Students will communicate geometric concepts and measurement concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**

**MA 3.3.1 Characteristics:** Students will identify and describe geometric characteristics and create two- and three-dimensional shapes.

MA 3.3.1.a Identify the number of sides, angles, and vertices of two-dimensional shapes.

MA 3.3.1.b Sort quadrilaterals into categories (e.g., rhombuses, squares, and rectangles).

MA 3.3.1.c Draw lines to separate two-dimensional figures into equal areas, and express the area of each part as a unit fraction of the whole.

**MA 3.3.2 Coordinate Geometry:** Students will determine location, orientation, and relationships on the coordinate plane.

No additional indicator(s) at this level. Mastery is expected at previous grade levels.

**MA 3.3.3 Measurement:** Students will perform and compare measurements and apply formulas.

MA 3.3.3.a Find the perimeter of polygons given the side lengths, and find an unknown side length.

MA 3.3.3.b Tell and write time to the minute using both analog and digital clocks.

MA 3.3.3.c Solve real-world problems involving addition and subtraction of time intervals and find elapsed time.

MA 3.3.3.d Identify and use the appropriate tools and units of measurement, both customary and metric, to solve real-world problems involving length, weight, mass, liquid volume, and capacity (within the same system and unit).

MA 3.3.3.e Estimate and measure length to the nearest half inch, quarter inch, and centimeter.

MA 3.3.3.f Use concrete and pictorial models to measure areas in square units by counting square units.

MA 3.3.3.g Find the area of a rectangle with whole-number side lengths by modeling with unit squares, and show that the area is the same as would be found by multiplying the side lengths.

MA 3.3.3.h Identify and draw rectangles with the same perimeter and different areas or with the same area and different perimeters.

**MA 3.4 DATA: Students will communicate data analysis/probability concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**

**MA 3.4.1 Representations:** Students will create displays that represent data.

MA 3.4.1.a Create scaled pictographs and scaled bar graphs to represent a data set—including data collected through observations, surveys, and experiments—with several categories.

MA 3.4.1.b Represent data using line plots where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters.

**MA 3.4.2 Analysis & Applications:** Students will analyze data to address the situation.

MA 3.4.2.a Solve problems and make simple statements about quantity differences (e.g., how many more and how many less) using information represented in pictographs and bar graphs.

**MA 3.4.3 Probability:** Students will interpret and apply concepts of probability.

No additional indicator(s) at this level.

# Nebraska Mathematics Standards

## Grade 4

**MA 4.1 NUMBER: Students will communicate number sense concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**

**MA.4.1.1 Numeric Relationships:** Students will demonstrate, represent, and show relationships among fractions and decimals within the base-ten number system.

MA 4.1.1.a Read, write, and demonstrate multiple equivalent representations for whole numbers up to one million and decimals to the hundredths, using objects, visual representations, standard form, word form, and expanded notation.

MA 4.1.1.b Recognize a digit in one place represents ten times what it represents in the place to its right and  $\frac{1}{10}$  what it represents in the place to its left.

MA 4.1.1.c Classify a number up to 100 as prime or composite.

MA 4.1.1.d Determine whether a given whole number up to 100 is a multiple of a given one-digit number.

MA 4.1.1.e Determine factors of any whole number up to 100.

MA 4.1.1.f Compare whole numbers up to one million and decimals through the hundredths place using  $>$ ,  $<$ , and  $=$  symbols, and visual representations.

MA 4.1.1.g Round a multi-digit whole number to any given place.

MA 4.1.1.h Use decimal notation for fractions with denominators of 10 or 100.

MA 4.1.1.i Generate and explain equivalent fractions by multiplying by an equivalent fraction of 1.

MA 4.1.1.j Explain how to change a mixed number to a fraction and how to change a fraction to a mixed number.

MA 4.1.1.k Compare and order fractions having unlike numerators and unlike denominators using visual representations (number line), comparison symbols and verbal reasoning (e.g., using benchmarks or common numerators or common denominators).

MA 4.1.1.l Decompose a fraction into a sum of fractions with the same denominator in more than one way and record each decomposition with an equation and a visual representation.

**MA 4.1.2 Operations:** Students will demonstrate the meaning of addition and subtraction of whole numbers and fractions and compute accurately.

MA 4.1.2.a Add and subtract multi-digit numbers using the standard algorithm.

MA 4.1.2.b Multiply a four-digit whole number by a one-digit whole number.

MA 4.1.2.c Multiply a two-digit whole number by a two-digit whole number using the standard algorithm.

MA 4.1.2.d Divide up to a four-digit whole number by a one-digit divisor with and without a remainder.

MA 4.1.2.e Use drawings, words, and symbols to explain the meaning of addition and subtraction of fractions with like denominators.

MA 4.1.2.f Add and subtract fractions and mixed numbers with like denominators.

MA 4.1.2.g Multiply a fraction by a whole number.

MA 4.1.2.h Determine the reasonableness of whole number products and quotients in real-world problems using estimation, compatible numbers, mental computations, or other strategies.



**MA 4.2 ALGEBRA: Students will communicate algebraic concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**

**MA 4.2.1 Algebraic Relationships: Students will demonstrate, represent, and show relationships with expressions and equations.**

MA 4.2.1.a Create a simple algebraic expression or equation using a variable for an unknown number to represent a math process (e.g.,  $3 + n = 15$ ,  $81 \div n = 9$ ).

