North Caldwell

Grade Level: 6

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Instructional Materials

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Supplemental Resources

- Illustrative Mathematics https://www.illustrativemathematics.org/
- Khan Academy https://www.khanacademy.org/
- National Council of Teachers of Mathematics http://www.nctm.org/
- NCTM Illuminations Resources for Teaching Math http://illuminations.nctm.org/

Interdisciplinary Connections

Mathematics is a unified body of knowledge whose concepts build upon each other. Connecting mathematical concepts includes linking ideas to related ideas learned previously.

Major emphasis should be given to ideas and concepts across mathematical content areas that help students see that mathematics is a web of closely connected ideas. Students need to connect their mathematical learning to appropriate real-world contexts. They need to create interest and maintain the interest after the novelty of the work has worn off.

Mathematics is the language of science and is greatly utilized in industry and business. It gives us the power to solve difficult real-world problems, but also helps us to understand how the universe operates.

Every mathematics teacher needs to make students unafraid of the subject by convincing the students of the usefulness of learning mathematics in their daily lives and for higher studies. The world today, which leans more and more heavily on Science and Technology, demands more from mathematics. Tomorrow's world will, no doubt, make still greater demands from mathematics.

Interdisciplinary Connections for Grade 6

Big Ideas, 2022:7.1-7.7, 8.6
Language Arts/Science – (MS ETS 1-1), (NJSLSA.W2)

- Design an Aquarium – Unit Project

Science (MS LS 1-1)

- Microscope lens – Covering and Surrounding Resource Ace Question 93

Climate Change for Grade 6

With the adoption of the 2020 New Jersey Student Learning Standards (NJSLS), New Jersey became the first state in the nation to include climate change across content areas. The goal of inclusion of climate change education implementation is to foster generations of New Jersey students that can analyze, question, interpret, to think independently, and bring critical deduction to fulfill, and to lead in jobs created by burgeoning industries of the future green economy.

- **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.
    - Students will take food production data and create equations based on the data. They will then take their equations and graph them. Students will then answer questions based on their equation and graphs.

New Jersey Student Learning Standards (NJSLS)

In Grade 6, instructional time should focus on four critical areas: (1) connecting ratio and rate to whole number multiplication and division and using concepts of ratio and rate to solve problems; (2) completing understanding of division of fractions and extending the notion of number to the system of rational numbers, which includes negative numbers; (3) writing, interpreting, and using expressions and equations; and (4) developing understanding of statistical thinking.

(1) Students use reasoning about multiplication and division to solve ratio and rate problems about quantities. By viewing equivalent ratios and rates as deriving from, and extending, pairs of rows (or columns) in the multiplication table, and by analyzing simple drawings that indicate the relative size of quantities, students connect their understanding of multiplication and division with ratios and rates. Thus students expand the scope of problems for which they can use multiplication and division to solve problems, and they connect ratios and fractions. Students solve a wide variety of problems involving ratios and rates.

(2) Students use the meaning of fractions, the meanings of multiplication and division, and the relationship between multiplication and division to understand and explain why the procedures for dividing fractions make sense. Students use these operations to solve problems. Students extend their previous understandings of number and the ordering of numbers to the full system of rational numbers, which includes negative rational numbers, and in particular negative integers. They reason about the order and absolute value of rational numbers and about the location of points in all four quadrants of the coordinate plane.

(3) Students understand the use of variables in mathematical expressions. They write expressions and equations that correspond to given situations, evaluate expressions, and use expressions and formulas to solve problems. Students understand that expressions in different forms can be equivalent, and they use the properties of operations to rewrite expressions in equivalent forms. Students know that the solutions of an equation are the values of the variables that make the equation true. Students use properties of operations and the idea of maintaining the equality of both sides of an equation to solve simple one-step equations. Students construct and analyze tables, such as tables of quantities that are in equivalent ratios, and they use equations (such as $3x = y$) to describe relationships between quantities.

