

North Dakota Standards and Benchmarks

Achievement Standards

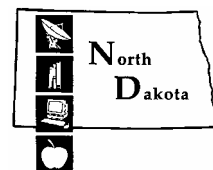
Mathematics

Version 3.0

Grade 8

2000-2001

North Dakota Department of Public Instruction
Dr. Wayne G. Sanstead, State Superintendent
600 E Boulevard Avenue, Dept. 201
Bismarck, North Dakota 58505-0440
www.dpi.state.nd.us



This publication is based on work sponsored wholly, or in part, by the Office of Educational Research and Improvement (OERI), Department of Education, under Contract Number R215P70035. The content of this publication does not necessarily reflect the views of OERI or any other agency of the U. S. Government.

Standard 1: Numbers and Operations

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

Benchmark

8.1.1 *Understand numbers, number systems, and ways of representing numbers.*

Level 4 The student demonstrates knowledge of numbers such as fractions, decimals, percents, and scientific notation with oral and/or written explanation of what process is used.

Level 3 The student demonstrates knowledge of numbers such as fractions, decimals, percents, and scientific notation with an adequate explanation such as work shown.

Level 2 The student occasionally demonstrates knowledge of numbers such as fractions, decimals, percents, and scientific notation.

Level 1 The student rarely demonstrates knowledge of numbers such as fractions, decimals, percents, and scientific notation.

8.1.2 *Apply number theory concepts in mathematical problems.*

Level 4 The student describes the process and demonstrates application of basic concepts of number theory. Examples are lowest common multiples, greatest common factors, prime, or composite, divisibility rules, multiples, factors, prime factorization.

Level 3 The student demonstrates the application and attempts to describe the process of basic concepts of number theory. Examples are lowest common multiples, greatest common factors, prime, or composite, divisibility rules, multiples, factors, prime factorization.

Level 2 The student demonstrates partial application of basic concepts of number theory. Examples are lowest common multiples, greatest common factors, prime, or composite, divisibility rules, multiples, factors, prime factorization.

Level 1 The student demonstrates minimal application of basic concepts of number theory. Examples are lowest common multiples, greatest common factors, prime, or composite, divisibility rules, multiples, factors, prime factorization.

8.1.3 **Level 4** The student is able to extract necessary information and use appropriate methods to solve problems accurately and justify their choices and/or methods.

Level 3 The student is able to extract necessary information and use appropriate methods to solve problems accurately.

Level 2 The student is able to partially solve the problems using some information.

Level 1 The student is unable to apply the information and/or method to solve the problems.

8.1.4 *Compute with real numbers using appropriate computational methods for given situations.*

Level 4 Student uses accurate computation methods for given situations and obtains correct solution to solve problems accurately and justifies their choices and/or methods.

Level 3 Student uses accurate computation methods for given situations and obtains correct solution.

Level 2 Student uses accurate computation methods but has computation error(s).

Level 1 Student uses incorrect computation methods.

8.1.5 *Apply appropriate estimation strategies to determine if a solution is reasonable.*

Level 4 Student uses clear and precise language to express appropriate strategies based on correct mathematical fact (measured, or counted) and has a well-defined explanation of why estimate is reasonable.

Level 3 Student expresses strategies used and has explanation of why estimate is reasonable.

Level 2 Student uses strategies with attempted explanation or work shown.

Level 1 Student uses inappropriate strategy such as an unfounded guess.

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

- 8.2.1 *Understands the relationships and properties of two- and three-dimensional figures.*
- Level 4** Student demonstrates an understanding of the relationships among two- and three-dimensional shapes by describing their similarities, differences, congruency, measurement of angles, correspondence.
Level 3 Student will distinguish among two and three-dimensional figures using the properties such as similarities, differences, congruency, measurement of angles, correspondence.
Level 2 Student can identify some shapes but are unable to demonstrate understanding of the relationships among two- and three-dimensional shapes.
Level 1 Student is unable to identify the relationship among two and three-dimensional figures.
- 8.2.3 *Know the components of the coordinate plane.*
- Level 4** Student will identify the components of a coordinate plane, which must include quadrants, origin, coordinates, x- and y-axis and are able to solve problems using the coordinate plane. (Distance, midpoint, area, perimeter.)
Level 3 Student will identify the components of a coordinate plane, which must include quadrants, origin, coordinates, x- and y-axis.
Level 2 Student identifies some of the components of a coordinate plane, which may include quadrants, origin, coordinates, x- and y-axis.
Level 1 Student misidentifies components of the coordinate plane. Such as quadrants, origin, coordinates, x- and y-axis.
- 8.2.4 *Determine perimeter, circumference, and area in two dimensions, and surface area and volume in three dimensions.*
- Level 4** Student accurately solves for perimeter, circumference, surface area, area and volume in irregular two- and three-dimensional figures and/or makes practical applications with explanation
Level 3 Student accurately solves for perimeter, circumference, surface area, area, volume in two- and three-dimensional figures.
Level 2 Student solves for perimeter, circumference, surface area, area, and volume in two- and three-dimensional figures, with some inaccuracies in formulas used.
Level 1 Student attempts to solve for perimeter, circumference, surface area, area and volume in two- and three-dimensional figures.

