Benchmark Achievement Level Descriptors (Benchmark ALDs)

Overview and Purpose

The development of Achievement Level Descriptors (ALDs) is a critical step in communicating student performance in terms of levels or categories of performance on any standardized assessment. For Minnesota Comprehensive Assessments (MCAs), ALDs are developed in collaboration with educators during the first year of full implementation. The ALDs provide a description of grade-level student performance on MCAs for each of the achievement levels of Exceeds the Standards, Meets the Standards, Partially Meets the Standards, and Does Not Meet the Standards. These statements are included on a student's MCA score report to aid families in score interpretation. More detail regarding the development of the MCA Achievement Level Descriptors is on Testing 1, 2, 3.

Over the years, educators have requested more specific descriptions of the knowledge, skills and abilities of students who typically score in each of the different MCA achievement levels beyond what the traditional ALDs offer. In response to this need, Minnesota Department of Education (MDE) staff collaborated to outline more specific descriptions, the Benchmark ALDs for Mathematics and Reading. The purpose of Benchmark ALDs is to

1. promote equity for all students across the state by clarifying expected learning outcomes for instruction and local assessment of Minnesota Academic Standards in Reading and Mathematics; and
2. support teachers' analysis of the depth of their curriculum, instruction, and classroom assessments.

The Mathematics and Reading Benchmark ALDs were developed by

- reviewing test questions and test data for all operational MCA III questions, in many cases 800–1,000 questions per grade;
- grouping items within each benchmark based on student performance on the items relative to their overall performance on the MCAs; and
- reviewing the achievement level groupings of questions within each benchmark for commonalities in the skills, understanding and context needed to correctly answer the items. Each Benchmark ALD describes some of the skills typically demonstrated by students whose overall performance on the MCAs is at that achievement level. These skills are in addition to the descriptions at the lower achievement levels.

Released Examples

Where possible, released examples that illustrate skills described in the benchmark and achievement level are listed in the document. To view examples, click on "Released Example" in the Benchmark ALD tables or go to the Minnesota Question Tool (https://public.education.mn.gov/nqt/). Once at the Minnesota Question Tool (MQT) site, you can enter or copy and paste the released example identification number into the "Search by Question ID" field. Note that within the MQT you can find additional questions that are aligned to the academic standards but are not specifically listed in the Benchmark ALD tables.

Example items are not currently available for all benchmarks and achievement levels in the Benchmark ALD tables. MDE will update the document as more released examples become available.

Training Module

Watch the training module to learn how to use the Benchmark ALDs to evaluate the rigor of classroom assessments and instructional materials: https://testing123.education.mn.gov/test/plan/success/.

This module will help educators understand how the Benchmark ALDs can be used to facilitate the learning outcomes defined in the Minnesota K–12 Academic Standards in Mathematics and Reading and to evaluate the rigor of classroom assessment and instruction.

Grade 7 Mathematics Benchmark Achievement Level Descriptors

Number & Operation

Read, write, represent and compare positive and negative rational numbers, expressed as integers, fractions and decimals. (7.1.1)

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7.1.1.1 **Know that every rational number can be written as the ratio of two integers or as a terminating or repeating decimal. Recognize that π is not rational, but that it can be approximated by rational numbers such as 22/7 and 3.14.**	Understands that a non-terminating decimal is a characteristic of numbers that are not rational	Knows common fractions and repeating decimals are rational numbers	Recognizes pi as not rational Understands and states that a rational number can be written as a ratio of two integers or as a terminating or repeating decimal	Consistently identifies negative rational values as rational Explains why a value or ratio of two numbers is rational or not rational Determines whether an expression that includes pi is rational or not by adding, subtracting, multiplying, and dividing **Released Examples:** 44134, 274196, 275000

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7.1.1.2 **Understand that division of two integers will always result in a rational number. Use this information to interpret the decimal result of a division problem when using a calculator.**	Interprets decimals with a pattern and ellipses and decimals with a vinculum over them as repeating	Knows a decimal is not an integer Understands that a single decimal with a bar over it means repeating decimal	Creates a ratio that forms a repeating decimal when only the numerator or denominator is given Understands the definitions of rational number, terminating decimal, and repeating decimal, and applies these definitions to positive and negative ratios	Interprets the quotient of a ratio as a rational number, repeating decimal, terminating decimal, or integer Identifies a rational number or its equivalent from a list of values, including identifying when a number is not rational **Released Examples:** 275000, 274204

