

## Mathematics MCA Achievement Level Descriptor Maps

### Grade 3 Mathematics Achievement Level Descriptors

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Strand	Does Not Meet A student at this level of mathematics succeeds at few of the most fundamental mathematics skills of the Minnesota Academic Standards. Some of the skills demonstrated may include:	Partially Meets A student at this level of mathematics partially meets the mathematics skills of the Minnesota Academic Standards. Some of the skills demonstrated may include:	Meets A student at this level of mathematics meets the mathematics skills of the Minnesota Academic Standards. Some of the skills demonstrated may include:	Exceeds A student at this level of mathematics exceeds the mathematics skills of the Minnesota Academic Standards. Some of the skills demonstrated very consistently may include:
Number & Operation	<ul style="list-style-type: none"> <li>• Represents whole numbers with words</li> <li>• Adds multi-digit whole numbers</li> <li>• Matches fractions with correct area model</li> </ul>	<ul style="list-style-type: none"> <li>• Represents whole numbers up to 1,000 using expanded notations</li> <li>• Compares whole numbers up to 100,000</li> <li>• Subtracts multi-digit whole numbers without regrouping</li> <li>• Knows common multiplication and division facts (2s, 5s, 10s)</li> <li>• Writes fractions for a given representation, including number line</li> </ul>	<ul style="list-style-type: none"> <li>• Compares and represents whole numbers up to 100,000</li> <li>• Solves real-world and mathematical problems using addition and subtraction</li> <li>• Represents multiplication and division in various ways (reference MN Academic Standards 3.1.2.3)</li> <li>• Compares and orders fractions with common denominators</li> </ul>	<ul style="list-style-type: none"> <li>• Solves real-world and mathematical problems using addition, subtraction, and multiplication</li> <li>• Understands that the size of a fractional part is relative to the size of the whole</li> </ul>
Algebra	<ul style="list-style-type: none"> <li>• Recognizes additive patterns in lists of numbers</li> <li>• Recognizes basic facts represented in number sentences</li> </ul>	<ul style="list-style-type: none"> <li>• Identifies next number in a pattern</li> <li>• Represents simple situations with a number sentence involving basic facts and an isolated unknown</li> </ul>	<ul style="list-style-type: none"> <li>• Continues patterns to a specified term (e.g., given first three terms in a pattern, finds sixth term)</li> <li>• Represents real-world situations with a number sentence involving basic facts and an unknown</li> </ul>	<ul style="list-style-type: none"> <li>• Conceptual understanding of pattern (e.g., recognizes input-output relationship)</li> <li>• Interprets number sentences involving unknowns</li> </ul>
Geometry & Measurement	<ul style="list-style-type: none"> <li>• Recognizes parallel lines</li> <li>• Matches a picture to the name of a familiar polygon (pattern blocks)</li> <li>• Knows to use a ruler to measure distance</li> <li>• Knows the value of coins</li> <li>• Reads a thermometer</li> </ul>	<ul style="list-style-type: none"> <li>• Names and describes polygons based on a familiar pictorial orientation by counting number of sides</li> <li>• Determines perimeter using additive model</li> </ul>	<ul style="list-style-type: none"> <li>• Identifies parallel and perpendicular lines</li> <li>• Calculates perimeter</li> <li>• Makes correct change from a dollar</li> <li>• Tells time from an analog clock</li> <li>• Determines elapsed time within an hour</li> <li>• Solves problems involving reading a thermometer and calculating temperature</li> </ul>	<ul style="list-style-type: none"> <li>• Distinguishes between parallel and perpendicular lines in a shape</li> <li>• Has a conceptual understanding of perimeter</li> <li>• Determines elapsed time and does not require a graphic</li> </ul>
Data Analysis	<ul style="list-style-type: none"> <li>• Reads data from a bar graph</li> </ul>	<ul style="list-style-type: none"> <li>• Matches set of data with data display (e.g., table or graph)</li> </ul>	<ul style="list-style-type: none"> <li>• Interprets bar graphs, pictographs, and tally charts</li> </ul>	<ul style="list-style-type: none"> <li>• Translates between data and data displays in a variety of situations</li> </ul>

