

New Jersey Student Learning Standards for Mathematics and Student Learning Objectives

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Grade 6 – Quotients of Fractions Ratio and Rate Reasoning – Unit 1, Module A

Rationale

Unit 1 begins with the additional work of the grade as grade 6 learners build on previously learned concepts of performing operations on decimals to the hundredths and multi-digit whole numbers using concrete models or drawings, place value strategies and properties of operations. The major focus of the unit quotients of fractions, ratios, and unit rates. Learners interpret and compute quotients of fractions and solve word problems involving division of fractions by fractions. They understand the concept of a ratio, use ratio language to describe a ratio relationship, and use rate language in the context of a ratio relationship. The unit concludes as learners use ratio and rate reasoning to solve real-world and mathematical problems. They reason about tables of equivalent ratios, solve unit rate problems, find a percent of a quantity as a rate per 100, solve problems involving finding the whole, given a part and the percent, and use ratio reasoning to convert measurement units.

Grade 6 – Unit 1, Module A

Standard	Student Learning Objectives We are learning to ... / We are learning that ...
6.NS.B.2. Fluently divide multi-digit numbers using the standard algorithm.	divide multi-digit numbers using the standard algorithm working towards accuracy and efficiency
6.NS.B.3 Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.	add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation, working towards accuracy and efficiency

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Standard	Student Learning Objectives We are learning to ... / We are learning that ...
6.NS.A.1 Interpret and compute quotients of fractions and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem. <i>For example, create a story context for $(2/3) \div (3/4)$ and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that $(2/3) \div (3/4) = 8/9$ because $3/4$ of $8/9$ is $2/3$. (In general, $(a/b) \div (c/d) = ad/bc$). How much chocolate will each person get if 3 people share $1/2$ lb. of chocolate equally? How many $3/4$-cup servings are in $2/3$ of a cup of yogurt? How wide is a rectangular strip of land with length $3/4$ mi and area $1/2$ square mi?</i>	- compute quotients of fractions - interpret quotients of fractions - solve word problems involving division of fractions by fractions using visual models and equations

Grade 6 – Unit 1, Module B

Standard	Student Learning Objectives We are learning to ... / We are learning that ...
6.RP.A.1. Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. <i>For example, “The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak.” “For every vote candidate A received, candidate C received nearly three votes.”</i>	- explain the concept of a ratio through definition. - use ratio language to describe a relationship between two quantities.
6.RP.A.2 Understand the concept of a unit rate a/b associated with a ratio $a:b$ with $b \neq 0$, and use rate language in the context of a ratio relationship. <i>For example, “This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is $3/4$ cup of flour for each cup of sugar.” “We paid \$75 for 15 hamburgers, which is a rate of \$5 per hamburger.”</i>	- construct a unit rate (a/b) from a given ratio $(a:b)$ - explain a unit rate (a/b) associated with a ratio $(a:b)$ - express a ratio relationship using rate language

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Standard	Student Learning Objectives We are learning to ... / We are learning that ...
■ 6.RP.A.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. a. 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. b. Solve unit rate problems including those involving unit pricing and constant speed. <i>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?</i> c. 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. d. Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.	▪ represent and solve rate and ratio real-world and mathematical problems by using tables, tape diagrams, double number line diagrams, and equations ▪ create tables of equivalent ratios and find missing values with whole number measurements ▪ plot pairs of values, in the coordinate plane, from a ratio table to compare ratios ▪ solve unit rate problems, including unit pricing and constant speed ▪ find the part, whole, and percent of a quantity in real-world problems ▪ unit ratios can be used to manipulate and transform units accurately ▪ convert measurement units utilizing ratio reasoning

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Grade 6 – Introductory Statistics – Unit 2, Module A

Rationale

Unit 2 focuses on foundational statistics which includes recognizing a statistical question and understanding that data collected in response to a statistical question has a distribution. Learners understand that a distribution can be described by its center, spread and overall shape, and that the measure of center is a single number that summarizes all of the data. They display numerical data in dot plots, histograms, and box plots. The unit concludes as learners identify the number of observations for a dataset, describe how the data was measured, give the median or mean as a measure of center, give the interquartile range or mean absolute deviation as a measure of variability, and relate the choice of measures of center and variability to the shape of the data distribution. Learners discuss statistics and report on data in context, consistently reporting units of measure

Grade 6 – Unit 2, Module A

Standard	Student Learning Objectives We are learning to ... / We are learning that ...
6.SP.A.1 Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. <i>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.</i>	- a statistical question is one that anticipates variability in the data related to the question and accounts for it in the answers - recognize statistical questions
6.SP.A.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.	a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape
6.SP.A.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.	- a measure of center (mean and median) for a numerical data set summarizes all of its values with a single number - a measure of variation (interquartile range and mean absolute deviation) describes how its values vary with a single number
6.SP.B.4 Display numerical data in plots on a number line, including dot plots, histograms, and box plots.	display numerical data in plots on a number line, including dot plots, histograms, and box plots