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7.1.1.3 **Locate positive and negative rational numbers on a number line, understand the concept of opposites, and plot pairs of positive and negative rational numbers on a coordinate grid.**	Identifies or plots a point with integer values on a 4-quadrant coordinate grid Identifies a number and its opposite on a number line **Released Examples:** 274125, 274169	Identifies a point on a number line or on a coordinate grid when multiple points are shown Identifies and plots decimals and fractions in increments of fourths on a number line divided into the same or different increments Plots a point given as a decimal or fraction or its opposite on a number line	Fluently works with negative rational values on a number line divided into different increments and vice versa Plots fractions and their opposites on a number line divided into different increments than the denominator **Released Example:** 272356	Consistently works with negative rational values on a number line divided into different increments or on a coordinate grid Consistently plots fractions and decimals and their opposites on a number line divided into different increments than the denominator

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7.1.1.4 **Compare positive and negative rational numbers expressed in various forms using the symbols** **<, >, =, ≤, ≥ .**	Identifies positive rational numbers that make a given inequality true	Identifies positive and negative integers, mixed numbers, fractions (with familiar denominators), and decimals to make a given inequality true	Identifies and compares two positive and negative percentages, decimals, fractions, or mixed numbers using an inequality **Released Examples:** 276101, 274687	Identifies, compares, and orders inequalities with up to 5 values expressed as positive and negative percentages, decimals, fractions (including less familiar denominators), and/or mixed integers **Released Examples:** 274177, 44428
7.1.1.5 **Recognize and generate equivalent representations of positive and negative rational numbers, including equivalent fractions.**	Recognizes the decimal or percent equivalent of a proper fraction with a calculator **Released Example:** 270090	Identifies equivalent expressions of negative and positive fractions in decimal, fraction, mixed number, and percentage forms with a calculator	Identifies equivalent expressions of fractions and repeating negative and positive decimals in reduced fraction or decimal form with and without a calculator **Released Example:** 270000	Creates equivalent expressions of positive and negative fractions in fraction or decimal form with and without a calculator **Released Examples:** 274217, 42594

Calculate with positive and negative rational numbers, and rational numbers with whole number exponents, to solve real-world and mathematical problems. (7.1.2)

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7.1.2.1 **Add, subtract, multiply and divide positive and negative rational numbers that are integers, fractions and terminating decimals; use efficient and generalizable procedures, including standard algorithms; raise positive rational numbers to whole-number exponents.**	Finds the value of simple expressions containing positive 1-digit values raised to whole number exponents **Released Examples:** 270086, 270089	Adds positive and negative integers, decimals to the hundredths, or common fractions with unlike denominators Identifies the square or cube of common positive fractions **Released Examples:** 275235, 275260	Adds, subtracts, multiplies, and divides with positive and negative rational numbers, including decimals to the hundredths place, proper fractions with unlike denominators, and exponentials (square or cube) with 1-digit whole numbers **Released Examples:** 44327, 275262	Adds, subtracts, multiplies, and divides positive and negative rational numbers including decimals to the thousandths place, fractions with unlike denominators, and rational numbers raised to whole number exponents **Released Examples:** 276081, 274122

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7.1.2.2 **Use real-world contexts and the inverse relationship between addition and subtraction to explain why the procedures of arithmetic with negative rational numbers make sense.**	Identifies a number sentence, using addition and subtraction properties, that matches the real-world situation given Identifies a model or number line that represents the sum of two integers **Released Example:** 274660	Identifies a number sentence or number line that models the real-world situation using positive and negative integers to represent distance or length **Released Examples:** 44542, 45113	Creates number sentences using adding and subtracting positive and negative integers, common fractions, and/or mixed numbers that represent values from real-world situations	Creates number sentences using the four operations with any positive or negative rational numbers that represent values from real-world situations
7.1.2.3 **Understand that calculators and other computing technologies often truncate or round numbers.**	Assessed within 7.1.2.4	Assessed within 7.1.2.4	Assessed within 7.1.2.4	Assessed within 7.1.2.4

