

Diocese of Phoenix Math Standards
Eighth Grade

The Number System (NS) Know that there are numbers that are not rational, and approximate them by rational numbers	
2021	Standard
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. ☐ Convert a decimal expansion which repeats eventually into a rational number. DG8.S1-C1:PO2 Identify irrational numbers. DG8.S1-C1:PO3 Classify real numbers as rational or irrational. DG8.S1-C1:DPO1 Represent and use numbers in equivalent forms (integers, fractions, percents, decimals, exponents, scientific notation and square roots). DG8.S1-C1:DPO2 Identify greatest common factor and least common multiple for a set of whole numbers. ☐ Find multiples, common multiples, and least common multiples of two or more numbers. ☐ Find factors, common factors, and greatest common factor or two or more numbers.
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. DG8.S1-C1:PO1 Locate rational numbers on a number line. DG8.S1-C1:PO2 Identify irrational numbers. DG8.S1-C1:PO3 Classify real numbers as rational or irrational.

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	DG8.S1.C1:DPO1 Represent and use numbers in equivalent forms (integers, fractions, percents, decimals, exponents, scientific notation and square roots) DG8.S1.C1:DPO2 Identify greatest common factor and least common multiple for a set of whole numbers. □ Find multiples, common multiples, and least common multiples of two or more numbers. □ Find factors, common factors, and greatest common factor or two or more numbers.
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Expressions and Equations (EE) Work with radicals and integer exponents	
2021	Standard
8.EE.1	Know and apply the properties of integer exponents to generate equivalent numerical expressions. For example, $32 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$.
8.EE.2	Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, 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. DG8.S1.C1:PO2 Identify irrational numbers. DG8.S1.C1:PO3 Classify real numbers as rational or irrational. DG8.S1.C2:PO3 Determine the square of an integer. DG8.S1.C2:PO4 Determine the square root of an integer.

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	DG8.S1.C2:PO5 Identify squaring and finding square roots as inverse operations. DG8.S1.C2:PO6 Apply grade-level appropriate properties to assist in computation. DG8.S1.C2:PO7 Apply the symbols “$\sqrt{}$” to represent square root, “$\pm$” to represent roots, and “$\{\}$” as grouping symbols.
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. DG8.S1.C2:PO10 Convert standard notation to scientific notation, and vice versa.
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. DG8.S1.C2:PO10 Convert standard notation to scientific notation, and vice versa.
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. DG8.S2.C1:PO1 Formulate questions to collect data in contextual situations. DG8.S2.C1:PO4 Interpret box-and-whisker plots, circle graphs, and scatter plots. DG8.S2.C1:PO7 Formulate reasonable predictions based on a given set of data. DG8.S2.C1:PO8 Compare trends in data related to the same investigation. DG8.S2.C1:PO9 Solve contextual problems using scatter plots, box-and-whiskers plots, and double line graphs of continuous data.

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	DG8.S2.C1:PO12 Distinguish between causation and correlation. DG8.S3.C2:PO3 Determine whether a graph or table is related to a given equation of the form $y=ax^2$ where 'a' is a natural number. DG8.S3.C2:PO4 Identify independent and dependent variables for a contextual situation. DG8.S3.C3:PO2 Use variables in contextual situations DG8.S3.C4:PO1 Identify the slope of a line as the rate of change (the ratio of rise over run).
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. DG8.S3.C2:PO1 Describe the rule used in a simple grade-level appropriate function (e.g., T-chart, input/output model). DG8.S3.C2:DPO1 Represent and analyze patterns and relationships using shapes, tables, graphs, data points, verbal rules and standard algebraic notation. DG8.S3.C2:PO3 Determine whether a graph or table is related to a given equation of the form $y=ax^2$ where 'a' is a natural number. DG8.S4.C1:PO1 Draw a model that demonstrates basic geometric relationships such as parallelism, perpendicularity, similarity/proportionality, and congruence. DG8.S4.C4:PO6 Identify the properties of angles created by a transversal intersecting two parallel lines (e.g., corresponding angles are congruent). DG8.S5.C1:PO1 Describe how to use a proportion to solve a problem in context.

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8.EE.7	Solve linear equations in one variable. □ 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). □ Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms. DG8.S1.C2:DPO1 Identify the properties of addition and multiplication: Commutative, Associative, Distributive, and Identity. DG8.S1.C2:PO6 Apply grade-level appropriate properties to assist in computation. DG8.S1.C2:PO8 Use grade-level appropriate mathematical terminology. DG8.S1.C2:PO11 Simplify numerical expressions using the order of operations with grade- appropriate operations on number sets. DG8.S3.C2:PO2 Distinguish between linear and nonlinear functions, given graphic examples. DG8.S3.C2:PO3 Determine whether a graph or table is related to a given equation of the form $y=ax^2$ where 'a' is a natural number. DG8.S3.C3:PO7 Solve one-step equations with rational numbers as coefficients or as solutions.
8.EE.8	Analyze and solve pairs of simultaneous linear equations. □ 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. □ 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.

