

Diocese of Phoenix Math Standards
Sixth Grade

Ratios of Proportional Relationships (RP) Understand ratio concepts and use ratio reasoning to solve problems	
2021	Standard
6.RP.1	Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. DG6-S1-C1-PO1 Express fractions as ratios, comparing two whole numbers. DG6-S1-C1-DPO1 Develop, analyze and explain methods for solving proportions by identifying equal ratios.
6.RP.2	Understand the concept of a unit rate a/b associated with a ratio $a:b$ with $b \neq 0$, and use rate language DG6-S1-C1-PO1 Express fractions as ratios, comparing two whole numbers (e.g., $\frac{3}{4}$ is equivalent to 3:4 and 3 to 4). DG6-S1-C1-DPO1 Develop, analyze and explain methods for solving proportions by identifying equal ratios. DG6-S1-C1-DPO2 Describe how to solve a problem in context using a proportion.
6.RP.3	Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. □ Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios. □ Solve unit rate problems including those involving unit pricing and constant speed. For example, if it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?

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	□ Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent. □ Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities. DG6-S1-C1-PO1 Express fractions as ratios, comparing two whole numbers (e.g., $\frac{3}{4}$ is equivalent to 3:4 and 3 to 4). DG6-S1-C1-DPO1 Develop, analyze and explain methods for solving proportions by identifying equal ratios. DG6-S1-C1-DPO2 Describe how to solve a problem in context using a proportion. DG6-S1-C1-DPO10 Calculate the percent of a number (e.g. find 50% of 100) utilizing concrete and illustrative models.
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The Number System (NS) Apply and extend previous understandings of multiplication and division to divide fractions by fractions and compute fluently with multi-digit numbers and find common factors and multiples	
2021	Standard
6.NS.1	Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions. DG6-S1-C1-PO4 Determine the equivalency between and among fractions, decimals, and percents in contextual situations. DG6-S1-C1-DPO8 Convert fractions, decimals and percents from one to another.

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	DG6-S1-C1-DPO10 Calculate the percent of a number (e.g. find 50% of 100) utilizing concrete and illustrative models. DG6-S1-C2-PO14 Solve problems involving fractions or decimals (including money) in contextual situations. DG6-S1-C2-PO1 Select the grade-level appropriate operation to solve word problems. DG6-S1-C2-PO2 Solve word problems using grade-level appropriate operations and numbers.
6.NS.2	Fluently divide multi-digit numbers using the standard algorithm. DG5-S1-C2-PO4 Divide with whole numbers.
6.NS.3	Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation. DG5-S1-C2-PO12 Add or subtract decimals. DG5-S1-C2-PO13 Multiply decimals. DG5-S1-C2-PO14 Divide decimals “to hundredths place”. DG6-S1-C2-PO14 Solve problems involving fractions or decimals (including money) in contextual situations.
6.NS.4	Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. □ Use the distributive property to express a sum of two whole numbers 1–100 with a common factor as a multiple of a sum of two whole numbers with no common factor. For example, express $36 + 8$ as $4(9+2)$. DG5-S1-C1-DPO4 Determine lowest common multiples and greatest common factors for a set of two whole numbers.

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	DG6-S1-C1-DPO11 Factor numbers into prime form and express in exponential form. DG6-S1-C1-PO5 Identify the greatest common factor for two whole numbers. DG6-S1-C1-PO6 Determine the least common multiple for two whole numbers. DG6-S1-C1-PO7 Express a whole number as a product of its prime factors, using exponents when appropriate. DG7-S1-C1-PO2 Identify the greatest common factor for a set of whole numbers 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 multiple of two or more numbers ☐ Find factors, common factors and greatest common factor of two or more numbers
6.NS.5	Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.
6.NS.6	Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates. ☐ Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., $-(-3) = 3$, and that 0 is its own opposite. ☐ Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes. ☐ Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane. DG8-S1-C1-PO1 Locate rational numbers on a number line.