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Grade 6 – Unit 2, Module B

Standard	Student Learning Objectives We are learning to ... / We are learning that ...
6.SP.B.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.	- summarize numerical data sets in relation to their context, such as by reporting the number of observations and describing how it was measured and the units for the measurement - describe overall patterns and any striking deviations from a data set by giving the measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation) with reference to the context with which the data was collected - the shape of the data distribution and the context in which the data were gathered can be related to the choice of measures of center and variability

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Grade 6 – Expressions, Equations, and Geometry – Unit 3

Rationale

The focus of unit 3 is writing and evaluating both numerical and algebraic expressions. The major conceptual understanding of the unit is equivalence, specifically equivalent expressions. Learners, building on the work of grade 5 using parentheses, brackets, or braces and writing simple numerical expressions, grade 6 learners write and evaluate numerical expressions involving whole-number exponents. Learners extend the grade 4 work of finding all factor pairs for a whole number in the range 1–100 by finding the greatest common factor of two whole numbers and by using the distributive property to express a sum of two whole numbers. They use order of operations to perform arithmetic operations, including those involving whole number exponents.

Grade 6 learners write, read, and evaluate algebraic expressions and apply the properties of operations (introduced in grade 1) to generate equivalent algebraic expressions. A key conceptual understanding of the unit is that solving an equation or inequality as a process of answering the question “which values from a specified set, if any, make the equation or inequality true?”. Learners move on to solve real-world and mathematical problems by writing and solving equations.

The unit concludes as learners revisit conceptual understandings from grade 3, namely that area is additive. They find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes. Learners represent three-dimensional figures using nets and use the nets to find the surface area of these figures. They also build upon the volume concepts of grade 5 to find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes.

Grade 6 – Unit 3, Module A

Standard	Student Learning Objectives We are learning to ... / We are learning that ...
■ 6.EE.A.1. Write and evaluate numerical expressions involving whole-number exponents.	▪ write a numerical expression using whole-number exponents ▪ evaluate numerical expressions involving whole number exponents
■ 6.EE.A.2 Write, read, and evaluate expressions in which letters stand for numbers. a. Write expressions that record operations with numbers and with letters standing for numbers. <i>For example, express the calculation “Subtract y from 5” as $5 - y$.</i>	▪ write an algebraic expression from a verbal description that includes operations, numbers, and variables

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Standard	Student Learning Objectives We are learning to ... / We are learning that ...
■ 6.EE.A.2 Write, read, and evaluate expressions in which letters stand for numbers. b. 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. <i>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.</i>	▪ 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
■ 6.EE.A.2 Write, read, and evaluate expressions in which letters stand for numbers. c. 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). <i>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 $s = \frac{1}{2}$.</i>	▪ evaluate expressions, including formulas, for specific values of the variables ▪ perform arithmetic operations, utilizing the Order of Operations, that include whole number exponents and no parentheses
○ 6.NS.B.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. <i>For example, express $36 + 8$ as $4(9 + 2)$.</i>	▪ find the greatest common factor of two whole numbers that are less than or equal to 100 ▪ find the least common multiple of two whole numbers that are less than or equal to 12 ▪ use the distributive property to factor the greatest common factor from a sum of two whole numbers in the range 1 to 100

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Standard	Student Learning Objectives We are learning to ... / We are learning that ...
■ 6.EE.A.3 Apply the properties of operations to generate equivalent expressions. <i>For example, 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 $3y$.</i>	▪ generate equivalent expressions using the properties of operations
■ 6.EE.A.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). <i>For example, the expressions $y + y + y$ and $3y$ are equivalent because they name the same number regardless of which number y stands for.</i>	▪ two expressions are equivalent when they name the same number regardless of which value is substituted into them ▪ identify when two expressions are equivalent
■ 6.EE.B.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.	▪ variables are used to represent unknown numbers, including any number in a specified set ▪ write expressions using variables to represent real-world or mathematical situations

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Grade 6 – Unit 3, Module B

Standard	Student Learning Objectives We are learning to ... / We are learning that ...
■ 6.EE.B.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.	▪ determine if a given number from a specified set is a solution to an equation or an inequality using substitution
■ 6.EE.B.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.	▪ write and solve equations of the form $x + p = q$ and $px = q$, where p, q, and x are all nonnegative rational numbers, for real-world and mathematical problems
■ 6.EE.C.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. <i>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.</i>	▪ two quantities which change in relationship to one another are expressed as independent and dependent variables ▪ write an equation using two quantities, an independent and a dependent variable, to represent a real-world problem ▪ analyze the relationship between the dependent and independent variables using graphs and tables and relate them to the equation

