Grade 8 Mathematics

Achievement level descriptions (ALDs) describe a student's level of achievement (e.g., Below Satisfactory, On-Grade-Level, Above Satisfactory) on a large-scale assessment. The purpose of the ALD development framework is to enable valid inferences about student content area knowledge and skill in relation to a state's content standards measured on a large-scale assessment.

Achievement Level	Achievement Level Descriptions
Level 1	Students performing at Level 1 are just beginning to access the challenging content of the B.E.S.T. Standards.
Level 2	Students at this level demonstrate a **below satisfactory** level of success with the challenging content of the *Florida B.E.S.T. Standards*. A student performing at Level 2: • identifies numbers as rational or irrational. • given an irrational square root or cube root, determines the integer values it lies between. • applies the Laws of Exponents to identify equivalent numerical expressions, limited to integer exponents and rational number bases, and applies one property from the Law of Exponents. • given two numbers in scientific notation with different powers of 10, determines which one is larger or smaller. • adds and subtracts numbers expressed in scientific notation in the same power of 10 wherein the sum of the coefficients is not larger than 10. • solves real-world problems by adding and subtracting numbers expressed in scientific notation in the same power of 10 wherein the sum of the coefficients is not larger than 10. • solves multi-step mathematical problems with up to 4 steps involving the order of operations with rational numbers including integer exponents. • applies the Laws of Exponents to identify equivalent algebraic expressions, using integer exponents and monomial bases using one law of exponents. • applies properties of operations to multiply two linear expressions with integer coefficients where both factors are monomials. • identifies a common monomial factor in the sum of two algebraic expressions. • solves multi-step linear equations in one variable, with variables on one side of the equation and rational number coefficients that generate one solution. • solves two-step linear inequalities in one variable with whole number coefficients and represents solutions algebraically. • given an equation in the form of $x^2=p$, where p is a perfect square between 0 and 225, determines a positive solution. • determines whether a linear relationship is also a proportional relationship from a graph. • given a graph of a linear relationship involving integer values, determines the slope. • given a graph of a linear relationship, identifies the equivalent equation in slope-intercept form. • given a two-variable linear equation in slope-intercept form, identifies the graph that represents the given linear equation.

Achievement Level	Achievement Level Descriptions
Level 2	• given a real-world context, determines the slope and *y*-intercept of a two-variable linear equation from an equation in slope-intercept form. • recognizes that a solution to a system of equations can be represented as an ordered pair. • when given a system of two linear equations represented graphically, identifies the solution. • given a graph or mapping diagram, determines whether the relationship is a function. • given a function defined by a graph, determines whether the function is a linear function. • given a specific section of a graph that represents a function, analyzes the specific section as increasing or decreasing. • applies the Pythagorean Theorem in a mathematical problem to find the hypotenuse of a right triangle resulting in a whole number. • applies the Pythagorean Theorem to solve mathematical problems involving the distance between two points in the first quadrant of a coordinate plane when the two points are shown as part of a right triangle. • identifies the relationship between supplementary, complementary, vertical, or adjacent angles with numerical angle measures. • given a triangle including two interior numerical angle measures, identifies the corresponding equation to solve for the third unknown interior angle measure. • given a preimage and image generated by a translation, identifies the transformation that describes the relationship. • given a preimage and image generated by a single dilation, identifies the scale factor of the dilation as less than 1 or greater than 1. • identifies the two-dimensional figure resulting from a single translation. • solves mathematical problems involving proportional relationships between similar triangles where a diagram and the scale factor are provided and the scale factor is a whole number. • given a set of real-world bivariate numerical data, identifies the corresponding scatter plot or line graph. • given a scatter plot, identifies a positive or negative association and any outliers. • determines the sample space for a repeated experiment, that is repeated two times, involving a coin. • finds the theoretical probability of an event related to a repeated experiment, which include tossing a fair coin or rolling a fair die, and expresses that probability as a fraction. • solves real-world problems involving probabilities related to single experiments involving coins, dice, or a given fair spinner.
Level 3	Students at this level demonstrate **on-grade-level** success with the challenging content of the *Florida B.E.S.T. Standards*. A student performing at Level 3: • defines irrational numbers within the real number system and locates an approximate value of an irrational number on a number line. • plots, orders, and compares, using <, >, =, rational and irrational numbers (when roots are included, roots will have the same index).

