

NEW MEXICO Grade 8 MATHEMATICS STANDARDS

PROCESS STANDARDS

To help New Mexico students achieve the Content Standards enumerated below, teachers are encouraged to base instruction on the following Process Standards:

<p>Problem Solving</p> <ul style="list-style-type: none"> • Build new mathematical knowledge through problem solving • Solve problems that arise in mathematics and other contexts • Apply and adapt a variety of appropriate strategies to solve problems, and • Monitor and reflect on the process of problem solving. 	<ul style="list-style-type: none"> • Analyze and evaluate the mathematical thinking and strategies of others, • Use the language of mathematics to express mathematical ideas precisely, and • Describe mathematical concepts using developmentally appropriate definitions.
<p>Reasoning and Proof</p> <ul style="list-style-type: none"> • Recognize reasoning and proof as fundamental aspects of mathematics, • Make and investigate mathematical conjectures, • Develop and evaluate mathematical arguments and proofs, and • Select and use various types of reasoning and methods of proof. 	<p>Connections</p> <ul style="list-style-type: none"> • Recognize and use connections among mathematical ideas, • Understand how mathematical ideas interconnect and build on one another to produce a coherent whole, and • Recognize and apply mathematics in contexts outside of mathematics.
<p>Communication</p> <ul style="list-style-type: none"> • Organize and consolidate their thinking through communication, • Communicate their mathematical thinking coherently and clearly to peers, teachers, and others, 	<p>Representation</p> <ul style="list-style-type: none"> • Create and use representations to organize, record, and communicate mathematical ideas, • Select, apply, and translate among mathematical representations to solve problems, and • Use representations to model and interpret physical, social, and mathematical phenomena.

CONTENT STANDARDS

Strand: NUMBER AND OPERATIONS

Standard: Students will understand numerical concepts and mathematical operations.

5-8 Benchmark N.1: Understand numbers, ways of representing numbers, relationships among numbers, and number systems.

Performance Standards

8.N.1.1 Sort numbers by their properties (e.g., prime, composite, square, square root).

8.N.1.2 Demonstrate the magnitude of rational numbers (e.g., trillions to millions).

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5-8 Benchmark N.2: Understand the meaning of operations and how they relate to one another.

Performance Standards

- 8.N.2.1 Use real number properties (e.g., commutative, associative, distributive) to perform various computational procedures.
- 8.N.2.2 Perform arithmetic operations and their inverses (e.g., addition/subtraction, multiplication/division, square roots of perfect squares, cube roots of perfect cubes) on real numbers.
- 8.N.2.3 Find roots of real numbers using calculators.

5-8 Benchmark N.3: Compute fluently and make reasonable estimates.

Performance Standards

- 8.N.3.1 Formulate algebraic expressions that include real numbers to describe and solve real-world problems.
- 8.N.3.2 Use a variety of computational methods to estimate quantities involving real numbers.
- 8.N.3.3 Differentiate between rational and irrational numbers.
- 8.N.3.4 Use real number properties to perform various computational procedures and explain how they were used.
- 8.N.3.5 Perform and explain computations with rational numbers, pi, and first-degree algebraic expressions in one variable in a variety of situations.
- 8.N.3.6 Select and use appropriate forms of rational numbers to solve real-world problems including those involving proportional relationships.
- 8.N.3.7 Approximate, mentally and with calculators, the value of irrational numbers as they arise from problem situations.
- 8.N.3.8 Express numbers in scientific notation (including negative exponents) in appropriate problem situations using a calculator.
- 8.N.3.9 Estimate answers and use formulas to solve application problems involving surface area and volume.

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Strand: ALGEBRA

Standard: Students will understand algebraic concepts and applications.

5-8 Benchmark A.1: Understand patterns, relations, and functions.

Performance Standards

8.A.1.1 Move between numerical, tabular, and graphical representations of linear relationships.

8.A.1.2 Use variables to generalize patterns and information presented in tables, charts, and graphs:

- a. graph linear functions noting that the vertical change per unit of horizontal change (the slope of the graph) is always the same
- b. plot the values of quantities whose ratios are always the same, fit a line to the plot, and understand that the slope of the line equals the quantities

5-8 Benchmark A.2: Represent and analyze mathematical situations and structures using algebraic symbols.