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	□ 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. DG8.S2.C4:PO1 Solve contextual problems represented by vertex-edge graphs.
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Functions (F) Define, evaluate, and compare functions	
2021	Standard
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.)
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, given 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. DG8.S3.C2:PO1 Describe the rule used in a simple grade-level appropriate function (e.g., T- chart, input/output model). DG8.S3.C2:DPO1 Represent and analyze patterns and relationships using shapes, tables, graphs, data points, verbal rules and standard algebraic notation.

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	DG8.S3.C2:PO4 Identify independent and dependent variables for a contextual situation.
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. DG8.S3.C2:PO2 Distinguish between linear and nonlinear functions, given graphic examples.
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 a relationship or from two (x, 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. DG8.S3.C1:PO1 Communicate a grade-level appropriate iterative or recursive pattern, using symbols or numbers. DG8.S3.C1:PO2 Extend a grade-level appropriate iterative or recursive pattern. DG8.S3.C1:PO3 Solve grade-level appropriate iterative or recursive pattern problems. DG8.S3.C2:PO1 Describe the rule used in a simple grade-level appropriate function (e.g., T- chart, input/output model). DG8.S3.C2:DPO1 Represent and analyze patterns and relationships using shapes, tables, graphs, data points, verbal rules and standard algebraic notation DG8.S3.C2:PO3 Determine whether a graph or table is related to a given equation of the form $y=ax^2$ where 'a' is a natural number. DG8.S3.C2:PO4 Identify independent and dependent variables for a contextual situation. DG8.S3.C4:PO1 Identify the slope of a line as the rate of change (the ratio of rise over run).

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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. DG8.S3.C2:PO4 Identify independent and dependent variables for a contextual situation. DG8.S3.C3:PO6 Identify an equation or inequality that represents a contextual situation. DG8.S3.C4:PO1 Identify the slope of a line as the rate of change (the ratio of rise over run).
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Geometry (G) Understanding congruence and similarity using physical models, transparencies, or geometry software	
2021	Standard
8.G.1	Verify experimentally the properties of rotations, reflections, and translations. □ Lines are taken to lines, and line segments to line segments of the same length. □ Angles are taken to angles of the same measure. □ Parallel lines are taken to parallel lines. DG8.S4.C1:PO6 Identify the properties of angles created by a transversal intersecting two parallel lines (e.g., corresponding angles are congruent). DG8.S4.C2:PO1 Identify the planar geometric figure that is the result of a given rigid transformation.

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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. DG8.S4.C1:PO1 Draw a model that demonstrates basic geometric relationships such as parallelism, perpendicularity, similarity/proportionality, and congruence. DG8.S4.C1:PO2 Draw 3-dimensional figures by applying properties of each (e.g., parallelism, perpendicularity, congruency). DG8.S4.C2:PO1 Identify the planar geometric figure that is the result of a given rigid transformation.
8.G.3	Using coordinates on two-dimensional figures, describe the effect of: ☐ Dilations ☐ Translations ☐ Rotations ☐ Reflections DG8.S4.C2:PO1 Identify the planar geometric figure that is the result of a given rigid transformation. DG8.S4.C3:PO2 Determine the midpoint given two points on a number line. DG8.S4.C3:PO3 Determine the distance between two points on a number line.
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. DG8.S4.C1:PO1 Draw a model that demonstrates basic geometric relationships such as parallelism, perpendicularity, similarity/proportionality, and congruence. DG8.S4.C1:PO10 Identify corresponding angles of similar polygons as congruent and sides as proportional. DG8.S4.C2:PO1 Identify the planar geometric figure that is the result of a given rigid transformation.

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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 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. DG8.S4.C1:PO6 Identify the properties of angles created by a transversal intersecting two parallel lines (e.g., corresponding angles are congruent). DG8.S4.C1:PO9 Determine whether three given lengths can form a triangle.
8.G.6	Explain a proof of the Pythagorean Theorem and its converse. DG8.S3.C2:PO4 Identify independent and dependent variables for a contextual situation. DG8.S3.C3:PO12 Solve applied problems using 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. DG8.S1.C2:PO4 Determine the square root of an integer. DG8.S1.C2:PO5 Identify squaring and finding square roots as inverse operations. DG8.S3.C3:PO12 Solve applied problems using the Pythagorean theorem. DG8.S4.C4:PO5 Find the measure of a missing interior angle in a triangle or quadrilateral. DG8.S4.C4:PO7 Calculate the length of a side, given two similar triangles.
8.G.8	Apply the Pythagorean Theorem to find the distance between two points in a coordinate system. DG8.S2.C4:PO1 Solve contextual problems represented by vertex-edge graphs. DG8.S3.C3:PO12 Solve applied problems using the Pythagorean theorem.