Achievement Level	Achievement Level Descriptions
Level 3	• applies the Laws of Exponents to evaluate numerical expressions and identify equivalent numerical expressions, limited to integer exponents and rational number bases. • expresses numbers in scientific notation to represent and approximate very large quantities. • adds and subtracts numbers expressed in scientific notation in the same power of 10, and multiplies and divides numbers expressed in scientific notation. • solves real-world problems by adding and subtracting numbers expressed in scientific notation in the same power of 10, and multiplies and divides numbers expressed in scientific notation. • solves multi-step mathematical and real-world problems with up to 5 steps involving the order of operations with rational numbers including integer exponents. • applies the Laws of Exponents to identify equivalent algebraic expressions, using positive exponents and monomial bases using laws of exponents. • applies properties of operations to multiply two linear expressions with rational coefficients where both factors are monomials. • given a sum of two algebraic expressions, identifies the equivalent expression having a common monomial factor as a common factor multiplied by the sum of two algebraic expressions. • solves multi-step linear equations in one variable, with variables on both sides of the equation and rational number coefficients that generate one solution. • solves two-step linear inequalities in one variable with positive rational coefficients and represents solutions algebraically or graphically. • given an equation in the form of $x^2=p$ and $x^3=q$, where p is a perfect square between 0 and 225 and q is a perfect cube between 0 and 125, determines a positive solution. • determines whether a linear relationship is also a proportional relationship using tables and equations. • given a table of a linear relationship involving integer values, determines the slope. • given a table (including the y-intercept), graph, or written description (including ordered pairs where one is the y-intercept) of a linear relationship involving integer values, writes the equation in slope-intercept form. • given a mathematical context, graphs a two-variable linear equation from a table, or an equation in slope-intercept form. • given a real-world context involving integer values, determines and interprets the slope and y-intercept of a two-variable linear equation from a written description, a table, a graph, or an equation in slope-intercept form. • given a system of two linear equations that has one solution with integer values and a specified set of possible solutions, determines the ordered pair that satisfies the system of linear equations. • given a system of two linear equations represented graphically on the same coordinate plane, determines whether there is one solution. • given a mathematical or real-world context, solves systems of two linear equations by graphing; solutions are integers. • given a set of ordered pairs, a table, a graph, or mapping diagram, determines whether the relationship is a function, and given a set of ordered pairs, a table, or mapping diagram, identifies the domain and range of the relation as a list of numbers.

Achievement Level	Achievement Level Descriptions
Level 3	• given a function defined by an equation, determines whether the function is a linear function. • analyzes a graphical representation of a functional relationship between two quantities and identifies where the function is increasing, decreasing, or constant. • applies the Pythagorean Theorem to solve mathematical problems involving unknown side lengths in right triangles. • applies the Pythagorean Theorem to solve mathematical problems involving the distance between two points in a coordinate plane when the two points are shown as part of a right triangle. • uses the Triangle Inequality Theorem to determine whether a triangle can be formed from a given set of sides. • solves mathematical problems with one relationship between supplementary, complementary, vertical, or adjacent angles with numerical angle measures. • solves problems involving the relationships of interior angles of a triangle. • develops formulas for the sums of interior angles of regular polygons by decomposing them into triangles. • given a preimage and image generated by a reflection, identifies the transformation that describes the relationship. • given a scale factor for generating a single dilation, identifies the corresponding preimage and image generated by the given scale factor and single dilation. • applies a single transformation, either a reflection over the x- or y-axis or translation, on two-dimensional figures using the coordinate plane. • solves mathematical problems involving proportional relationships between similar triangles where a diagram is provided and the scale factor is a whole or rational number. • given a set of real-world bivariate numerical data, constructs either a scatter plot or a line graph as directed. • given a scatter plot, identifies a positive or negative association and whether it is strong or weak and has any outliers. • given a scatter plot with a linear association, identifies a straight line that appropriately fits the data. • determines the sample space for a repeated experiment involving a coin, a die, or a given fair spinner. • finds the theoretical probability of an event related to a repeated experiment, which include tossing a fair coin, rolling a fair die, picking a card randomly from a deck with replacement, picking marbles randomly from a bag with replacement, and spinning a fair spinner, and expresses that probability as a fraction. • solves real-world problems involving probabilities related to single or repeated experiments involving coins, dice, or a given fair spinner, including making predictions based on theoretical probability.

