

Nevada Grade 8 Mathematics Item Specifications

Grade 8 CRT 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
1.8.1 Place Value Represent numbers using scientific notation in mathematical and practical situations.	DOK 1	Items may ask students to identify the standard form of a number given in scientific notation and vice versa.
1.8.2 Fractions Translate among fractions, decimals, and percents, including percents greater than 100 and percents less than 1. Explain and use the relationship among equivalent representations of rational numbers in mathematical and practical situations.	DOK 1	Items may also ask students to identify equivalent rational numbers of the same type. (e.g., $0.2 = 0.200$) Items may contain fractional percents.
1.8.3 Comparing and Ordering Compare and order real numbers, including powers of whole numbers in mathematical and practical situations.	DOK 2	When ordering a list of numbers, a maximum of five numbers may be used. Real number formats that may be used include: integers, fractions, decimals (as rational numbers), percents, exponents, radicals, and π . Limit radicals to square roots of numbers 225 or less. Do not include numbers written in scientific notation when comparing and ordering.
1.8.5 Facts Identify perfect squares to 225 and their corresponding square roots.	DOK 1	
1.8.6 Estimation Use estimation strategies to determine the reasonableness of an answer in mathematical and practical situations.	DOK 2	Answer choices may be single numbers, ranges of numbers, or descriptions. Items may be written in context.
1.8.7 Computation Calculate with real numbers to solve mathematical and practical situations. Use order of operations to solve equations in the real number system.	DOK 1	Real number formats that may be used include: integers, fractions, decimals (as rational numbers), percents, exponents, radicals, and π . Expressions can be left in terms of π . Limit radicals to square roots of numbers 225 or less.

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

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Grade 8 CRT 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
2.8.1 Patterns Find the missing term in a numerical sequence or a pictorial representation of a sequence.	DOK 1	At least 3 terms of the sequence must be shown. Sequences may be arithmetic or geometric. Formal sequence notation (t_n) may be used
2.8.2 Variables and Unknowns Evaluate formulas and algebraic expressions using rational numbers (with and without technology). Solve and graphically represent equations and inequalities in one variable, including absolute value	DOK 1	Geometric formulas should not be used. Equations limited to one variable. Equations or inequalities involving absolute values are assessed in 2.8.2 Examples: solve $ x + 2 = 4$ Graph $ x < 2$
2.8.3 Expressions and Polynomials Add and subtract binomials.	DOK 1	
2.8.4 Relations and Functions Identify, model, describe, and evaluate functions (with and without technology). Translate among verbal descriptions, graphic, tabular, and algebraic representations of mathematical situations (with and without technology).	DOK 2	Functions limited to linear functions. Items may not use function notation
2.8.5 Linear Equations and Inequalities Solve inequalities and represent the solution on a number line. <i>Solve linear equations and represent the solution graphically.</i> (assessed in 2.8.4)	DOK 1	Inequalities must be linear. Limit inequalities to one-step.
2.8.6 Algebraic Representations and Applications Describe how changes in the value of one variable affect the values of the remaining variables in a relation.	DOK 2	Limit to two variables only.

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Grade 8 CRT 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
3.8.1 Estimation and Conversion Estimate and convert units of measure for mass and capacity within the same measurement system (customary and metric).	DOK 2	Customary units for weight include: grain, ounce, pound, and ton. Metric units for weight/mass include: milligram, centigram, gram, and kilogram. Customary units for capacity include: ounces, cups, pints, quarts, and gallons. Metric units for capacity include: milliliter, centiliter, liter, and kiloliter. Items should have conversion factor embedded.
3.8.2 Precision in Measurement Demonstrate an understanding of precision, error, and tolerance when using appropriate measurement tools.	DOK 1	Answer choices in precision items may involve different units in the metric system only . Tolerance problems may not use the \pm symbol.
3.8.3 Formulas Identify how changes in a dimension of a figure effect changes in its perimeter, area and volume	DOK 2	Items may include circumference and area of circles. May be left in terms of π . Formulas will be embedded as necessary.
3.8.4 Money Calculate percents in monetary problems.	DOK 1	Items may include calculating with percents or calculating percent. Calculations should be manageable without a calculator.
3.8.5 Ratios and Proportions Apply ratios and proportions to calculate rates and solve mathematical and practical problems using indirect measure.	DOK 2	Ratio and proportion problems that include perimeter, area and volume are assessed in 3.8.3.