8.2.5

Use transformations and symmetry to investigate similar figures.

Level 4 Student is able to determine a sequence of transformations that could be used to transform a figure from one point to another or be able to follow a given sequence of transformations to construct a final figure.

Level 3 Student is able to do all of the one-step transformations: translations, reflections and rotations.

Level 2 Student is able to do some of the one-step transformations: translations, reflections and rotations.

Level 1 Student attempts to one-step transformations: translations, reflections, and rotations.

Standard 3: Data Analysis, Statistics, and Probability

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

Benchmark

8.3.1 *Collect, read, and display data using appropriate techniques and technology.*

Level 4 Student collects, organizes and models, with or without technology, a set of data using an appropriate display and justifies their choice of display including labels, scale and title.

Level 3 Student collects, organizes and models, with or without technology, a set of data using an appropriate display including labels, scale and title.

Level 2 Student collects, organizes and models, with or without technology, a set of data with some inaccuracies or inappropriate display including labels, scale and title.

Level 1 Student attempts to collect, organize and display data.

8.3.2 *Display and use measures of central tendency and measure of variability.*

Level 4 Student will determine and justify their choice of the mean, median or mode and is able to identify the range in a given set of data.

Level 3 Student is able to find the mean, median, mode and range given a set of data.

Level 2 Student is able to find the mean, median, mode and range with some inaccuracies.

Level 1 Student attempts to find the mean, median, mode and range.

8.3.3 *Evaluate arguments that are based on statistical claims.*

Level 4 Student will be able to determine if the conclusions drawn from a statistical study are valid by analyzing method of display, choice of scale, measure of central tendency and experimental results. Student expresses what is misleading and what steps are needed to make the presentation valid.

Level 3 Student will be able to determine and express if the conclusions drawn from a statistical study are valid by analyzing method of display, choice of scale, measure of central tendency and experimental results.

Level 2 Student will be able to determine if the conclusions drawn from a statistical study are valid but is unable to explain.

Level 1 Student is unable to determine if the conclusions drawn from a statistical study are valid.

8.3.4

Identify basic trends in tables and graphs and use these trends to make predictions.

Level 4 Students will be able to recognize and explain the pattern in tables and graphs (such as gradual increase or decrease or leveling off at a point) and makes a valid prediction from their interpretations.

Level 3 Students will be able to recognize the pattern in tables and graphs (such as gradual increase or decrease or leveling off at a point) and make a valid prediction from their observations.

Level 2 Students will be able to recognize the pattern in tables and graphs (such as gradual increase or decrease or leveling off at a point) but makes a prediction that is reasonable but incorrect.

Level 1 Student is unable to recognize the pattern in tables and graphs (such as gradual increase or decrease or leveling off at a point) and makes a prediction that is unreasonable.

8.3.5

Determine probabilities through experiments or simulations.

Level 4 Student is able to determine probability in proper form, reduced fractions, of an outcome from an experiment using a random sample of independent or dependent events or a simulation. Student is able to explain strategy used for determining probability.

Level 3 Student is able to determine the probability in proper form, reduced fraction, of an outcome from an experiment using a random sample of independent or dependent events or a simulation.

Level 2 Student is able to determine probability of an outcome from an experiment using a random sample of independent or dependent events or a simulation with minor errors such as counting errors, unreduced fractions, improper form.

Level 1 Student is unable to determine probability.

8.3.6

Understand and apply the basic notions of probability.

Level 4 Student is able to compute theoretical probabilities from random samples. Student is able to compare experimental probability to theoretical probability and explain discrepancies between them.

