

Nevada High School Mathematics Item Specifications

HSPE Item Specifications – Number and Operations		
Content Standard 1.0 Students will accurately calculate and use estimation techniques, number relationships, operation rules, and algorithms; they will determine the reasonableness of answers and the accuracy of solutions to solve problems, communicate, reason, and make connections within and beyond the field of mathematics.		
“Enduring and Important Knowledge” identified in previous grade-levels may be included within the context of some problems.		
Assessed Indicators	Depth of Knowledge Essence (*)	Item Specifications and Assessment Development Notes
1.12.6 Estimation Determine an approximate value of radical and exponential expressions using a variety of methods.	DOK 2	Items may use square roots of numbers up to 225, 400, 625 and 900 and cube roots of whole numbers up to 125 and 1,000. Items may use positive integer exponents only. Answers choices may be ranges of numbers or a single number. The law of exponents will not be assessed.
1.12.7 Computation Solve mathematical problems involving exponents and roots. Perform addition, subtraction, and scalar multiplication on matrices.	DOK 1	Items should focus on computation with numbers. Working with algebraic expressions is assessed in 2.12.6. Items may include square numbers up to 225, 400, 625 and 900 or cubic numbers to 125 and 1,000. Items may include positive integer exponents only. Matrices may be up to 3 x 3.
1.12.8 Number Theory Identify and apply real number properties to solve problems.	DOK 1	Variables may be used.

(*) = 50% of the assessed items must be at or above the Depth of Knowledge Essence

Nevada High School Mathematics Item Specifications

HSPE Item Specifications - Algebra		
Content Standard 2.0 Students will use various algebraic methods to analyze, illustrate, extend, and create numerous representations (words, numbers, tables, and graphs) of patterns, functions and algebraic relations as modeled in practical situations to solve problems, communicate, reason, and make connections within and beyond the field of mathematics.		
“Enduring and Important Knowledge” identified in previous grade-levels may be included within the context of some problems.		
Assessed Indicators	Depth of Knowledge Essence (*)	Item Specifications and Assessment Development Notes
2.12.1 Patterns Use algebraic expressions to identify and describe the n^{th} term of a sequence.	DOK 2	Items may ask students to write the rule to find the n^{th} term in the pattern, find the n^{th} term in the pattern, and identify the pattern given the rule. Function tables may be used. Expressions used to describe the n^{th} term may be one or two terms. Item may ask for a term after the next term in the pattern.
2.12.2 Variables and Unknowns Isolate any variable in given equations, inequalities, proportions, and formulas to use in mathematical and practical situations.	DOK 1	Equations and formulas should not be widely recognized. Do not use geometric formulas that may be used in 3.12.5. Items may ask students to solve multi-variable equations, inequalities, proportions, and formulas for a specified variable.
2.12.3 Expressions and Polynomials Add, subtract, multiply, and factor 1 st and 2 nd degree polynomials connecting the arithmetic and algebraic processes. Simplify algebraic expressions, including exponents and radicals.	DOK 1	For factoring polynomials, rational roots may be used. Leading coefficient has to be one or factorable down to one when factoring quadratic equations. Coefficient of x^2 not greater than 3. Expressions may include algebraic fractions. Positive exponents only.
2.12.4 Relations and Functions Determine the domain and range of functions, including linear, quadratic, and absolute value, algebraically and graphically. Solve absolute value equations and inequalities both algebraically and graphically	DOK 2	Function notation may be used. Absolute value equations and inequalities to be solved should only have variables on one side. Absolute value inequalities with only one variable must have the variable inside the absolute value symbol.
2.12.5 Linear Equations and Inequalities Solve systems of two linear equations algebraically and graphically and verify solutions (with and without technology).	DOK 2	Items may have rational solutions. Items should focus on algebraic methods; graphical solutions are assessed in 4.12.5.
2.12.6 Algebraic Representation and Application Solve mathematical and practical problems involving linear and quadratic equations with a variety of methods, including discrete methods (with and without technology).	DOK 2	Answers may be given in radical form. Limited to two unknowns. Leading coefficient has to be one or factorable down to one when factoring quadratic equations.

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Nevada High School Mathematics Item Specifications

HSPE Item Specifications - Measurement		
Content Standard 3.0 Students will use appropriate tools and techniques of measurement to determine, estimate, record, and verify direct and indirect measurements to solve problems, communicate, reason, and make connections within and beyond the field of mathematics.		
“Enduring and Important Knowledge” identified in previous grade-levels may be included within the context of some problems.		
Assessed Indicators	Depth of Knowledge Essence (*)	Item Specifications and Assessment Development Notes
3.12.2 Precision in Measurements Justify, communicate, and differentiate between precision, error, and tolerance in practical problems	DOK 2	Tolerance problems may use the \pm symbol. Items may ask students which measurement is most precise. Items may ask students about error / tolerance when error / tolerance is given in stem. Students may be asked to determine error / tolerance.
3.12.3 Formulas Select and use appropriate measurement tools, techniques, and formulas to solve problems in mathematical and practical situations.	DOK 1	Items might ask students to select and use techniques and formulas to calculate and compare rates, distances ($d = rt$), and interest. Items can ask to solve for any of the variables within the formula. Temperature items should require students to convert between Celsius and Fahrenheit.
3.12.4 Money Interpret and apply consumer data presented in charts, tables, and graphs to make informed financial decisions related to practical applications	DOK 2	The following financial terms are considered common knowledge: Interest, principal, rate, profit, loss, debt, discount, income, net, gross, tax, and tip. Data may be presented in a list
3.12.5 Ratios and Proportions Determine the measure of unknown dimensions, angles, areas, and volumes using relationships and formulas to solve problems.	DOK 2	Items will not require the use of trigonometric ratios. Items may ask students to work backwards through a formula.