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	DG7-S3-C3-PO5 Solve one-step equations using inverse operations with positive rational numbers (e.g., $23n = 6$). DG5-S1-C1-DPO7 Recognize negative numbers as integers less than zero by extending the number line. DG7-S1-C1-PO6 Locate integers on a number line. DG8-S3-C3-PO10 Graph an inequality on a number line.
6.NS.7	Understand ordering and absolute value of rational numbers. □ Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. For example, interpret $-3 > -7$ as a statement that -3 is located to the right of -7 on a number line oriented from left to right. □ Write, interpret, and explain statements of order for rational numbers in real-world contexts. For example, write $-3^{\circ}\text{C} > -7^{\circ}\text{C}$ to express the fact that -3°C is warmer than -7°C. □ Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation. For example, for an account balance of -30 dollars, write $-30 = 30$ to describe the size of the debt in dollars. □ Distinguish comparisons of absolute value from statements about order. For example, recognize that an account balance less than -30 dollars represents a debt greater than 30 dollars.
6.NS.8	Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate. DG7-S4-C3-PO1 Graph data points in (x, y) form in any quadrant of a coordinate grid.
6.NS.9	Convert between expressions for positive rational numbers, including fractions, decimals, and percents. DG6-S1-C1-DPO2 Describe how to solve a problem in context using a proportion. DG6-S1-C1-PO2 Compare two proper fractions, improper fractions, or mixed numbers.

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	DG6-S1-C1-PO4 Determine the equivalency between and among fractions, decimals, and percents in contextual situations. DG6-S1-C1-DPO8 Convert fractions, decimals and percents from one to another. DG6-S1-C2-PO14 Solve problems involving fractions or decimals (including money) in contextual situations.
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Expressions and Equations (EE) Apply and extend previous understandings of numbers to the system of rational numbers	
2021	Standard
6.EE.1	Write and evaluate numerical expressions involving whole-number exponents. DG6-S1-C1-DPO12 Read, write and evaluate numbers involving exponents. DG7-S1-C2-DPO8 Read, write and evaluate numbers involving negative and positive exponents. DG8-S1-C1-DPO1 Represent and use numbers in equivalent forms (integers, fractions, percents, decimals, exponents, scientific notation and square roots).

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6.EE.2	Write, read, and evaluate expressions in which letters stand for numbers. □ Write expressions that record operations with numbers and with letters standing for numbers. For example, express the calculation “Subtract y from 5” as $5 - y$. □ Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity. For example, describe the expression $2(8+7)$ as a product of two factors; view $(8+7)$ as both a single entity and a sum of two terms □ Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). For example, use the formulas $V=s^3$ and $A=6s^2$ to find the volume and surface area of a cube with sides of length $s=1/2$. DG4-S3-C3-PO3 Solve one-step equations with one variable represented by a letter or symbol using multiplication of whole numbers (e.g., $12 = n \times 4$). DG5-S3-C3-PO3 Solve one-step equations with one variable represented by a letter or symbol (e.g., $15 = 45 \div n$). DG5-S3-C3-DPO1 Create numerical and algebraic expressions and equations using contextual situations. DG6-S3-C3-PO1-5 Evaluate expressions involving the four basic operations by substituting given fractions for the variable (e.g., $n+3$, when $n= \frac{1}{2}$): □ Use variables in contextual situations. □ Translate a written phrase to an algebraic expression (e.g., The quotient of m and 5 is m or m 5.) □ Translate a phrase written in context into an algebraic expression (e.g., Write an expression to describe the situation: John has x pieces of candy and buys three more. $x + 3$). □ Solve one-step equations with one variable represented by a letter or symbol, using inverse operations with whole numbers.
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6.EE.3	Apply the properties of operations to generate equivalent expressions. □ apply the distributive property to the expression $3(2 + x)$ to produce the equivalent expression $6 + 3x$. □ apply the distributive property to the expression $24x + 18y$ to produce the equivalent expression $6(4x + 3y)$. □ apply properties of operations to $y + y + y$ to produce the equivalent expression $3y$. DG5-S1-C2-PO5 Demonstrate the distributive property of multiplication over addition. DG7-S1-C2-PO7 Apply grade-level appropriate properties to assist in computation. DG7-S1-C2-DPO6 Identify the properties of addition and multiplication: Commutative, Associative, Distributive, and Identity.
6.EE.4	Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them). For example, the expressions $y + y + y$ and $3y$ are equivalent because they name the same number regardless of which number y stands for. DG4-S3-C3-PO1 Solve grade-level appropriate problems using estimation. DG5-S3-C3-PO1 Evaluate expressions involving the four basic operations by substituting given decimals for the variable. DG6-S1-C2-PO15 Simplify numerical expressions using the order of operations with gradeappropriate operations on number sets. DG6-S3-C3-PO1 Evaluate expressions involving the four basic operations by substituting given fractions for the variable (e.g., $n+3$, when $n = \frac{1}{2}$). DG7-S1-C2-PO12 Simplify numerical expressions using the order of operations with grade appropriate operations on number sets.