Performance Standards

8.A.2.1 Demonstrate the difference between an equation and an expression.

8.A.2.2 Solve two-step linear equations and inequalities in one variable with rational solutions.

8.A.2.3 Evaluate formulas using substitution.

8.A.2.4 Demonstrate understanding of the relationships between ratios, proportions, and percents and solve for a missing term in a proportion.

8.A.2.5 Graph solution sets of linear equations in two variables on the coordinate plane.

8.A.2.6 Formulate and solve problems involving simple linear relationships, find percents of a given number, variable situations, and unknown quantities.

8.A.2.7 Use symbols, variables, expressions, inequalities, equations, and simple systems of equations to represent problem situations that involve variables or unknown quantities.

5-8 Benchmark A.3: Use mathematical models to represent and understand quantitative relationships.

Performance Standards

8.A.3.1 Generate different representations to model a specific numerical relationship given one representation of data (e.g., a table, a graph, an equation, a verbal description).

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5-8 Benchmark A.4: Analyze changes in various contexts.

Performance Standards

- 8.A.4.1** Use graphs, tables, and algebraic representations to make predictions and solve problems that involve change.
- 8.A.4.2** Estimate, find, and justify solutions to problems that involve change using tables, graphs, and algebraic expressions.
- 8.A.4.3** Use appropriate problem-solving strategies (e.g., drawing a picture, looking for a pattern, systematic guessing and checking, acting it out, making a table or graph, working a simpler problem, writing an algebraic expression or working backward) to solve problems that involve change.
- 8.A.4.4** Solve multi-step problems that involve changes in rate, average speed, distance, and time.
- 8.A.4.5** Analyze problems that involve change by identifying relationships, distinguishing relevant from irrelevant information, identifying missing information, sequencing, and observing patterns.
- 8.A.4.6** Generalize a pattern of change using algebra and show the relationship among the equation, graph, and table of values.
- 8.A.4.7** Recognize the same general pattern of change presented in different representations.

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Strand: GEOMETRY

Standard: Students will understand geometric concepts and applications.

5-8 Benchmark G.1: Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematics arguments about geometric relationships.

Performance Standards

8.G.1.1 Recognize, classify, and discuss properties of all geometric figures including point, line, and plane.

8.G.1.2 Identify arc, chord, and semicircle and explain their attributes.

8.G.1.3 Use the Pythagorean theorem and its converse to find the missing side of a right triangle and the lengths of the other line segments.

5-8 Benchmark G.2: Specify locations and describe spatial relationships using coordinate geometry and other representational systems.

Performance Standards

8.G.2.1 Represent, formulate, and solve distance and geometry problems using the language and symbols of algebra and the coordinate plane and space (e.g., ordered triplets).

5-8 Benchmark G.3: Apply transformations and use symmetry to analyze mathematical situations.

Performance Standards

8.G.3.1 Describe the symmetry of three-dimensional figures.

8.G.3.2 Describe and perform single and multiple transformations that include rotation, reflection, translation, and dilation (i.e., shrink or magnify) to two-dimensional figures.

5-8 Benchmark G.4: Use visualization, spatial reasoning, and geometric modeling to solve problems.

Performance Standards

8.G.4.1 Understand angle relationships formed by parallel lines cut by a transversal.

8.G.4.2 Recognize and apply properties of corresponding parts of similar and congruent triangles and quadrilaterals.

8.G.4.3 Represent and solve problems relating to size, shape, area, and volume using geometric models.

8.G.4.4 Develop and use formulas for area, perimeter, circumference, and volume.

8.G.4.5 Construct two-dimensional patterns for three-dimensional models (e.g., cylinders, prisms, cones).

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Strand: MEASUREMENT

Standard: Students will understand measurement systems and applications.

5-8 Benchmark M.1: Understand measurable attributes of objects and the units, systems, and processes of measurement.

Performance Standards

- 8.M.1.1** Understand the concept of volume and use the appropriate units in common measuring systems (e.g., cubic centimeter, cubic inch, cubic yard) to compute the volume of rectangular solids.
- 8.M.1.2** Use changes in measurement units (e.g., square inches, cubic feet) to perform conversions from one-, two-, and three-dimensional shapes.

