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ABSTRACT

The Nebraska K-12 Mathematics Standards are intended to reflect what students should know and be able to do by the end of the grades 1, 4, 8, and 12. In addition to identifying grade-level specific standards, the content standards are further divided into six topic strands: (1) Numeration/Number Sense; (2) Computation/Estimation; (3) Measurement; (4) Geometry/Spatial Concepts; (5) Data analysis, Probability, and Statistical Concepts; and (6) Algebraic Concepts. This document also lists Nebraska Social Studies/History Standards for grades K-12. (ASK)

Nebraska Mathematics Standards
Grades K–12

Adopted by the State Board of Education
February 6, 1998

The Nebraska K-12 Mathematics Standards are intended to reflect what students should know and be able to do by the end of grades 1, 4, 8, and 12. In addition to identifying grade-level specific standards, the content standards are further divided into six topic strands: Numeration/Number Sense; Computation/Estimation; Measurement; Geometry/Spatial Concepts; Data Analysis, Probability, and Statistical Concepts; and Algebraic Concepts. Topic strands are identified to help organize the standards. They should **not** to be confused with secondary course titles.

The Nebraska K-12 Mathematics Standards document is not a curriculum guide, defining what is taught at each grade level or prescribing how content should be taught. Standards are to guide local school districts and communities as they work together to set high expectations for ALL students and plan instruction that enables students to meet those expectations.

MATHEMATICS

ALL students must be equipped with the skills and knowledge that will permit them to enter an ever-changing job market. Teachers should relate mathematical concepts to their students' personal lives and help them apply concepts in real-life situations.

The following conceptual threads are assumed to be woven throughout the Mathematics Standards:

Problem Solving - The problem-solving process helps students learn mathematical concepts through clarification, formulation, representation, analysis, and communication. Problems can involve real situations or explore and extend mathematical ideas. To be successful, students must use a variety of methods and tools to do computations, including paper and pencil, mental arithmetic, estimation, and calculators. Technology should not be a substitute for a student's understanding of the basic facts.

Mathematical Communication - Mathematics is a language used to communicate ideas. Students should be asked to illustrate, demonstrate, describe and report their problem-solving strategies and processes. Students should use the correct concepts, skills, symbols, and vocabulary. Students should have the tools needed to collect, analyze and report data, conduct research, and explore mathematics. Graphing utilities, spreadsheets, calculators, computers, and other forms of technology allow all students to succeed. Technology must be an integral part of teaching and learning.

Mathematical Reasoning - Persuasive arguments, evaluating the arguments of others and estimation skills are important uses of mathematical reasoning used to verify reasonableness of answers.

Mathematical Connections - Using mathematical ideas in other disciplines and real life creates connections that make mathematics useful. Exploring connections helps students build concepts on past experiences.

Nebraska Mathematics Standards
Grades K-1

M 1.1 Numeration/Number Sense

M 1.1.1 By the end of first grade, students will communicate the sequential nature of the number system.

Student demonstrations:
- Recognize and write numerals from 0-100.
- Count forward by 1s, 2s, 5s and 10s up to 100.
- Count backward from 10 to 0 by 1s.

Suggested classroom practices:
- Teach students to recognize and write numerals representing the value of zero through one hundred and provide opportunities to practice in a variety of situations.
- Teach students to group and count by the patterns of ones, twos, fives and tens up to one hundred by using a variety of materials such as beans, buttons, shells and rocks.
- Teach students to count backwards using objects and through poems like "Ten Little Monkeys Jumping on the Bed." This is good preparation for suotraction.

Suggested parent activities:
- Use newspapers to find numbers from zero to 100, cut the numbers out and glue them in order onto a large piece of paper. Ask the child to write down the numbers which are between those gathered from the newspaper.
- Make a statement with a number included and ask the child to write the numeral on a piece of paper, like "I saw 52 birds fly by the window."
- Use 100 items of choice like beans, buttons, or rocks to have the child count out groups of 2s, 5s, or 10s and then practice counting by the selected value up to 100.
- Share poems or songs like "Ten Little Monkeys Jumping on a Bed" and ask the child to count backwards with fingers or stuffed animals to represent the monkeys.

M 1.1.2 By the end of first grade, students will communicate the mathematical relations of the number system.

Student demonstrations:
- Count objects to demonstrate one-to-one correspondence.
- Use comparison vocabulary, such as bigger, smaller, more, less, equal, higher, and lower.
- Identify ordinal positions of first, second, third, . . . through tenth.
- Identify and represent wholes into equal parts for the fractions of one-half and one-fourth.

Suggested classroom practices:
- Teach students to count any given collection of objects indicating each value during the counting process.
- Teach students to use the proper vocabulary when comparing two amounts of materials.
- Teach students to identify what position an object or themselves may be placed in order.
- Teach students to understand the concept of one-half of a whole provides two equal parts and the concept of one-fourth of a whole provides four equal parts.

Suggested parent activities:
- Ask the child "how many" questions like "How many chairs do we have or how many doorknobs?" and have the child count out loud indicating the numerical value of each one found during the counting process.

- Select any items that can be compared in terms of bigger or smaller, more, less or equal, and higher or lower and have the child indicate with examples such as "Which shoe is bigger or smaller for different family members?" or "Who has more or less milk in their drinking cup than I do?"
- Use 10 paper cups or small containers that you can label one through ten and line them up. Place a small item like a button under one of the cups then have the child try to find it by asking "Is the button under the fifth cup?" You will indicate the button is before or after that position and the child is to try again until the button is found. Beginning with five cups is a good idea until the child understands they are to guess the location of the object in the least amount of questions.
- Use any item that can be divided into two or four equal parts, have the child assist if possible to separate the whole item into halves or fourths and also have the child put the item back together to represent the whole. Sectioned candy bars and apples are easy to show as well as a nice treat for working on math.