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	DG8-S1-C2-PO11 Simplify numerical expressions using the order of operations with grade appropriate operations on number sets. DG8-S3-C3-PO1 Evaluate algebraic expressions by substituting rational values for variables [e.g., $2(ab+ac+bc)$, when $a = 2$, $b = 3/5$, and $c = 4$].
6.EE.5	Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true. DG5-S3-C2-DPO1 Use substitution of variables to complete input/output models. DG6-S1-C2-PO1-3 Select the grade-level appropriate operation to solve word problems; Solve word problems using grade-level appropriate
6.EE.6	Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. DG5-S3-C3-DPO1 Create numerical and algebraic expressions and equations using contextual situations. DG5-S3-C3-PO2 Use variables in contextual situations. DG6-S3-C3-PO4 Translate a phrase written in context into an algebraic expression (e.g., Write an expression to describe the situation: John has x pieces of candy and buys three more. $x + 3$). DG7-S3-C3-PO3 Translate a written sentence into a one-step, one-variable algebraic equation. DG7-S3-C3-PO4 Translate a sentence written in context into an algebraic equation involving one operation.

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6.EE.7	Solve real-world and mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which p, q and x are all nonnegative rational numbers. DG7-S3-C3-PO3 Translate a written sentence into a one-step, one-variable algebraic equation. DG7-S3-C3-DPO1 Translate a written sentence into a two-step, one-variable algebraic equation. DG7-S3-C3-PO4 Translate a sentence written in context into an algebraic equation involving one operation.
6.EE.8	Write an inequality of the form $x > c$ or $x < c$ to represent a constraint or condition in a real world or mathematical problem. ☐ Recognize that inequalities of the form $x > c$ or $x < c$ have infinitely many solutions. ☐ Represent solutions of such inequalities on number line diagrams. DG7-S3-C3-DPO3 Express a simple inequality from a contextual situation (e.g. Joe earns more than \$5.00 an hour; therefore, $x > 5$). DG8-S3-C3-PO5 Translate a contextual situation into an algebraic inequality (e.g., Joe earns more than \$5.00 an hour; therefore, $x > 5$). DG8-S3-C3-PO6 Identify an equation or inequality that represents a contextual situation. DG8-S3-C3-PO10 Graph an inequality on a number line.

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6.EE.9	Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation $d = 65t$ to represent the relationship between distance and time. DG7-S4-C3-PO1 Graph data points in (x, y) form in any quadrant of a coordinate grid. DG8-S3-C2-PO4 Identify independent and dependent variables for a contextual situation.
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Geometry (G) Solve real-world and mathematical problems involving area, surface area, and volume	
2021	Standard
6.G.1	Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems. DG4-S4-C4-DPO2 Solve problems using given formulas for simple area and perimeter. DG4-S4-C4-PO9 Determine the area of squares and rectangles. DG5-S4-C4-DPO3 Develop, understand, and use formulas to find the area of rectangles, related triangles, and parallelograms. DG5-S4-C4-PO7 Solve problems involving the area of simple polygons. DG6-S4-C4-PO7 Determine the area of triangles.

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	DG6-S4-C4-PO9 Solve problems for the areas of parallelograms (includes rectangles).
6.G.2	Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas $V = l w h$ and $V = b h$ to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems. DG6-S4-C4-DPO2 Solve problems using given formulas for volume of prisms. DG5-S4-C4-DPO5 Measure length, volume, weight, and temperature in both U.S. customary and metric units. DG8-S4-C4-PO2 Solve problems involving the volume of rectangular prisms and cylinders.
6.G.3	Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems. DG6-S4-C3-PO2 State the missing coordinate of a given figure in the first quadrant of a coordinate grid using geometric properties (e.g., Find the coordinates of the missing vertex of a rectangle when two adjacent sides are drawn.). DG7-S4-C3-PO2 State the missing coordinate of a given figure in any quadrant of a coordinate grid using geometric properties (e.g., Find the coordinates of the missing vertex of a rectangle when two adjacent sides are drawn).
6.G.4	Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems. DG5-S4-C4-DPO5 Develop strategies to determine the surface area and volume of rectangular solids. DG6-S4-C1-DPO3 Draw or build three-dimensional shapes by applying significant properties of each.