MA 4.2.1.b Generate and analyze a number or shape pattern to follow a given rule, such as  $y = 3x + 5$  is a rule to describe a relationship between two variables and can be used to find a second number when a first number is given.

**MA 4.2.2 Algebraic Processes: Students will apply the operational properties when evaluating expressions and solving equations.**

MA 4.2.2.a Solve one- and two-step problems which use any or all of the four basic operations and include the use of a letter to represent the unknown quantity.

**MA 4.2.3 Applications: Students will solve real-world problems involving equations with fractions.**

MA 4.2.3.a Solve real-world problems involving multi-step equations comprised of whole numbers using the four operations, including interpreting remainders.

MA 4.2.3.b Solve real-world problems involving addition and subtraction of fractions and mixed numbers with like denominators.

**MA 4.3 GEOMETRY: Students will communicate geometric concepts and measurement concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**

**MA 4.3.1 Characteristics: Students will identify and describe geometric characteristics and create two- and three-dimensional shapes.**

MA 4.3.1.a Recognize angles as geometric shapes that are formed where two rays share a common endpoint.

MA 4.3.1.b Classify an angle as acute, obtuse, or right.

MA 4.3.1.c Identify and draw points, lines, line segments, rays, angles, parallel lines, perpendicular lines, and intersecting lines, and recognize them in two-dimensional figures.

MA 4.3.1.d Classify two-dimensional shapes based on the presence or absence of parallel and perpendicular lines, or the presence or absence of specific angles.

MA 4.3.1.e Identify right triangles.

MA 4.3.1.f Measure angles in whole number degrees using a protractor.

MA 4.3.1.g Sketch angles of a specified measure.

MA 4.3.1.h Recognize and draw lines of symmetry in two-dimensional shapes.

**MA 4.3.2 Coordinate Geometry: Students will determine location, orientation, and relationships on the coordinate plane.**

No additional indicator(s) at this level. Mastery is expected at previous grade levels.

**MA 4.3.3 Measurement:** Students will perform and compare measurements and apply formulas.

MA 4.3.3.a Apply perimeter and area formulas for rectangles.

MA 4.3.3.b Identify and use the appropriate tools, operations, and units of measurement, both customary and metric, to solve real-world problems involving time, length, weight, mass, capacity, and volume.

MA 4.3.3.c Generate simple conversions from a larger unit to a smaller unit within the customary and metric systems of measurement.

**MA 4.4 DATA: Students will communicate data analysis/probability concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**

**MA 4.4.1 Representations:** Students will create displays that represent data.

MA 4.4.1.a Represent data using line plots where the horizontal scale is marked off in appropriate units (e.g., whole numbers, halves, quarters, or eighths).

**MA 4.4.2 Analysis & Applications:** Students will analyze data to address the situation.

MA 4.4.2.a Solve problems involving addition or subtraction of fractions using information presented in line plots.

**MA 4.4.3 Probability:** Students will interpret and apply concepts of probability.

No additional indicator(s) at this level.

## Nebraska Mathematics Standards Grade 5

**MA 5.1 NUMBER: Students will communicate number sense concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**

**MA.5.1.1 Numeric Relationships:** Students will demonstrate, represent, and show relationships among whole numbers, fractions, and decimals within the base-ten number system.

MA 5.1.1.a Determine multiple equivalent representations for whole numbers and decimals through the thousandths place using standard form, word form, and expanded notation.

MA 5.1.1.b Compare whole numbers, fractions, mixed numbers, and decimals through the thousandths place and represent comparisons using symbols  $<$ ,  $>$ , or  $=$ .

MA 5.1.1.c Round whole numbers and decimals to any given place.

MA 5.1.1.d Recognize and generate equivalent forms of commonly used fractions, decimals, and percents (e.g., halves, thirds, fourths, fifths, and tenths).

MA 5.1.1.e Write powers of 10 with exponents.

**MA 5.1.2 Operations:** Students will demonstrate the meaning of operations and compute accurately with whole numbers, fractions, and decimals.

MA 5.1.2.a Multiply multi-digit whole numbers using the standard algorithm.

MA 5.1.2.b Divide four-digit whole numbers by a two-digit divisor, with and without remainders using the standard algorithm.

MA 5.1.2.c Multiply a whole number by a fraction or a fraction by a fraction using models and visual representations.

MA 5.1.2.d Divide a unit fraction by a whole number and a whole number by a unit fraction.

MA 5.1.2.e Explain division of a whole number by a fraction using models and visual representations.

MA 5.1.2.f Interpret a fraction as division of the numerator by the denominator.

MA 5.1.2.g Add, subtract, multiply, and divide decimals to the hundredths using concrete models or drawings and strategies based on place value, properties of operations (i.e. Commutative, Associative, Distributive, Identity, Zero), and/or relationships between operations.

MA 5.1.2.h Add and subtract fractions and mixed numbers with unlike denominators.

MA 5.1.2.i Determine the reasonableness of computations involving whole numbers, fractions, and decimals.

MA 5.1.2.j Multiply and divide by powers of 10.

**MA 5.2 ALGEBRA: Students will communicate algebraic concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**

**MA 5.2.1 Algebraic Relationships:** Students will demonstrate, represent, and show relationships with expressions and equations.

MA 5.2.1.a Form ordered pairs from a rule such as  $y=2x$ , and graph the ordered pairs on a coordinate plane.

**MA 5.2.2 Algebraic Processes:** Students will apply the operational properties when evaluating expressions and solving equations.