## Grade 4 Mathematics Achievement Level Descriptors

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Number & Operation	<ul style="list-style-type: none"> <li>Partial recall of basic multiplication facts</li> <li>Computes inefficiently (e.g., uses repeated addition instead of multiplication)</li> <li>Uses models to represent fractions</li> </ul>	<ul style="list-style-type: none"> <li>Knows basic multiplication facts and recognizes some division facts</li> <li>Knows decimal and fraction equivalents for halves and fourths</li> <li>Uses models to compute with fractions</li> </ul>	<ul style="list-style-type: none"> <li>Knows division facts</li> <li>Multiplies multi-digit numbers</li> <li>Solves multiplication problems when all relevant information is present and the question is clearly defined</li> <li>Solves division problems by solving for missing factor</li> <li>Connects relationship between multiplication and division</li> <li>Solves multi-step problems involving addition and subtraction</li> <li>Uses fraction models to determine equivalent fractions</li> <li>Reads and writes decimals up to thousandths</li> </ul>	<ul style="list-style-type: none"> <li>Chooses correct operation in a problem solving situation</li> <li>Uses various strategies to solve multi-step problems and assess the reasonableness of results</li> <li>Develops a rule for addition and subtraction of fractions with common denominators</li> <li>Compares and orders decimals to the thousandths</li> </ul>
Algebra	<ul style="list-style-type: none"> <li>Recognizes patterns in lists of numbers</li> </ul>	<ul style="list-style-type: none"> <li>Uses a verbal rule to continue pattern</li> <li>Matches number sentences with an isolated unknown in situations involving only multiplication</li> </ul>	<ul style="list-style-type: none"> <li>Uses a verbal rule for input-output table</li> <li>Recognizes an Algebraic rule for a one-operation pattern</li> <li>Represents real-world situations with a number sentence involving an unknown</li> </ul>	<ul style="list-style-type: none"> <li>Uses multi-step rules for patterns presented in different formats</li> <li>Translates between real-world situations and number sentences</li> </ul>
Geometry & Measurement	<ul style="list-style-type: none"> <li>Names familiar polygons (e.g., pattern blocks)</li> <li>Classifies angles in a familiar orientation (e.g., one ray is horizontal)</li> </ul>	<ul style="list-style-type: none"> <li>Names and describes polygons based on a familiar pictorial orientation using solely one attribute</li> <li>Identifies lines of symmetry</li> <li>Recognizes congruent shapes with the same orientation</li> <li>Calculates perimeter when all sides of a graphic are labeled</li> </ul>	<ul style="list-style-type: none"> <li>Names and describes triangles and common quadrilaterals using definitions</li> <li>Classifies angles in a variety of orientations</li> <li>Has a conceptual understanding of area as length times width</li> <li>Identifies a transformation (reference MN Academic Standards 4.3.3)</li> </ul>	<ul style="list-style-type: none"> <li>Names and classifies polygons in a variety of contexts and orientations</li> <li>Has a conceptual understanding that polygons can be described using sides AND/OR angles</li> <li>Calculates area by decomposing shapes into rectangles</li> <li>Applies transformations to shapes</li> <li>Has a conceptual understanding of congruency (reference MN Academic Standards 4.3.3.4)</li> </ul>
Data Analysis	<ul style="list-style-type: none"> <li>Displays data from a table in a bar graph</li> </ul>	<ul style="list-style-type: none"> <li>Translates between tables and bar graphs</li> </ul>	<ul style="list-style-type: none"> <li>Collects, organizes, and displays data</li> <li>Solves problems in data displays involving fractions</li> </ul>	<ul style="list-style-type: none"> <li>Conceptual understanding of solving problems involving data displays, including timelines and Venn diagrams</li> </ul>