(4) Building on and reinforcing their understanding of number, students begin to develop their ability to think statistically. Students recognize that a data distribution may not have a definite center and that different ways to measure center yield different values. The median measures center in the sense that it is roughly the middle value. The mean measures center in the sense that it is the value that each data point would take on if the total of the data values were redistributed equally, and also in the sense that it is a balance point. Students recognize that a measure of variability (interquartile range or mean absolute deviation) can also be useful for summarizing data because two very different sets of data can have the same mean and median yet be distinguished by their variability. Students learn to describe and summarize numerical data sets, identifying clusters, peaks, gaps, and symmetry, considering the context in which the data were collected.

Students in Grade 6 also build on their work with area in elementary school by reasoning about relationships among shapes to determine area, surface area, and volume. They find areas of right triangles, other triangles, and special quadrilaterals by decomposing these shapes, rearranging or removing pieces, and relating the shapes to rectangles. Using these methods, students discuss, develop, and justify formulas for areas of triangles and parallelograms. Students find areas of polygons and surface areas of prisms and pyramids by decomposing them into pieces whose area they can determine. They reason about right rectangular prisms with fractional side lengths to extend formulas for the volume of a right rectangular prism to fractional side lengths. They prepare for work on scale drawings and constructions in Grade 7 by drawing polygons in the coordinate plane.

Connecting the Standards for Mathematical Content to the Standards for Mathematical Practice

The Standards for Mathematical Practice describe ways in which developing student practitioners of the discipline of mathematics increasingly ought to engage with the subject matter as they grow in mathematical maturity and expertise throughout the elementary, middle and high school years. Designers of curricula, assessments, and professional development should all attend to the need to connect the mathematical practices to mathematical content in mathematics instruction.

The Standards for Mathematical Content are a balanced combination of procedure and understanding. Expectations that begin with the word "understand" are often especially good opportunities to connect the practices to the content. Students who lack understanding of a topic may rely on procedures too heavily. Without a flexible base from which to work, they may be less likely to consider analogous problems, represent problems coherently, justify conclusions, apply the mathematics to practical situations, use technology mindfully to work with the mathematics, explain the mathematics accurately to other students, step back for an overview, or deviate from a known procedure to find a shortcut. In short, a lack of understanding effectively prevents a student from engaging in the mathematical practices.

In this respect, those content standards, which set an expectation of understanding, are potential "points of intersection" between the Standards for Mathematical Content and the Standards for Mathematical Practice. These points of intersection are intended to be weighted toward central and generative concepts in the school mathematics curriculum that most merit the time, resources, innovative energies, and focus necessary to qualitatively improve the curriculum, instruction, assessment, professional development, and student achievement in mathematics.

Standards for Mathematical Practice

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. The first of these are the NCTM process standards of problem solving, reasoning and proof, communication, representation, and connections. The second are the strands of mathematical proficiency specified in the National Research Council's report *Adding It Up*: adaptive reasoning, strategic competence, conceptual understanding (comprehension of mathematical concepts, operations and relations), procedural fluency (skill in carrying out procedures flexibly, accurately, efficiently and appropriately), and productive disposition (habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one's own efficacy).

1. Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

2. Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to *decontextualize*—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to *contextualize*, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

3. Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

4. Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

5. Use appropriate tools strategically.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

6. Attend to precision.

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

7. Look for and make use of structure.

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7×8 equals the well-remembered $7 \times 5 + 7 \times 3$, in preparation for learning about the distributive property. In the expression $x^2 + 9x + 14$, older students can see the 14 as 2×7 and the 9 as $2 + 7$. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see $5 - 3(x - y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

8. Look for and express regularity in repeated reasoning.

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation $(y - 2)/(x - 1) = 3$. Noticing the regularity in the way terms cancel when expanding $(x - 1)(x + 1)$, $(x - 1)(x^2 + x + 1)$, and $(x - 1)(x^3 + x^2 + x + 1)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

Ratios and Proportional Relationships

A. Understand ratio concepts and use ratio reasoning to solve problems.

6.RP.A.1 Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. *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."*

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. *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."*[1]

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. *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?*
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.

[1] Expectations for unit rates in this grade are limited to non-complex fractions.