Level 3 Student is able to compute theoretical probabilities from random samples. Student is able to compare experimental probability to theoretical probability.

Level 2 Student is able to compute probabilities from random samples.

Level 1 Student makes an attempt to compute probabilities.

8.3.7

Use counting strategies to determine all the possible outcomes.

Level 4 Student is able to list all possible outcomes of an experiment using counting strategies such as permutations, combinations, factorials, tree diagrams etc. Student is able to explain process used to determine number of outcomes including number of categories and choices in each category and factors from these choices.

Level 3 Student is able to determine the number or a list of all possible outcomes of an experiment using counting strategies such as permutations, combinations, factorials, tree diagrams etc.

Level 2 Student is able to give a partial list of possible outcomes of an experiment using counting strategies such as permutations, combinations, factorials, tree diagrams etc.

Level 1 Student makes a list with errors of possible outcomes of an experiment.

Standard 4: Measurement

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

Benchmark

8.4.1 *Select appropriate units and scale to estimate and measure.*

Level 4 Student is able to select appropriate unit of measurement for capacity, length, weight, area and angles given various situations. Student is able to make accurate estimates of various measurements. Student is able to measure accurately. Student must justify their choice of unit of measurement and explain their procedures.

Level 3 Student is able to select appropriate unit for measurement, measures and estimates for capacity, length, weight, and angles given various situations.

Level 2 Student is able to select appropriate unit for measurement, measures or estimates with some errors for capacity, length, weight, and angles given various situations.

Level 1 Student is unable to select appropriate unit of measurement.

8.4.2 *Select and use appropriate measurement unit and tools when solving problems.*

Level 4 Student is able to measure accurately and use measurement to find weight, capacity, length and angle to solve problems and communicates strategies used in solving the problems.

Level 3 Student is able to measure accurately and use measurements to find weight, capacity, length, and angles to solve problems.

Level 2 Student is able to measure accurately and uses measurement to find weight, capacity, length, and angles with minor errors in solution.

Level 1 Student attempts to measure and solve the problem.

8.4.3 *Use formulas and procedures to solve problems involving measurement.*

Level 4 Student uses the proper formulas to compute area, perimeter and volume. Student is able to justify method used to solve the problem.

Level 3 Student uses the proper formulas to compute area, perimeter and volume.

Level 2 Student uses inappropriate formula to find area, perimeter and volume.

Level 1 Student attempts problem but doesn't use formulas to solve for area, perimeter, and volume.

Standard 5: Algebra, Functions, and Patterns

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

Benchmark

8.5.1 *Find, represent, describe, and analyze patterns, functions, and relations using tables, graphs, verbal descriptions, and standard algebraic notation.*

Level 4 Student recognizes the relationship between two quantities and represents the relationship using algebraic notation, tables or graphs. Student is able to give a verbal explanation of the relationship between two quantities.

Level 3 Student recognizes the relationship between two quantities and represents the relationship using algebraic notation, tables or graphs.

Level 2 Student recognizes that there is a pattern between two quantities but is unable to represent the pattern appropriately.

Level 1 Student finds an incorrect pattern or student is unable to determine pattern.

8.5.2 *Understand the concepts of variables, expressions, equations and inequalities.*

Level 4 Student is able to use variables to represent unknown quantities. Student uses variables and symbols to form expressions, equations, and inequalities. Student is able to determine and explain appropriate use of expression, equation and inequalities.

Level 3 Student is able to use variable to represent unknown quantities. Student uses variables and symbols to form expressions, equations, and inequalities. Student is able to differentiate among expressions, equations and inequalities.

Level 2 Student is able to use variables to represent unknown quantities. Student uses variables and symbols to form expressions, equations, and inequalities.

Level 1 Student is able to use variables to represent unknown quantities. Student attempts to use variables and symbols to form expressions, equations, and inequalities.

8.5.3 *Solve linear equations, inequalities, and systems of equations in problem solving situations using a variety of tools.*

Level 4 Student is able to represent and solve problems involving equations, inequalities and systems of equations. Student demonstrates solution using more than one method such as technology, algebra or a graphing method.

Level 3 Student is able to represent and solve problem involving equations, inequalities and systems of equations using technology, algebra or a graphing method.

Level 2 Student is able to represent and solve problems (with minor errors involving equations, inequalities and systems of equations using technology, algebra or a graphing method.

Level 1 Student attempts to represent and solve problems.