M 1.1.3 By the end of first grade, students will recognize numbers and applications in everyday situations.

Student demonstrations:
- Identify how numbers are used in counting situations, such as setting the table and passing out candy treats.
- Identify how numbers are used for identification, such as room numbers and phone numbers.
- Recognize and demonstrate the value of a collection of pennies, nickels, dimes, and quarters whose total value is 100 cents or less.
- Demonstrate the number system of base ten using one dime to ten pennies and ten dimes to one dollar.

Suggested classroom practices:
- Teach students how numbers are used in counting situations and provide opportunities for students to practice and identify situations.
- Teach students how numbers are used for identification and provide opportunities for students to practice and identify uses.
- Teach students the value of a penny, nickel, dime, and quarter and provide opportunities to count combinations of 100 cents or less.
- Teach students the number system of base ten and place value using pennies to represent ones, dimes to represent tens, and one dollar to represent hundreds.

Suggested parent activities:
- Have the child experience with you counting situations like setting the table, selecting fruit at the grocery store, and picking out party favors for a celebration.
- Have the child experience with you how numbers are used for identification like room numbers at school, phone numbers and house numbers of their friends.
- Put coins out on the table and have a discussion about what color and pictures are found on a penny, nickel, dime, and quarter and their value. Select a combination of coins less than one dollar and have the child count the coins and determine the total value.
- Use only pennies, dimes, and one dollar bills and have you and the child take turns rolling a die to collect money with the goal of each of you trying to reach one dollar. After ten pennies are collected, it must be traded in for one dime and continued until ten dimes are used to exchange for the one dollar bill.

M 1.1.4 By the end of first grade, students will demonstrate the value of numbers (0-20) using concrete objects.

Suggested classroom practices:
- Teach students the value of numbers (0-20) by using materials like blocks and asking students to demonstrate several ways a given number, such as 7, can be shown.

Suggested parent activities:
- Choose a number between zero and twenty such as five, then ask the child to demonstrate using objects how the number five can be represented like two buttons and three rocks or one shell and four blocks.

M 1.2 Computation/Estimation

M 1.2.1 By the end of first grade, students will demonstrate the concepts of addition and subtraction up to ten.

Student demonstrations:
- Communicate the basic facts and show their value using concrete objects.
- Recognize the symbols + and - as representing the operations of addition and subtraction.
- Recognize the symbol = represents equal quantities.
- Solve problems involving one-step solutions, using addition and subtraction facts.

Suggested classroom practices:
- Teach students the basic facts up to ten using concrete objects and number sentences.
- Teach students to recognize the symbols + and - as representing the operations of addition and subtraction in a number sentence.
- Teach students to recognize the symbol = to represent equal quantities in a number sentence.
- Teach students to find missing values using addition and subtraction facts. Missing addend situations can be true problem-solving activities for first graders.

Suggested parent activities:
- Describe a number statement like five boys and three girls are in the park and have the child tell you how many children are in the park and show you the total with five red marbles representing the boys and three green blocks representing the girls for a total of eight items.
- Using two decks of cards (remove the face cards), each person turns over one card and then the child tells if his or her card is more, less or equal and then how many more or less to learn about adding and subtracting. The child can then practice making statements such as 5 (diamonds on my card) + 2 (more diamonds) = 7 (hearts on your card).

M 1.2.2 By the end of first grade, students will determine the reasonableness of proposed solutions to mathematical problems.

Student demonstrations:
- Make estimations and comparisons to actual results.

Suggested classroom practices:
- Teach students to make estimations by providing a range of possible answers and experiments with objects to compare to actual results.

Suggested parent activities:
- Give the child a container and ask how many items like marbles would fit. Have the child begin estimating a range of possibilities like 20-40, then actually fill the container and compare the estimate to the actual result. Continue the process with the same container and different sized items and ask for the estimation ranges to get smaller.

M 1.3 Measurement

M 1.3.1 By the end of first grade, students will compare two or more items or sets using direct comparisons or nonstandard units of measure for the following attributes: length (shorter/longer), height (taller/shorter), weight (heavier/lighter), temperature (hotter/colder). Nonstandard unit examples are: length of a human foot, hand span, new pencil, a toothpick, block, etc.

Suggested classroom practices:
- Teach students to compare two or more objects regarding length, height, weight, or temperature directly or using nonstandard units such as how many toothpicks long is each of the objects.

Suggested parent activities:

- Use a variety of items and opportunities to ask the child to compare the length (shorter/longer), height (taller/shorter), weight (heavier/lighter), and temperature (hotter/colder). To practice measuring with nonstandard units like a new pencil, a shoe string, or toothpick, select an object such as a table and ask the child to first estimate how many pencils long might the table be then determine its length using a pencil.

M 1.3.2 By the end of first grade, students will recognize tools of measurement and their appropriate use, such as clocks, calendar, ruler, balance scale, and thermometer.

Suggested classroom practices:

- Teach students to associate the tools of measurement and their appropriate use such as a clock is used to tell time and a thermometer is used to tell the temperature.
- Allow students to explore with tools to see what they measure and how the tools work, like placing blocks on the balance scale to weigh their favorite toy, working with the calendar to see how the time of the week and year are organized, and using rulers with only inch markings.

Suggested parent activities:

- Show a measuring tool like a clock to the child and ask what it measures. In reverse, ask the child what tool or tools measure time in which the response could be a clock and/or calendar.

M 1.3.3 By the end of first grade, students will tell time to the half-hour using an analog and digital clock.