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	DG8.S4.C3:PO3 Determine the distance between two points on a number line.
8.G.9	Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems. DG8.S4.C1:PO1 Draw a model that demonstrates basic geometric relationships such as parallelism, perpendicularity, similarity/proportionality, and congruence. DG8.S4.C1:PO2 Draw 3-dimensional figures by applying properties of each (e.g., parallelism, perpendicularity, congruency). DG8.S4.C1:PO3 Recognize the 3-dimensional figure represented by a net. DG8.S4.C4:PO2 Solve problems involving the volume of rectangular prisms and cylinders. DG8.S4.C4:PO4 Identify rectangular prisms and cylinders having the same volume.

Statistics and Probability (SP)
Investigate patterns of association in bivariate data

2021	Standard
8.SP.1	Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe these patterns: ☐ Clustering ☐ Outliers ☐ Positive or negative association

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- ☐ Linear association
- ☐ Nonlinear association

DG8.S2.C1:PO3 Determine the appropriate type of graphical display for a given data set.

DG8.S2.C1:PO4 Interpret box-and-whisker plots, circle graphs, and scatter plots.

DG8.S2.C1:PO5 Answer questions based on box-and-whisker plots, circle graphs, and scatter plots.

DG8.S2.C1:PO6 Solve problems in contextual situations using the mean, median, mode, and range of a given data set.

DG8.S2.C1:PO8 Compare trends in data related to the same investigation.

DG8.S2.C1:PO9 Solve contextual problems using scatter plots, box-and-whiskers plots, and double line graphs of continuous data.

DG8.S2.C1:PO10 Evaluate the effects of missing or incorrect data on the results of an investigation (e.g., Susie's teacher recorded a 39 instead of a 93 for her last quiz, what will happen to Susie's average?).

DG8.S2.C1:PO11 Identify a line of best fit for a scatter plot.

DG8.S2.C1:PO12 Distinguish between causation and correlation.

DG8.S2.C2:PO3 Predict the outcome of a grade-level appropriate probability experiment.

DG8.S2.C2:PO6 Distinguish between independent and dependent events.

DG8.S2.C2:PO7 Compare the results of two repetitions of the same grade-level appropriate probability experiment.

DG8.S2.C3:PO1 Determine all possible outcomes involving the combination of two or more sets of objects (e.g., If you roll a six-sided number cube 4 times, how many possible outcomes are possible?).

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	DG8.S2.C2:PO2 Solve contextual situations using probability (e.g., If the probability of Michelle making a free throw is 0.25, what is the probability that she will make three free throws in a row?). DG8.S2.C2:PO4 Record the data from performing a grade-level appropriate probability experiment.
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. DG8.S2.C1:PO8 Compare trends in data related to the same investigation. DG8.S2.C1:PO11 Identify a line of best fit for a scatter plot.
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. DG8.S2.C1:PO7 Formulate reasonable predictions based on a given set of data. DG8.S2.C1:PO11 Identify a line of best fit for a scatter plot. DG8.S2.C2:PO2 Construct box-and-whisker plots.
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? DG8.S2.C1:PO1 Formulate questions to collect data in contextual situations.

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	DG8.S2.C1.PO3 Determine the appropriate type of graphical display for a given data set. DG8.S2.C1.PO5 Answer questions based on box-and-whisker plots, circle graphs, and scatter plots. DG8.S2.C1.PO7 Formulate reasonable predictions based on a given set of data. DG8.S2.C1.PO8 Compare trends in data related to the same investigation. DG8.S2.C1.PO9 Solve contextual problems using scatter plots, box-and-whiskers plots, and double line graphs of continuous data. DG8.S2.C1.PO11 Identify a line of best fit for a scatter plot. DG8.S2.C1.PO12 Distinguish between causation and correlation. DG8.S2.C2.PO1 Determine the probability that a specific event will occur in a 2-stage probability experiment. DG8.S2.C2.PO6 Distinguish between independent and dependent events.
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Computation Students compute with rational numbers expressed in a variety of forms. They solve problems involving ratios, proportions and percentages	
2021	Standard
8.C.1	Add, subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) in multi-step problems.

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8.C.2	Solve problems by computing simple and compound interest.
8.C.3	Use estimation techniques to decide whether the answers to computations on a calculator are reasonable.
8.C.4	Use mental arithmetic to compute with common fractions, decimals, powers, and percents.