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Number & Operation	<ul style="list-style-type: none"> <li>• Partial mastery of basic division facts</li> <li>• Recognizes fractions and decimals in familiar context</li> </ul>	<ul style="list-style-type: none"> <li>• Knows basic division facts</li> <li>• Knows benchmark decimal and fraction equivalents (e.g., <math>\frac{1}{2} = 0.5</math>, <math>\frac{1}{4} = 0.25</math>)</li> </ul>	<ul style="list-style-type: none"> <li>• Divides multi-digit numbers</li> <li>• Solves division problems when all relevant information is present and the question is clearly defined</li> <li>• Orders and compares common fractions and decimals</li> <li>• Adds and subtracts fractions</li> <li>• Adds and subtracts decimals</li> </ul>	<ul style="list-style-type: none"> <li>• Efficiently divides and knows when to divide in a problem solving situation</li> <li>• Adds and subtracts fluently with fractions and decimals</li> </ul>
Algebra	<ul style="list-style-type: none"> <li>• Recognizes patterns that use skip counting</li> <li>• Works with simple variable representations</li> </ul>	<ul style="list-style-type: none"> <li>• Recognizes patterns in a list of numbers</li> <li>• Resorts to calculation to verify commutative and associative properties</li> <li>• Solves verbal and simple one-step equations and inequalities by substituting a value for the unknown</li> </ul>	<ul style="list-style-type: none"> <li>• Uses rules to generate patterns</li> <li>• Translates between patterns and rules</li> <li>• Applies commutative and associative properties</li> <li>• Understands simple inequalities</li> <li>• Represents a situation with an equation containing a variable</li> </ul>	<ul style="list-style-type: none"> <li>• Works fluently with patterns and/or rules involving more than one operation or complex problem</li> <li>• Applies the commutative, associate and distributive properties</li> <li>• Interprets inequalities using variables</li> </ul>
Geometry & Measurement	<ul style="list-style-type: none"> <li>• Distinguishes between two- and three-dimensional shapes</li> <li>• Uses informal naming conventions</li> </ul>	<ul style="list-style-type: none"> <li>• Recognizes similar attributes of three-dimensional figures</li> <li>• Has limited vocabulary for attributes of three-dimensional figures</li> <li>• Recognizes area as a multiplicative model (e.g., multiplies two sides of any shape to find area)</li> </ul>	<ul style="list-style-type: none"> <li>• Classifies three-dimensional figures and describes distinct attributes using correct vocabulary</li> <li>• Uses formulas to calculate area, surface area, and volume</li> <li>• Decomposes familiar shapes</li> </ul>	<ul style="list-style-type: none"> <li>• Understands the connections between two- and three-dimensional representations</li> <li>• Has a conceptual understanding of area, surface area, and volume</li> </ul>
Data Analysis	<ul style="list-style-type: none"> <li>• Performs procedures for finding mean, median and range according to direct instructions</li> <li>• Reads displays of data</li> </ul>	<ul style="list-style-type: none"> <li>• Applies rote procedures for calculating mean, median and range (e.g., median is always middle number in a list)</li> <li>• Interprets simple displays of data to solve problems</li> </ul>	<ul style="list-style-type: none"> <li>• Calculates mean, median and range, and data can be provided in a variety of formats (e.g., tables, bar graphs)</li> <li>• Works fluently with data displays and solving problems</li> </ul>	<ul style="list-style-type: none"> <li>• Conceptual understanding of mean, median and range</li> <li>• Analyzes complex situations that include data displays and making interpretations</li> </ul>