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Nevada High School Mathematics Item Specifications

HSPE Item Specifications - Geometry		
Content Standard 4.0 Students will identify, represent, verify, and apply spatial relationships and geometric properties to solve problems, communicate, and make connections within and beyond the field of mathematics.		
“Enduring and Important Knowledge” identified in previous grade-levels may be included within the context of some problems.		
Assessed Indicators	Depth of Knowledge Essence (*)	Item Specifications and Assessment Development Notes
<p>4.12.1 Two-Dimensional Shapes Identify and use the parts of a circle to solve mathematical and practical problems.</p> <p>Identify and apply properties of interior and exterior angles of polygons to solve mathematical and practical problems</p>	DOK 2	<p>Parts of a circle include: central angles, inscribed angles, arcs, chords, secants, and tangents.</p> <p>Items may ask students to determine the missing measure of a part of a circle. Identify and describe angle relationships.</p> <p>Calculate the measures of 1 exterior angle of a regular polygon. Calculate the missing measure of an angle in a polygon. Calculate the measure of 1 interior angle of a regular polygon</p> <p>Identify the sum of the measures of the exterior angles on a regular convex polygon. Use the same polygons as tested in 7th and 8th grade.</p>
<p>4.12.2 Congruence, Similarity and Transformations Apply properties of similarity through right triangle trigonometry to find missing angles and sides.</p>	DOK 1	<p>Determine the missing length of a side of a triangle, given a similar triangle. Use right triangle trigonometry (sine, cosine, and tangent) to determine the missing length or angle measure in a right triangle. Limit right triangles to 45-45-90 and 30-60-90.</p>
<p>4.12.5 Algebraic Connections Determine the slope of lines using coordinate geometry and algebraic techniques.</p> <p>Identify parallel, perpendicular, and intersecting lines by slope.</p> <p>Graph linear equations and find possible solutions to those equations using coordinate geometry.</p> <p>Find possible solution sets of systems of equations whose slopes indicate parallel, perpendicular, or intersecting lines.</p>	DOK 2	<p>Items may use no more than two sets of equations. Items may focus on graphical representations.</p> <p>Determine the slope of a line graphed on a coordinate plane or from the equation in slope-intercept form, or given an equation in non-slope intercept form or given the locations of two points on a line or line segment.</p> <p>Select the correct graph of a given equation or vice versa. Find solutions of an equation graphed on a coordinate plane. Items may ask students to identify parallel, perpendicular, or intersecting lines, given two equations (in slope-intercept form) that represent lines. Items may ask students to identify the equation or graph of a line that is parallel or perpendicular to a given line.</p>

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Nevada High School Mathematics Item Specifications

Assessed Indicators	Depth of Knowledge Essence (*)	Item Specifications and Assessment Development Notes
4.12.6 Lines, Angles, and their Properties Solve problems using complementary and supplementary angles, congruent angles, vertical angles, angles formed when parallel lines are cut by a transversal and angles in polygons.	DOK 2	Items may ask students to calculate angle measures. Items may involve multi-step or practical situations.
4.12.7 Triangles Apply the Pythagorean Theorem and its converse in mathematical and practical situations.	DOK 2	Items may use radical form. Items may ask students to determine the missing measure of a leg or hypotenuse of a right triangle.
4.12.9 Logic Formulate, evaluate, and justify arguments using inductive and deductive reasoning in mathematical and practical situations.	DOK 3	Items may include Venn diagrams, (up to three circles), counterexamples, and conditional statements. Logic problems solved on an organizational grid can be no larger than a 3 x 3.

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Nevada High School Mathematics Item Specifications

HSPE Item Specifications – Data Analysis		
Content Standard 5.0 Students will collect, organize, display, interpret, and analyze data to determine statistical relationships and probability projections to solve problems, communicate, reason, and make connections within and beyond the field of mathematics.		
“Enduring and Important Knowledge” identified in previous grade-levels may be included within the context of some problems.		
Assessed Indicators	Depth of Knowledge Essence (*)	Item Specifications and Assessment Development Notes
5.12.1 Data Collection and Organization Organize statistical data through the use of tables, graphs, and matrices (with and without technology).	DOK 1	Lower grade –level displays may be used. Items may ask students to select the correct data display given a set of data. Items may ask students to compare data or to perform simple calculations to answer questions about a data display.
5.12.2 Central Tendency and Data Distribution Select and apply appropriate statistical measures in mathematical and practical situations.	DOK 1	Measures of central tendency (mean, median, and mode) and variability (range, inter-quartile range, and outlier) may be assessed. Include context students might see as adults.
5.12.3 Interpretation of Data Distinguish between a sample and a census. Identify sources of bias and their effect on data representations and statistical conclusions. Use the shape of a normal distribution to compare and analyze data from a sample	DOK 2	Determine the appropriateness of a data display. Identify a data collection strategy that would result in a biased sample. Items will not include standard deviation on the state HSPE.
5.12.4 Permutations and Combinations Apply permutations and combinations to mathematical and practical situations, including the Fundamental Counting Principle.	DOK 2	
5.12.5 Experimental and Theoretical Probability Determine the probability of an event with and without replacement using sample spaces. Design, conduct, analyze, and effectively communicate the results of multi-stage probability experiments.	DOK 2	Items may ask students to determine the probability of an activity with up to 3 events. Items may ask students to translate among verbal descriptions and sample spaces.

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