

North Dakota Standards and Benchmarks

Achievement Standards

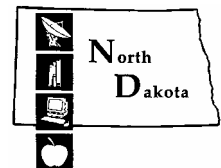
Mathematics

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Grade 4

2000-2001

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Standard 1: Numbers and Operations

Students understand and use basic and advanced concepts of number and number systems.

Benchmark

4.1.1 *Construct and interpret meanings through real-world experiences.*

Level 4 The student accurately constructs, interprets, and extends number meanings through real-world experiences.

Example: *Given two makes/models of an automobile, the student can draw conclusions as to why prices may vary between the two, such as options or mileage.*

Level 3 The student accurately constructs and interprets number meanings using such strategies as grouping, ordering, one-to one correspondence, and use of fractions, decimals, and percents to represent real-world experiences.

Example: *The student can solve this problem: Which is the better deal and why: 3 pencils for \$1.00, 6 pencils for \$1.75, or 9 pencils for \$2.70?*

Level 2 The student constructs and interprets number meanings through real-world experiences with some inaccuracies.

Level 1 The student attempts but is unable to construct and interpret number meanings through real-world experiences.

4.1.2 *Understand the characteristics and properties of our numeration system.*

Level 4 The student accurately and consistently applies the characteristics and properties of our numeration system and understands the relationship among numerical concepts.

Example: *Given a simple fraction, the student can convert it to equivalent decimals or percents (e.g., $1/4 = 25\% = 0.25$)*

Level 3 The student accurately uses the characteristics and properties of our numeration system, such as place value, grouping, ordering, base 10, fractions, decimals, percents, standard numbers, expanded numbers, ordinal numbers, cardinal numbers, and odd and even numbers.

Example: *The student can properly identify the place values in a four-digit number.*

Level 2 The student uses the characteristics and properties of our numeration system with some inaccuracies.

Level 1 The student inconsistently uses the characteristics and properties of our numeration system.

4.1.3	<p><i>Understand how arithmetic operations are related to one another in addition, subtraction, multiplication, and division.</i></p> <p>Level 4 The student accurately and consistently explains how the arithmetic operations of addition, subtraction, multiplication, and division are related to one another. Example: <i>The student can represent and explain multiplication as repeated addition and division as repeated subtraction.</i></p> <p>Level 3 The student accurately shows how the arithmetic operations of addition and subtraction and the arithmetic operations of multiplication and division are related to each another. Example: <i>Given the numbers 15, 8, and 7, the student can provide the basic family facts of addition and subtraction.</i></p> <p>Level 2 The student shows with some inaccuracies how the arithmetic operations of addition and subtraction and the arithmetic operations of multiplication and division are related to each another.</p> <p>Level 1 The student attempts but is unable to show how the arithmetic operations of addition and subtraction and the arithmetic operations of multiplication and division are related to each another.</p>
4.1.4	<p><i>Rename, order, and compare numbers.</i></p> <p>Level 4 The student accurately identifies multiple relationships among numbers by renaming, ordering, and comparing. Example: <i>Given the number 40, the student can rename it in several different ways such as 5×8, 20×2, four 10s, $20 + 20$, or $\frac{1}{2}$ of 80.</i></p> <p>Level 3 The student accurately identifies a relationship among numbers by renaming, ordering, or comparing. Example: <i>Given the number 40, the student can rename it in one way such as four 10s.</i></p> <p>Level 2 The student identifies a relationship among numbers by renaming, ordering, or comparing with some inaccuracies.</p> <p>Level 1 The student attempts but is unable to identify a relationship among numbers by renaming, ordering, or comparing.</p>
4.1.5	<p><i>Know and use basic facts and computational algorithms for whole numbers, fractions, and decimals.</i></p> <p>Level 4 The student accurately (1) adds, subtracts, multiplies, and divides whole numbers, (2) adds and subtracts like fractions and decimals, and (3) selects appropriate algorithms. Example: <i>When given a word problem, the student can choose and perform the appropriate operation.</i></p> <p>Level 3 The student accurately (1) adds, subtracts, multiplies, and divides whole numbers, and (2) adds and subtracts like fractions and decimals. Example: <i>When provided with the appropriate operation, the student can solve the problem.</i></p> <p>Level 2 The student inaccurately (1) adds, subtracts, multiplies, and divides whole numbers, and (2) adds and subtracts like fractions and decimals.</p> <p>Level 1 The student attempts but is unable to (1) add, subtract, multiply, and divide whole numbers, and (2) add and subtract like fractions and decimals.</p>

4.1.6

Use estimation strategies in working with quantities, measurement, computation, and problem solving.