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Number & Operation	<ul style="list-style-type: none"> <li>• Can only name common pairs of factors of a given number (e.g., <math>12 = 3 \times 4</math>)</li> <li>• Uses decimals to separate numbers (e.g., <math>\frac{3}{4} = 3.4</math>)</li> <li>• Sees decimal in money context only</li> <li>• Solves ratio or rate problems as multiplication and division problems</li> </ul>	<ul style="list-style-type: none"> <li>• Names pairs of factors of numbers (e.g., <math>12 = 2 \times 6</math>, <math>12 = 3 \times 4</math>)</li> <li>• Recognizes equivalences among common fractions, decimals, and percents</li> <li>• Recognizes a ratio (only) in numeric form</li> <li>• Solves unit rate problems in a straightforward context (division)</li> </ul>	<ul style="list-style-type: none"> <li>• Understands the concept of factors and factoring (composing and decomposing numbers)</li> <li>• Determines equivalences among fractions, decimals, and percents but reverts to one representation to solve problems (e.g., changes everything to decimals)</li> <li>• Creates ratio to represent situation when given key words in context</li> <li>• Understands concept of ratio</li> </ul>	<ul style="list-style-type: none"> <li>• Recognizes when it is appropriate to apply the concept of factoring</li> <li>• Sees connection between factoring and application in a problem solving situation</li> <li>• Translates efficiently between fraction, decimal, and percent forms of positive rational number to solve problems</li> <li>• Compares ratios and understands their relationship to fractions</li> <li>• Recognizes ratios in context</li> </ul>
Algebra	<ul style="list-style-type: none"> <li>• Understands concept of variable as a place holder for an answer</li> <li>• Recognizes patterns (additive) within lists of numbers</li> <li>• Solves occasionally one-step problems in very familiar situations (money)</li> <li>• Can find missing whole number based on number facts, not Algebraic properties</li> </ul>	<ul style="list-style-type: none"> <li>• Solves one-step problems in straightforward situations</li> <li>• Uses computational facts, instead of equality, to find solutions</li> <li>• Recognizes patterns (e.g., multiplicative and additive patterns)</li> <li>• Recognizes relationships between varying quantities represented in tables, graphs, or verbal descriptions</li> </ul>	<ul style="list-style-type: none"> <li>• Represents relationships between varying quantities using equations and inequalities, involving variables, graphs, and verbal descriptions</li> <li>• Uses the properties of arithmetic as well as order of operations to generate equivalent expressions and to solve problems</li> </ul>	<ul style="list-style-type: none"> <li>• Interprets equations and inequalities with multiple unknowns</li> <li>• Understands that solving for a variable is not always the answer to the question</li> </ul>
Geometry & Measurement	<ul style="list-style-type: none"> <li>• When determining area and perimeter of irregular shapes, counts by whole numbers (part is whole, diagonal is always one unit)</li> <li>• Associates 180 degrees with a triangle and 90 degrees with a right angle</li> <li>• Finds one missing angle if given the other two in a triangle</li> <li>• Will multiply or divide when given a problem requiring unit conversion</li> </ul>	<ul style="list-style-type: none"> <li>• Calculates area and volume for basic figures (rectangles) when dimensions are provided</li> <li>• Determines area and perimeter of irregular shapes by counting</li> <li>• Calculates surface area when a net is provided</li> <li>• Converts between feet and inches, hours and minutes</li> </ul>	<ul style="list-style-type: none"> <li>• Recognizes and applies formulas for two- and three-dimensional figures</li> <li>• Determines area and perimeter of irregular shapes when key is one-square unit</li> <li>• Recognizes vocabulary associated with angles</li> <li>• Knows basic conversions among units within a measurement system (e.g., feet to inches, centimeters to meters)</li> </ul>	<ul style="list-style-type: none"> <li>• Determines area and perimeter of irregular shapes</li> <li>• Determines surface area</li> <li>• Understands and uses relationships between angles in geometric figures</li> <li>• Converts among units of measure within a measurement system</li> </ul>
Data Analysis	<ul style="list-style-type: none"> <li>• Determines probability as a fraction when sample space is given</li> </ul>	<ul style="list-style-type: none"> <li>• Determines sample space (i.e., the set of all possible outcomes) in a simple and very familiar context</li> <li>• Understands simple probability expressed in fractional form</li> </ul>	<ul style="list-style-type: none"> <li>• Determines sample space</li> <li>• Understands simple probability in fractions, decimals, and percents</li> </ul>	<ul style="list-style-type: none"> <li>• Represents probabilities in real-world problems, including determining sample space in a variety of ways</li> <li>• Understands concept of probability</li> <li>• Solves problems involving compound probability</li> </ul>

