

GLENCOE CORRELATION

GEOMETRY: INTEGRATION • APPLICATIONS • CONNECTIONS

NEW MEXICO

Mathematics Performance Standards

Grades 9–12

STANDARDS	LESSON REFERENCES
CONTENT STANDARD 1: UNIFYING CONCEPTS AND PROCESSES STUDENTS WILL UNDERSTAND AND USE MATHEMATICS IN PROBLEM SOLVING	
A. Analyze problem-solving approaches to investigate and understand mathematical content.	
1. Clarify the strategy involved in solving given problems by breaking complex problems into simpler parts.	1-3, 7-2, 8-3, 8-4, 11-5
2. Adapt previously used strategies to new problems.	3-1
B. Formulate problems from global mathematical situations.	
1. Identify mathematical implications of real-world situations.	Long-Term Project Chapters 4 and 5
2. Formulate appropriate problems involving these situations.	Long-Term Project Chapters 4 and 5
3. Apply previously developed strategies to solve these problems.	Long-Term Project Chapters 4, 5, and 10
C. Select the best strategies to solve a wide variety of problems in diverse contexts.	
1. Use a variety of mathematical models such as tables, graphs, and algebraic expressions to represent real-world problems.	3-3, 3-4, 3-5
2. Apply a variety of reasoning processes to solve problems.	1-5, 2-1, 2-2, 2-3, 2-4
3. Evaluate the validity of arguments and the efficiency of chosen strategies.	1-5, 2-1, 2-2, 2-3, 2-4
D. Verify and interpret results with respect to the original problem situation.	
1. Check to see that the solution of a problem is reasonable, and justify the solution verbally or in writing.	4-4, 5-2, 5-5, 6-2, 7-3
E. Use manipulatives, calculators, computers, and other tools, as appropriate, in order to strengthen mathematical thinking, understanding, and power to build upon foundational concepts.	
1. Use appropriate tools (e.g., manipulatives, calculators, and computers) to demonstrate mathematical properties and relationships from numeric, algebraic, and geometric perspectives.	1-7, 2-6, 3-3, 4-1, 6-2

STANDARDS	LESSON REFERENCES
F. Analyze solutions and strategies for use in mathematical modeling.	
1. Describe and analyze mathematical situations in a variety of ways including orally, pictorially, graphically, in writing, and with concrete materials and algebraic expressions.	1-5, 3-6, 7-2
CONTENT STANDARD 2: UNIFYING CONCEPTS AND PROCESSES STUDENTS WILL UNDERSTAND AND USE MATHEMATICS IN COMMUNICATION	
A. Analyze personal mathematical thinking for validity and applicability to specific problems.	
1. Decide how mathematics would be an aid in solving a real-life problem.	Long-Term Project Chapter 10, Chapter 1,3,4,6 Projects
2. Determine the best method of solution (graph, formula, logic, etc.)	Long-Term Project Chapters 6, 10 and 11
B. Use drawings, discussion, reading, writing, and listening to access, learn, and communicate mathematical ideas.	
1. Express mathematical ideas in an easy-to-understand format such as drawing, discussing, listening, reading, and writing, etc., using appropriate vocabulary and notation.	2-1, 2-2, 2-3
2. Ask clarifying and extending questions about mathematical ideas.	2-5
C. Select the most economical and illustrative method to communicate mathematical concepts, thoughts, and problem solutions including mathematical notation, charts, slides, graphs, maps, drawings, pictures, sound recordings, video, e-mail, and others.	
1. Discern among the many modes of communication of mathematics to choose the most easy-to-understand, effective, or economical method.	3-1, 3-2, 3-4
D. Analyze mathematical ideas through the use of learning tools such as manipulatives, calculators, and computers.	
1. Use manipulatives as an aid to understanding the meaning of a problem and to suggest a mode of solution.	5-1, 6-1
2. Learn to use computers and graphing calculators to simulate situations, analyze data, and solve complicated problems in an effective way.	2-1, 3-3, 9-7, 10-5
E. Describe the economy, power, and elegance of mathematical notation and its role in the development of mathematical ideas.	
1. Demonstrate that translating a real-life problem to a mathematical equation results in an easier and organized method of solution.	9-8, 12-2, 12-6
2. Use appropriate notation for mathematics.	1-6, 3-1, 4-1, 7-2, 8-3