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Grade 6 – Unit 3, Module C

Standard	Student Learning Objectives We are learning to ... / We are learning that ...
▣ 6.G.A.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.	▪ find the area of right triangles and other triangles by composing into rectangles ▪ find the area of special quadrilaterals and polygons by composing into rectangles or decomposing into triangles and other shapes ▪ apply the techniques of finding area of polygons by composition or decomposition to solve real-world and mathematical problems
▣ 6.G.A.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.	▪ represent three-dimensional figures made up of rectangles and triangles by using nets ▪ use the net to find the surface area of three-dimensional figures made up of rectangles and triangles ▪ solve real-world and mathematical problems by using nets to find surface area applying net surface area techniques
▣ 6.G.A.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.	▪ we can find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes ▪ show that volume of a right rectangular prism is the same when multiplying edge lengths or packing it with unit cubes ▪ find volumes of right rectangular prisms with fractional edge lengths applying the volume formulas $V = l w h$ and $V = B h$ in real-world or mathematical problems

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Grade 6 – Integers in the Number System – Unit 4

Rationale

The major focus of Unit 4 includes positive and negative numbers, and statements of inequality. The key conceptual understanding of the unit is that positive and negative numbers are used together to describe quantities having opposite directions or values. Learners find that, as with fractions, a rational number is a point on the number line. Learners are introduced to absolute value and understand the absolute value of a rational number as its distance from 0 on the number line.

In grade 5, learners defined a coordinate system and graphed points in the first quadrant. Those ideas are extended so that learners represent points on the line and in the plane with negative number coordinates. They solve real-world and mathematical problems by graphing points in all four quadrants, including drawing polygons in the coordinate plane given coordinates for the vertices and using coordinates to find the lengths of sides in special cases.

Grade 6 – Unit 4, Module A

Standard	Student Learning Objectives We are learning to ... / We are learning that ...
6.NS.C.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.	- the signs of an ordered pair indicate its quadrant location in the coordinate plane - ordered pairs that differ only by signs are reflections across one or both axes
6.NS.C.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.	- locate numbers with opposite signs as points on opposite sides of zero on the number line - the opposite of an opposite of a number is the number itself and that zero is its own opposite

New Jersey Student Learning Standards for Mathematics and Student Learning Objectives

Standard	Student Learning Objectives We are learning to ... / We are learning that ...
6.NS.C.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. <i>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.</i> - Write, interpret, and explain statements of order for rational numbers in real-world contexts. <i>For example, write $-3^{\circ}C > -7^{\circ}C$ to express the fact that $-3^{\circ}C$ is warmer than $-7^{\circ}C$.</i> - 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. <i>For example, for an account balance of -30 dollars, write $-30 = 30$ to describe the size of the debt in dollars.</i> - Distinguish comparisons of absolute value from statements about order. <i>For example, recognize that an account balance less than -30 dollars represents a debt greater than 30 dollars.</i>	- represent the relative position of two numbers on a number line diagram using inequality statements - write and interpret statements of order using rational numbers to explain real-world problems - absolute value of a rational number is its distance from zero on the number line - express the magnitude of a positive or negative quantity in a real-world situation using absolute value - statements about order are used to distinguish comparisons of absolute value
6.EE.B.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.	- represent a constraint or condition in a real-world or mathematical problem by writing an inequality in the form $x > c$ or $x < c$ - inequalities of the form $x > c$ or $x < c$ have infinitely many solutions - represent the infinitely many solutions to the inequalities $x > c$ or $x < c$ on a number line diagram

New Jersey Student Learning Standards for Mathematics and Student Learning Objectives

Grade 6 – Unit 4, Module B

Standard	Student Learning Objectives We are learning to ... / We are learning that ...
■ 6.NS.C.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. c. 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.	▪ find and position integers and other rational numbers on a horizontal or vertical number line ▪ find and plot pairs of integers and other rational numbers on the coordinate plane
■ 6.NS.C.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. b. 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.	▪ the signs of an ordered pair indicate its quadrant location in the coordinate plane ▪ ordered pairs that differ only by signs are reflections across one or both axes
■ 6.NS.C.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.	▪ use coordinates and absolute value to find distances between points, with the same first coordinates or same second coordinates, in the four quadrants to solve real-world and mathematical problems
■ 6.G.A.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.	▪ draw polygons in the coordinate plane given coordinates of the vertices ▪ find the length of a side of a polygon using coordinates with the same first coordinate or the same second coordinate ▪ apply the technique of finding the length of a side of a polygon to solve real-world and mathematical problems in the coordinate plane