## Grade 7 Mathematics Achievement Level Descriptors

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Number & Operation	<ul style="list-style-type: none"> <li>Changes numbers in fractional form to decimal form by dividing</li> <li>Recognizes that short terminating decimals, fractions, and whole numbers are rational</li> <li>Recognizes familiar numbers as rational</li> <li>Recognizes that a negative numbers is less than a positive number</li> <li>Solves one-step problems with integers</li> <li>Uses a set of defined steps to find a missing number in a given proportion</li> </ul>	<ul style="list-style-type: none"> <li>Changes numbers in fractional form to decimal form and uses to compare</li> <li>Recognizes common repeating decimals and perfect squares under 100 as rational</li> <li>Solves multi-step problems involving familiar rational numbers when all relevant information is present and the question is clearly defined</li> </ul>	<ul style="list-style-type: none"> <li>Recognizes rational numbers in various forms and converts between forms</li> <li>Compares positive and negative rational numbers</li> <li>Solves multi-step problems involving rational numbers in routine problems/situations including proportions</li> <li>Understands that absolute value is the distance from zero</li> </ul>	<ul style="list-style-type: none"> <li>Conceptual understanding of rational numbers including justification of why a number is rational</li> <li>Solves non-routine (complex) problems/situations using rational numbers</li> </ul>
Algebra	<ul style="list-style-type: none"> <li>Represents simple context as a graph</li> <li>Relies on key words to determine operations to represent relationships</li> <li>Solves one-step equations in explicit situations following rote procedure, instead of the concept of equality</li> </ul>	<ul style="list-style-type: none"> <li>Matches a proportion to a given problem situation</li> <li>Writes algebraic expressions using the commutative and associative properties</li> <li>Solves equations numerically (by substitution)</li> </ul>	<ul style="list-style-type: none"> <li>Understands the concept of proportionality and applies to routine problem solving situations</li> <li>Uses properties of algebra as well as order of operations to generate equivalent algebraic expressions and solve problems</li> <li>Represents and solves equations involving one variable, symbolically</li> </ul>	<ul style="list-style-type: none"> <li>Distinguishes proportional relationships from other relationships</li> <li>Understands the concept of proportionality and applies it to non-routine problem solving situations</li> <li>Uses the properties as well as order of operations to generate equivalent algebraic expressions and solve non-routine problems</li> <li>Represents and solves equations involving non-routine representations</li> </ul>
Geometry & Measurement	<ul style="list-style-type: none"> <li>Calculates the circumference of a circle when given the diameter</li> <li>Recognizes a translation or a reflection on a coordinate grid</li> </ul>	<ul style="list-style-type: none"> <li>Uses formulas for area and circumference of a circle and volume of a cylinder when exact values to substitute are given</li> <li>Solves problems with similar figures when a diagram is provided with corresponding parts labeled with “friendly” numbers</li> <li>Uses verbal description to perform a single translation or reflection on a grid</li> </ul>	<ul style="list-style-type: none"> <li>Uses formulas to calculate area and circumference of circles and volume and surface area of cylinders</li> <li>Uses proportions and ratios to solve problems involving scale drawings and conversions</li> <li>Uses verbal descriptions to perform translations or reflections on a grid</li> </ul>	<ul style="list-style-type: none"> <li>Justifies formulas for surface area and volume</li> <li>Can see relationships between circles and cylinders</li> <li>Solves problems involving scale factor and area ratios (with or without a diagram)</li> <li>Uses algebraic rules to describe multiple translations or reflections on a grid</li> </ul>
Data Analysis	<ul style="list-style-type: none"> <li>Calculates mean, median and range from a string of numbers using rote procedures (numbers must be in increasing order to calculate median)</li> <li>Matches a given data set to the graph of the data</li> <li>Determines sample space (i.e., the set of all possible outcomes) in a simple and very familiar context</li> <li>Understands simple probability expressed in fractional form</li> </ul>	<ul style="list-style-type: none"> <li>Calculates mean, median and range from a string of numbers (knows to order data set to determine median – or does not have to write down the ordered data set)</li> <li>Reads circle graphs to solve problems</li> <li>Determines the sample space for an experiment using inefficient procedures</li> <li>Understands simple probability in fractions, decimals, and percents</li> </ul>	<ul style="list-style-type: none"> <li>Calculates mean, median and range from various data displays</li> <li>Understands impact of change in data set (increase or decrease)</li> <li>Reads circle graphs and histograms to solve problems</li> <li>Calculates probability as a fraction of sample space</li> </ul>	<ul style="list-style-type: none"> <li>Efficiently determines mean, median and range regardless of presentation</li> <li>Understands abstractly how change in data set impacts mean and median (quantity of change without recalculating)</li> <li>Interprets circle graphs and histograms to solve problems</li> <li>Uses proportions to calculate probabilities and solve non-routine problems</li> </ul>