Suggested classroom practices:

- Teach students to tell time to the half-hour by learning the value of 30 minutes on a digital clock and the large hand on the six on an analog clock.

Suggested parent activities:

- Use both digital and analog (face dial) clocks to practice reading with the child half-hour times by 30 minutes display on the digital clock and the large hand on six on the analog clock.

M 1.3.4 By the end of first grade, students will identify the different units of measurement used in their environment, such as cents, dollars, pounds, gallons, liters, meters, miles, minutes, and hours.

Suggested classroom practices:

- Teach students to make associations with the different units of measurement used in their environment such as to measure money we use dollars and cents and to measure liquids we use cups, ounces, gallons, and liters.
- Allow students to explore with tools to see what they measure and the type of units used like pounds on a scale to weigh themselves and cents and dollars used in the school store.

Suggested parent activities:

- Discuss with the child what units of measurement are used with different items like gallons of milk or gasoline, liters of soda pop, and miles to a relative's home.

M 1.3.5 By the end of first grade, students will demonstrate an understanding of orientation in time for past, present, future, earlier and later.

Suggested classroom practices:

- Teach students an orientation of time through ordering stories, events or pictures to show past, present, and future, and earlier and later.

Suggested parent activities:

- Talk with the child about events that occurred during the child's life in terms of past, present, and future. An example would be attendance of school -- in the past you attended preschool, in the present you attend elementary school, and in the future you will attend high school.

M 1.4 Geometry/Spatial Concepts

M 1.4.1 By the end of first grade, students will compare relative position and spatial relationships, such as left/right, above/below, over/under, up/down, and near/far.

Suggested classroom practices:

- Teach students to compare position and relationships through stories, events, pictures, or objects such as the boat is under the bridge and the airplane is flying over the bridge.

Suggested parent activities:

- Use naturally occurring situations to reinforce the child's location of objects and their position, such as putting on left and right shoes and mittens, going up and down the stairs, and running under or over the play bridge.

M 1.4.2 By the end of first grade, students will identify, describe, and create circles, squares, triangles, and rectangles.

Student demonstrations:

- Construct congruent shapes and designs using manipulatives.
- Identify and describe common geometric shapes in their environment.

Suggested classroom practices:

- Teach students to sort and classify examples to recognize and describe how triangles, rectangles, squares, and circles are alike in some ways and can be distinguished from each other. For example, triangles and rectangles can vary in shape, but that is not possible for squares and circles.
- Teach students to create the geometric figures by tracing, drawing, cutting out from different materials such as paper, cloth, etc., and forming the figures on a geoboard.
- Teach students to construct congruent shapes using manipulatives to create and describe the design or pattern they have made.
- Teach students to identify two-dimensional and three-dimensional figures in their environment to see which ones are most common and the many ways some are used.

Suggested parent activities:

- Talk with the child about the different shapes that can be seen, cut, and colored so the child becomes comfortable with the geometric shapes of circles, squares, triangles, and rectangles.
- Use objects that when traced form a geometric shape, a large piece of clean paper and crayons, and let the child create a colorful design by locating the shapes on the paper.
- Look around your home with the child and see what geometric shapes can be identified on walls, floors, ceilings, furniture and fabric coverings.

M 1.5 Data Analysis, Probability, And Statistical Concepts

M 1.5.1 By the end of first grade, students will count and collect information about objects and events in their environment, such as what is your favorite candy bar, who has a brother, how many pets, and who is going to the library.

Suggested classroom practices:

- Teach students to determine what is to be counted and in what ways might the information be collected about objects or events and topics which are of interest to them.

M 1.5.2 By the end of first grade, students will organize and display collected information using objects and pictures.

Suggested classroom practices:

- Teach students how to organize and display the collected information using the actual items, pictures, connecting blocks, or simple bar graph paper.

M 1.5.3 By the end of first grade, students will make comparisons from displayed data, such as more, less, and fewer.

Suggested classroom practices:

- Teach students to make observations about the displayed data and discuss comparisons of data using the terms of more, less, and fewer.

M 1.5.4 By the end of first grade, students will describe the steps used in collecting and analyzing information.

Suggested classroom practices:

- Teach students to describe in order the steps used in the process of collecting and organizing the information.

Suggested parent activities:
(One continuous activity is described below to represent the standards for Data Analysis, Probability, and Statistical Concepts.)

- Have the child select a type of candy or cereal that has different colors and possibly different shapes that the family would be willing to eat later.
- On a piece of lined paper, use the selected candy or cereal and have the child organize about ½ cup full into rows of similar color or shape.
- Ask the child to make comparisons of the candy or cereal that is displayed such as there are more red candies than orange ones.
- Listen to the child's description of what the child did to collect, organize, and talk about the displayed items.

M 1.6 Algebraic Concepts

M 1.6.1 By the end of first grade, students will identify, describe, extend, and create a variety of patterns, such as objects, sounds, movements, shapes, numbers, and colors.

Suggested classroom practices:

- Teach students to identify and describe the predictability and repetition of patterns that repeat the basic unit and patterns that seem to grow in objects, sounds, movements, shapes, numbers and colors. An example would be to use rubber stamps representing different items to create linear repetitive patterns of AB, ABB, AABB, and a growing pattern of ABAABAAAB.
- Teach students to extend patterns and transfer them from one medium to another such as using a song with a pattern of words that would then be represented with colored blocks, pictures and symbolic forms and provide students the opportunity to create their own patterns for classmates to extend and complete missing pieces of a given pattern.

Suggested parent activities:

- Create simple patterns with sounds, movements, shapes, and colors and have the child continue the pattern. The sounds and movements can be generated by you and repeated by the child. Stamps and stamping pads are a fun way to make patterns with different shapes and/or colors. The child also enjoys creating the pattern and asking the adult to finish it.