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	DG7-S4-C1-PO3 Identify the net (2-dimensional representation) that corresponds to a rectangular prism, cone, or cylinder. DG8-S4-C1-PO4 Represent the surface area of rectangular prisms and cylinders as the area of their net
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Statistics and Probability (SP) Develop understanding of statistical variability	
2021	Standard
6.SP.1	Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. For example, “How old am I?” is not a statistical question, but “How old are the students in my school?” is a statistical question because one anticipates variability in students’ ages. DG6-S2-C1-PO1 Formulate questions to collect data in contextual situations.
6.SP.2	Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape. DG5-S2-C1-DPO5 Justify predictions made from a given set of data. DG6-S2-C1-PO1 Formulate questions to collect data in contextual situations. DG6-S2-C1-PO2 Construct a histogram, line graph, scatter plot, or stem-and-leaf plot with appropriate labels and title from organized data. DG6-S2-C1-PO3 Interpret simple displays of data including double bar graphs, tally charts, frequency tables, circle graphs, and line graphs.

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	DG6-S2-C1-PO4 Answer questions based on simple displays of data including double bar graphs, tally charts, frequency tables, circle graphs, and line graphs. DG6-S2-C1-PO5 Find the mean, median (odd number of data points), mode, range, and extreme values of a given numerical data set. DG6-S2-C1-PO6 Identify a trend (variable increasing, decreasing, remaining constant) from displayed data.
6.SP.3	Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number. DG6-S2-C1-PO5 Find the mean, median (odd number of data points), mode, range, and extreme values of a given numerical data set.
6.SP.4	Display numerical data in plots on a number line, including dot plots, histograms, and box plots. DG7-S2-C1-PO3 Determine when it is appropriate to use histograms, line graphs, double bar graphs, and stem-and-leaf plots. DG7-S2-C1-PO4 Interpret data displays including histograms, stem-and-leaf plots, circle graphs, and double line graphs. DG7-S2-C1-PO5 Answer questions based on data displays including histograms, stem-and-leaf plots, circle graphs, and double line graphs. DG8-S2-C1-PO2 Construct box-and-whisker plots.
6.SP.5	Summarize numerical data sets in relation to their context, such as by: ☐ Reporting the number of observations. ☐ Describing the nature of the attribute under investigation, including how it was measured and its units of measurement. ☐ Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered. ☐ Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.

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	DG6-S2-C1-PO6 Identify a trend (variable increasing, decreasing, remaining constant) from displayed data. DG6-S2-C1-PO7 Compare trends in data related to the same investigation.
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Computation Students solve problems involving addition, subtraction, multiplication and division of integers. They solve problems involving fractions, decimals, ratios, proportions and percentages	
2021	Standard
6.C.1	Read and write whole numbers in scientific notation.
6.C.2	Understand and apply the basic concept of negative numbers (e.g., on a number line, in counting, in temperature, in "owing").
6.C.3	Interpret the absolute value of a number as the distance from zero on a number line, and find the absolute value of real numbers.
6.C.4	Compare and represent on a number line positive and negative integers.
6.C.5	Compare and represent on a number line positive and negative fractions and mixed numbers.
6.C.6	Compare and represent on a number line positive and negative decimals (to the ten thousandths).

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6.C.7	Convert between any two representations of numbers (fractions, mixed numbers, decimals, and percents) without the use of a calculator.
6.C.8	Recognize decimal equivalents for commonly used fractions without the use of a calculator.
6.C.9	Use models to represent ratios.
6.C.10	Find the least common multiple and the greatest common factor of whole numbers. Use them to solve problems with fractions (e.g., to find a common denominator to add up to three fractions and mixed numbers or to find the simplified form for a fraction and mixed number).
6.C.11	Understand and compute whole number power of whole numbers.
6.C.12	Find the prime factorization of whole numbers and write the results using exponents.