## Grade 8 Mathematics Achievement Level Descriptors

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Number & Operation	<ul style="list-style-type: none"> <li>Recognizes fractions and terminating decimals as rational numbers</li> </ul>	<ul style="list-style-type: none"> <li>Recognizes familiar rational and irrational numbers</li> </ul>	<ul style="list-style-type: none"> <li>Recognizes real numbers in various forms</li> <li>Compares real numbers</li> <li>Generates equivalent expressions involving rational numbers in routine problems/situations, including scientific notation</li> </ul>	<ul style="list-style-type: none"> <li>Conceptual understanding of real numbers</li> </ul>
Algebra	<ul style="list-style-type: none"> <li>Recognizes linear functions in graphic presentations</li> <li>Translates linear representations from a table to a graph</li> <li>Identifies slope by counting whole number units on a graph</li> <li>Identifies patterns in a table of a linear function (e.g., recognizes patterns for x or y-values but not the relationship between x and y)</li> <li>Substitutes “easy” numbers and evaluates simple expressions</li> </ul>	<ul style="list-style-type: none"> <li>Recognizes familiar linear functions in symbolic (using key variables) and graphic presentations</li> <li>Translates linear representations from an equation in slope-intercept form to a graph</li> <li>Identifies y-intercept and slope from graphical representation or an equation written in slope-intercept form</li> <li>Evaluates routine algebraic expressions</li> <li>Solves equations with variables using substitution</li> </ul>	<ul style="list-style-type: none"> <li>Recognizes a linear function in symbolic and graphic presentations</li> <li>Represents familiar and routine linear situations with tables, verbal descriptions, symbols, equations, and graphs and translates from one representation to another</li> <li>Identifies graphical properties of linear functions</li> <li>Generates and evaluates equivalent algebraic expressions</li> <li>Identifies systems of linear equations when provided a verbal description</li> <li>Identifies the solution of a linear system as the intersection of the two lines when given the graph</li> <li>Solves equations and inequalities using algebraic properties</li> </ul>	<ul style="list-style-type: none"> <li>Conceptual understanding of dependent and independent variables</li> <li>Solves equations and inequalities and interprets solutions</li> <li>Represents non-routine linear situations with tables, verbal descriptions, symbols, equations, and graphs</li> <li>Converts between forms of a linear equation (i.e., standard, point-slope, slope-intercept)</li> <li>Knows names of algebraic properties for justification in evaluating algebraic expressions</li> <li>Represents systems of linear equations provided a verbal description</li> <li>Solves a linear system algebraically and graphically and expresses the solution as an ordered pair</li> </ul>
Geometry & Measurement	<ul style="list-style-type: none"> <li>Recognizes the equation for the Pythagorean Theorem</li> <li>Recognizes parallel or perpendicular lines on a graph</li> </ul>	<ul style="list-style-type: none"> <li>Substitutes numbers in the Pythagorean Theorem to determine hypotenuse</li> <li>Makes partial connection of slope with parallel lines</li> </ul>	<ul style="list-style-type: none"> <li>Applies the Pythagorean Theorem to solve problems</li> <li>Identifies parallel lines graphically and symbolically</li> <li>Makes partial connection of slope with perpendicular lines</li> </ul>	<ul style="list-style-type: none"> <li>Conceptual understanding of the Pythagorean Theorem and applies it in non-routine problems</li> <li>Understands and applies slopes of parallel and perpendicular lines graphically and symbolically</li> </ul>
Data Analysis	<ul style="list-style-type: none"> <li>Generalizes the properties of the line of best fit of a graphed data set</li> <li>Displays data using scatterplots</li> </ul>	<ul style="list-style-type: none"> <li>Given a data set, student identifies the line of best fit and makes statements about the general trend of the data</li> </ul>	<ul style="list-style-type: none"> <li>Given a data set, student identifies the line of best fit and interprets the data</li> <li>Makes predictions about the data set</li> </ul>	<ul style="list-style-type: none"> <li>Given a data set, determines the line of best fit and interprets the data</li> <li>Assesses reasonableness of predictions in non-routine situations</li> </ul>

## Grade 11 Mathematics Achievement Level Descriptors

These are supplementary materials to the Mathematics MCA Achievement Level Descriptors. The overview for the MCA Achievement Level Descriptors and how to interpret them are on the MDE website at [MDE > Districts, Schools and Educators > Statewide Testing > Achievement Level Descriptors](#).