M 1.6.2 By the end of first grade, students will sort and classify objects according to one or more attributes, such as size, shape, color, and thickness.

Suggested classroom practices:

- Teach students to sort and classify objects according to one or more attributes such as size, shape, color, and thickness and extend their sorting skills to sets of objects that overlap.

Suggested parent activities:

- Use a bag of groceries to have the child sort the purchased products. Let the child chose one attribute/characteristic to put the like items all together like these are all cans. Then have the child take all the items and sort them again like these all go in the freezer.

M 1.6.3 By the end of first grade, students will identify and describe patterns in their environment.

Suggested classroom practices:

- Teach students to identify and describe patterns found in nature such as the seasons, the order of traffic lights, words in a song, poem or story, and movement of objects.

Suggested parent activities:

- Look around the neighborhood on the way to school or in the child's room and have the child find and tell about patterns they see like all the garages are on the right on this street.

SOURCES FOR SUGGESTED PARENT ACTIVITIES:

Family Math, Lawrence Hall of Science, University of California, Berkeley, CA 94720.

Family Math for Young Children: Comparing, Lawrence Hall of Science, University of California, Berkeley, CA 94720.

Helping Your Child Learn Math, U.S. Department of Education, Office of Educational Research and Improvement, Washington, D.C. 20208. Copies and pricing information are available from D.C. Heath by calling 1-800-334-3284.

Math Matters, National PTA and Exxon Foundation.

Focus Issue: Beyond the Classroom: Linking Mathematics Learning with Parents, Communities, and Business and Industry, *Teaching Children Mathematics*, February 1998, National Council of Teachers of Mathematics, 1906 Association Drive, Reston, VA 22091-1593 (1-800-235-7566).

Addenda Series Grades K-6, National Council of Teachers of Mathematics, 1906 Association Drive, Reston, VA 22091-1593 (1-800-235-7566).

Nebraska Mathematics Standards
Grade 4

M 4.1 Numeration/Number Sense

M 4.1.1 By the end of fourth grade, students will demonstrate an understanding of place value through the millions and decimals to the hundredths place.

Student demonstrations:
- Read and write numerals (in digits and words) to the one millions place and decimals to the hundredths place.
- Order and compare numbers to the one millions place and decimals to the hundredths place using the symbols <, >, and =.
- Round whole numbers to the nearest named place, such as rounding 1,234 to the nearest hundred would be 1,200.

Suggested classroom practices:
- Teach students to read and write in words and digits the numerals up to the millions place and decimals to the hundredths.
- Teach students to compare the numerals using the symbols <, >, and = and place numerals in proper order sequence.
- Teach students to recognize the place value selected for the rounding process and round whole numbers to the nearest named place.

Suggested parent activities:
- Use vehicle license plates to have the child read and write in words the value of the license without the letters.
- Order the license plate values and compare using greater than, less than and equal to your own family's vehicle.
- Ask the child to round the next license plates, for example, to the nearest one hundred, so a license plate of 23-475 would be rounded to 23,500 since 475 is closer to 500 than to 400.
- Repeat the same steps above using a store receipt to practice reading, writing, ordering, comparing, and rounding decimals.

M 4.1.2 By the end of fourth grade, students will represent numbers in equivalent forms.

Student demonstrations:
- Write numbers in expanded form, such as 432 = 4x100 + 3x10 + 2x1.
- Represent equivalent fractions and decimals for common fractions with denominators of 2, 4, 5, 8 and 10 using concrete objects.

Suggested classroom practices:
- Teach students to identity the value of the digit in each place and write numbers in expanded form.
- Teach students to use concrete objects and graph paper to represent fractions with denominators of 2, 4, 5, 8, and 10 and their decimal equivalences.

Suggested parent activities:
- Give the child a number such as 5,410 and ask the child what value is represented by the numeral 4 (answer being 4x100 or 400).
- Use some candy bars that can be divided into two equal parts, four equal parts and eight equal parts to have the child represent equivalent fractions like 4/8 = 2/4 = ½ and the decimal of .5.

M 4.1.3 By the end of fourth grade, students will describe and apply relationships between numbers by order, comparison, and across the operation, such as subtraction as the opposite of addition and multiplication as repeated addition.

Student demonstrations:
- Order and compare common fractions and decimals using the symbols <, >, and =.
- Illustrate mathematical concepts by using objects and drawing pictures or diagrams.
- Solve and check a mathematical problem by using the related facts.

Suggested classroom practices:
- Teach students to compare common fractions using the symbols <, >, and = and place several in proper order sequence. Teach students to compare decimals using the symbols <, >, and = and place several in proper order sequence.
- Teach students how to illustrate the value of fractions and decimals using objects and grid paper and drawing pictures or diagrams.
- Teach students to use related math facts to solve and check a mathematical problem.

Suggested parent activities:
- Use a receipt from a grocery store and give an amount like $1.67, have the child go through the items purchased and indicate if the amounts are greater than, less than, or equal to the given amount.
- Ask the child to draw a picture or use objects to show you how the child got an answer to a word problem from their math materials or one that you created.
- Continue the receipt idea above by asking the child questions like "How much more money would you need from the given amount to purchase a selected item? or How much money would you get back if the item cost less? or How many items could you buy and still have money left?"

M 4.1.4 By the end of fourth grade, students will identify and demonstrate positive and negative numbers and zero.

Student demonstrations:
- Demonstrate simple concepts of positive and negative numbers, such as using a thermometer for temperature or distances to the right or left of zero on a number line.

Suggested classroom practices:
- Teach students to identify examples of where positive and negative numbers exist.
- Student modeling could include walking forward to represent positive number of steps, backwards to represent negative number of steps and the starting point to represent zero.