Understandings	Essential Questions
Students will understand that… • Ratios compare two values. • unit rates are *a/b* given that the ratio is *a:b*, such that $b \neq 0$.	• Why does one need to compare numbers? • When does one need to use ratios to compare numbers? • How can one compare and contrast numbers?
Knowledge	**Skills**
Students will know… • ratio language (the ratio of *a:b* means that there is *a* of something for every *b* of a corresponding item). • *a/b* is the same as *a:b* or *a to b.* • how to relate a percent of a quantity to a rate per 100.	Students will be able to... • use ratio language to describe a ratio relationship between two quantities. • use rate language in the context of a ratio relationship. • use ratio and rate reasoning to solve real-world and mathematical problems. • make a table of equivalent ratios relating quantities with whole-number measurements. • solve unit rate problems including those involving unit pricing and constant rate. • find a percent of a quantity as a rate per 100 and solve problems involving finding the whole, given a part or the percent. • use ratio reasoning to convert measurement units. • manipulate and transform units appropriately when multiplying or dividing quantities.

Standards for Mathematical Practice
MP1. Make sense of problems and persevere in solving them. MP2. Reason abstractly and quantitatively. MP3. Construct viable arguments and critique the reasoning of others. MP4. Model with mathematics. MP7. Look for and make use of structure. MP8. Look for and express regularity in repeated reasoning.

Resources
• **Big Ideas, 2022**:1.5, 3.1-3.6, 4.1, 4.2, 4.4, 7.1, 7.7 • **Supplemental Lessons**: Binder pp. 10-16

Assessment	
Formative Binder Quiz Exit Slips Do Now Homework	Summative Check-up Partner Quiz Unit Assessments Unit Projects

The Number System

A. Apply and extend previous understandings of multiplication and division to divide fractions by fractions.

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. *For example, create a story context for (2/3) ÷ (3/4) and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that (2/3) ÷ (3/4) = 8/9 because 3/4 of 8/9 is 2/3. (In general,* ***(a/b) ÷ (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?*

Understandings	Essential Questions
Students will understand that… • the size of a factor impacts the size of the answer with respect to the other factor. • division by a rational number may result in a quotient whose value is bigger than, equal to, or smaller than the value of the dividend.	• What is represented by division of a fraction by a fraction? • What type of visual models can be used to represent division of fractions? • How are division and multiplication of a fraction by a fraction related?
Knowledge	**Skills**
Students will know… • multiplication with fractions represents part of a part. • division of a fraction by a proper fraction creates a larger answer. • multiplication of a fraction by a proper fraction creates a smaller answer.	Students will be able to... • compute quotients of fractions. • interpret quotients of fractions. • create a story context for division. • solve word problems involving division of fractions.

Standards for Mathematical Practice

MP1. Make sense of problems and persevere in solving them.
MP2. Reason abstractly and quantitatively.
MP4. Model with mathematics
MP7. Look for and make use of structure.
MP8. Look for and express regularity in repeated reasoning.

Resources

Big Ideas, 2022: 2.1, 2.2, 2.3

Assessment

Formative	Summative
Binder Quiz Exit Slips Do Now Homework	Check-up Partner Quiz Unit Assessments Unit Projects

The Number System

B. Compute fluently with multi-digit numbers and find common factors and multiples.

6.NS.B.2 With accuracy and efficiency, divide multi-digit numbers using the standard algorithm.

6.NS.B.3 With accuracy and efficiency, add, subtract, multiply and divide multi-digit decimals using the standard algorithm for each operation.

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. *For example, express 36 + 8 as 4 (9 + 2).*

Understandings	Essential Questions
Students will understand that… • the proper operations and procedures must be determined in order to solve problems. • factors of a (whole) number are always less than or equal to the number itself. • multiples of a (whole) number are always greater than or equal to the number itself.	• Why would one need to find common factors and multiples? • In what situation would one want to use the distributive property to add two whole numbers? • What type(s) of problems require using multi-digit decimal operations?