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7.1.2.4 **Solve problems in various contexts involving calculations with positive and negative rational numbers and positive integer exponents, including computing simple and compound interest.**	Solves basic change in temperature problems when provided signed integer numbers and the result is positive and less than 20 **Released Example:** 272429	Solves problems in context by adding and/or subtracting up to 3 positive and negative integers or mixed numbers, with denominators all in the same fact family and less than 12, that represent changes in depth or height **Released Examples:** 271029, 270052	Solves routine multi-step problems involving combinations of positive and negative rational numbers, including percents, decimals, mixed numbers, fractions, and exponents in context Solves simple interest problems when provided the formula and all values in context **Released Examples:** 273020, 44523	Solves simple and compound interest problems using formulas Solves unique multi-step problems involving combinations of positive and negative rational numbers, including percents, decimals, mixed numbers, fractions, and exponents in context **Released Example:** 273194

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7.1.2.5 **Use proportional reasoning to solve problems involving ratios in various contexts.**	Finds missing whole number quantities in simple ratio problems in familiar, real-world situations with whole numbers and no unit conversion **Released Example:** 274113	Solves simple word problems using given proportional ratios comprised of integers or common fractions; may also require a common unit conversion Understands that ratios are different than the difference between two numbers **Released Examples:** 272025, 273121	Solves routine word problems involving proportional reasoning or ratios expressed as *a*:*b*, with positive decimals and mixed numbers; may require multiple steps **Released Examples:** 276022, 270093	Uses the total values and the ratio to solve for individual values that represent the ratio Solves multi-step problems involving multiple unit conversions Sets up proportional equations that can be used to solve situations **Released Example:** 274111

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7.1.2.6 **Demonstrate an understanding of the relationship between the absolute value of a rational number and distance on a number line. Use the symbol for absolute value.**	Understands that absolute value is in reference to zero	Identifies the absolute value of a number with or without the absolute value symbols Understands that absolute value represents a distance from zero	Sorts absolute values and integers on a number line from least to greatest Uses absolute value in simple expressions and equations to solve for a value or to represent distances on a number line **Released Examples:** 275213, 275200	Graphs the solution for an absolute value expression on a number line Recognizes and solves for the distance from zero of the solution of an absolute value expression Finds all possible values that satisfy an equation or expression when variables are expressed as absolute values and graphs values on a number line **Released Examples:** 276043, 275014

Algebra

Understand the concept of proportionality in real-world and mathematical situations, and distinguish between proportional and other relationships. (7.2.1)

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7.2.1.1 **Understand that a relationship between two variables, *x* and *y*, is proportional if it can be expressed in the form *y*/*x* = *k* or *y* = *kx*. Distinguish proportional relationships from other relationships, including inversely proportional relationships (*xy* = *k* or *y* = *k*/*x*).**	Identifies when a relationship in context is proportional	Identifies equations or points that satisfy given proportional relationships	Identifies proportional relationships in input-output tables	Identifies and solves equations that represent directly and inversely proportional relationships from real-world and mathematical descriptions Identifies multiple equations representing directly and inversely proportional relationships **Released Examples:** 274788, 275265

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7.2.1.2 **Understand that the graph of a proportional relationship is a line through the origin whose slope is the unit rate (constant of proportionality). Know how to use graphing technology to examine what happens to a line when the unit rate is changed.**	Identifies a graph that represents a proportional relationship **Released Example:** 274789	Identifies graphs of a proportional relationship for a given unit rate in context when the scales on the graph match the context	Identifies the graph of a proportional relationship based on changes to a given proportional relationship Identifies the graph of a proportional relationship by solving for the unit rate and vice versa	Graphs a proportional relationship given the slope Understands and demonstrates how changes in the unit rate affect the graph of a line Uses and understands the terms slope and constant of proportionality **Released Examples:** 275021, 274506

Recognize proportional relationships in real-world and mathematical situations; represent these and other relationships with tables, verbal descriptions, symbols and graphs; solve problems involving proportional relationships and explain results in the original context. (7.2.2)