Strand	Does Not Meet A student at this level of mathematics succeeds at few of the most fundamental mathematics skills of the Minnesota Academic Standards. Some of the skills demonstrated may include:	Partially Meets A student at this level of mathematics partially meets the mathematics skills of the Minnesota Academic Standards. Some of the skills demonstrated may include:	Meets A student at this level of mathematics meets the mathematics skills of the Minnesota Academic Standards. Some of the skills demonstrated may include:	Exceeds A student at this level of mathematics exceeds the mathematics skills of the Minnesota Academic Standards. Some of the skills demonstrated very consistently may include:
Algebra	<ul style="list-style-type: none"> <li>• Uses the vertical line test to identify a function</li> <li>• Recognizes linear and exponential functions using tables, symbols and graphs</li> <li>• Factors common monomial factors from polynomials</li> <li>• Factors quadratic expressions with leading coefficient of 1</li> </ul>	<ul style="list-style-type: none"> <li>• Identifies key features (e.g., intercepts, slopes) of linear functions using symbolic and graphical methods</li> <li>• Evaluates polynomial and rational expressions</li> <li>• Adds, subtracts, and multiplies polynomials</li> <li>• Uses factoring to solve quadratic equations with leading coefficient of 1</li> <li>• Recognizes, represents and solves problems involving linear and exponential functions using tables, verbal descriptions, symbols and graphs</li> <li>• Solves systems of linear inequalities when represented graphically</li> </ul>	<ul style="list-style-type: none"> <li>• Identifies key features (e.g., intercepts, translations) of functions and other relations using symbolic and graphical methods</li> <li>• Generates equivalent algebraic expressions involving polynomials and radicals</li> <li>• Uses algebraic properties to evaluate expressions</li> <li>• Represents and solves real-world and mathematical situations involving linear, quadratic, exponential and nth root functions using equations, inequalities, tables or graphs</li> </ul>	<ul style="list-style-type: none"> <li>• Identifies key features of rational functions and other relations using symbolic and graphical methods</li> <li>• Represents and solves non-routine problems in real-world and mathematical situations using equations, inequalities, tables, or graphs</li> </ul>
Geometry & Measurement	<ul style="list-style-type: none"> <li>• Substitutes numbers into measurement formulas and performs calculations</li> <li>• Identifies the sine, cosine, or tangent ratio</li> <li>• Identifies properties of geometric figures and recognizes congruent and similar figures</li> </ul>	<ul style="list-style-type: none"> <li>• Uses formulas to calculate measurements of geometric figures</li> <li>• Uses sine, cosine, or tangent to find the missing leg in a right triangle</li> <li>• Classifies polygons</li> <li>• Identifies the missing statements or reasons in a proof regarding geometric relationships</li> <li>• Solves problems using the Pythagorean Theorem or its converse</li> <li>• Solves problems involving congruent or similar figures</li> </ul>	<ul style="list-style-type: none"> <li>• Uses context to obtain information needed to apply measurement formulas for geometric figures, including scale factors</li> <li>• Solves typical geometric problems using algebraic methods and trigonometric ratios sine, cosine and tangent</li> <li>• Provides a logical chain of reasoning, with justifications, to construct an argument</li> <li>• Applies properties of geometric figures to solve problems and to logically justify results in geometry</li> </ul>	<ul style="list-style-type: none"> <li>• Solves non-routine geometric problems using algebraic methods and trigonometric ratios sine, cosine and tangent</li> <li>• Explains or repairs the flaws in an argument</li> <li>• Applies properties of geometric figures to solve non-routine problems and to logically justify results in geometry</li> </ul>
Data Analysis	<ul style="list-style-type: none"> <li>• Given a data set, computes measures of center and location</li> <li>• Applies the multiplication principle to determine the size of a sample space</li> <li>• Calculates experimental probabilities by using relative frequencies of outcomes</li> </ul>	<ul style="list-style-type: none"> <li>• Uses various measures of spread to compare data sets</li> <li>• Determines sample size to compute probabilities</li> <li>• Identifies intersections and unions in Venn diagrams</li> </ul>	<ul style="list-style-type: none"> <li>• Analyzes data using various measures (e.g., regression line, correlation coefficient) to describe relationships, identify trends, make inferences, and draw conclusions</li> <li>• Applies probability concepts, including intersections, unions and complements of events, conditional probability and independence</li> <li>• Reads and interprets contingency tables</li> </ul>	<ul style="list-style-type: none"> <li>• Analyzes data using various measures to describe relationships, identify trends, make inferences, and justify conclusions</li> <li>• Creates contingency tables</li> </ul>