Knowledge	Skills
Students will know… • the standard algorithm for division of multidigit numbers • the standard algorithms for addition, subtraction, multiplication, and division of multi-digit decimals • the definition of a factor. • the process of finding a factor. • the definition of a multiple. • the process of finding a multiple. • how to find the prime factorization of a number. • how to factor out a number from the sum of two whole numbers	Students will be able to... • fluently divide using the standard algorithm. • fluently add multi-digit decimals using the standard algorithm. • fluently subtract multi-digit decimals using the standard algorithm. • fluently multiply multi-digit decimals using the standard algorithm. • fluently divide multi-digit decimals using the standard algorithm. • find the greatest common factor of two whole numbers less than or equal to 100 • find 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 the sum of two whole numbers with no common factor. *For example, express 36 + 8 as 4(9 + 2).*

Standards for Mathematical Practice

MP1. Make sense of problems and persevere in solving them. MP2. Reason abstractly and quantitatively. MP4. Model with mathematics	MP5. Use appropriate tools strategically. MP7. Look for and make use of structure. MP8. Look for and express regularity in repeated reasoning.

Resources

- **Big Ideas, 2022**: 1.3, 1.4, 1.5, 2.4-2.7, 5.5
- **Supplemental Lessons**: Binders pp. 1-9

Assessment

Formative	Summative
Binder Quiz Exit Slips Do Now Homework	Check-up Partner Quiz Unit Assessments Unit Projects

The Number System

C. Apply and extend previous understandings of numbers to the system of rational numbers.

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.

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.

a. 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.
b. 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.
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.

6.NS. C.7 Understand ordering and absolute value of rational numbers.

a. 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.*
b. Write, interpret, and explain statements of order for rational numbers in real-world contexts. *For example, write –3 ºC > –7 ºC to express the fact that –3 ºC is warmer than –7 ºC.*
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.*
d. 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. 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.

Understandings	Essential Questions
Students will 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). • a rational number is a point on the number line. • rational numbers on the number line are oriented from left to right • rational numbers have an order that exists related to their location on a number line. • the absolute value of a rational number is its distance from 0 on the number line. • the distance from a point on the coordinate system to the origin (0,0) is related to the absolute value of its x- and y- coordinates .	• What are some rational numbers around us? • What are some non-rational numbers around us? • How can ordering of rational numbers help to make sense of the world around us? • When is the absolute value of a rational number used in real life?

Knowledge	Skills
Students will know… • opposite signs of numbers indicate locations on opposite sides of 0 on the number line. • the opposite of the opposite of a number is the number itself, e.g., –(–3) = 3, and that 0 is its own opposite. • signs of numbers in ordered pairs indicate locations in quadrants of the coordinate plane. • that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes. • how to find the absolute value of a rational number.	Students will be able to... • use positive and negative numbers to represent quantities in real-world contexts. • explain the meaning of 0 in situations using positive and negative numbers. • extend number-line diagrams and coordinate axes to represent points on the line and in the plane with negative number coordinates. • 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. • 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 ºC > –7 ºC to express the fact that –3 ºC is warmer than –7 ºC.* • 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.* • solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. • find distances between points with the same first coordinate or the same second coordinate, using coordinates and absolute value.

Standards for Mathematical Practice

MP1. Make sense of problems and persevere in solving them.
MP2. Reason abstractly and quantitatively.
MP4. Model with mathematics.
MP5. Use appropriate tools strategically.

Resources

- **Big Ideas, 2022:** 4.1-4.3, 8.1-8.8

Assessment

Formative	Summative
Binder Quiz Exit Slips Do Now Homework	Check-up Partner Quiz Unit Assessments Unit Projects

Expressions and Equations

A. **Apply and extend previous understandings of arithmetic to algebraic expressions.**

6.EE. A.1 Write and 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. *For example, express the calculation "Subtract y from 5" as 5 – y.*

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. *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.*

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). *For example, use the formulas $V = s^3$ and $A = 6 s^2$ to find the volume and surface area of a cube with sides of length $s = 1/2$.*

6.EE.A.3 Apply the properties of operations to generate equivalent expressions. *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.*