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7.2.2.1 **Represent proportional relationships with tables, verbal descriptions, symbols, equations and graphs; translate from one representation to another. Determine the unit rate (constant of proportionality or slope) given any of these representations.**	Identifies the whole number unit rate of a proportional relationship when given in table or equation form Matches a table of values with a given proportional equation, with a whole number constant of proportionality	Compares up to 4 whole number unit rates to determine least or greatest Matches between tables, graphs, equations, or verbal descriptions given in context and when the constant of proportionality is a whole number Finds the missing values in a table that match the whole number unit	Recognizes a rational proportional relationship and graphs, completes a table of values, or relates to verbal descriptions that match the relationship, with all values Compares up to 6 unit rates to determine least or greatest **Released Examples:** 276109, 275268	Understands and applies the meaning of slope and determines the slope using a graph, equation, table, or verbal description Understands and applies the meaning of constant of proportionality and identifies it from a table, verbal description, or graph **Released Examples:** 276026, 45231

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7.2.2.2 **Solve multi-step problems involving proportional relationships in numerous contexts.**	Uses a given proportion to solve a simple expression	Sets up a proportion and solves for missing value in context Uses proportions to find percents **Released Examples:** 272074, 272110	Finds the proportion based on data given and then uses that proportion to solve using different data Determines percent change from final to original value **Released Examples:** 273028, 274750	Calculates final cost or percent involving discounts and sales tax in context Solves real-world problems involving proportional changes including percent change **Released Examples:** 271212, 274716, 274229
7.2.2.3 **Use knowledge of proportions to assess the reasonableness of solutions.**	Assessed within 7.2.2.1 & 7.2.2.2	Assessed within 7.2.2.1 & 7.2.2.2	Assessed within 7.2.2.1 & 7.2.2.2	Assessed within 7.2.2.1 & 7.2.2.2

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7.2.2.4 **Represent real-world or mathematical situations using equations and inequalities involving variables and positive and negative rational numbers.**	Recognizes an expression or equation that represents a real-world situation with one variable and addition or subtraction	Identifies an expression or equation that represents a real-world situation with one variable and using addition, subtraction, and multiplication with whole numbers and up to one decimal **Released Example:** 271076	Identifies an equation or inequality that represents a real-world situation with one variable with integers and decimals **Released Examples:** 275053, 276071	Identifies an equation or inequality that represents a real-world situation with one or two variables **Released Examples:** 770604, 275024

Apply understanding of order of operations and algebraic properties to generate equivalent numerical and algebraic expressions containing positive and negative rational numbers and grouping symbols; evaluate such expressions. (7.2.3)

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7.2.3.1 **Use properties of algebra to generate equivalent numerical and algebraic expressions containing rational numbers, grouping symbols and whole number exponents. Properties of algebra include associative, commutative and distributive laws.**	Identifies the first step to be used in simplifying numeric and algebraic expressions with grouping and an exponent power of 2 **Released Example:** 274014	Simplifies numeric expressions with grouping and whole number exponents up to the power of 4	Finds equivalent expressions using the distributive and associative properties of algebra, grouping symbols, and exponents Simplifies algebraic expressions with exponents **Released Examples:** 272365, 276039	Simplifies algebraic expressions with one or more variables to the first and second degree using properties of algebra and whole number exponents Creates multiple equivalent expressions with variables, fractions, integers, and whole number exponents **Released Examples:** 272359, 45237, 44726

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7.2.3.2 **Evaluate algebraic expressions containing rational numbers and whole number exponents at specified values of their variables.**	Evaluates simple single-variable expressions containing whole number coefficients using multiplication, addition, and exponents to the power of 2, given a whole number or decimal value of the variable	Evaluates algebraic expressions containing positive integer and/or simple fraction coefficients with up to 3 variables by computing with given values of the variables that are whole numbers, simple fractions, or decimals Determines the value of an input variable based on context	Evaluates algebraic expressions containing rational coefficients and/or whole number exponents with up to 3 variables by computing with given rational values of the variables **Released Examples:** 274189, 276010, 273216	Evaluates complex algebraic expressions with up to 3 variables that are rational numbers in various formats **Released Examples:** 275247, 276103
7.2.3.3 **Apply understanding of order of operations and grouping symbols when using calculators and other technologies.**	Assessed within 7.2.3.1 & 7.2.3.2	Assessed within 7.2.3.1 & 7.2.3.2	Assessed within 7.2.3.1 & 7.2.3.2	Assessed within 7.2.3.1 & 7.2.3.2