STANDARDS	LESSON REFERENCES
<i>F. Read presentations of mathematics with understanding.</i>	
1. Be aware of how mathematics is presented in everyday publications.	Chapter 2 Project
2. Interpret results of graphs, statistics, etc., in daily news.	Chapter 2 Project
3. Verify or refute implications and conclusions presented in news publications.	Chapter 2 Project
CONTENT STANDARD 3: UNIFYING CONCEPTS AND PROCESSES STUDENTS WILL UNDERSTAND AND USE MATHEMATICS IN REASONING	
<i>A. Develop and test conjectures and mathematical arguments.</i>	
1. Brainstorm, in a cooperative setting, possible conjectures and modes of solution to a mathematical problem.	Long-Term Project Chapter 10
2. Give pros and cons to test the validity and/or usefulness of such conjectures and methods of solutions.	Long-Term Project Chapter 10
<i>B. Evaluate reasoning strategies to select the most appropriate reasoning method to solve a given problem.</i>	
1. Know several possible problem-solving strategies such as guess and check, develop a pattern, form an equation, etc.	2-3, 4-5, 5-5, 7-6, 10-2
2. Analyze and choose the best of these strategies for the particular problem.	2-3
<i>C. Judge the validity of mathematical arguments.</i>	
1. Give a counterexample to demonstrate an invalid mathematical argument or reasons to substantiate logical valid arguments.	2-1, 2-3, 4-5, 5-1
<i>D. Construct and evaluate logical arguments.</i>	
1. Given an assumption, develop a logical sequence of arguments leading to a valid conclusion or solution to a problem (statement/reasons proof, informal proof, and algebraic steps).	1-5, 2-1, 2-3, 2-5
<i>E. Formulate counterexamples to understand mathematical reasoning.</i>	
1. Give a counterexample and explain why it demonstrates that a mathematical argument was invalid and led to a false conclusion.	2-1
CONTENT STANDARD 4: UNIFYING CONCEPTS AND PROCESSES STUDENTS WILL UNDERSTAND AND USE MATHEMATICAL CONNECTIONS	
<i>A. Relate mathematical procedures in one representation to procedures in equivalent representations.</i>	
1. Given a representation of a problem or data (e.g., pictorial, graph, and equation), represent it using another of these methods.	1-1, 13-2

STANDARDS	LESSON REFERENCES
B. Compare and contrast equivalent representations of the same concept.	
1. Given several different methods of representing a problem or data, students will be able to identify which representations are more useful for identifying certain information.	11-1
2. Discuss which representations are easiest to read, more economical in terms of time, give more information, etc.	11-1
C. Assess the relationship among mathematical topics.	
1. Use material learned in one math course or section of a course to solve problems in another area of mathematics (e.g., to solve geometry problems, students must be able to solve algebraic equations).	1-3, 2-4, 10-6, 12-3
D. Incorporate the use of technology into the application of mathematical reasoning and problem solving to other disciplines.	
1. Use graphing calculators and/or computers in the analysis of results of experiments or population data that are important in other fields of study.	12-2A
E. Evaluate mathematical solutions for problems in daily life and in the greater society.	
1. Examine the validity and usefulness of mathematics solutions being offered to problems in everyday life (e.g., environmental issues, health issues, etc.).	5-3, 10-4
CONTENT STANDARD 5: NUMBER AND OPERATION CONCEPTS STUDENTS WILL UNDERSTAND AND USE NUMBERS AND NUMBER RELATIONSHIPS	
A. Extend number sense skills to include irrational numbers.	
1. Use models, such as number lines and Venn diagrams, to show similarities and differences among real numbers.	1-4
B. Apply number-sense skills within the real number system.	
1. Compare and order members of the real number system.	1-4
C. Apply ratios, proportions, and percents in more complex mathematical situations.	
1. Investigate and describe the application of ratios, proportions, and percents in real-world situations.	7-1, 7-2, 7-4