Level 4	Students at this level demonstrate an **above satisfactory** level of success with the challenging content of the Florida B.E.S.T. Standards. A student performing at Level 4: • defines irrational numbers within the real number system and locates an approximate value of a two-term numerical expression involving irrational numbers on a number line. • plots, orders, and compares, using <, >, =, rational and irrational numbers represented in various forms (must include at least one square root and one cube root). • applies the Laws of Exponents to evaluate numerical expressions and generate equivalent numerical expressions, limited to integer exponents and rational number bases, with procedural fluency. • expresses numbers in scientific notation to represent and approximate very large or very small quantities and determines how many times larger or smaller one number is compared to a second number. • adds, subtracts, multiplies, and divides numbers expressed in scientific notation. • solves real-world problems by adding, subtracting, multiplying, and dividing numbers expressed in scientific notation. • solves multi-step mathematical and real-world problems with up to 6 steps involving the order of operations with rational numbers including exponents and radicals. • applies the Laws of Exponents to generate equivalent algebraic expressions, using integer exponents and monomial bases using laws of exponents. • applies properties of operations to multiply two linear expressions with rational coefficients where one factor is a monomial. • rewrites the sum of two algebraic expressions having a common monomial factor with a common factor multiplied by the sum of two algebraic expressions. • solves multi-step linear equations in one variable, with rational number coefficients that generate one solution, no solution, or infinitely many solutions. • solves two-step linear inequalities in one variable and represents solutions algebraically and graphically. • given an equation in the form of $x^2=p$ and $x^3=q$, where p is a perfect square between 0 and 225 and q is a perfect cube between -125 and 125, determines positive and negative solutions. • determines whether a linear relationship is also a proportional relationship using written descriptions. • given a table, graph, or written description of a linear relationship involving rational values, determines the slope. • given a table, graph, or written description of a linear relationship, writes the equation in slope-intercept form. • given a mathematical or real-world context, graphs a two-variable linear equation from a written description, a table, or an equation in slope-intercept form. • given a real-world context involving rational values, determines and interprets the slope and y-intercept of a two-variable linear equation from a written description, a table, a graph, or an equation in slope-intercept form.

Level 4	• given a system of two linear equations and a specified set of possible solutions, determines the ordered pairs that satisfy the system of linear equations. • given a system of two linear equations represented graphically on the same coordinate plane, determines whether there is no solution or infinitely many solutions. • given a mathematical or real-world context, solves systems of two linear equations by graphing; solutions can be rational numbers. • given a set of ordered pairs, a table, a graph, or mapping diagram, determines whether the relationship is a function and determines the domain and range of the relation as a list of numbers or as a simple inequality (e.g. $x \geq 1$). • given a function defined by an input-output table, determines whether the table could represent a linear function. • analyzes a real-world written description or graphical representation of a functional relationship between two quantities and identifies where the function is increasing, decreasing, or constant. • applies the Pythagorean Theorem to solve real-world problems involving unknown side lengths in right triangles. • applies the Pythagorean Theorem to solve mathematical and real-world problems involving the distance between two points with a given coordinate plane. • uses the Triangle Inequality Theorem to determine whether a triangle can be formed from a given set of sides and uses the converse of the Pythagorean Theorem to determine whether the resulting triangle is a right triangle. • solves mathematical problems involving multiple relationships between supplementary, complementary, vertical, or adjacent angles with numerical angle measures. • solves problems involving the relationships of interior and exterior angles of a triangle when one angle measure is given as an algebraic expression. • develops and uses formulas for the sums of interior angles of regular polygons by decomposing them into triangles. • given a preimage and image generated by a rotation, identifies the transformation that describes the relationship. • given a preimage and image generated by a single dilation, identifies the scale factor of the dilation. • describes and applies a single transformation, either a rotation about the origin or a dilation centered at the origin on two-dimensional figures using coordinates and the coordinate plane. • solves mathematical or real-world problems involving proportional relationships between similar triangles with or without a diagram where the scale factor is a whole or rational number. • given a set of real-world bivariate numerical data, constructs a scatter plot or a line graph as appropriate for the context. • given a scatter plot within a real-world context, describes patterns of association, including linear or nonlinear and any outliers. • given a scatter plot with a linear association, informally fits a straight line. • determines the sample space for a repeated experiment including experiments that involve replacement (marbles in a bag and cards from a deck).