Represent real-world and mathematical situations using equations with variables. Solve equations symbolically using the properties of equality. Also solve equations graphically and numerically. Interpret solutions in the original context. (7.2.4)

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7.2.4.1 **Represent relationships in various contexts with equations involving variables and positive and negative rational numbers. Use the properties of equality to solve for the value of a variable. Interpret the solution in the original context.**	Solves for a variable in equations that require one-step addition	Uses properties of equality to solve for real-world, single-variable equations Matches real-world situations with correct single-variable equations **Released Example:** 274215	Uses properties of equality to solve for one variable in real-world, multivariable equations when values of the other variables are provided Matches real-world situations to a multi-variable equation with whole number coefficients Justifies steps in solving equations using properties of equality **Released Examples:** 275282, 274805	Uses properties of equality to solve for one variable in real-world equations with rational coefficients in one or more variables when values of the other variables are provided, including rational expressions with variables in denominators Matches real-world situations to the correct equations with rational coefficients, including rational expressions with variables in denominators **Released Examples:** 275033, 275285

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7.2.4.2 **Solve equations resulting from proportional relationships in various contexts.**	Solves real-world, proportional relationships that are multiples of each other	Uses proportional reasoning to solve simple real-world problems Writes proportional relationships to model a situation	Solves for one variable in real-world proportional equations when the value of the other variable is provided (e.g., $\frac{x}{10} = \frac{y}{2}$ and $y = 7$) Explains steps to solve real-world problems when the proportional relationships are written **Released Examples:** 275292, 276017, 275511	Solves for one variable in real-world proportional equations when the values of the other variables are provided (e.g., $\frac{x}{w} = \frac{y}{z}$) Solves for a variable in non-standard proportional equations (e.g., $\frac{x}{3} = \frac{2x-6}{4}$) **Released Examples:** 274200, 275294

Geometry & Measurement

Use reasoning with proportions and ratios to determine measurements, justify formulas and solve real-world and mathematical problems involving circles and related geometric figures. (7.3.1)

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7.3.1.1 **Demonstrate an understanding of the proportional relationship between the diameter and circumference of a circle and that the unit rate (constant of proportionality) is π. Calculate the circumference and area of circles to solve problems in various contexts.**	Computes circumferences of circles given diameter and pi **Released Examples:** 273201, 271131	Computes areas or circumferences of circles given radius or diameter in mathematical problems Finds diameters of circles when given circumference	Finds areas of sectors of circles given diameter or radius Solves real-world and mathematical problems involving the area or circumference of circles **Released Examples:** 271049, 272137	Solves multi-step problems involving use of properties of a circle as well as formulas for area/circumference Finds areas of part or whole circles given circumferences **Released Examples:** 272382, 274766

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7.3.1.2 **Calculate the volume and surface area of cylinders and justify the formulas used.**	Computes volumes of cylinders given area of base and height	Computes volumes of cylinders given radius and height when all dimensions are whole numbers	Applies a formula for the volume of cylinders to real-world situations given whole number diameters and heights Finds missing whole number dimensions of cylinders given volume	Computes surface and lateral area of cylinders in both real-world and mathematical situations using radius or diameter Creates and justifies expressions that can be used to calculate surface area and volume Computes volumes and partial volumes of cylinders with rational dimension values **Released Examples:** 274781, 770527, 271160

Analyze the effect of change of scale, translations and reflections on the attributes of two-dimensional figures. (7.3.2)