Suggested parent activities:
- Discuss with the child when negative values occur like during the winter when the wind chill is ten below zero or a loss of five yards on the football field.

M 4.1.5 By the end of fourth grade, students will make change and count out in amounts up to $20.00.

Suggested classroom practices:
- Teach students how to make the correct change and properly count back the amount of change aloud from the purchase price up to twenty dollars.

Suggested parent activities:
- Practice with the child making change starting with one dollar and increasing to twenty dollars and listening to the child count it back to you. Count back change with the child from a store purchase.

M 4.2 Computation/Estimation

M 4.2.1 By the end of fourth grade, students will estimate and accurately calculate without and with calculators and solve problems involving addition, subtraction, multiplication, and division of whole numbers and understand the relationships among the operations.

Student demonstrations:
- Demonstrate with accuracy and reasonable speed the basic facts of addition (1-20), subtraction (1-20), multiplication (1-144), and division (1-144).
- Add and subtract accurately five-digit numbers including columns of numbers.
- Multiply up to a three-digit number by a two-digit number.
- Divide up to a three-digit number by a one-digit divisor.

Suggested classroom practices:
- Teach students the basic facts relationships for addition (1-20), subtraction (1-20), multiplication (1-144), and division (1-144) with the emphasis on accuracy.
- Teach students how to estimate and accurately add and subtract multiple digit numbers including adding columns of numbers and determine when a calculator is an appropriate tool to be used.
- Teach students how to estimate and accurately multiply multiple digit numbers and determine when a calculator is an appropriate tool to be used.
- Teach students how to estimate and accurately divide multiple digit numbers and determine when a calculator is an appropriate tool to be used.

Suggested parent activities:
- Use a deck of cards (without the face cards) and give four cards to the child and ask that all four cards and any choice of the four operations (addition, subtraction, division and multiplication) be used to make as many different answers as the child can get applying the order of operations.
- Use license plates and rules on the amount of digits to practice adding, subtracting, multiplying, and dividing with the child.

M 4.2.2 By the end of fourth grade, students will estimate and accurately calculate without and with calculators and solve problems involving addition and subtraction of decimals and understand the relationships among these two operations.

Suggested classroom practices:
- Teach students how to estimate and accurately add and subtract decimals and solve problems and determine when a calculator is the appropriate tool to be used.

Suggested parent activities:
- Ask the child to first estimate the total bill by looking at only the items purchased on store receipts and then practice adding and subtracting decimals with the child.

M 4.2.3 By the end of fourth grade, students will estimate and accurately calculate without and with calculators and solve problems involving addition and subtraction of fractions and understand the relationships among these two operations.

Student demonstrations:
- Add and subtract common fractions with like and unlike denominators.
- Solve problems involving fractions of halves, fourths, and eighths using the operations of addition and subtraction.

Suggested classroom practices:
- Teach students how to make equivalent fractions with like denominators to add and subtract common fractions with unlike denominators.
- Teach students to solve problems using addition and subtraction of fractions.

Suggested parent activities:

- Use coupons and grocery ads to have the child estimate what fraction of the cost is saved using the coupon.
- Cook with your child and have the child help measure the ingredients for the recipes. This is excellent fraction practice.
- Use a deck of cards (without the face cards) to draw four cards to form two proper fractions (the denominator (bottom) is larger than the numerator (top)) then have the child add and subtract the values of the fractions. Examples might be to select cards of 2,5,6, and 3 and (2/5 + 3/6 and 3/6 - 2/5) or (3/5 + 2/6 and 3/5 - 2/6) would be two possible problems formed.

M 4.3 Measurement

M 4.3.1 By the end of fourth grade, students will estimate, measure, and solve problems using metric units for linear measure, area, mass/weight, and capacity.

Student demonstrations:

- Demonstrate an understanding of metric units of measure.
- Use the appropriate units of measurement.
- Estimate and accurately measure length to the nearest meter or centimeter and calculate area.
- Estimate and accurately measure mass/weight to the nearest gram.
- Estimate and accurately measure capacity to the nearest milliliter.
- Measure and read temperature accurately to the nearest degree using Celsius thermometer.

Suggested classroom practices:

- Teach students the commonly used relationships among metric units of measure such as 100 centimeters in one meter.
- Teach students to use appropriate standard units of metric measure for linear measure such as centimeters and meters, weight/mass such as grams and kilograms, liquid capacity of milliliters and liters, and area such as square centimeters.
- Teach students how to estimate and accurately measure and solve problems using length to the nearest meter or centimeter and calculate area using measuring tools and real objects.
- Teach students how to estimate and accurately measure and solve problems using mass/weight to the nearest gram using measuring tools and real objects.
- Teach students how to estimate and accurately measure and solve problems using capacity to the nearest milliliter using measuring tools and real objects.
- Teach students how to measure and read temperature accurately and solve problems to the nearest degree using a Celsius thermometer.

Suggested parent activities:

- Ask the child to estimate and measure items using the metric units of measure for a variety of items such as the length of the child's favorite book in centimeters, the temperature on the bank Celsius temperature display, and the amount of medicine in milliliters.

M 4.3.2 By the end of fourth grade, students will estimate, measure, and solve problems using standard units for linear measure, area, mass/weight, and capacity.

Student demonstrations:

- Demonstrate an understanding of standard units of measure.
- Use the appropriate units of measurement.
- Estimate and accurately measure length to the nearest yard, foot, inch, and quarter inch and calculate area.
- Estimate and accurately measure mass/weight to the nearest ounce and pound.
- Estimate and accurately measure capacity to the nearest fluid ounce.
- Measure and read temperature accurately to the nearest degree using Fahrenheit thermometer.