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Grade 8 CRT 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
4.8.1 Two-Dimensional Shapes Find and use the sum of the measures of interior angles of polygons.	DOK 1	Polygons are limited to 3- to 10-sided figures. Items may ask students to determine the missing measure of an interior angle of a polygon, given the measures of the other interior angles. Items may give the sum of the interior angle measures and ask for the name of the polygon.
4.8.2 Congruence and Similarity Apply the properties of equality and proportionality to congruent or similar shapes	DOK 2	Items may use angle or tic marks to display congruency. Given two similar shapes, determine the missing length of a side. Constructed response items may use properties of equality and proportionality to solve practical situations. Items may ask students to identify a proportion that may be used to determine the missing length of a side, given two similar shapes or to identify corresponding sides of congruent or similar shapes.
4.8.3 Coordinate Geometry and Lines of Symmetry Demonstrate dilation using coordinate geometry and models. Describe the relationship between an original figure and its transformation or dilation	DOK 2	Items may ask students to determine the location of a point, or the measure of the angles or sides on a transformed figure, given the name of the transformation performed and, where applicable, the amount of the dilation. Limit items to one transformation. Dilation limited to $\frac{1}{2}$ or integer factor.
4.8.5 Algebraic Connections Calculate slope, midpoint, and distance using equations and formulas (with and without technology). Determine the x- and y-intercepts of a line	DOK 1	Formulas for midpoint, slope, and distance must be embedded in the item.
4.8.6 Lines, Angles, and their Properties Form generalizations and validate conclusions about geometric figures and their properties.	DOK 2	Properties may include parallel lines, perpendicular lines, bisectors, number of sides, vertices, angles, sum of the interior angles, and lengths of sides.
4.8.7 Triangles Verify and explain the Pythagorean Theorem using a variety of methods. Determine the measure of the missing side of a right triangle.	DOK 1	Answer choices are limited to whole numbers or radical form only.

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Grade 8 CRT 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
<p>5.8.1 Data Collection and Organization Formulate questions and design a study that guides the collection of data.</p> <p>Organize, display, and read data including box and whisker plots (with and without technology).</p>	DOK 2	<p>Data displays may include all previously assessed types of data displays, plus box-and-whisker plots.</p> <p>Items may ask a simple question about a data display.</p> <p>Items may ask students to select the correct data display given a set of data.</p> <p>Item may ask students to compare data or to perform calculations to answer questions about a data display.</p> <p>Items may ask students to construct a data display that represents given set of data.</p>
<p>5.8.2 Central Tendency and Data Distribution Select and apply appropriate measures of data distribution, using interquartile range and central tendency</p>	DOK 2	<p>True outliers must be greater than or equal to 1.5 times the inter-quartile range plus the upper quartile or less than or equal to the lower quartile minus 1.5 times the inter-quartile range.</p> <p>If no data display is given, limit data set to no more than 10 data points.</p> <p>Items may ask students to describe inter-quartile range and measures of central tendency and data distribution (mean, median, range, mode, outlier, upper quartile value, and lower quartile value) shown in a data display.</p>
<p>5.8.3 Interpretation of Data Evaluate statistical arguments that are based on data analysis for accuracy and validity.</p>	DOK 3	<p>Items may ask students to explain how misleading representations of data may affect conclusions.</p> <p>Compare and contrast data displays.</p>
<p>5.8.4 Permutations and Combinations Find the number of combinations possible in mathematical and practical situations.</p> <p>Distinguish between permutations and combinations.</p>	DOK 2	<p>Limit calculations to reasonable numbers.</p> <p>Items may assess a variety of counting methods.</p>
<p>5.8.5 Experimental and Theoretical Probability Differentiate between the probability of an event and the odds of an event</p>	DOK 1	<p>When assessing odds in favor, do not use odds against as a distracter. Be careful about using gaming as a context for the item.</p>
<p>5.8.6 Statistical Inferences Formulate reasonable inferences and predictions through interpolation and extrapolation of data to solve practical problems.</p>	DOK 2	

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