Benchmark	Does Not Meet *A typical student at this level of mathematics succeeds at few of the most fundamental mathematics skills of the Minnesota Academic Standards.* **Some of the skills typically demonstrated may include:**	Partially Meets *A typical student at this level of mathematics partially meets the mathematics skills of the Minnesota Academic Standards.* **Some of the skills typically demonstrated may include:**	Meets *A typical student at this level of mathematics meets the mathematics skills of the Minnesota Academic Standards.* **Some of the skills typically demonstrated may include:**	Exceeds *A typical student at this level of mathematics exceeds the mathematics skills of the Minnesota Academic Standards.* **Some of the skills typically demonstrated may include:**
7.3.2.1 **Describe the properties of similarity, compare geometric figures for similarity and determine scale factors.**	Identifies corresponding sides and angles of similar triangles in the same orientation Recognizes one-letter labels as referring to vertices and two-letter labels as referring to sides	Calculates whole number scale factors between two labeled figures and identifies a scale factor of $\frac{1}{2}$ Identifies corresponding sides and angles of polygons in the same orientation or reflections **Released Example:** 44770	Calculates scale factors given some side lengths to compare similar figures represented in different orientations or from written descriptions Identifies corresponding sides and angles of polygons in different orientations Consistently uses ~ (similar), ≅ (congruent), $\overline{FG}$ (segment *FG*), *FG* (length of segment *FG*) notation **Released Example:** 770028	Calculates scale factors that are proper or improper fractions based on the directionality of the transformation **Released Examples:** 276096, 273227

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7.3.2.2 **Apply scale factors, length ratios and area ratios to determine side lengths and areas of similar geometric figures.**	Uses a 1-digit scale factor to scale up a 1-digit dimension Identifies corresponding sides of similar figures in the same orientation **Released Example:** 270755	Calculates differences in lengths of corresponding sides	Applies scale factors (including decimals), given side lengths and ratios to compute unknown side lengths in similar figures that are either shown in the same orientation or described in words Finds scale factor of area by calculating area and comparing **Released Examples:** 274033, 274770	Calculates areas of similar figures based on the ratio of side lengths and vice versa Solves multi-step problems involving a scale factor **Released Examples:** 274740, 275506

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7.3.2.3 **Use proportions and ratios to solve problems involving scale drawings and conversions of measurement units.**	Solves one-step problems by multiplying or dividing whole-number dimensions by a given scale (1 to X, where X is a 1-digit number), whose result is a whole number **Released Example:** 274777	Solves one-step problems by multiplying or dividing a given dimension by a common or given scale/ratio by calculating with fractions or mixed numbers with denominators less than 5 or decimals to the tenths place **Released Example:** 272178	Consistently applies scales involving rational numbers Solves multi-step problems that are represented visually and involve both scale drawings and conversion of measurement units, including measures of time **Released Examples:** 274117, 273226	Solves and explains multi-step problems that involve both scale drawings and conversion of measurement units **Released Examples:** 274052, 274718, 276347
7.3.2.4 **Graph and describe translations and reflections of figures on a coordinate grid and determine the coordinates of the vertices of the figure after the transformation.**	Determines coordinates of the image of a point reflected across an axis	Identifies vertex coordinates of a figure after two translations when given original figure and written translation rule	Uses translation notation $(x, y) \rightarrow (x + a, y + b)$ to perform translations of polygons on a coordinate grid Identifies image of figure reflected over either axis **Released Examples:** 275619, 274738	Performs reflections over horizontal lines, vertical lines, and the line $y = x$ Performs multiple transformations involving both translations and reflections **Released Examples:** 45091, 44347, 44080

Data Analysis & Probability

Use mean, median and range to draw conclusions about data and make predictions. (7.4.1)

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7.4.1.1 **Design simple experiments and collect data. Determine mean, median and range for quantitative data and from data represented in a display. Use these quantities to draw conclusions about the data, compare different data sets and make predictions.**	Calculates means and medians from small data sets with whole-number values less than 100 or money (with a quarter value) in lists and tables **Released Example:** 275214	Calculates means, medians, and ranges from data sets in lists, tables, and line plots with whole numbers or decimals to the hundredths place Reads and calculates range from a stem-and-leaf plot **Released Examples:** 273097, 273002, 273096	Compares means, medians, or ranges of different data sets displayed in tables and plots Finds a single missing data value given some data and mean, median, or range Determines means, medians, and ranges from provided data values in data displays (e.g., bar graphs, stem-and-leaf plots) **Released Examples:** 275211, 42580	Compares means, medians, and ranges of different data sets displayed in tables, frequency tables, and plots Finds multiple missing data values given some data and mean, median, or range Creates data sets satisfying given conditions on means, medians, and ranges **Released Examples:** 274515, 275215