MA 5.2.2.a Interpret and evaluate numerical or algebraic expressions using order of operations (excluding exponents).

**MA 5.2.3 Applications:** Students will solve real-world problems involving equations with fractions and mixed numbers.

MA 5.2.3.a Solve real-world problems involving addition and subtraction of fractions and mixed numbers with like and unlike denominators.

**MA 5.3 GEOMETRY: Students will communicate geometric concepts and measurement concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**

**MA 5.3.1 Characteristics:** Students will identify and describe geometric characteristics and create two- and three-dimensional shapes.

MA 5.3.1.a Identify three-dimensional figures including cubes, cones, pyramids, prisms, spheres, and cylinders.

MA 5.3.1.b Identify faces, edges, and vertices of rectangular prisms.

MA 5.3.1.c Justify the classification of two-dimensional figures based on their properties.

**MA 5.3.2 Coordinate Geometry:** Students will determine location, orientation, and relationships on the coordinate plane.

MA 5.3.2.a Identify the origin, x axis, and y axis of the coordinate plane.

MA 5.3.2.b Graph and name points in the first quadrant of the coordinate plane using ordered pairs of whole numbers.

**MA 5.3.3 Measurement:** Students will perform and compare measurements and apply formulas.

MA 5.3.3.a Recognize that solid figures have volume that is measured in cubic units.

MA 5.3.3.b Use concrete models to measure the volume of rectangular prisms in cubic units by counting cubic units.

MA 5.3.3.c Generate conversions within the customary and metric systems of measurement.

**MA 5.4 DATA: Students will communicate data analysis/probability concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**

**MA 5.4.1 Representations:** Students will create displays that represent data.

No additional indicator(s) at this level. Mastery is expected at previous grade levels.

**MA 5.4.2 Analysis & Applications:** Students will analyze data to address the situation.

MA 5.4.2.a Use observations, surveys, and experiments to collect, represent, and interpret the data using tables (e.g., frequency charts) and bar graphs.

MA 5.4.2.b Formulate questions that can be addressed with data and make predictions about the data.

**MA 5.4.3 Probability:** Students will interpret and apply concepts of probability.

No additional indicator(s) at this level.

# Nebraska Mathematics Standards

## Grade 6

**MA 6.1 NUMBER: Students will communicate number sense concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**

**MA.6.1.1 Numeric Relationships:** Students will demonstrate, represent, and show relationships among fractions, decimals, percents, and integers within the base-ten number system.

MA 6.1.1.a Determine common factors and common multiples using prime factorization of numbers with and without exponents.

MA 6.1.1.b Represent non-negative whole numbers using exponential notation.

MA 6.1.1.c Compare and order rational numbers both on the number line and not on the number line.

MA 6.1.1.d Convert among fractions, decimals, and percents using multiple representations.

MA 6.1.1.e Determine ratios from drawings, words, and manipulatives.

MA 6.1.1.f Explain and determine unit rates.

MA 6.1.1.g Model integers using drawings, words, manipulatives, number lines, and symbols.

MA 6.1.1.h Compare and order integers and absolute value both on the number line and not on the number line.

MA 6.1.1.i Determine absolute value of rational numbers.

**MA 6.1.2 Operations:** Students will compute with fractions and decimals accurately.

MA 6.1.2.a Multiply and divide non-negative fractions and mixed numbers.

MA 6.1.2.b Evaluate expressions with positive exponents.

MA 6.1.2.c Divide multi-digit whole numbers using the standard algorithm.

MA 6.1.2.d Add, subtract, multiply, and divide decimals using the standard algorithms.

MA 6.1.2.e Estimate and check reasonableness of answers using appropriate strategies and tools.

**MA 6.2 ALGEBRA: Students will communicate algebraic concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**

**MA 6.2.1 Algebraic Relationships:** Students will demonstrate, represent, and show relationships with expressions, equations, and inequalities.

MA 6.2.1.a Create algebraic expressions (e.g., one operation, one variable as well as multiple operations, one variable) from word phrases.

MA 6.2.1.b Recognize and generate equivalent algebraic expressions involving distributive property and combining like terms.

MA 6.2.1.c Represent and analyze the relationship between two variables using graphs, tables, and one-step equations.

**MA 6.2.2 Algebraic Processes:** Students will apply the operational properties when evaluating expressions and solving expressions, equations, and inequalities.

MA 6.2.2.a Simplify expressions using the distributive property and combining like terms.

MA 6.2.2.b Use substitution to determine if a given value for a variable makes an equation or inequality true.

MA 6.2.2.c Evaluate numerical expressions, including absolute value and exponents, with respect to order of operations.

MA 6.2.2.d Given the value of the variable, evaluate algebraic expressions (which may include absolute value) with respect to order of operations (non-negative rational numbers).

MA 6.2.2.e Solve one-step equations with non-negative rational numbers using addition, subtraction, multiplication and division.

MA 6.2.2.f Use equivalent ratios relating quantities with whole numbers to create a table. Find missing values in the table.

MA 6.2.2.g Represent inequalities on a number line (e.g., graph  $x > 3$ ).

**MA 6.2.3 Applications:** Students will solve real-world problems involving ratios, unit rates, and percents.

MA 6.2.3.a Write equations (e.g., one operation, one variable) to represent real-world problems involving non-negative rational numbers.

MA 6.2.3.b Solve real-world problems involving non-negative rational numbers.

MA 6.2.3.c Solve real-world problems involving percents of numbers.

