8th Grade
Mathematics Alignment—Common Core State Standards and CT Frameworks

NOTE: CCSS standards shown in blue do not equivalent CT standards.

CCSS Standards	CT Framework Grade Level Expectations
The Number System	
Know that there are numbers that are not rational, and approximate them by rational numbers.	
8.NS.1: Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion. For rational numbers, show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number.	CT.6.2.1.6: Determine equivalent fraction, decimal, and percentage representations and choose among these forms to solve problems.
	CT.7.2.1.2: Represent rational numbers in equivalent fraction, decimal and percentage forms.
	CT.7.2.1.3: Represent fractions as terminating or repeating decimals and determine when it is appropriate to round the decimal form in context.
	CT.8.2.1.1: Compare and order rational and common irrational numbers and locate them on number lines, scales and coordinate grids.
	CT.8.2.1.4: Represent fractions, mixed numbers, decimals and percentages in equivalent forms.
8.NS.2: Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π^2). For example, by truncating the decimal expansion of $\sqrt{2}$, show that $\sqrt{2}$ is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.	CT.8.2.1.1: Compare and order rational and common irrational numbers and locate them on number lines, scales and coordinate grids.
	CT.8.2.1.2: Identify perfect squares and their square roots to corresponding roots and use these relationships to estimate other square roots.
	CT.8.2.2.6: calculate the square roots of positive rational numbers using technology.
Expressions and Equations	
Work with radicals and integer exponents.	
8.EE.1: Know and apply the properties of integer exponents to generate equivalent numerical expressions. For example, $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$.	CT.7.2.1.4: Use patterns to compute with and write whole numbers and fractions as powers of whole numbers and vice versa.
	CT.8.2.2.11: Use the rules for exponents to multiply and divide with powers of 10 and extend to other bases.
8.EE.2: Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational.	--Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational.

	CT.7.2.1.4: Use patterns to compute with and write whole numbers and fractions as powers of whole numbers and vice versa.
	CT.7.2.1.5: Understand the relationship between squares and square roots.
	CT.8.1.3.10: Evaluate and simplify algebraic expressions, equations and formulas including those with powers using algebraic properties and the order of operations.
	CT.8.2.1.2: Identify perfect squares and their square roots to corresponding roots and use these relationships to estimate other square roots.
	CT.8.2.2.6: calculate the square roots of positive rational numbers using technology.
	CT.8.2.2.11: Use the rules for exponents to multiply and divide with powers of 10 and extend to other bases.
8.EE.3: Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. For example, estimate the population of the United States as 3×10^8 and the population of the world as 7×10^9, and determine that the world population is more than 20 times larger.	CT.7.2.1.6: Read, write, compare and solve problems with whole numbers in scientific notation and vice versa.
	CT.7.2.2.14: Develop and describe strategies for estimating and multiplying whole numbers expressed in scientific notation.
	CT.7.2.2.15: Estimate and solve problems containing whole numbers expressed in expanded notation, powers of 10 and scientific notation.
	CT.8.2.1.3: Read and represent whole numbers and those between zero and one in scientific notation and vice versa and compare their magnitudes.
	CT.8.2.2.12: Estimate answers to problems in context containing numbers expressed in scientific notation.
8.EE.4: Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.	--Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.
	CT.7.2.2.14: Develop and describe strategies for estimating and multiplying whole numbers expressed in scientific notation.
	CT.7.2.2.15: Estimate and solve problems containing whole numbers expressed in expanded notation, powers of 10 and scientific notation.
	CT.8.2.2.12: Estimate answers to problems in context containing numbers expressed in scientific notation.

