ILLINOIS STATE BOARD OF EDUCATION

MATHEMATICS GRADE 8

Theory of Action: Academic standards represent a collective commitment around what students should learn each year. The state assessment asks students to demonstrate their knowledge, skills, and understanding related to these standards using a common measure. The resulting data allows us to see patterns in performance that should guide school and district improvement, helping identify areas of strength and opportunity.

Role of Performance Level Descriptors in Defining Proficiency: Performance level descriptors bridge the state assessment to classroom instruction and the systems of formative assessments that guide local instruction and choices about individual students. ***Academic proficiency represents a range of observable student performance characteristics***. There are multiple pathways to proficiency, and students rely upon their strengths differently within that range of performance.

Proficiency and Difficulty: A student's ability to demonstrate proficiency is influenced by the complexity of the texts or stimuli presented, tasks they're asked to complete, and the contexts in which they are engaged. As student performance improves, students are typically able to handle more challenging texts/stimuli, tasks, and contexts, and are able to demonstrate their skills and knowledge more accurately and consistently.

Functions *Student performance indicates the ability to…*

Claim 1	Below Proficient	Approaching Proficient	Proficient	Above Proficient
8.F.1-1	Recognize that some multiplication equations can be considered comparisons.	Recognize that a function is a relation with inputs and outputs.	Determine whether a relation is a function.	Determine whether a function is a one-to-one function.
8.F.1-2	Create a table consisting of an input and the corresponding output.	Create ordered pairs of inputs and the corresponding outputs.	Graph the set of ordered pairs consisting of an input and the corresponding output.	Use function notation, evaluate functions for inputs in their domains and interpret statements that use function notation in terms of a context.
8.F.2	Identify basic differences between two functions.	Compare two linear functions.	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).	Interpret key features of graphs and tables in terms of the quantities and sketches graphs showing key features given a verbal description of the relationship. Key features include intercepts intervals where the function is increasing, decreasing, positive, or negative, relative maximums and minimums.
8.F.3	Identify functions.	Classify functions as linear or nonlinear.	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.	Relate the domain of a function to a graph and, where applicable, to the quantitative relationship it describes, limiting to linear functions and non-linear.

Claim 1	Below Proficient	Approaching Proficient	Proficient	Above Proficient
8.F.4	Identify the slope and the y-intercept in a function.	Construct a function given the slope and the y-intercept.	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 a relationship or from two (x, y) values, including reading these from a table or from a graph.	Construct a function to model a linear relationship between two quantities. Use the rate of change and initial value to make conjectures about the data.
8.F.5	Identify basic trends in a graph, such as general increases or decreases.	Describe simple functional relationships between two quantities, recognizing whether a function is increasing, decreasing, linear, or nonlinear with some inaccuracies.	Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear, or nonlinear).	Analyze and describe complex functional relationships, identifying precise changes and intervals in the graph.
	Describe features of a function with a graph.	Describe a function with a graph, verbally or explicitly in writing.	Sketch a graph that exhibits the qualitative features of a function that has been described verbally.	Given a graph, describe a real-world situation that would be represented by the given graph.

The Number System *Student performance indicates the ability to…*

Claim 2	Below Proficient	Approaching Proficient	Proficient	Above Proficient
8.NS.1	Recognize that a fraction is a division problem and compare whole numbers on a number line.	Convert simple fractions into rational and irrational numbers to the second-place value and convert a decimal expansion up to two places beyond the decimal into a fraction.	Convert a fraction with a double-digit dividend and a single digit divisor into rational or irrational numbers that have decimal expansions up to three or more place values and convert decimals with three or more place values into fractions.	Convert a fraction with double-digit dividend and a double-digit divisor into rational or irrational numbers. Convert decimals with four or more place values into fractions.
8.NS.2	Identify a decimal on a number line.	Compare rational and irrational numbers to one decimal place value on a number line.	Compare rational and irrational numbers to two decimal places on a number line.	Compare rational and irrational numbers to three decimal places on a number line.