STANDARDS	LESSON REFERENCES
D. Analyze and interpret numerical relationships in one- and two-dimensional graphs, both manually and using tools such as graphing calculators and computers.	
1. Graph and use such tools as graphing calculators and computers to analyze and interpret relationships.	1-4, 1-5, 3-3, 3-5
CONTENT STANDARD 6: NUMBER AND OPERATION CONCEPTS STUDENTS WILL UNDERSTAND AND USE NUMBER SYSTEMS AND NUMBER THEORY	
A. Use order relations within the real number system.	
1. Order and compare whole numbers, fractions, decimals, integers, and rational and irrational numbers.	1-1, 8-1, 8-2, 8-3
B. Apply number theory concepts to a variety of problem situations.	
1. Apply mathematical thinking using a variety of tools to demonstrate concepts, such as order, primes, factors, and multiples.	1-4
C. Identify how seemingly different mathematical situations may be essentially the same (for example, the intersection of two lines is the same as the solution to a system of linear equations).	
1. Compare, translate, extend, and represent numbers in various forms such as decimal, fraction, scientific notation, patterns, graphs, charts, and tables.	1-4
D. Compare and contrast the real number system and its various subsystems with regard to structural characteristics.	
1. Explain how a number system differs from a set of numbers.	1-4
E. Develop and analyze algorithms.	
1. Explain the four basic arithmetic operations.	1-4
2. Describe which field properties hold for each of a variety of subsets of real numbers such as odd numbers, even numbers, prime numbers, composite numbers, powers of 2, factors of a given number, squares, and square roots.	1-4
CONTENT STANDARD 7: NUMBER AND OPERATION CONCEPTS STUDENTS WILL UNDERSTAND AND USE COMPUTATION AND ESTIMATION	
A. Develop, analyze, and explain methods for solving a variety of problem situations.	
1. Clarify and express orally, in writing, or by project simulation the mathematical thinking involved in solving given problems.	1-1, 1-2, 3-2, 3-3, 4-1, 6-2, 8-4, 10-4

STANDARDS	LESSON REFERENCES
B. <i>Extend solutions of problems to formulate predictions.</i>	
1. Compare, translate, extend, and represent numbers in various forms such as decimal, fraction, scientific notation, patterns, graphs, charts, and tables.	1-2, 4-1, 4-4, 4-6
2. Solve an application involving optimal production and marketing decisions.	7-1
C. <i>Justify the reasonableness of solutions and predictions.</i>	
1. Use estimation as a first step in all calculations, especially when using calculators.	8-1, 11-3
2. Evaluate relationships between key components and the original problem situation to determine the reasonableness of solutions and predictions.	2-3, 3-5, 4-2, 7-2, 7-4
CONTENT STANDARD 8: GEOMETRY AND MEASUREMENT CONCEPTS STUDENTS WILL HAVE A FOUNDATION IN GEOMETRIC CONCEPTS	
A. <i>Interpret and draw three-dimensional objects.</i>	
1. Use top, front, and side views to create accurate and complete representations of three-dimensional objects.	11-2, 11-3, 11-4
B. <i>Deduce properties of figures using transformations and using coordinates.</i>	
1. Draw geometric figures on a coordinate plane.	1-4, 4-3, 12-2, 12-4
C. <i>Classify figures in terms of congruence and similarity and apply these relationships.</i>	
1. Explain why triangles are similar or congruent.	4-3, 4-4, 7-3
2. Apply congruence and similarity to other polygons.	7-2, 9-3
D. <i>Represent problem situations with geometric models and apply properties of figures.</i>	
1. Apply right triangle trigonometry to solve a problem.	8-3, 8-4, 8-5, 8-6
E. <i>Deduce properties of and relationships between figures from given assumptions.</i>	
1. Given assumptions about a figure, students will give formal or informal proofs regarding properties of the figure or relationships between the given figures.	2-2, 2-5, 2-6, 3-1, 3-2
F. <i>Identify congruent and similar figures using transformations.</i>	
1. Understand the effect that translating, reflecting, rotating, or dilating has on a figure and use this information to identify congruencies or similarities between figures.	13-5, 13-6, 13-7, 13-8