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7.4.1.2 **Describe the impact that inserting or deleting a data point has on the mean and the median of a data set. Know how to create data displays using a spreadsheet to examine this impact.**	Knows the general process of how to find the mean of a set of numbers	Identifies the original and new mean or median in a small data set when adding or removing a value Identifies whether the mean and median increase, decrease, or remain the same in a straightforward situation with a small data set **Released Example:** 275230	Determines whether the addition or removal of a data point to a data set in a list or table will cause the mean or median to increase or decrease, and by how much Finds data point value to add or remove from a data set in a list or table that causes a specified change in the mean or median **Released Examples:** 274819, 275613	Explains how the addition or removal of a data point to a data set described in context will cause the mean and median to increase or decrease, and by how much Solves multi-step problems using given mean, median, or range values Finds possible data values to add to or remove from a data set described in context that causes a specified change in the mean and median **Released Examples:** 274830, 275229

Display and interpret data in a variety of ways, including circle graphs and histograms. (7.4.2)

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7.4.2.1 **Use reasoning with proportions to display and interpret data in circle graphs (pie charts) and histograms. Choose the appropriate data display and know how to create the display using a spreadsheet or other graphing technology.**	Identifies a circle graph by viewing relative proportions or based on a stated data set Makes basic comparisons of categories in a circle graph when provided the percents as well **Released Examples:** 274516, 274656	Reads values from histograms and circle graphs Solves one-step problems using data from a circle graph Graphs bars on histograms from small data lists	Uses proportional reasoning to determine or estimate values in circle graphs Solves multi-step problems using histograms and circle graphs in context Plots data on histograms originally displayed in lists, tables, circle graphs, or from proportional information **Released Examples:** 274103, 276098	Uses fractional proportions to solve problems Designs and creates histograms based on data that includes decimals, fractions, and mixed numbers **Released Examples:** 274517, 274662

Calculate probabilities and reason about probabilities using proportions to solve real-world and mathematical problems. (7.4.3)

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7.4.3.1 **Use random numbers generated by a calculator or a spreadsheet or taken from a table to simulate situations involving randomness, make a histogram to display the results and compare the results to known probabilities.**	Not assessed on MCA-III	Not assessed on MCA-III	Not assessed on MCA-III	Not assessed on MCA-III

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7.4.3.2 **Calculate probability as a fraction of sample space or as a fraction of area. Express probabilities as percents, decimals and fractions.**	Knows that probabilities can be written as percents between 0% and 100% or as fractions between 0 and 1 **Released Example:** 273015	Calculates probabilities of up to 3 related mutually exclusive events (e.g., rolls a 2 or a 5) written as a fraction or decimal in real-world situations Determines the size of a sample space, up to 100 objects in the space **Released Examples:** 273103, 271102	Calculates probabilities of mutually exclusive events (e.g., sums from rolling two dice) written as a fraction, percent, or decimal in real-world situations Calculates probabilities of random selection from simple area models and writes them as a fraction, percent, or decimal **Released Examples:** 273103, 273037, 273047	Calculates probabilities of complements of events and compound events (using sample space) Calculates probabilities of random selection from geometric areas (e.g., concentric circles or rectangles) written as a fraction, percent, or decimal **Released Examples:** 274712, 275603

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7.4.3.3 **Use proportional reasoning to draw conclusions about and predict relative frequencies of outcomes based on probabilities.**	Uses proportional reasoning to predict future outcomes using multiples of 100	Uses proportional reasoning to predict future outcomes using simple values (e.g., multiples of 10) **Released Example:** 271110	Uses probabilities to determine most likely outcomes Uses proportional reasoning to find theoretical expected values and to predict future outcomes Compares experimental frequencies to expected frequencies **Released Examples:** 271113, 274700	Uses experimental frequencies of a situation to make predictions using proportional reasoning **Released Examples:** 274699, 272309, 272058