MA 6.2.3.d Solve real-world problems using ratios and unit rates.

**MA 6.3 GEOMETRY:** Students will communicate geometric concepts and measurement concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.

**MA 6.3.1 Characteristics:** Students will identify and describe geometric characteristics and create two- and three-dimensional shapes.

MA 6.3.1.a Identify and create nets to represent two-dimensional drawings of prisms, pyramids, cylinders, and cones.

**MA 6.3.2 Coordinate Geometry:** Students will determine location, orientation, and relationships on the coordinate plane.

MA 6.3.2.a Identify the ordered pair of a given point in the coordinate plane.

MA 6.3.2.b Plot the location of an ordered pair in the coordinate plane.

MA 6.3.2.c Identify the quadrant of a given point in the coordinate plane.

MA 6.3.2.d Draw polygons in the coordinate plane given coordinates for the vertices.

MA 6.3.2.e Calculate vertical and horizontal distances in the coordinate plane to find perimeter and area.

**MA 6.3.3 Measurement:** Students will perform and compare measurements and apply formulas.

MA 6.3.3.a Determine the area of quadrilaterals, including parallelograms, trapezoids, and triangles by composition and decomposition of polygons as well as application of formulas.

MA 6.3.3.b Determine the surface area of rectangular prisms and triangular prisms using nets.

MA 6.3.3.c Apply volume formulas for rectangular prisms.

**MA 6.4 DATA: Students will communicate data analysis/probability concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**

**MA 6.4.1 Representations:** Students will create displays that represent data.

MA 6.4.1.a Represent data using line plots, dot plots, box plots, and histograms.

**MA 6.4.2 Analysis & Applications:** Students will analyze data to address the situation.

MA 6.4.2.a Solve problems using information presented in line plots, dot plots, box plots, and histograms.

MA 6.4.2.b Compare and interpret data sets based upon their graphical representations (e.g., center, spread, and shape).

MA 6.4.2.c Find and interpret the mean, median, mode, and range for a set of data.

MA 6.4.2.d Compare the mean, median, mode, and range from two sets of data.

**MA 6.4.3 Probability:** Students will interpret and apply concepts of probability.

No additional indicator(s) at this level.



# Nebraska Mathematics Standards Grade 7

**MA 7.1 NUMBER: Students will communicate number sense concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**

**MA.7.1.1 Numeric Relationships:** Students will demonstrate, represent, and show relationships among rational numbers within the base-ten number system.

No additional indicator(s) at this level. Mastery is expected at previous grade levels.

**MA 7.1.2 Operations:** Students will compute with rational numbers accurately.

MA 7.1.2.a Solve problems using proportions and ratios (e.g., cross products, percents, tables, equations, and graphs).

MA 7.1.2.b Add, subtract, multiply, and divide rational numbers (e.g., positive and negative fractions, decimals, and integers).

MA 7.1.2.c Apply properties of operations as strategies for problem solving with rational numbers.

MA 7.1.2.d Use multiple strategies to add, subtract, multiply, and divide integers.

MA 7.1.2.e Estimate and check reasonableness of answers using appropriate strategies and tools.

**MA 7.2 ALGEBRA: Students will communicate algebraic concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**

**MA 7.2.1 Algebraic Relationships:** Students will demonstrate, represent, and show relationships with expressions, equations, and inequalities.

MA 7.2.1.a Describe and create an inequality from words and pictures (e.g., one-step, one-variable).

MA 7.2.1.b Represent real-world situations with proportions.

**MA 7.2.2 Algebraic Processes:** Students will apply the operational properties when evaluating expressions, and solving equations and inequalities.

MA 7.2.2.a Solve equations using the distributive property and combining like terms.

MA 7.2.2.b Use factoring and properties of operations to create equivalent algebraic expressions (e.g.,  $2x + 6 = 2(x + 3)$ ).

MA 7.2.2.c Given the value of the variable(s), evaluate algebraic expressions (including absolute value).

MA 7.2.2.d Solve two-step equations involving rational numbers which include the integers.

MA 7.2.2.e Solve one-step inequalities involving integers and rational numbers and represent solutions on a number line.

**MA 7.2.3 Applications:** Students will solve real-world problems involving expressions, equations, and inequalities.

MA 7.2.3.a Describe and write linear equations from words and tables.

MA 7.2.3.b Write a two-step equation to represent real-world problems involving rational numbers in any form.

MA 7.2.3.c Solve real-world problems with equations that involve rational numbers in any form.

MA 7.2.3.d Solve real-world problems with inequalities.

MA 7.2.3.e Use proportional relationships to solve real-world problems, including percent problems, (e.g., % increase, % decrease, mark-up, tip, simple interest).

MA 7.2.3.f Solve real-world problems involving scale drawings using a proportional relationship.

**MA 7.3 GEOMETRY: Students will communicate geometric concepts and measurement concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**

**MA 7.3.1 Characteristics:** Students will identify and describe geometric characteristics of two-dimensional shapes.

MA 7.3.1.a Apply and use properties of adjacent, complementary, supplementary, and vertical angles to find missing angle measures.

MA 7.3.1.b Draw triangles (freehand, using a ruler and a protractor, and using technology) with given conditions of three measures of angles or sides, and notice when the conditions determine a unique triangle, more than one triangle, or no triangle.

**MA 7.3.2 Coordinate Geometry:** Students will determine location, orientation, and relationships on the coordinate plane.

No additional indicator(s) at this level. Mastery is expected at previous grade levels.