Suggested classroom practices:

- Teach students the commonly used relationships among standard units of measure, such as 12 inches in one foot.
- Teach students to use appropriate U.S. standard units of measure for linear measure such as feet and inches, weight/mass such as ounces and pounds, liquid capacity of fluid ounces and gallons, and area such as square yards.
- Teach students how to estimate and accurately measure and solve problems using length to the nearest yard, foot, inch, and quarter inch and calculate area using measuring tools and real objects.
- Teach students how to estimate and accurately measure and solve problems using mass/weight to the nearest ounce and pound using measuring tools and real objects.
- Teach students how to estimate and accurately measure and solve problems using capacity to the nearest fluid ounce using measuring tools and real objects.
- Teach students how to measure and read temperature accurately and solve problems to the nearest degree using Fahrenheit thermometer.

Suggested parent activities:

- Ask the child to estimate and measure items using the standard unit of measure for a variety of items such as estimating if six apples weigh more than a pound before actually weighing them, the length of the child's bed in inches, and the amount of liquid that your child's favorite glass holds in ounces.

> *Students should begin to make "ballpark" comparisons and not memorize conversion factors between U.S. and metric units such as one quart is a little less than one liter, one meter is a little longer than one yard, one inch is about 2.5 centimeters, one kilometer is slightly farther than a half mile, one ounce is about 28 grams or one gram is about the weight of a paper clip, and one kilogram is a little more than two pounds.*

M 4.3.3 By the end of fourth grade, students will tell correct time to the minute on an analog clock.

Student demonstrations:

- Figure elapsed time to the nearest quarter hour.

Suggested classroom practices:

- Teach students to tell time correctly to the nearest minute on an analog (face dial) clock.
- Teach students to figure elapsed time to the nearest quarter hour given a time problem.

Suggested parent activities:

- Ask the child to tell time to the nearest minute on an analog (face dial) clock periodically during the day and evening.

M 4.3.4 By the end of fourth grade, students will determine the perimeter of a many-sided figure (without a formula) using both standard and nonstandard units of measure, such as the six-sided figure measures 30 inches or 15 toothpicks around the edges.

Suggested classroom practices:

- Teach students the concept of perimeter and have students determine the perimeter of many-sided figures using standard, metric and nonstandard units of linear measure.

Suggested parent activities:

- Ask the child to measure the distance around a variety of objects with multiple sides using inches and nonstandard units like pencils or toothpicks.

M 4.4 Geometry/Spatial Concepts

M 4.4.1 By the end of fourth grade, students will identify, describe, and create two- and three-dimensional geometric shapes.

Suggested classroom practices:
- Teach students to identify shapes using appropriate geometric terms, describe the properties and create two- and three-dimensional geometric shapes by drawing, cutting and building with materials.

Suggested parent activities:
- Use items at the store to explore geometric shapes, have the child identify items that are in the shape of a cube, rectangular prism (box), cylinder, cone, and pyramid. The child can also tell what shapes are found on the sides of packages like squares, rectangles, circles, and triangles.

M 4.4.2 By the end of fourth grade, students will identify and draw points, lines, line segments, rays, and angles.

Student demonstrations:
- Identify properties of parallel and perpendicular lines and line segments.

Suggested classroom practices:
- Teach students to identify the properties of points, lines, line segments, rays and angles and represent each with drawings.
- Teach students to identify the properties of parallel and perpendicular for lines and line segments.

Suggested parent activities:
- Ask the child to identify and draw outlines of objects that would form parallel lines or perpendicular lines. Examples might be (for parallel lines) the opposite sides of the doorway and (for perpendicular lines) the sides of a picture frame that forms the corner.

M 4.4.3 By the end of fourth grade, students will analyze, compare, and solve problems with geometric figures using congruence, symmetry, similarity, and simple transformations.

Suggested classroom practices:
- Teach the students the concepts of congruence, symmetry, similarity, and simple transformations to compare, analyze, and solve problems with geometric figures.

Suggested parent activities:
- Use the books like *Grandfather Tang's Story* by Ann Tompert and *The Bedspread* by Sylvia Fair with tangram puzzle pieces and geometric shapes to have the child create the tangram animals and geometric bedspread designs.

M 4.5 Data Analysis, Probability, And Statistical Concepts

M 4.5.1 By the end of fourth grade, students will collect, organize, represent, and interpret numerical and categorical data and clearly communicate the findings.

Student demonstrations:
- Collect, construct, and interpret data in line plots, tables, charts, and graphs, such as pie graphs, bar graphs, and pictographs.
- Draw valid conclusions from displayed data.
- Investigate and represent possible outcomes for a simple probability situation in an organized way, such as tables, grids, and tree diagrams.

Suggested classroom practices:

- Teach students collection techniques, how to construct tables, charts, line plots, and graphs such as pie graphs, bar graphs, and pictographs and interpret the displayed data.
- Teach students to draw valid conclusions from displayed data by identifying invalid conclusions as well.
- Teach students to investigate and represent possible outcomes for a simple probability situation in an organized way, such as tables, grids, and tree diagrams.

Suggested parent activities:

- Use popular magazines or newspapers and ask the child to find examples of charts and graphs and talk about how they are helpful to understand the information presented.
- Ask the child to explain about the topic that was chosen to collect data and what information was concluded from the display.
- Ask the child to create a table to record some results of a four-colored spinner or toss the coin for a tally of heads or tails.

M 4.6 Algebraic Concepts

M 4.6.1 By the end of fourth grade, students will use and interpret variables, mathematical symbols and properties to write and simplify expressions and sentences.