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). *For example, the expressions y + y + y and 3y are equivalent because they name the same number regardless of which number y stands for.*

Understandings	**Essential Questions**
Students will understand that… • algebraic expressions have letters that stand for numbers and arithmetic expressions have only numbers and no letters. • numbers can be substituted in place of letters in algebraic expressions • algebraic expressions can be equivalent to each other • area, perimeter, or volume formulas are algebraic expressions • that verbal sentences or expressions can be written as algebraic expressions	• How are mathematical expressions in which letters stand for numbers useful in real life? • What is the purpose of identifying equivalent expressions? • What is the difference between an algebraic expression and an arithmetic expression?

Knowledge	**Skills**
Students will know… • the definition of sum, term, product, factor, quotient, coefficient. • how to identify two algebraic expressions that are equivalent . • to apply the conventional order of operations when no parentheses are given. • how to apply the distributive property.	Students will be able to... • write numerical expressions involving whole-number exponents. • evaluate numerical expressions involving whole-number exponents. • write expressions in which letters stand for numbers. • read expressions in which letters stand for numbers. • evaluate expressions in which letters stand for numbers. • write expressions that record operations with numbers and with letters standing for numbers. • 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. • 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).

	• apply the properties of operations to generate equivalent expressions. Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them).

Standards for Mathematical Practice

MP1. Make sense of problems and persevere in solving them.
MP2. Reason abstractly and quantitatively.
MP5. Use appropriate tools strategically.
MP6. Attend to precision.
MP8. Look for and express regularity in repeated reasoning.

Resources

- **Big Ideas, 2022**: 1.1-1.5, 5.1-5.5, 6.1-6.4, 7.1-7.7, 8.7, 8.8

Assessment

Formative	Summative
Binder Quiz Exit Slips Do Now Homework	Check-up Partner Quiz Unit Assessments Unit Projects

Expressions and Equations

B. Reason about and solve one-variable equations and inequalities.

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.

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.

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.

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.

Understandings	Essential Questions
Students will understand that… • solving an equation or inequality will find the value(s) that will make the statement true. • a variable can represent an unknown number. • a variable can represent any number in a specified set.	• What is the difference between an equation and an inequality? • What does it mean when a number does not satisfy an equation or inequality?

Knowledge	Skills
Students will know… • that a random number may not make an equation or inequality true. • that a variable in an equation or inequality represents an unknown number. • inequalities of the form $x > c$ or $x <$ c have infinitely many solutions. • that solutions of inequalities of form x>c or x<c can be represented as intervals on the number line. • that while inequalities may have infinitely many solutions, equations have a finite number of solutions.	Students will be able to... • use substitution to determine whether a given number in a specified set will make an equation or inequality true. • use variables to represent numbers • solve real-world and mathematical problems by writing and solving equations of the form $x + p = q$ for cases in which p, q and x are all nonnegative rational numbers. • solve real-world and mathematical problems by writing and solving equations of the form $px = q$ for cases in which p, q and x are all nonnegative rational numbers. • write 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 inequalities on number line diagrams

Standards for Mathematical Practice

MP1. Make sense of problems and persevere in solving them. MP2. Reason abstractly and quantitatively.	MP4. Model with mathematics. MP5. Use appropriate tools strategically.

Resources

- **Big Ideas, 2022**: 6.1-6.4, 7.1-7.3, 8.7, 8.8
- **Supplemental Lessons**: Binder pp.17-30

Assessment

Formative	Summative
Binder Quiz Exit Slips Do Now Homework	Check-up Partner Quiz Unit Assessments Unit Projects

Expressions and Equations

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**. *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.*

Understandings	Essential Questions
Students will understand that… • quantities can change in relation to one another and the relationship can be expressed as an equation relating the two. • the value of one quantity determines the value of the second quantity. • two quantities may or may not be related.	• How is a relationship represented in tables? • How is a relationship represented in graphs? • How is a relationship represented in an equation? • How can one tell that there is a relationship between two quantities? • Why is it useful to write an equation to express one quantity in terms of another quantity?