**MA 7.3.3 Measurement:** Students will perform and compare measurements and apply formulas.

MA 7.3.3.a Solve real-world problems involving perimeter and area of composite shapes made from triangles, quadrilaterals and polygons.

MA 7.3.3.b Solve real-world problems involving surface area and volume of composite shapes made from rectangular and triangular prisms.

MA 7.3.3.c Determine the area and circumference of circles both on and off the coordinate plane.

**MA 7.4 DATA: Students will communicate data analysis/probability concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**

**MA 7.4.1 Representations:** Students will create displays that represent data.

MA 7.4.1.a Represent data using circle graphs.

**MA 7.4.2 Analysis & Applications:** Students will analyze data to address the situation.

MA 7.4.2.a Solve problems using information presented in circle graphs.

MA 7.4.2.b Explain the difference between a population and a sample.

MA 7.4.2.c Generate conclusions about a population based upon a random sample.

MA 7.4.2.d Determine and critique biases in different data representations.

**MA 7.4.3 Probability:** Students will interpret and apply concepts of probability.

MA 7.4.3.a Generate a list of possible outcomes for a simple event.

MA 7.4.3.b Describe the theoretical probability of an event using a fraction, percentage, and decimal.

MA 7.4.3.c Find theoretical probabilities for independent events.

MA 7.4.3.d Perform simple experiments and express the degree of likelihood (possible, impossible, certain, more likely, equally likely, or less likely); write as fractions and percentages.

MA 7.4.3.e Find experimental probability for independent events.

MA 7.4.3.f Compare and contrast theoretical and experimental probabilities.

MA 7.4.3.g Find the probability of dependent compound events.

MA 7.4.3.h Identify complementary events and calculate their probabilities.

# Nebraska Mathematics Standards

## Grade 8

**MA 8.1 NUMBER: Students will communicate number sense concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**

**MA.8.1.1 Numeric Relationships:** Students will demonstrate, represent, and show relationships among real numbers within the base-ten number system.

MA 8.1.1.a Determine subsets of numbers as natural, whole, integer, rational, irrational, or real, based on the definitions of these sets of numbers.

MA 8.1.1.b Represent numbers with positive and negative exponents and in scientific notation.

MA 8.1.1.c Describe the difference between a rational and irrational number.

MA 8.1.1.d Approximate, compare, and order real numbers (both rational and irrational) and order real numbers both off and on the number line.

**MA 8.1.2 Operations:** Students will compute with exponents and roots.

MA 8.1.2.a Evaluate the square roots of perfect squares less than or equal to 400 and cube roots of perfect cubes less than or equal to 125.

MA 8.1.2.b Simplify numerical expressions involving exponents and roots (e.g.,  $4^{(-2)}$  is the same as  $1/16$ ).

MA 8.1.2.c Simplify numerical expressions involving absolute value.

MA 8.1.2.d Multiply and divide numbers using scientific notation.

MA 8.1.2.e Estimate and check reasonableness of answers using appropriate strategies and tools.

**MA 8.2 ALGEBRA: Students will communicate algebraic concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**

**MA 8.2.1 Algebraic Relationships:** Students will demonstrate, represent, and show relationships with expressions, equations, and inequalities.

MA 8.2.1.a Create algebraic expressions, equations, and inequalities (e.g., two-step, one variable) from word phrases, tables, and pictures.

MA 8.2.1.b Determine and describe the rate of change for given situations through the use of tables and graphs.

MA 8.2.1.c Describe equations and linear graphs as having one solution, no solution, or infinitely many solutions.

MA 8.2.1.d Graph proportional relationships and interpret the slope.

**MA 8.2.2 Algebraic Processes:** Students will apply the operational properties when evaluating expressions and solving expressions, equations, and inequalities.

MA 8.2.2.a Solve multi-step equations involving rational numbers with the same variable appearing on both sides of the equal sign.

MA 8.2.2.b Solve two-step inequalities involving rational numbers and represent solutions on a number line.

**MA 8.2.3 Applications:** Students will solve real-world problems involving multi-step equations and multi-step inequalities.

MA 8.2.3.a Describe and write equations from words, patterns, and tables.

MA 8.2.3.b Write a multi-step equation to represent real-world problems using rational numbers in any form.

MA 8.2.3.c Solve real-world multi-step problems involving rational numbers in any form.

**MA 8.3 GEOMETRY:** Students will communicate geometric concepts and measurement concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.

**MA 8.3.1 Characteristics:** Students will identify and describe geometric characteristics of two-dimensional shapes.

MA 8.3.1.a Determine and use the relationships of the interior angles of a triangle to solve for missing measures.

MA 8.3.1.b Identify and apply geometric properties of parallel lines cut by a transversal and the resulting corresponding, alternate interior, and alternate exterior angles to find missing measures.

**MA 8.3.2 Coordinate Geometry:** Students will determine location, orientation, and relationships on the coordinate plane.

MA 8.3.2.a Perform and describe positions and orientation of shapes under single transformations including rotations (in multiples of 90 degrees about the origin), translations, reflections, and dilations on and off the coordinate plane.

MA 8.3.2.b Find congruent two-dimensional figures and define congruence in terms of a series of transformations.

MA 8.3.2.c Find similar two-dimensional figures and define similarity in terms of a series of transformations.

**MA 8.3.3 Measurement:** Students will perform and compare measurements and apply formulas.

MA 8.3.3.a Explain a model of the Pythagorean Theorem.