Level 4 The student selects, uses, and justifies appropriate strategies to estimate a quantity or a computation in order to solve a problem.

Example: *When given a jar of jelly beans, the student can estimate its weight and the number of beans in the jar by choosing and applying a strategy and can then explain why that strategy is appropriate.*

Level 3 The student uses a teacher-provided strategy to estimate a quantity or a computation in order to solve a problem.

Example: *When given a teacher-provided strategy, the student can use it to estimate the weight of a jar of jellybeans and the number of beans in the jar. The student can round off numbers to estimate a computation.*

Level 2 The student uses with some inaccuracies a teacher-provided strategy to estimate a quantity or a computation in order to solve a problem.

Level 1 The student attempts but is unable to use a teacher-provided strategy to estimate a quantity or a computation in order to solve a problem.

4.1.7

Understand and communicate strategies to solve a wide variety of problems.

Level 4 The student consistently and accurately identifies, uses, and explains strategies to solve a wide variety of problems.

Example: *The student can solve this problem: What is Suzy's age if she is twice as old as her brother and their ages add up to 12? The student selects guess-and-check to solve the problem and explains why guess-and-check is the best choice.*

Level 3 The student accurately uses and explains a strategy (i.e., guess/check, work backwards, draw diagrams, use objects, or determine pertinent or irrelevant information) to solve a wide variety of problems.

Example: *The student can solve this problem and explain the process: The students in grade 4 took a class trip to the zoo. There were 18 students and 4 adults. The student tickets are 75 cents each, adult tickets are \$1.25, and senior tickets are \$1.00. How much did it cost for all students to get in? Explain how you found the answer.*

Level 2 The student uses a strategy with some inaccuracies to solve a wide variety of problems.

Level 1 The student attempts but is unable to use strategies to solve a wide variety of problems.

Standard 2: Geometry and Spatial Sense

Students understand and apply geometric concepts and spatial relationships to represent and solve problems in mathematical and nonmathematical situations.

Benchmark

4.2.1 *Know the characteristics of two- and three-dimensional shapes.*

Level 4 The student explains the relationship among two- and three-dimensional shapes.

Example: *Given a two-dimensional drawing, the student can visualize and identify the three-dimensional shape that would result from folding along the lines of the given two-dimensional shape, i.e., a net.*

Level 3 The student sorts, classifies, compares and contrasts two- and three-dimensional geometric figures in regards to shapes (e.g., triangle, square, rectangle, circle, hexagon, parallelogram), polygons (number of sides, number of angles), geometric solids (i.e., number of faces, number of edges, number of vertices), attributes (i.e., size, color, shape), or geometric characteristics (quadrilateral, equilateral, obtuse, acute, right, line, segment, intersecting, perpendicular, parallel, vertex, symmetrical, congruent, and ray).

Example: *When given a shape, the student can describe two or three characteristics of the shape.*

Level 2 The student sorts, classifies, compares and contrasts two- and three-dimensional geometric figures with some inaccuracies.

Level 1 The student attempts but is unable to sort, classify, compare, and contrast two- and three-dimensional geometric figures.

4.2.2 *Understand how two- and three-dimensional shapes can be changed by combining and dividing.*

Level 4 The student manipulates two and three-dimensional shapes by combining and dividing to create new shapes and explains the process.

Example: *Given a square, the student can visualize and communicate, through drawing or the use of math language, several ways a set of pattern blocks can be combined or divided to make a square.*

Level 3 The student manipulates two and three-dimensional shapes by combining and dividing to create new shapes. This includes identifying symmetry, congruence, and transformations, i.e., flips, turns, slides, and rotations.

Example: *Given two identical right isosceles triangles, the student can show how one of them must be flipped or rotated so that they can be joined to form a square.*

Level 2 The student is inconsistent at successfully changing two- and three-dimensional shapes by combining and dividing to create new shapes.

Level 1 The student attempts but is unable to change two- and three-dimensional shapes by combining and dividing to create new shapes.

4.2.3

Understand that geometry is found within and outside mathematics.

Level 4 The student identifies objects as having attributes of two- or three-dimensional shapes and explains how a shape is related to its use.

Example: *The student can identify a recessed light as being a cone or a cylinder and can explain how that shape is appropriate for that use; the student can explain why a rectangular door is better than a square door.*

Level 3 The student identifies objects as having attributes of two- or three-dimensional shapes.

Example: *The student can identify a ceiling-mounted fire detector and a recessed light as being a cylinder as well as a circle.*

Level 2 The student identifies objects as having attributes of two-dimensional shapes.

Example: *The student can identify ceiling tiles as being squares or rectangles and a recessed light as being a circle.*

Level 1 The student can label an object as a two-dimensional shape.