Knowledge	Skills
Students will know… • the meaning of a dependent variable. • the meaning of an independent variable. • when two quantities are related to each other.	Students will be able to... • 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. • use the equation of a relationship between two dependent and independent variables to predict ordered pairs that are not displaced in a given graph or table

Standards for Mathematical Practice

MP1. Make sense of problems and persevere in solving them.
MP2. Reason abstractly and quantitatively.
MP4. Model with mathematics.
MP5. Use appropriate tools strategically.

Resources

- **Big Ideas, 2022**: 6.4

Assessment

Formative	Summative
Binder Quiz Exit Slips Do Now Homework	Check-up Partner Quiz Unit Assessments Unit Projects

Geometry

A. Solve real-world and mathematical problems involving area, surface area and volume.

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.

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.

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.

6.G.A.4. Represent three-dimensional figures (e.g. pyramid, triangular prism, rectangular prism) 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.

Understandings	Essential Questions
Students will understand that… • triangles and rectangles can be used to find areas of other polygons • a 2-D net of a 3-D figure can be used to find the surface area of the figure • surface area is related to "wrapping" or "covering" of a surface with square units, i.e. squares with side length of one unit • volume is related to "filling" of space with cubic units, i.e. cubes with edges of one-unit length	• Why would one want to calculate areas of polygons? • How are areas of polygons found? • How are volume and surface area of a right rectangular prism found? • Why are volumes represented in cubic units? • What is the connection between the net and surface area of 3-D figures?

Knowledge	Skills
Students will know… • that areas of triangles, including right triangles, and rectangles can be used to find areas of other polygons, when the other polygons are decomposed into triangles or composed into rectangles • that the volume of a right rectangular prism is the number of unit cubes it contains (of the appropriate unit fraction edge length) • the total area of a net of a 3-D figure is the surface area of the figure	Students will be able to... • find the area of right triangles. • find the area of other triangles. • find the area of special quadrilaterals. • find the areas of polygons by composing them into rectangles or decomposing them into triangles • represent three-dimensional figures using nets • to find the surface area of a 3-D figure by finding the total area of its 2-D net

Standards for Mathematical Practice

MP1. Make sense of problems and persevere in solving them. MP4. Model with mathematics. MP5. Use appropriate tools strategically.	MP6. Attend to precision. MP7. Look for and make use of structure.

Resources

- **Big Ideas, 2022**:7.1-7.7, 8.6
- **Supplemental Lessons**: Binder pp.31-36

Assessment

Formative	Summative
Binder Quiz Exit Slips Do Now Homework	Check-up Partner Quiz Unit Assessments Unit Projects

Statistics and Probability

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. *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.*

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.

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.

Understandings	Essential Questions
Students will understand that… • statistical questions anticipate variability • a set of data has a distribution • center and spread are two related but different ways of describing a set of data	What is a statistical question? • What is a distribution? • What is the difference between the center and the spread of a numerical set? • How are data sets described?
Knowledge	**Skills**
Students will know… • that a set of data can be described by its center, spread, and overall shape • how to find the center of a numerical data set • the center summarizes a data set with a single number • the spread is a measure of variation of all values in a data set about the center	Students will be able to... • 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.* • 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. • 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.

Standards for Mathematical Practice

MP1. Make sense of problems and persevere in solving them. MP4. Model with mathematics. MP5. Use appropriate tools strategically.	MP6. Attend to precision. MP7. Look for and make use of structure. MP8. Look for and express regularity in repeated reasoning.

Resources

- **Big Ideas, 2022**: 9.1-9.5, 10.1, 10.3-10.5

Assessment

Formative Binder Quiz Exit Slips Do Now Homework	Summative Check-up Partner Quiz Unit Assessments Unit Projects

Statistics and Probability

B. Summarize and describe distributions

6.SP. B.4. Display numerical data in plots on a number line, including dot plots, histograms, and box plots.

6.SP. B.5. Summarize numerical data sets in relation to their context, such as by:

a. Reporting the number of observations.
b. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.
c. 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.
d. 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.