Understand the connections between proportional relationships, lines, and linear equations.	
8.EE.5: Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.	--Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.
	CT.8.1.1.3: Write and solve problems involving proportional relationships (direct variation) using linear equations ($y = mx$).
	CT.8.1.2.5: Represent linear and nonlinear mathematical relationships with verbal descriptions, tables, graphs and equations (when possible).
	CT.8.1.2.6: Determine the constant rate of change in a linear relationship and recognize this as the slope of a line.
8.EE.6: Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b.	CT.8.1.2.5: Represent linear and nonlinear mathematical relationships with verbal descriptions, tables, graphs and equations (when possible).
	CT.8.1.2.6: Determine the constant rate of change in a linear relationship and recognize this as the slope of a line.
	CT.8.1.2.9: Interpret and describe slope and y-intercepts from contextual situations, graphs and linear equations.
Analyze and solve linear equations and pairs of simultaneous linear equations.	
8.EE.7: Solve linear equations in one variable: a. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form $x = a$, $a = a$, or $a = b$ results (where a and b are different numbers). b. Solve linear equations with rational number coefficients, including equations who solutions require expanding expressions using the distributive property and collecting like terms.	--Solve linear equations in one variable: a. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form $x = a$, $a = a$, or $a = b$ results (where a and b are different numbers). b. Solve linear equations with rational number coefficients, including equations who solutions require expanding expressions using the distributive property and collecting like terms.
	CT.8.1.3.12: Write and solve multistep equations using various algebraic methods including the distributive property and properties of equality and justify the solutions.
	CT.8.1.3.10: Evaluate and simplify algebraic expressions, equations and formulas including those with powers using algebraic properties and the order of operations.

8.EE.8: Analyze and solve pairs of simultaneous linear equations: a. Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously. b. Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. For example, *3x + 2y = 5* and *3x + 2y = 6* have no solution because *3x + 2y* cannot simultaneously be 5 and 6. c. Solve real-world and mathematical problems leading to two linear equations in two variables. For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.	--Analyze and solve pairs of simultaneous linear equations: a. Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously. b. Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. For example, *3x + 2y = 5* and *3x + 2y = 6* have no solution because *3x + 2y* cannot simultaneously be 5 and 6. c. Solve real-world and mathematical problems leading to two linear equations in two variables. For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.
	CT.8.1.2.8: Compare and contrast the slopes and the graphs of lines to classify lines as parallel, perpendicular or intersecting.
	CT.8.1.3.11: Examine systems of two linear equations in context that have a common solutions (i.e., point of intersection, using tables, graphs and substitution and interpret the solution).
Functions	
Define, evaluate, and compare functions.	
8.F.1: Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output. Function notation is not required in Grade 8.	--Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output. Function notation is not required in Grade 8.
8.F.2: Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, give a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.	--Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, give a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.
	CT.8.1.2.7: Compare and contrast the slopes and the graphs of lines that have a positive slope, negative slope, zero slope, undefined slope, slopes greater than one and slopes between zero and one.
	CT.8.1.2.9: Interpret and describe slope and y-intercepts from contextual situations, graphs and linear equations.

	CT.8.1.3.11: Examine systems of two linear equations in context that have a common solution (i.e., point of intersection, using tables, graphs and substitution and interpret the solution).
8.F.3: Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. For example, the function $A = s^2$ giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line.	CT.8.1.1.2: Determine whether relationships are linear or nonlinear.
	CT.8.1.1.4: Examine and make comparisons in writing between linear and non-linear mathematical relationships including $y = mx$, $y = mx^2$ and $y – mx^3$ using a variety of representations.
	CT.8.1.2.5: Represent linear and nonlinear mathematical relationships with verbal descriptions, tables, graphs and equations (when possible).
Use functions to model relationships between quantities.	
8.F.4: Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of the relationship or from two (*s*, *y*) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.	--Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of the relationship or from two (*s*, *y*) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.
	CT.8.1.2.6: Determine the constant rate of change in a linear relationship and recognize this as the slope of a line.
8.F.5: Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.	CT.8.1.1.4: Examine and make comparisons in writing between linear and non-linear mathematical relationships including $y = mx$, $y = mx\text{^}2$ and $y = mx\text{^}3$ using a variety of representations.
	CT.8.1.2.5: Represent linear and nonlinear mathematical relationships with verbal descriptions, tables, graphs and equations (when possible).
Geometry	
Understand congruence and similarity using physical models, transparencies, or geometry software.	
8.G.1: Verify experimentally the properties of rotations, reflections, and translations: a. Lines are taken to lines, and line segments to line segments of the same length. b. Angles are taken to angles of the same measure. c. Parallel lines are taken to parallel lines.	CT.6.3.1.3: Identify lines of symmetry and reflections, rotations and translations of geometric figures.
	CT.7.3.1.3: Draw the result of transformations on polygons on coordinate planes including translations, rotations, reflections and dilations (reductions and enlargements).
	CT.8.3.2.5: Use a coordinate plane to make and test conjectures about changes in the coordinates of the vertices of polygons as a result of a transformation (translation and/or reflection) and describe the results in writing.