MA 8.3.3.b Apply the Pythagorean Theorem to find side lengths of triangles and to solve real-world problems.

MA 8.3.3.c Find the distance between any two points on the coordinate plane using the Pythagorean Theorem.

MA 8.3.3.d Determine the volume of cones, cylinders, and spheres, and solve real-world problems using volumes.

**MA 8.4 DATA:** Students will communicate data analysis/probability concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.

**MA 8.4.1 Representations:** Students will create displays that represent data.

MA 8.4.1.a Represent bivariate data (i.e. ordered pairs) using scatter plots.

**MA 8.4.2 Analysis & Applications:** Students will analyze data to address the situation.

MA 8.4.2.a Solve problems and make predictions using an approximate line of best fit.

**MA 8.4.3 Probability:** Students will interpret and apply concepts of probability.

No additional indicator(s) at this level. Mastery is expected at previous grade levels.

## Nebraska Mathematics Standards Grades 9 – 11

**MA 11.1 NUMBER: Students will communicate number sense concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**

**MA.11.1.1 Numeric Relationships:** Students will demonstrate, represent, and show relationships among the subsets of real numbers and the complex number system.

MA 11.1.1.a Compare and contrast subsets of the complex number system, including imaginary, rational, irrational, integers, whole, and natural numbers.

MA 11.1.1.b Recognize that closure properties apply to the subsets of the complex number system, under the standard operations.

MA 11.1.1.c Use drawings, words, and symbols to explain the effects of operations such as multiplication and division on the magnitude of quantities in the real number system, including powers and roots (e.g., if you take the square root of a number, will the result always be smaller than the original number?).

**MA 11.1.2 Operations:** Students will compute with real and complex numbers.

MA 11.1.2.a Compute with subsets of the complex number system, including imaginary, rational, irrational, integers, whole, and natural numbers.

MA 11.1.2.b Simplify expressions with rational exponents.

MA 11.1.2.c Select, apply, and explain the method of computation when problem solving using real numbers (e.g., models, mental computation, paper-pencil, or technology).

MA 11.1.2.d Use estimation methods to check the reasonableness of real number computations and decide if the problem calls for an approximation (including appropriate rounding) or an exact number.

**MA 11.2 ALGEBRA: Students will communicate algebraic concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**

**MA 11.2.1 Algebraic Relationships:** Students will demonstrate, represent, and show relationships with functions.

MA 11.2.1.a Define a function and use function notation.

MA 11.2.1.b Analyze a relation to determine if it is a function given graphs, tables, or algebraic notation.

MA 11.2.1.c Classify a function given graphs, tables, or algebraic notation, as linear, quadratic, or neither.

MA 11.2.1.d Identify domain and range of functions represented in either algebraic or graphical form.

MA 11.2.1.e Analyze and graph linear functions and inequalities (point-slope form, slope-intercept form, standard form, intercepts, rate of change, parallel and perpendicular lines, vertical and horizontal lines, and inequalities).

MA 11.2.1.f Analyze and graph absolute value functions (finding the vertex, symmetry, transformations, determine intercepts, and minimums or maximums using the piecewise definition).

MA 11.2.1.g Analyze and graph quadratic functions (standard form, vertex form, finding zeros, symmetry, transformations, determine intercepts, and minimums or maximums).

MA 11.2.1.h Represent, interpret, and analyze inverses of functions algebraically and graphically.

**MA 11.2.2 Algebraic Processes:** Students will apply the operational properties when evaluating rational expressions, and solving linear and quadratic equations, and inequalities.

MA 11.2.2.a Convert equivalent rates (e.g., miles per hour to feet per second).

MA 11.2.2.b Identify and explain the properties used in solving equations and inequalities.

MA 11.2.2.c Simplify algebraic expressions involving integer and fractional exponents.

MA 11.2.2.d Perform operations on rational expressions (add, subtract, multiply, divide, and simplify).

MA 11.2.2.e Evaluate expressions at specified values of their variables (polynomial, rational, radical, and absolute value).

MA 11.2.2.f Solve an equation involving several variables for one variable in terms of the others.

MA 11.2.2.g Solve linear and absolute value equations and inequalities.

MA 11.2.2.h Analyze and solve systems of two linear equations and inequalities in two variables algebraically and graphically.

MA 11.2.2.i Perform operations (addition subtraction, multiplication, and division) on polynomials.

MA 11.2.2.j Factor polynomials to include factoring out monomial terms and factoring quadratic expressions.

MA 11.2.2.k. Recognize polynomial multiplication patterns and their related factoring patterns (e.g.,  $(a + b)^2 = a^2 + 2ab + b^2$ ,  $a^2 - b^2 = (a + b)(a - b)$ ).

MA 11.2.2.l Make the connection between the factors of a polynomial and the zeros of a polynomial.

MA 11.2.2.m Combine functions by composition and perform operations (addition, subtraction, multiplication, division) on functions.

MA 11.2.2.n Solve quadratic equations involving real coefficients and real or imaginary roots.

**MA 11.2.3 Applications:** Students will solve real-world problems involving linear equations and inequalities, systems of linear equations, quadratic, exponential, square root, and absolute value functions.

MA 11.2.3.a Analyze, model, and solve real-world problems using various representations (graphs, tables, linear equations and inequalities, systems of linear equations, quadratic, exponential, square root, and absolute value functions).

**MA 11.3 GEOMETRY:** Students will communicate geometric concepts and measurement concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.