Understandings	Essential Questions
Students will understand that… • numerical data can be displayed in multiple ways. • summaries of numerical data vary based on their contexts. • overall patterns of numerical data can vary. • some patters in numerical data can have striking deviations.	How do measures of center and variability help us make sense of the world around us? • In what contexts are the measures of center and variability preferred descriptions of the data? • Why do we need multiple ways of describing numerical data?

Knowledge	Skills
Students will know… • how to display numerical data using dot plots, histograms, and box plots. • how to summarize numerical data in multiple ways. • that the choice of measures of center and variability depends on the context. • how to identify a striking deviation from the overall pattern. • real life examples of patterns with, and without, striking deviations.	Students will be able to... • construct dot plots, histograms, and box plots. • summarize numerical data by: o reporting the number of observations; o describing the nature of the attribute under investigation, including how it was measured and its units of measurement; o giving quantitative measures of center (median and/or mean) o giving quantitative measures of variability (interquartile range and/or mean absolute deviation); o describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered; o 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.

Standards for Mathematical Practice

MP1. Make sense of problems and persevere in solving them. MP4. Model with mathematics. MP5. Use appropriate tools strategically.	MP6. Attend to precision. MP7. Look for and make use of structure. MP8. Look for and express regularity in repeated reasoning.

Resources

- **Big Ideas, 2022**: 9.1-9.5, 10.1-10.5

Assessment

Formative	Summative
Binder Quiz Exit Slips Do Now Homework	Check-up Partner Quiz Unit Assessments Unit Projects

Career Readiness, Life Literacies, and Key Skills

Career Readiness, Life Literacies, and Key Skills
Rapid advancements in technology and subsequent changes in the economy have created opportunities for individuals to compete and connect on a global scale. In this increasingly diverse and complex world, the successful entrepreneur or employee must not only possess the requisite education for specific industry pathways but also employability skills necessary to collaborate with others and manage resources effectively in order to establish and maintain stability and independence. This document outlines concepts and skills necessary for New Jersey's students to thrive in an ever-changing world. Intended for integration throughout all K–12 academic and technical content areas, the New Jersey Student Learning Standards- Career Readiness, Life Literacies, and Key Skills (NJSLS-CLKS) provides the framework for students to learn the concepts, skills, and practices essential to the successful navigation of career exploration and preparation, personal finances and digital literacy.

Mission
Career readiness, life literacies, and key skills education provides students with the necessary skills to make informed career and financial decisions, engage as responsible community members in a digital society, and to successfully meet the challenges and opportunities in an interconnected global economy.

Vision
An education in career readiness, life literacies, and key skills fosters a population that:
•Continually self-reflects and seeks to improve the essential life and career practices that lead to success;
•Uses effective communication and collaboration skills and resources to interact with a global society;
•Possesses financial literacy and responsibility at home and in the broader community;
•Plans, executes, and alters career goals in response to changing societal and economic conditions; and
•Seeks to attain skill and content mastery to achieve success in a chosen career path.

Standards for Career Readiness, Life Literacy and Key Skills

- **9.1.8.CDM.1:** Compare and contrast the use of credit cards and debit cards for specific purchases and the advantages and disadvantages of using each.
- **9.1.8.CDM.2:** Demonstrate an understanding of the terminology associated with different types of credit (e.g. credit cards, installment loans, mortgages, lines of credit) and compare and calculate the interest rates associated with each.
- **9.1.8. FP.7:** Identify the techniques and effects of deceptive advertising.
- **9.4.8.IML.2:** Identify specific examples of distortion, exaggeration, or misrepresentation of information.
- **9.4.8.IML.12:** Use relevant tools to produce, publish, and deliver information supported with evidence for an authentic audience.
- **9.4.8.TL.2:** Gather data and digitally represent information to communicate a real-world problem (e.g. MS-ESS3-4, 6.1.8.EconET.1, 6.1.8.CivicsPR.4)
- **9.4.8.TL.3:** Select appropriate tools to organize and present information digitally.
- **9.4.8.TL.6:**Collaborate to develop and publish work that provides perspectives on a real-world problem.