STANDARDS	LESSON REFERENCES
G. Analyze properties of Euclidean transformations and relate transformations to vectors.	
1. Understand the effect that translating, reflecting, rotating, or dilating has on a figure and use this information to identify the results of transforming vectors.	12-5, 13-5, 13-6, 13-7, 13-8
2. Use vectors as tools to transform figures into congruent or similar figures.	12-5
CONTENT STANDARD 9: GEOMETRY AND MEASUREMENT CONCEPTS STUDENTS WILL UNDERSTAND AND USE MEASUREMENT	
A. Apply measurement as a tool in other disciplines and in everyday problem situations.	
1. Use ratio and proportion to find distances which are difficult to measure directly, e.g., heights of buildings or flagpoles.	8-3, 8-4
2. Find volumes and surface areas of geometric solids (e.g., cones, pyramids, and prisms).	11-2, 11-3, 11-4, 11-5, 11-6, 11-7
B. Identify and use the appropriate units and tools of measurement to the degree of accuracy required in particular problems.	
1. Estimate the cost of a construction job given the job's blueprints, specifications, and material and labor costs.	Long-Term Project Chapters 6 and 7, Chapter 8 Project
2. Determine if errors are within acceptable levels.	4-4
CONTENT STANDARD 10: STATISTICS AND PROBABILITY CONCEPTS STUDENTS WILL UNDERSTAND AND USE STATISTICS	
A. Construct and draw inferences from charts, tables, and graphs that summarize data from inside and outside the school environment.	
1. Create and interpret a scatter plot.	12-3
B. Use curve fitting to predict from data.	
1. Given data, students will manually or with the aid of technology find a best curve fit.	12-3
2. After determining the equation of the best fit, students will apply the equation in order to predict results of what could happen at other data points.	12-3
C. Apply measures of central tendency, variability, and correlation.	
1. Determine the most meaningful measure of central tendency for a given situation.	Chapter 9 Project
D. Define sampling and recognize its role in statistical claims.	
1. Use sampling techniques to draw inferences about large populations.	Chapter 9 Project

STANDARDS	LESSON REFERENCES
E. Design an experiment to study a problem and use the correct statistical procedures to summarize and analyze the data.	
1. Explore questions of experimental design, use of control groups, and reliability.	Chapter 9 Project
F. Analyze the effects of data transformations on measures of central tendency and variability.	
1. Explain what effect multiplication by a constant on a data set will have on the mean, median, mode, and standard deviation.	See Glencoe's <i>Advanced Mathematical Concepts</i> Lessons 15-2, 15-3.
CONTENT STANDARD 11: STATISTICS AND PROBABILITY CONCEPTS STUDENTS WILL UNDERSTAND AND USE PROBABILITY	
A. Use simulations to estimate probability.	
1. Devise experiments which can be generalized to estimate the probability of a larger event.	10-6
B. Use experimental or theoretical probability to represent and solve problems involving uncertainty.	
1. Organize the results of an experiment to give the best possible representation (graph, table, etc.) and use this representation as a tool to predict results and solve problems.	10-6
2. Use permutations and/or combinations to solve problems involving uncertainty.	10-6
C. Apply the definition of a random variable to experimental design.	
1. Understand the meaning of a completely random event.	5-5, 6-1, 10-6
2. Be able to use technology to simulate a random event.	5-5
3. Devise an experiment in which a random event plays a key role.	6-1
D. Create and interpret discrete probability distributions.	
1. Analyze bar graphs, pie graphs, broken line graphs, etc.	5-5
2. Given data, create an appropriate bar graph, broken line graph, tree diagram, box and whiskers plot, etc., to display in the best possible way.	12-3
E. Describe the normal curve and apply its properties to answer questions about data that are assumed to be normally distributed.	
1. Given a normal curve, apply its properties to identify the number (or percent) of data points within one standard deviation, two standard deviations, etc.	See Glencoe's <i>Advanced Mathematical Concepts</i> Chapter 15 Project.

STANDARDS	LESSON REFERENCES
F. Solve enumeration and finite probability problems.	
1. Apply knowledge of permutations and combinations to solve problems involving enumeration and finite probability.	See Glencoe's <i>Advanced Mathematical Concepts</i> Lessons 14-1, 14-2, 14-3, 14-4.
CONTENT STANDARD 12: FUNCTIONS AND ALGEBRA CONCEPTS STUDENTS WILL UNDERSTAND AND USE PATTERNS AND FUNCTIONS	
A. Model everyday experiences with a variety of functions.	
1. Given a realistic problem or event, describe and correctly use various functions, including linear, exponential, power, rational, square and square root, and cube and cube root.	12-1, 12-2
B. Represent and analyze relationships using tables, graphs, rules, and equations.	
1. Model realistic problems or the result of experiments using a table, graph, rule, or equation.	12-1, 12-2, 13-1
2. Given a table, graph, rule, or equation, analyze the meaning and apply to a realistic situation.	12-1, 12-2, 13-1
C. Translate among tabular, symbolic, and graphical representations of functions.	
1. Use technology, such as graphing calculators, to analyze functions and to note properties such as domain and range.	12-1, 12-2
2. Given one form of function representation (table, symbol, and graph), display the information in the other two ways.	12-2
D. Model a variety of problem situations using the same type of function.	
1. Determine which graphs and equations result from the following functions: linear, exponential, power, rational, square and square root, and cube and cube root.	12-1, 12-2
2. Given a type of function, formulate a realistic situation which would result in the given type of equation.	12-1
E. Analyze the effects of parameter changes on the graph of functions.	
1. Predict the effect of changes in slope and y-intercept on the graph of a linear function.	3-3, 12-1
2. Predict the effect on a graph which results from adding, subtracting, multiplying, or dividing various parts of an equation by a constant.	12-1
F. Explore and represent everyday situations using the sine and cosine functions.	
1. Illustrate examples which approximate sine and cosine functions (voice patterns, radio frequency, etc.).	See Glencoe's <i>Advanced Mathematical Concepts</i> Lessons 6-1, 6-2, 6-3.