**MA 11.3.1 Characteristics:** Students will identify and describe geometric characteristics and create two- and three-dimensional shapes.

MA 11.3.1.a Know and use precise definitions of ray, line segment, angle, perpendicular lines, parallel lines, and congruence based on the undefined terms of geometry: point, line and plane.

MA 11.3.1.b Prove geometric theorems about angles, triangles, congruent triangles, similar triangles, parallel lines with transversals, and quadrilaterals using deductive reasoning.

MA 11.3.1.c Apply geometric properties to solve problems involving similar triangles, congruent triangles, quadrilaterals, and other polygons.

MA 11.3.1.d Identify and apply right triangle relationships including sine, cosine, tangent, special right triangles, and the converse of the Pythagorean Theorem.

MA 11.3.1.e Create geometric models to visualize, describe, and solve problems using similar triangles, right triangles, and trigonometry.

MA 11.3.1.f Know and use precise definitions and terminology of circles, including central angle, inscribed angle, arc, intercepted arc, chord, secant, and tangent.

MA 11.3.1.g Apply the properties of central angles, inscribed angles, angles formed by intersecting chords, and angles formed by secants and/or tangents to find the measures of angles related to the circle.

MA 11.3.1.h Sketch, draw, and construct appropriate representations of geometric objects using a variety of tools and methods which may include ruler/straight edge, protractor, compass, reflective devices, paper folding, or dynamic geometric software.

**MA 11.3.2 Coordinate Geometry:** Students will determine location, orientation, and relationships on the coordinate plane.

MA 11.3.2.a Derive and apply the midpoint formula.

MA 11.3.2.b Use coordinate geometry to analyze linear relationships to determine if lines are parallel or perpendicular.

MA 11.3.2.c Given a line, write the equation of a line that is parallel or perpendicular to it.

MA 11.3.2.d Derive and apply the distance formula.

MA 11.3.2.e Use coordinate geometry to prove triangles are right, acute, obtuse, isosceles, equilateral, or scalene.

MA 11.3.2.f Use coordinate geometry to prove quadrilaterals are trapezoids, isosceles trapezoids, parallelograms, rectangles, rhombi, kites, or squares.

MA 11.3.2.g Perform and describe positions and orientation of shapes under a single translation using algebraic notation on a coordinate plane.

MA 11.3.2.h Perform and describe positions and orientation of shapes under a rotation about the origin in multiples of 90 degrees using algebraic notation on a coordinate plane.

MA 11.3.2.i Perform and describe positions and orientation of shapes under a reflection across a line using algebraic notation on a coordinate plane.

MA 11.3.2.j Perform and describe positions and orientation of shapes under a single dilation on a coordinate plane.

MA 11.3.2.k Derive the equation of a circle given the radius and the center.

**MA 11.3.3 Measurement:** Students will perform and compare measurements and apply formulas.

MA 11.3.3.a Convert between various units of length, area, and volume (e.g., such as square feet to square yards).

MA 11.3.3.b Convert between metric and standard units of measurement.

MA 11.3.3.c Apply the effect of a scale factor to determine the length, area, and volume of similar two- and three-dimensional shapes and solids.

MA 11.3.3.d Find arc length and area of sectors of a circle.

MA 11.3.3.e Determine surface area and volume of spheres, cones, pyramids, and prisms using formulas and appropriate units.



**MA 11.4 DATA: Students will communicate data analysis/probability concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**

**MA 11.4.1 Representations:** Students will create displays that represent data.

No additional indicator(s) at this level. Mastery is expected at previous grade levels.

**MA 11.4.2 Analysis & Applications:** Students will analyze data to address the situation.

MA 11.4.2.a Identify and compute measures of central tendency (mean, median, mode) when provided data both with and without technology.

MA 11.4.2.b Explain how transformations of data, including outliers, affect measures of central tendency.

MA 11.4.2.c Compare data sets and formulate conclusions.

MA 11.4.2.d Support conclusions with valid arguments.

MA 11.4.2.e Develop linear equations for linear models to predict unobserved outcomes using the regression line and correlation coefficient with technology.

MA 11.4.2.f Describe the shape, identify any outliers, and determine the spread of a data set.

MA 11.4.2.g Explain the impact of sampling methods, bias, and the phrasing of questions asked during data collection, and the conclusions that can rightfully be made.

MA 11.4.2.h Explain the differences between a randomized experiment and observational studies.

MA 11.4.2.i Using scatter plots, analyze patterns and describe relationships in paired data.

MA 11.4.2.j Recognize when arguments based on data confuse correlation with causation.

MA 11.4.2.k Interpret data represented by the normal distribution, formulate conclusions, and recognize that some data sets are not normally distributed.

**MA 11.4.3 Probability:** Students will interpret and apply concepts of probability.

MA 11.4.3.a Construct sample spaces and probability distributions.

MA 11.4.3.b Use appropriate counting techniques to determine the probability of an event.

MA 11.4.3.c Determine if events are mutually exclusive and calculate their probabilities in either case.

## Nebraska Mathematics Standards Grade 12 – Advanced Topics (AT)

**MA 12.1 NUMBER: Students will communicate number sense concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**

**MA.12.1.1 Numeric Relationships:** Students will demonstrate, represent, and show relationships among the complex numbers.

MA 12.1.1.a (AT) Graph complex numbers on the complex plane.

MA 12.1.1.b (AT) Determine the magnitude of complex numbers.

MA 12.1.1.c (AT) Use matrices to represent and manipulate data.