Student demonstrations:

- Use letters, boxes, or other symbols to stand for any number, measured quantity, or object in simple situations to demonstrate the beginning concept of a variable and writing formulas.
- Identify and use various indicators of multiplication (parentheses, x, *) and division, (/, ÷).

Suggested classroom practices:

- Teach students the beginning concept of variable and writing formulas by using symbols to represent objects, measured quantity or numbers in a simple situation.
- Teach students to identify and use various symbols for the operations of multiplication and division.

Suggested parent activities:

- Ask the child to write simple equations using letters, boxes or other symbols representing some situation like the animals at our house include two fish and three hamsters might be written as F + H = A.

M 4.6.2 By the end of fourth grade, students will identify, describe, and extend arithmetic patterns, using concrete materials and tables.

Suggested classroom practices:

- Teach students to identify common patterns found in the multiplication table, describe what is occurring in a given arithmetic pattern, extend arithmetic patterns using concrete materials and then transferring the pattern to a table.

Suggested parent activities:

- Ask the child to use the multiplication table (12 by 12) and identify different patterns found.
- Another example you can experience with your child is King's Rule (computer software by O'Brien 1985) which provides patterns examples. You and the child are to determine the rule used in the pattern.

SOURCES FOR SUGGESTED PARENT ACTIVITIES:

Family Math, Lawrence Hall of Science, University of California, Berkeley, CA 94720.

Family Math for Young Children: Comparing, Lawrence Hall of Science, University of California, Berkeley, CA 94720.

Helping Your Child Learn Math, U.S. Department of Education, Office of Educational Research and Improvement, Washington, D.C. 20208. Copies and pricing information are available from D.C. Heath by calling 1-800-334-3284.

Math Matters, National PTA and Exxon Foundation.

Focus Issue: Beyond the Classroom: Linking Mathematics Learning with Parents, Communities, and Business and Industry, *Teaching Children Mathematics*, February 1998, National Council of Teachers of Mathematics, 1906 Association Drive, Reston, VA 22091-1593 (1-800-235-7566).

Addenda Series Grades K-6, National Council of Teachers of Mathematics, 1906 Association Drive, Reston, VA 22091-1593 (1-800-235-7566).

Nebraska Mathematics Standards
Grade 8 Standards

M 8.1 Numeration/Number Sense

M 8.1.1 By the end of eighth grade, students will recognize and utilize real numbers such as whole numbers, integers, and rational numbers.

M 8.1.2 By the end of eighth grade, students will apply relationships between fractions, decimals, and percents in a variety of situations.

Student demonstrations:
- Find the equivalencies between fractions, decimals, and percents.
- Solve problems with appropriate equivalencies.

M 8.1.3 By the end of eighth grade, students will represent and use numbers in a variety of different forms.

Student demonstrations:
- Write numbers in expanded form using exponential notation.
- Express small and large numbers using scientific notation.

M 8.1.4 By the end of eighth grade, students will apply appropriate use of number theory such as prime and composite, factors and multiples, divisibility, powers, properties, and identities.

M 8.2 Computation/Estimation

M 8.2.1 By the end of eighth grade, students will add, subtract, multiply, and divide decimals and proper, improper, and mixed fractions with uncommon and common denominators both with and without the use of technology.

M 8.2.2 By the end of eighth grade, students will identify the appropriate operation and do the correct calculations to solve word problems.

M 8.2.3 By the end of eighth grade, students will solve problems involving whole numbers, integers, and rational numbers (fractions, decimals, ratios, proportions, and percents) both with and without the use of technology. Problems will be of varying complexities and can involve real-life data.

Student demonstrations:
- Use proportions to solve scale-model problems with fractions and decimals.

M 8.2.4 By the end of eighth grade, students will apply the order of operations to solve problems both with and without the use of technology.

Student demonstrations:
- Evaluate all types of numerical expressions, including grouping symbols and exponents.

M 8.2.5 By the end of eighth grade, students will apply strategies of estimation to a variety of problems both with and without the use of technology.

Student demonstrations:

- Properly round to an appropriate place value if context permits.
- Perform estimation prior to calculation.
- Without a calculator, estimate square roots of whole numbers of zero to one hundred to the nearest whole number.
- Use compatible numbers to perform mental math.

M 8.3 Measurement

M 8.3.1 By the end of eighth grade, students will select appropriate tools and properly measure quantities for temperature, time, money, length and width, area and perimeter, volume and capacity, weight and mass in both standard and metric units at the level of precision required.

M 8.3.2 By the end of eighth grade, students will convert units within measurement systems using proper conversion factors (standard and metric).

Student demonstrations:

- Convert between various units of area and various units of volume, such as square foot to square yards and cubic decimeters to liters, etc.
- Check solutions to problems using unit analysis such as feet/second to miles/hour.

M 8.4 Geometry/Spatial Concepts

M 8.4.1 By the end of eighth grade, students will identify, describe, compare, and classify geometric figures such as plane figures like polygons and circles; solid figures like prisms, pyramids, cones, spheres, and cylinders; and lines, line segments, rays, angles, parallel and perpendicular lines.

M 8.4.2 By the end of eighth grade, students will understand and apply geometric properties and relationships of congruence, similarity, symmetry, and Pythagorean theorem.

M 8.4.3 By the end of eighth grade, students will understand and apply the formulas to solve problems involving perimeter and area of a square, rectangle, parallelogram, trapezoid and triangle and area and circumference of circles.

M 8.4.4 By the end of eighth grade, students will solve problems using the formulas for volume and surface area of rectangular prisms, cylinders, and cones.

M 8.4.5 By the end of eighth grade, students will apply transformations to geometric figures such as translations or slides, rotations or turns, reflections or flips, and scale or dilate.

M 8.4.6 By the end of eighth grade, students will use geometric representations to solve problems and describe the physical world.