STANDARDS	LESSON REFERENCES
CONTENT STANDARD 13: FUNCTIONS AND ALGEBRA CONCEPTS STUDENTS WILL UNDERSTAND AND APPLY ALGEBRAIC CONCEPTS	
A. Represent situations that involve variable quantities with expressions, equations, inequalities, and matrices.	
1. Given a realistic problem, translate the problem into an expression equation, inequality or matrix as a first step to working toward a solution.	7-1
B. Use tables and graphs as tools to interpret expressions, equations, and inequalities.	
1. Given an expression, equation, or inequality, represent it in tabular or graphical form as a further step toward clarity and analysis.	9-8, 12-1
C. Operate on expressions and matrices and solve equations and inequalities.	
1. Use appropriate steps to simplify expressions and matrices, in order to solve equalities and inequalities.	12-5
2. Solve quadratic equations using algebraic and graphing methods.	1-3
D. Identify the implications and usefulness of mathematical abstractions and symbolism.	
1. After solving the equation or inequality, use this information to make generalizations and/or explain what the results mean in the real-life problem or situation.	1-3, 7-1, 7-2, 7-3, 7-5, 8-1, 8-4, 10-3, 11-5
2. Understand that putting problems into algebraic expressions in order to use learned steps toward solutions results in a more efficient way of solving problems than trial and error.	7-3
E. Use matrices to solve linear systems.	
1. Verify solution of a matrix with a graphical solution.	See Glencoe's <i>Advanced Mathematical Concepts</i> Lessons 2-3, 2-4.
2. Use Cramer's rule (with the aid of technology) to solve linear equations with matrices.	See Glencoe's <i>Advanced Mathematical Concepts</i> Lessons 2-3, 2-4.
F. Apply trigonometry to problem situations involving triangles.	
1. Apply sine, cosine, or tangent to right triangles to find the measure of unknown sides or angles.	8-3, 8-4, 8-5, 8-6
2. Translate realistic problems to right triangles in order to solve problems (e.g., height of a flagpole, distance of a ship, etc.)	8-3, 8-4, 8-5, 8-6

STANDARDS	LESSON REFERENCES
<i>G. Determine maximum and minimum points of a graph and interpret the results in problem situations.</i>	
1. Given the equation of a parabola, find the maximum or minimum point.	1-3
2. Given an equation or graph, find maximums and minimums and apply their meaning to realistic problems (e.g., height of a rocket).	1-3
<i>H. Describe limiting processes by examining infinite sequences, series, and areas under curves.</i>	
1. Use manipulatives to investigate limiting processes (e.g., constantly decrease the height of a cylinder and determine the effect on volume, etc.).	See Glencoe's Advanced Mathematical Concepts Lessons 12-3, 17-1.
2. Estimate the limit (if any) of an infinite sequence.	See Glencoe's Advanced Mathematical Concepts Lesson 12-3.
3. Find the sum of a geometric series.	See Glencoe's Advanced Mathematical Concepts Lesson 12-2.
4. Estimate (by counting smaller and smaller squares or trapezoids) areas under a curve and predict actual area under the curve.	See Glencoe's Advanced Mathematical Concepts Lesson 17-3.
<i>I. Evaluate the logic of algebraic procedures.</i>	
1. Explore algebraic relationships using technology.	2-4
2. Give a logical sequence of steps to lead to the solution of a more complicated algebraic problem.	2-4