Example: *The student can identify a window as a rectangle.*

Standard 3: Data Analysis, Statistics and Probability

Students use data collection and analysis techniques, statistical methods, and probability to solve problems.

Benchmark

4.3.1 *Collect, organize and display data.*

Level 4 The student collects and organizes data and chooses and explains the most appropriate method of display.

Example: *When asked to display changes in writing scores over time, the student chooses a line graph and justifies why a line graph is an appropriate display method.*

Level 3 The student collects, organizes, and properly displays data when given a teacher-provided display model.

Example: *When told to make a bar chart, the student can create a bar chart in which the data in the chart corresponds to the data he/she collected.*

Level 2 The student collects, organizes, and displays data with some inaccuracies.

Level 1 The student attempts to collect, organize, and display data but has multiple errors.

4.3.2 *Formulate and solve problems that involve data.*

Level 4 The student applies data to accurately solve multi-step problems and explains and justifies the processes used.

Example: *When given data regarding the weekly allowance received by each student, the student can determine the total allowance for the class and how much more the class will make at the end of one week if each student receives a 35 cent raise. The student can explain how he/she came up with his/her answer and why he/she used that method.*

Level 3 The student applies data to accurately solve one-step problems and explains the processes used.

Example: *When given data regarding the weekly allowance received by each student, the student can determine the total allowance for the class and explain how he/she got the answer.*

Level 2 The student applies data to solve problems with some inaccuracies.

Level 1 The student attempts but is unable to formulate and solve problems that involve data.

4.3.3 *Draw conclusion based on probability.*

Level 4 The student predicts and explains outcomes from experiments involving chance and demonstrates understanding of the probability of a simple event.

Example: *When given two dice, the student can predict and thoroughly explain which sums should be rolled most often and which should be rolled least often by stating something like a 2 can only be made by rolling two 1s, a 7 can be made with a 3 and a 4 or a 2 and a 5, etc.*

Level 3 The student predicts outcomes from experiments involving chance and determines the general likelihood (e.g., most likely, least likely) of a simple event.

Example: *When given two dice, the student can predict which sums should be rolled most often and least often and can provide a simple explanation.*

Level 2 The student observes and reports outcomes from experiments involving chance.

Example: *When given two dice, the student might observe, "Since I rolled more 6s than anything else, I predict I will continue to get more 6s."*

Level 1 The student attempts but is unable to draw conclusions based on probability.

4.3.4 *Use technology and materials as tools to display data.*

Level 4 The student accurately identifies and uses appropriate technology and materials to display data.

Example: *When asked to display rolls of a dice, the student can accurately design his/her own display using a spreadsheet, graph paper, or manipulative.*

Level 3 The student uses teacher-identified technology to display data.

Example: *When asked to use a spreadsheet to display rolls of a dice, the student can use a spreadsheet template to create a graph.*

Level 2 The student uses technology with some inaccuracies to display data.

Level 1 The student attempts but is unable to use technology and other materials to display data.

Standard 4: Measurement

Students use concepts and tools of measurement to describe and quantify the world.

Benchmark

4.4.1 *Select and use the appropriate tool to determine measurement of length, area, perimeter, volume, and angle size.*

Level 4 The student selects the appropriate measurement tool for a given task, uses the tool to accurately measure length, area, perimeter, volume, or angle size, and **justifies** the selection of the tool.

Example: *When given the choice of a ruler, yardstick, or inch cube stick to find the length of a hallway, the student selects the yardstick and **tells why** the yardstick is most appropriate.*

Level 3 The student selects the appropriate measurement tool for a given task and uses the tool to accurately measure length, area, perimeter, volume, or angle size.

Example: *When given a selection of tools, the student selects the protractor and correctly uses it to measure an angle.*

Level 2 The student selects and uses a measurement tool with some inaccuracies.

Level 1 The student attempts but is unable to correctly select and use a measurement tool.

4.4.2 *Use estimation strategies in working with quantities, measurement, computation, and problem solving.*

Level 4 The student selects, uses, and justifies appropriate strategies to estimate a measurement in order to solve a problem.

Example: *When told to estimate the height of the gym ceiling, the student can select an appropriate estimation strategy and justify it.*

Level 3 The student uses a teacher-provided strategy to estimate a measurement in order to solve a problem.

Example: *The student can figure out the approximate height of the gym ceiling when told by the teacher to use an average-height student from the class as the measurement tool.*

Level 2 The student uses with some inaccuracies a teacher-provided strategy to estimate a measurement in order to solve a problem.

Level 1 The student attempts but is unable to use a teacher-provided strategy to estimate a measurement in order to solve a problem.