8.G.2: Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.	--Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.
	CT.8.3.1.2: Make and test conjectures about angle and side relationships to illustrate that similar figures have congruent angles and corresponding sides and congruent figures have congruent angles and sides.
8.G.3: Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.	CT.7.3.1.3: Draw the result of transformations on polygons on coordinate planes including translations, rotations, reflections and dilations (reductions and enlargements).
	CT.7.3.1.4: Describe the effect of transformations (i.e., position and orientation from the original figure, size) on polygons that have line and/or rotational symmetry.
	CT.8.3.2.5: Use a coordinate plane to make and test conjectures about changes in the coordinates of the vertices of polygons as a result of a transformation (translation and/or reflection) and describe the results in writing.
8.G.4: Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.	CT.7.3.1.3: Draw the result of transformations on polygons on coordinate planes including translations, rotations, reflections and dilations (reductions and enlargements).
	CT.7.3.1.4: Describe the effect of transformations (i.e., position and orientation from the original figure, size) on polygons that have line and/or rotational symmetry.
	CT.7.3.1.5: Compare and describe in writing the relationships, including congruence, equality and scale, between the angles, sides, perimeters and areas of congruent and similar geometric shapes.
	CT.8.3.1.2: Make and test conjectures about angle and side relationships to illustrate that similar figures have congruent angles and corresponding sides and congruent figures have congruent angles and sides.

8.G.5: Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut for a transversal, and the angle-angle criterion for similarity of triangles. For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.	--Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut for a transversal, and the angle-angle criterion for similarity of triangles. For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.
	CT.8.3.1.4: Apply side and angle relationships in geometric figures to solve problems, including the Pythagorean Theorem and similar figures.
Understand and apply the Pythagorean Theorem.	
8.G.6: Explain a proof of the Pythagorean Theorem and its converse.	CT.8.3.1.3: Construct and/or examine right triangles and make and test conjectures about the relationships of the angles and sides and develop the Pythagorean Theorem.
8.G.7: Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.	--Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.
	CT.8.3.1.4: Apply side and angle relationships in geometric figures to solve problems, including the Pythagorean Theorem and similar figures.
8.G.8: Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.	--Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.
	CT.8.3.1.4: Apply side and angle relationships in geometric figures to solve problems, including the Pythagorean Theorem and similar figures.
Solve real-world and mathematical problems involving volume of cylinders, cones and spheres.	
8.G.9: Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.	CT.8.3.2.7: Develop formulas using measurement strategies and concrete models; and use formulas to determine the volumes of pyramids, cones and spheres.
	CT.8.3.3.9: Use estimation and measurement strategies, including formulas, to solve surface area and volume problems in context.
Statistics and Probability	
Investigate patterns of association in bivariate data.	
8.SP.1: Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.	--Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.

	CT.8.4.2.1: Collect, organize and display data using an appropriate representation (including box-and-whisker plots, stem-and-leaf plots, scatter plots and histograms) based on the size and type of data set and the purpose for its use.
	CT.8.4.2.5: Make predictions from scatter plots by using or estimating a line-of-best-fit.
	CT.8.4.2.6: Make observations and inferences and evaluate hypotheses based on collected and/or experimental data.
8.SP.2: Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.	--Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.
	CT.8.4.2.5: Make predictions from scatter plots by using or estimating a line-of-best-fit.
8.SP.3: Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.	CT.8.1.2.9: Interpret and describe slope and y-intersepts from contextual situations, graphs and linear equations.
8.SP.4 Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?	--Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?
	CT.8.4.2.6: Make observations and inferences and evaluate hypotheses based on collected and/or experimental data.