MA 12.1.1.d (AT) Recognize the role that additive and multiplicative identities play in matrix operations.

MA 12.1.1.e (AT) Recognize that, unlike multiplication of numbers, matrix multiplication for square matrices is not a commutative operation, but still satisfies the associative and distributive properties.

MA 12.1.1.f (AT) Derive and use the formulas for the general term and summation of finite arithmetic and geometric series.

**MA 12.1.2 Operations:** Students will compute with matrices.

MA 12.1.2.a (AT) Multiply matrices by scalars to produce new matrices.

MA 12.1.2.b (AT) Add, subtract, and multiply matrices of appropriate dimensions.

**MA 12.2 ALGEBRA: Students will communicate algebraic concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**

**MA 12.2.1 Algebraic Relationships:** Students will demonstrate, represent, and show relationships with non-linear and trigonometric functions.

MA 12.2.1.a (AT) Analyze and graph non-linear functions (e.g., quadratic, trigonometric, square root, logarithmic, rational, higher-order polynomials, exponential, absolute value, piecewise, and sinusoidal).

MA 12.2.1.b (AT) Use the unit circle to define the trigonometric functions on all real numbers.

MA 12.2.1.c (AT) Evaluate sine, cosine, and tangent functions at positive and negative multiples of 30, and 45 degrees.

MA 12.2.1.d (AT) Create new functions out of existing functions using addition, subtraction, multiplication, division, translation, dilation, and composition.

MA 12.2.1.e (AT) Use limits to describe the behavior of a function near its asymptotes and removable discontinuities.

MA 12.2.1.f (AT) Understand that the radian measure of an angle is the length of the arc on the unit circle subtended by that angle.

MA 12.2.1.g (AT) Convert between radian and degree measures of an angle.

**MA 12.2.2 Algebraic Processes:** Students will apply the identities when evaluating and solving trigonometric equations.

MA 12.2.2.a (AT) Use trigonometric identities to solve trigonometric equations.

MA 12.2.2.b (AT) Explain symmetry (odd and even) and periodicity of trigonometric functions.

MA 12.2.2.c (AT) Create an invertible function from a non-invertible function by restricting the domain (e.g., arcsin, arccos, and arctan).

MA 12.2.2.d (AT) Find the period, amplitude, and midline of a trigonometric function of the form  $y=A + B\sin(Cx)$ , where A, B, and C are parameters, and identify these properties on a graph of the function.

**MA 12.2.3 Applications:** Students will solve real-world problems involving trigonometric functions.

MA 12.2.3.a (AT) Model periodic events with specified amplitude, frequency, and shifts.

MA 12.2.3.b (AT) Solve real-world problems using trigonometric and inverse trigonometric functions.

**MA 12.3 GEOMETRY:** Students will communicate geometric concepts and measurement concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.

**MA 12.3.1 Characteristics:** Students will identify and describe geometric characteristics and create two- and three-dimensional shapes.

MA 12.3.1.a (AT) Apply the Law of Sines and the Law of Cosines to find unknown measures in triangles.

MA 12.3.1.b (AT) Prove and apply properties of lengths of chords, secant segments, and tangent segments.

**MA 12.3.2 Coordinate Geometry:** Students will determine location, orientation, and relationships on the coordinate plane.

MA 12.3.2.a (AT) Identify features of a function (e.g., local and global maxima and minima, concavity, approximate locations of points of inflection and vertical and horizontal asymptotes) from its graph.

MA 12.3.2.b (AT) Identify symmetry properties of a function (e.g., axis of symmetry of a parabola) and know the connection between its symmetry properties and specific transformations.

MA 12.3.2.c (AT) Recognize that vector quantities have both magnitude and direction and can be represented by directed line segments.

MA 12.3.2.d (AT) Add and subtract vectors graphically and algebraically.

MA 12.3.2.e (AT) Perform scalar multiplication of a vector and show it graphically.

MA 12.3.2.f (AT) Derive the equations of parabolas, ellipses, and hyperbolas from a graph or given parameters.

MA 12.3.2.g (AT) Determine the three-dimensional object created by rotating or revolving a two-dimensional object about an axis.

MA 12.3.2.h (AT) Determine the shape of a two-dimensional cross-section of a three-dimensional object.

**MA 12.3.3 Measurement:** Students will perform and compare measurements and apply formulas.

MA 12.3.3.a (AT) Use Cavalieri's Principle to determine the volume of a sphere and other solid figures.

MA 12.3.3.b (AT) Determine the tolerance interval and percent of error in measurement.

**MA 12.4 DATA: Students will communicate data analysis/probability concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**

**MA 12.4.1 Representations:** Students will create displays that represent data.

No additional indicator(s) at this level. Mastery is expected at previous grade levels.

**MA 12.4.2 Analysis & Applications:** Students will analyze data to address the situation.

MA 12.4.2.a (AT) Make inferences and justify conclusions from sample surveys, experiments, and observational studies.

**MA 12.4.3 Probability:** Students will interpret and apply concepts of probability.

MA 12.4.3.a (AT) Calculate the expected value of a random variable and interpret it as the mean of a probability distribution.

MA 12.4.3.b (AT) Determine possible outcomes of a decision by assigning probabilities to outcome values and finding expected values.

MA 12.4.3.c (AT) Evaluate and compare strategies on the basis of expected values.

MA 12.4.3.d (AT) Analyze decisions and strategies using probability concepts (e.g., medical testing and product testing).