4.4.3

Apply a variety of techniques, tools, and formulas to determine measurements.

Level 4 The student uses a variety of techniques, tools, and formulas to accurately determine measurements and explains why the chosen technique, tool, or formula was appropriate.

Example: *When asked to determine the volume of a box, the student can select an appropriate tool such as inch cubes or ruler, provide the formula, and explain why he/she chose this technique or tool.*

Level 3 The student uses a variety of techniques, tools, and teacher provided formulas to accurately determine measurements.

Example: *When given the formula for area, the student can measure a square and accurately determine its area.*

Level 2 The student uses with some inaccuracies techniques, tools, and formulas to determine measurements.

Level 1 The student attempts but is unable to use any technique, tool, or formula to determine measurements.

4.4.4

Know and use units of time, money, and temperature.

Level 4 The student correctly uses **and converts** units of time, money, and temperature to accurately solve a problem.

Example: *The student can solve this problem: If a reading marathon starts at 1:30 p.m. and ends at 9:15 p.m., how many **minutes** did it last?*

Level 3 The student correctly uses units of time, money, and temperature to accurately solve a problem.

Example: *The student can solve this problem: If a reading marathon starts at 1:30 p.m. and ends at 9:15 p.m., how many **hours and minutes** did it last?*

Level 2 The student uses units of time, money, and temperature with some inaccuracies.

Level 1 The student attempts but is unable to accurately use units of time, money, and/or temperature.

Standard 5: Algebra, Functions, and Patterns

Students use algebraic concepts, functions, patterns, and relationships to solve problems.

Benchmark

4.5.1 *Understand when a simple pattern exists, identify the rule that generates the pattern, and use that information to solve problems.*

Level 4 The student accurately identifies, describes, extends, and creates a complex pattern.

Example: *The student can create, identify, describe, and extend a continuing pattern such as add 3, subtract 1, add 4, subtract 2, etc.*

Level 3 The student accurately identifies, describes, extends, and creates a simple pattern.

Example: *The student can create, identify, describe, and extend a repeated pattern such as ABAB and skip counting.*

Level 2 The student identifies, describes, extends, and creates a simple pattern with some inaccuracies.

Level 1 The student attempts but is unable to identify, describe, extend, or create a simple pattern.

4.5.2 *Represent and describe mathematical relationships using symbols for variables.*

Level 4 The student accurately uses variables to represent a mathematical relationship and explains his/her reasoning.

Example: $x \ 2 \ 4 \ 6 \ 8 \ 10 \ y \ 4 \ 8 \ 12 \ 16 \ ?$

Given the chart above, the student can represent the missing y as $y=2x$ and can explain his/her equation.

Level 3 The student accurately uses variables to represent mathematical relationships.

Example: *The student can solve this problem: The Dairy Queen used 40 bananas for banana spits on Monday. After Tuesday, they had used 85 bananas. Let B represent the bananas used on Tuesday. Write a number sentence to solve the problem.*

Level 2 The student uses variables with some inaccuracies to represent mathematical relationships.

Level 1 The student attempts but is unable to use variables to represent mathematical relationships.

4.5.3 *Solve problems with unknown variables.*

Level 4 The student accurately solves problems with unknown variables and multiple operations.

Example: *The student can solve these problems: $12 \mid a \cdot 8 = 16$; $y + y = 40 - 30$.*

Level 3 The student accurately solves problems with unknown variables and single operations.

Example: *The student can solve these problems: $3 \cdot y = 15$; $a \mid 4 = 12$.*

Level 2 The student solves problems with unknown variables with some inaccuracies.

Level 1 The student attempts but is unable to solve problems with unknown variables.

4.5.4

Use basic counting strategies to determine all possible outcomes.

Level 4 The student accurately shows, uses, and explains basic counting strategies to determine all possible outcomes of a three or more variable problem.

Example: *The student can solve this problem: If you have 2 types of cheese, 3 types of meat, and 2 types of bread, how many different sandwiches can you make if each sandwich has 1 type of bread, 1 type of cheese, and 1 type of meat? How do you know you have all the possibilities?*

Level 3 The student accurately shows, uses, and explains basic counting strategies to determine all possible outcomes of a two-variable problem.

Example: *The student can solve this problem: If you have 2 different colored shirts and 3 pairs of pants, what are all the possible combinations of shirts and pants? How do you know you have all the possibilities?*

Level 2 The student shows and describes basic counting strategies with some inaccuracies and determines some but not all possible outcomes of a given problem.

Level 1 The student attempts but is unable to show, describe, and use basic counting strategies to determine all possible outcomes of a given problem.