5-8 Benchmark M.2: Apply appropriate techniques, tools, and formulas to determine measurements.

Performance Standards

- 8.M.2.1** Use ratios and proportions to measure hard-to-measure objects.
- 8.M.2.2** Use estimation to solve problems.
- 8.M.2.3** Use proportional relationships in similar shapes to find missing measurements.
- 8.M.2.4** Apply strategies to determine the surface area and volume of prisms, pyramids, and cylinders.
- 8.M.2.5** Perform conversions with multiple terms between metric and U.S. standard measurement systems.
- 8.M.2.6** Estimate volume in cubic units.
- 8.M.2.7** Solve simple problems involving rates and derived measurements for such properties as velocity and density.

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Strand: DATA ANALYSIS AND PROBABILITY

Standard: Students will understand how to formulate questions, analyze data, and determine probabilities.

5-8 Benchmark D.1: Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them.

Performance Standards

- 8.D.1.1** Represent two numerical variables on a plot, describe how the data points are distributed, and identify relationships that exist between the two variables.
- 8.D.1.2** Generate, organize, and interpret real numbers in a variety of situations.
- 8.D.1.3** Organize, analyze, and display appropriate quantitative and qualitative data to address specific questions including:
- a. frequency distributions
 - b. plots
 - c. histograms
 - d. bar, line, and pie graphs
 - e. diagram and pictorial displays
 - f. charts and tables
- 8.D.1.4** Select the appropriate measure of central tendency to describe a set of data for a particular problem situation.
- 8.D.1.5** Simulate an event selecting and using different models.
- 8.D.1.6** Develop an appropriate strategy using a variety of data from surveys, samplings, estimations, and inferences to address a specific problem.

5-8 Benchmark D.2: Select and use appropriate statistical methods to analyze data.

Performance Standards

- 8.D.2.1** Use changes in scales, intervals, or categories to help support a particular interpretation of data.
- 8.D.2.2** Generate, organize, and interpret real number and other data in a variety of situations.
- 8.D.2.3** Analyze data to make decisions and to develop convincing arguments from data displayed in a variety of formats including:
- a. plots
 - b. distributions
 - c. graphs
 - d. scatter plots
 - e. diagrams
 - f. pictorial displays
 - g. charts and tables
 - h. Venn diagrams
- 8.D.2.4** Interpret and analyze data from graphical representations and draw simple conclusions (e.g., line of best fit).
- 8.D.2.5** Evaluate and defend the reasonableness of conclusions drawn from data analysis.
- 8.D.2.6** Use appropriate central tendency and spread as a means for effective decision-making in analyzing data and outliers.
- 8.D.2.7** Identify simple graphic misrepresentations and distortions of sets of data (e.g., unequal interval sizes, omission of parts of axis range, scaling).
- 8.D.2.8** Use appropriate technology to display data as lists, tables, matrices, graphs, and plots and to analyze the relationships of variables in the data displayed.

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5-8 Benchmark D.3: Develop and evaluate inferences and predictions that are based on data.

Performance Standards

8.D.3.1 Describe how changes in scale, intervals, or categories influence arguments for a particular interpretation of the data.

8.D.3.2 Describe how reader bias, measurement errors, and display distortion can affect the interpretation of data, predictions, and inferences based on data.

8.D.3.3 Conduct simple experiments and/or simulations, record results in charts, tables, or graphs, and use the results to draw conclusions and make predictions.

8.D.3.4 Compare expected results with experimental results and information used in predictions and inferences.

5-8 Benchmark D.4: Understand and apply basic concepts of probability.

Performance Standards

8.D.4.1 Calculate the odds of a desired outcome in a simple experiment.

8.D.4.2 Design and use an appropriate simulation to estimate the probability of a real-world event (e.g., disk toss, cube toss).

8.D.4.3 Explain the relationship between probability and odds and calculate the odds of a desired outcome in a simple experiment.

8.D.4.4 Use theoretical or experimental probability to make predictions about real-world events.

8.D.4.5 Use probability to generate convincing arguments, draw conclusions, and make decisions in a variety of situations.

8.D.4.6 Understand that the probability of two unrelated events occurring is the sum of the two individual possibilities and that the probability of one event following another, in independent trials, is the product of the two probabilities.