Expressions and Equations

Claim 3	Below Proficient	Approaching Proficient	Proficient	Above Proficient
8.EE.1	Identify numerical expressions using properties of integer exponents.	Evaluate numerical expressions using and applying properties of integer exponents.	Evaluate and generate equivalent numerical expressions using and applying properties of integer exponents.	Evaluate and generate numerical equivalent numerical expressions using and applying properties of integer exponents to solve real world problems.
8.EE.2	Identify a square root radical and a cube root radical. Evaluate square roots of small perfect squares less than 100. Evaluate perfect cubes less than 27.	Partially solve equations using square roots symbol where the solution is a positive rational number and a perfect square less than or equal to 100 and only the positive root is identified. Evaluate small perfect squares to 144 and perfect cube to 125.	Solve equations using square root and cube root symbols to represent solutions (solutions are positive rational numbers) and solutions are perfect squares or perfect cubes. Evaluate perfect squares and perfect cubes.	Solve equations using square root and cube root symbols to represent solutions to real world problems. Evaluate perfect squares and perfect cubes to solve real world problems.
8.EE.3	Identify numbers written in scientific notation. Express how many times as much one number is than another number with a quotient greater than 1.	Use numbers expressed in scientific notation to estimate very large quantities. Express how many times as much one number is than another number with a quotient less than 1.	Use numbers expressed in scientific notation to estimate very large and very small quantities. Express how many times as much one number, written in scientific notation is than another number written in scientific notation.	Generate the standard form of a number given the number in scientific notation. Use numbers written in scientific notation to calculate how many times larger or smaller one value is than another, given a real-world situation.
8.EE.4	Convert numbers in scientific notation with their decimal equivalent and vice versa. Arrange units of measure by size.	Perform operations with numbers expressed in scientific notation including problems where either decimal or scientific notation are used. Determine if a unit of measure is reasonable for a very large or very small quantity in context.	Perform operations with numbers expressed in scientific notation including problems where both decimal and scientific notation are used. Choose units of appropriate size for measurements of very large or very small quantities. Interpret scientific notation that has been generated by technology.	Perform operations using numbers written in scientific notation to solve real world situations where both decimal and scientific notation are used. Justify choice of unit of measure.
8.EE.5	Identify a proportional relationship on a graph.	Identify a proportional relationship from and identify the unit rate on the graph.	Graph proportional relationships; interpret the unit rate as the slope of the graph.	Graph proportional relationships: interpret the unit rate as the slope of the graph and apply these concepts to solve real-world problems.

Claim 3	Below Proficient	Approaching Proficient	Proficient	Above Proficient
8.EE.5	Identify two proportional relationships as being different when presented in the same ways.	Makes some comparisons between two different proportional relationships represented in different ways.	Compare two different real world proportional relationships represented in different ways.	
8.EE.6	Distinguish between a proportional and non-proportional relationship given a line on a graph.	Given a graph of a proportional relationship or non-proportional relationship, find slope between two points on the line by using slope triangles.	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.	Given a real-world situation, generate and graph the linear equation in the form y = mx or y = mx + b. Interpret the meaning of the slope and the y-intercept as they apply to the situation.
8.EE.7b	Solve one-step equations with whole numbers and can identify like terms.	Solve two-step equations with whole numbers and can combine like terms.	Solve multi-step equations with rational coefficients and can use the distributive property.	Solve complex multi-step equations with rational coefficients, use the distributive property, combine like terms, and identify equations with no solution or infinite solutions.
	Given a value, determine if it is a solution to the equation or not.	Identify a solution set to a multi-step equation as one, none, or infinite solutions.	Solve and identify the solution set for a multi-step equation as one, no, or infinitely many solutions by simplifying an equation into the form x = a, a = a, or a = b (where a and b are different values).	Solve and identify the solution set for a multi-step equation, including rational equations, as one, no solution, or infinitely many solutions by simplifying an equation into the form x = a, a = a, or a = b (where a and b are different values).
8.EE.8a	Graph a pair of simultaneous linear equations in two variables.	Solve pairs of simultaneous linear equations in two variables graphically and identify the point of intersection.	Analyze and solve pairs of simultaneous linear equations in two variables graphically and identify the point of intersection as the values for the variables that will satisfy both equations.	Solve a pair of simultaneous linear equations in two variables by graphing, substitution, and elimination. Identify the solution to the pair of equations and justify the solution mathematically by substituting the point of intersection into the pair of equations.
8.EE.8b	Solve a system of linear equations for one variable.	Solve systems of two linear equations in two variables algebraically using substitution.	Identify, by inspection, a simple case of no or infinite solutions to a pair of simultaneous equations. For example, 3x + 2y = 5 and 3x + 2y = 6 cannot simultaneously be 5 and 6 and therefore have no solution.	Identify by inspection the solution set to a system of two equations in different forms to have no solution, infinitely many, or one solution.

Claim 3	Below Proficient	Approaching Proficient	Proficient	Above Proficient
8.EE.8c	Solve a real-world system of linear equations for one variable.	Given a real-world situation, solve a given pair of simultaneous linear equations.	Solve real-world and mathematical problems leading to two linear equations in two variables. Solve by graphing algebraically and identify the solution and interpret the solution as it pertains to the real-world situation.	Given a real-world situation, write and then solve a system of two simultaneous equations in two variables. Solve the system graphically, algebraically using substitution or elimination then identify and interpret the solution as it pertains to the real-world situation.