Level 4	• finds the theoretical probability of an event related to a repeated experiment, which include tossing a fair coin, rolling a fair die, picking a card randomly from a deck with replacement, picking marbles randomly from a bag with replacement, and spinning a fair spinner, and expresses that probability as a percentage and/or as a decimal. • solves real-world problems involving probabilities related to single or repeated experiments, including experiments that involve replacement, including making predictions based on theoretical probability.
Level 5	Students at this level demonstrate **mastery** of the most challenging content of the *Florida B.E.S.T. Standards*. A student performing at Level 5: • defines irrational numbers within the real number system and locates an approximate value of a numerical expression involving irrational numbers on a number line and explains their reasoning. • explains and justifies how to plot, order, and compare rational and irrational numbers represented in various forms. • analyzes an error in the application of the Laws of Exponents used to evaluate numerical expressions and justifies the reasoning. • adds, subtracts, multiplies, and divides numbers expressed in scientific notation, including combinations of these operations. • solves real-world problems by adding, subtracting, multiplying, and dividing numbers expressed in scientific notation and interprets the solution in the context of the situation. • solves and explains multi-step mathematical and real-world problems with up to 6 steps and justifies each step in applying the order of operations with rational numbers including exponents and radicals. • applies the Laws of Exponents to generate equivalent algebraic expressions, limited to integer exponents and monomial bases using laws of exponents and provides justification. • rewrites the sum of two algebraic expressions having a common monomial factor in different ways (including factoring out the GCF) with a common factor multiplied by the sum of two algebraic expressions. • solves multi-step linear equations in one variable, with rational number coefficients that generate one solution, no solution, or infinitely many solutions and interprets the solution in the context of the situation. • solves two-step linear inequalities in one variable and represents solutions algebraically and graphically and interprets the solution in context of the situation. • given an equation in the form of $x^2=p$ and $x^3=q$, where p is a perfect square between 0 and 225 and q is a perfect cube between -125 and 125, determines positive and negative solutions and explains why both are valid. • given a table, graph, or written description of a linear relationship involving rational values, determines the slope, and explains the connection between slope and the constant of proportionality or explains the connection between slope and similar triangles on the coordinate plane. • given a system of two linear equations and a specified set of possible solutions, determines the ordered pairs that satisfy the system of linear equations and interprets the solution in the context of the situation.

Level 5	• given a system of two linear equations represented graphically on the same coordinate plane, determines and provides a justification as to whether there is one solution, no solution, or infinitely many solutions. • given a real-world context, solves systems of two linear equations by graphing, and interprets the solution in the context of the situation. • given a set of ordered pairs, a table, a graph, or mapping diagram, determines whether the relationship is a function, determines the independent and dependent variables, and identifies the domain and range of the relation as a list of numbers or as a simple inequality (e.g. $x \geq 1$) and interprets the domain constraints in terms of the context. • analyzes a real-world written description of a functional relationship between two quantities and draws a graph to identify where the function is increasing, decreasing, or constant. • applies the Pythagorean Theorem more than once to solve mathematical and real-world problems involving unknown side lengths in right triangles. • applies the Pythagorean Theorem to solve mathematical and real-world problems involving the distance between two points in a coordinate plane without the coordinate plane given. • given three side lengths that do not make a triangle, determine which side should be changed to form a triangle, and uses the converse of the Pythagorean Theorem to determine whether a given triangle is a right triangle. • solves mathematical problems involving the relationships between supplementary, complementary, vertical, or adjacent angles with at least one angle measures given as an algebraic expression. • solves problems involving the relationships of interior and exterior angles of a triangle when multiple angle measures are given as algebraic expressions. • develops and uses formulas for the sums of the interior angles of regular polygons by decomposing them into triangles; includes finding a missing angle measure and includes representing angle measures as algebraic expressions. • given a preimage and image generated by a single transformation, analyzes the transformation that describes the relationship and recognizes that translations, rotations, and reflections preserve congruence. • given a preimage and image generated by a single dilation, identifies the scale factor that describes the relationship, and recognizes and explains that dilations do not preserve congruence unless the scale factor is 1. • solves mathematical or real-world problems involving proportional relationships between similar triangles, having at least one side represented as an algebraic expression, where a diagram is not provided and the scale factor is a rational number. • given a set of real-world bivariate numerical data, justifies whether the construction of a scatter plot or a line graph is appropriate for the context. • given a scatter plot with a linear association, informally fits a straight line and uses the number of points above and below to justify. • analyzes an error and justifies a reasoning in a sample space for a corresponding repeated experiment. • analyzes an error in finding the theoretical probability of an event related to a repeated experiment and justifies the reasoning.