M 8.5 Data Analysis, Probability, And Statistical Concepts

M 8.5.1 By the end of eighth grade, students will collect, analyze, interpret, and display data.

Student demonstrations:

- Determine and calculate the appropriate measure of central tendency to describe the data set.
- Use appropriate representations of data such as graphs, tables, and charts.

M 8.5.2 By the end of eighth grade, students will read and interpret tables, charts, and graphs to make comparisons, predictions, and inferences.

M 8.5.3 By the end of eighth grade, students will conduct experiments or simulations to demonstrate an understanding of theoretical probability and relative frequency.

M 8.5.4 By the end of eighth grade, students will recognize appropriate use of statistical methods and appropriate use of probability as a means for decision making.

Student demonstrations:
- Recognize and use appropriate sampling techniques.
- Recognize and use appropriate charts and graphs.
- Recognize and use measures of central tendency appropriately.

M 8.6 Algebraic Concepts

M 8.6.1 By the end of eighth grade, students will demonstrate knowledge and use of the one- and two-dimensional coordinate systems.

Student demonstrations:
- Order numbers on a number line.
- Graph ordered pairs on a coordinate plane.
- Generate a table of ordered pairs to graph an equation in two variables.

M 8.6.2 By the end of eighth grade, students will apply algebraic concepts and algebraic operations to solving problems.

Student demonstrations:
- Solve multi-step equations with one variable.
- Use order of operations to evaluate algebraic expressions for given replacement values of the variables.
- Recognize and apply commutative, associative, distributive, inverse, and identity properties, and the properties of zero.

M 8.6.3 By the end of eighth grade, students will describe and represent relations, using tables, graphs, and rules.

Student demonstrations:
- Use variables to recognize and describe patterns.

Nebraska Mathematics Standards
Grade 12 Standards

M 12.1 Numeration/Number Sense

M 12.1.1 By the end of twelfth grade, students will describe and compare the relationships among all subsets of real numbers.

M 12.1.2 By the end of twelfth grade, students will express the equivalent forms of numbers using exponents, radicals, scientific notation, absolute values, fractions, decimals, and percents.

M 12.2 Computation/Estimation

M 12.2.1 By the end of twelfth grade, students will solve theoretical and applied problems using numbers in equivalent forms, radicals, exponents, scientific notation, absolute values, fractions, decimals, and percents, ratios and proportions, order of operations, and properties of real numbers.

M 12.2.2 By the end of twelfth grade, students will justify the reasonableness of solutions.

Student demonstrations:
- Using significant digits, determine the accuracy of a solution.

M 12.2.3 By the end of twelfth grade, students will perform estimations and computations mentally, with paper and pencil, and with technology.

M 12.3 Measurement

M 12.3.1 By the end of twelfth grade, students will select and use appropriate measuring units, tools, and/or technology to achieve a specified degree of accuracy and precision.

M 12.3.2 By the end of twelfth grade, students will convert between metric and standard units of measurement.

M 12.4 Geometry/Spatial Concept

M 12.4.1 By the end of twelfth grade, students will calculate perimeter, area, and volume for two- and three-dimensional shapes.

M 12.4.2 By the end of twelfth grade, students will utilize geometric relationships and terms to describe the physical world.

M 12.4.3 By the end of twelfth grade, students will analyze relationships among geometric forms.

Student demonstrations:
- Classify and compare attributes of two- and three-dimensional figures.
- Classify figures in terms of congruence and similarity and apply these relationships.
- Determine the effects of changing dimensions on perimeter, area, and volume.
- Investigate and deduce geometric properties using transformations such as translations, rotations, and reflections.

M 12.4.4 By the end of twelfth grade, students will apply coordinate geometry to locate objects and to describe objects algebraically.

M 12.4.5 By the end of twelfth grade, students will apply right triangle trigonometry to solve problems.

M 12.4.6 By the end of twelfth grade, students will understand and apply geometric properties to solve problems.

M 12.4.7 By the end of twelfth grade, students will apply deductive reasoning to arrive at valid conclusions.

M 12.5 Data Analysis, Probability, And Statistical Concepts

M 12.5.1 By the end of twelfth grade, students will apply sampling techniques to gather data, organize, display, and interpret data to solve complex problems.

M 12.5.2 By the end of twelfth grade, students will make inferences and predictions and write equations based on the analysis of sets of data.

M 12.5.3 By the end of twelfth grade, students will interpret theoretical probability to represent problems, solve problems, and make informal decisions.

M 12.5.4 By the end of twelfth grade, students will analyze the effects of data transformation on measures of central tendency and variability such as linear and non-linear relationships.

M 12.5.5 By the end of twelfth grade, students will formulate conclusions based on the interpretation of data represented by the normal distribution.

M 12.5.6 By the end of twelfth grade, students will calculate probabilities of independent events and counting problems.

M 12.6 Algebraic Concepts

M 12.6.1 By the end of twelfth grade, students will interpret algebraic equations and inequalities graphically and describe geometric relationships algebraically.

M 12.6.2 By the end of twelfth grade, students will apply and solve problems involving equations and inequalities.

Student demonstrations:
- Use appropriate methods to solve quadratic equations.

M 12.6.3 By the end of twelfth grade, students will apply and solve problems involving systems of equations, and systems of inequalities and matrices.

M 12.6.4 By the end of twelfth grade, students will apply and solve problems using patterns, algebraic expressions, functions, and regression analysis.

Student demonstrations:
- Apply direct and indirect variations.
- Recognize the properties of families of functions.
- Recognize patterns of exponential growth and decay and their significance to real-life situations.
- Represent a problem in multiple formats such as with words, tables, graphs, and symbols.

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