Statistics and Probability *Student performance indicates the ability to…*

Claim 4	Below Proficient	Approaching Proficient	Proficient	Above Proficient
8.SP.1	Identify an association between two quantities when given a scatter plot.	Interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities.	Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities.	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.
8.SP.2	Identify the line of best fit for a scatterplot that suggests a linear association when given choices.	Identify the line of best fit for a scatterplot that suggests a linear association.	Use a straight line to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line.	Use a straight line to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line and justify its accuracy.
8.SP.3	Identify the equation of a linear model in the context of bivariate measurement data.	Use the equation of a linear model to solve problems in the context of bivariate measurement data.	Use the equation of a linear model to solve problems in the context of bivariate measurement data interpreting the slope and intercept.	Use different equations of a linear model to solve problems in the context of bivariate measurement data interpreting the slope and intercept to compare to determine which is a better fit.
8.SP.4	Construct a two-way table summarizing data on two categorical variables collected from the same subjects.	Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects.	Represent 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.	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.

Geometry *Student performance indicates the ability to…*				
Claim 5	**Below Proficient**	**Approaching Proficient**	**Proficient**	**Above Proficient**
8.G.1	Identify planar figures (line, line segment, angle, or parallel line).	Verify congruence of a planar figure that has been rotated, reflected, or translated without using coordinates.	Verify congruence of a planar figure (line, line segment, angle, or parallel line) that has been rotated, reflected, or translated on a coordinate plane using physical models, transparencies, or geometry software.	Prove congruence of a planar figure (line, line segment, angle, or parallel line) that has been rotated, reflected, or translated using physical models, transparencies, or geometry software.
8.G.2	Perform a basic transformation of a two-dimensional figure on a coordinate plane.	Demonstrate that a two-dimensional figure is congruent to another by performing a single transformation accuracy.	Demonstrate 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.	Prove that a two-dimensional figure is congruent to another if one can be obtained from the other by a variety of sequences of transformations. Communicate detailed and precise explanations of rotations, reflections, and translations, using advanced mathematical reasoning and terminology. Demonstrate creativity and flexibility by generating and evaluating multiple valid sequences of transformations, clearly justifying their equivalence.
8.G.3	Accurately plot polygons in all four quadrants of a coordinate plane when given the coordinates.	Identify the effect of dilations, translations, rotation, and reflections on two-dimensional figures using a coordinate plane.	Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.	Describe and interpret the effect of dilations, translations, rotations, and reflections on two-dimensional figures with coordinates to solve real world problems.
8.G.4	Draw/graph the two-dimensional image that results from one given sequence of rigid motions or dilation.	Draw/graph the two-dimensional image that results from a given sequence of rigid motions or dilations, or both. Identify the center of dilation and scale factor that maps a two-dimensional figure onto another.	Demonstrate 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.	Describe and recognize that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rigid motions or dilations or both.

Claim 5	Below Proficient	Approaching Proficient	Proficient	Above Proficient
8.G.5	Establish facts about triangles from three measures of angles or sides with no facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles.	Use informal arguments to establish some facts about the angle sum and exterior angle of triangles, about some of the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles.	Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by 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 by a transversal, and the angle-angle and congruence criterion for similarity of triangles to solve problems and to prove relationships in geometric figures.
8.G.6	Identify the Pythagorean theorem.	Explain a proof of the Pythagorean theorem.	Explain a proof of the Pythagorean theorem and its converse.	Explain a proof of the Pythagorean theorem and its converse in a real-world mathematical problem.
8.G.7	Apply the Pythagorean theorem to determine the length of a hypotenuse in a right triangle.	Apply the Pythagorean theorem to determine the length of a leg in a right triangle.	Apply the Pythagorean theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.	Apply and explain the Pythagorean theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.
8.G.8	Given two points, draw a right triangle on the coordinate plane.	Given two points, draw a right triangle and label the length of the legs on the coordinate plane.	Apply the Pythagorean theorem to find the distance between two points in a coordinate system.	Apply the Pythagorean theorem in real world mathematical problems in two and three dimensions and to find the distance between two points on a coordinate system.
8.G.9	Identify the formulas for the volume of cones, cylinders, and spheres.	Use the formulas for volume of cones, cylinders, and spheres to find the volume of solids in mathematical problems.	Know the formulas for the volumes of cones, cylinders, and spheres, and use them to solve real-world and mathematical problems.	Generate the formulas for the volume of cones, cylinders, and spheres, and use them to find the volume or dimensions of solids in mathematical and real-world problems. Apply these formulas to multiple composite mathematical solids.