Computer Science and Design Thinking

Computer Science and Design Thinking
New approaches necessary for solving the critical challenges that we face as a society will require harnessing the power of technology and computing. Rapidly changing technologies and the proliferation of digital information have permeated and radically transformed learning, working, and everyday life. To be well-educated, global-minded individuals in a computing-intensive world, students must have a clear understanding of the concepts and practices of computer science. As education systems adapt to a vision of students who are not just computer users but also computationally literate creators who are proficient in the concepts and practices of computer science and design thinking, engaging students in computational thinking and human-centered approaches to design through the study of computer science and technology serves to prepare students to ethically produce and critically consume technology.

Mission
Computer science and design thinking education prepares students to succeed in today's knowledge-based economy by providing equitable and expanded access to high-quality, standards-based computer science and technological design education.

Vision
All students have equitable access to a rigorous computer science and design thinking education. Students will benefit from opportunities to engage in high-quality technology programs that foster their ability to:
• develop and apply computational and design thinking to address real-world problems and design creative solutions;
• engage as collaborators, innovators, and entrepreneurs on a clear pathway to success through postsecondary education and careers;
• navigate the dynamic digital landscape to become healthy, productive, 21st century global-minded individuals; and
• participate in an inclusive and diverse computing culture that appreciates and incorporates perspectives from people of different genders, ethnicities, and abilities.

Standards for Computer Science and Design Thinking

- **8.1.8.DA.1:** Organize and transform data collected using computational tools to make it usable for a specific purpose.
- **8.1.8.DA.5:** Test, analyze, and refine computational models.
- **8.1.8.AP.1:** Design and illustrate algorithms that solve complex problems using flowcharts and/or pseudocode.
- **8.1.8.AP.4:** Decompose problems and sub-problems into parts to facilitate the design, implementation and review of programs.

Differentiation Strategies

Students with Disabilities/ Students at Risk of School Failure

(For students with disabilities, appropriate accommodations, instructional adaptations, and/or modifications should be determined by the IEP or 504 team)

Modifications for Classroom

- Pair visual prompts with verbal presentations
- Ask students to restate information, directions, and assignments.
- Give repetition and practice exercises
- Model skills/techniques to be mastered
- Give extended time to complete class work
- Provide copy of class notes
- Determine if preferential seating would be beneficial
- Provide access to a computer
- Provide copies of textbooks for home
- Provide access to books on tape/CD/digital media, as available and appropriate
- Assign a peer helper in the class setting
- Provide oral reminders and check student work during independent work time
- Assist student with long- and short-term planning of assignments
- Encourage student to proofread assignments and tests
- Provide regular parent/school communication

Modifications for Homework and Assignments

- Provide extended time to complete assignments
- Break down assignments
- Provide the student with clearly stated (written) expectations and grading criteria for assignments
- Implement RAFT activities as they pertain to the types/modes of communication (role, audience, format, topic)

Modifications for Assessments

- Provide extended time on classroom tests and quizzes
- Provide alternate setting as needed
- Restate, reread, and clarify directions/questions
- Distribute study guide for classroom tests
- Establish procedures for accommodations /modifications for assessments

Differentiation Strategies

Gifted and Talented

(content, process, product and learning environment)

- Allow students to pursue independent projects based on their individual interests
- Provide enrichment activities that include more advanced material
- Allow team-teaching opportunities and collaboration
- Set individual goals
- Conduct research and provide presentation of appropriate topics
- Design surveys to generate and analyze data to be used in discussion.
- Use Higher-Level Questioning Techniques
- Provide assessments at a higher level of thinking

English Language Learners

Modifications for Classroom

- Pair visual prompts with verbal presentations
- Provide repetition and practice
- Model skills/techniques to be mastered

Modifications for Homework/Assignments

- Provide Native Language Translation (peer, online assistive technology, translation device, bilingual dictionary)
- Provide extended time for assignment completion as needed
- Highlight key vocabulary
- Use graphic organizers