Mathematics 6
Grade 6
Full Year

Course Overview

Grade 6 Mathematics endeavors to produce confident thinkers and problem solvers. Lessons in this course allow students of varying ability to demonstrate mastery over a broad range of core skills. The contents of this course require critical and creative thinking, multiple strategies for problem solving and the maturational level required for the beginning of pre-algebra. The curriculum challenges students to develop a strong foundation in skills and concepts and encourages them to investigate reason and explain. Units are tied to the New Jersey Student Learning Standards and include the following: Ratios and Proportional Relationships, The Number System, Expressions and Equations, Geometry, and Statistics and Probability.

New Jersey Student Learning Standards
The New Jersey Student Learning Standards (NJSLS) can be located at www.nj.gov/education/cccs/2020/.

Ratio and Proportional Relationships:
6.RP.A.1 Understand the concept of a ratio and use ratio language to describe a ratio 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
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.

The Number System:
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
6.NS.B.2 Fluently divide multi-digit numbers using the standard algorithm.
6.NS.B.3 Fluently 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
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.
6.NS.C.7 Understand ordering and absolute value of rational numbers.

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.

Expressions and Equations:
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.
6.EE.A.3 Apply the properties of operations to generate equivalent expressions.
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).
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.
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.

Geometry:
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 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.

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

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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.

Technology Standards
9.4.2.DC.6: Identify respectful and responsible ways to communicate in digital environments.

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9.1.8.PB.4: Construct a simple personal savings and spending plan based on various sources of income and different stages of life (e.g. teenager, young adult, family).
9.2.8.CAP.3: Explain how career choices, educational choices, skills, economic conditions, and personal behavior affect income.

Career Ready Practices
CRP4. Communicate clearly and effectively and with reason.
CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
CRP11. Use technology to enhance productivity.

Interdisciplinary Connections
English Language Arts:
   ● NJSLSA.R1. Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

Units of Study

Unit 1 - Numerical Expressions and Factors (~*16 days*)
   ● How can we write and evaluate an expression that represents a real-life problem?
   ● Which words correspond to the four operations of addition, subtraction, multiplication, and division?
   ● Does the order in which we perform an operation matter?
   ● How do we multiply two 2-digit numbers using mental math?
   ● How can we use formulas to find the area of an object with an unusual shape?

Unit 2 - Fractions and Decimals (~*27 days*)
   ● How can we use understanding of whole number multiplication and division to divide fractions by fractions?
   ● Can we use arithmetic to fluently compute using multi-digit numbers and find common factors and multiples?
   ● How can we apply understanding of numbers to the system of rational numbers?

Unit 3 - Ratios and Rates (~*28 days*)
   ● How can we use ratio concepts and ratio reasoning to solve problems?
   ● Do I understand the concepts of ratios and
   ● equivalent ratios?

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- Can I Use tape diagrams to model and solve ratio problems? Am I able to use ratio tables to represent equivalent ratios and solve ratio
- problems?
- Do I Understand the concept of a unit rate and solve rate problems?

Unit 4 - Percents (*~28 days*)
- How do we write percentages as fractions and fractions as percentages?
- How do we write percentages as decimals and decimals as percentages?
- How do we compare and order fractions, decimals, and percents?
- Are we able to find a percent of a quantity and solve percent problems?

Unit 5 - Algebraic Expressions and Properties (*~14 days*)
- How can we use understandings of arithmetic to apply and extend to algebraic expressions?

Unit 6 - Equations (*~14 days*)
- How can we reason about and solve one-variable equations and inequalities?
- How can we represent and analyze quantitative relationships between dependent and independent variables?

Unit 7 - Area, Surface Area, and Volume (*~18 days*)
- How can we use area, surface area, and volume to solve real-world and mathematical problems?

Unit 8 - Integers, Numbers Lines, and the Coordinate Plane (*~15 days*)
- Do we understand the concept of negative numbers and how they are used along with positive numbers to describe quantities?
- How can we compare and order integers?
- How do we compare and order rational numbers.?
- Do we understand the concept of absolute value?
- How do we plot and reflect ordered pairs in all four quadrants of a coordinate plane?
- What strategies are useful when drawing polygons in the coordinate plane and finding distances between points in the coordinate plane?
- How do we write inequalities and represent solutions of inequalities on number lines?
- What strategies are useful when we write and solve inequalities?

Unit 9/10 - Statistical Measures and Data Displays (combined) (*~20 days*)
- How can we summarize and describe distributions?
- What is statistical variability?

Learning Objectives/Discipline Standards of Practice

Learning Objectives:
- Write algebraic expressions that represent real-world scenarios
- Evaluate algebraic expressions that represent real-world scenarios
- Accurately utilize order of operations
- Multiply two-digit numbers effectively using mental math strategies
- Find the area of composite shapes
- Divide fractions by fractions
- Identify commons multiples
- Identify common factors

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- Understand the rational number system
- Solve problems that require reasoning with ratios
- Understand the concept of a unit rate
- Solve rate problems
- Convert percentages to fractions
- Convert fractions to percentages
- Convert percentages to proportions with decimals
- Convert proportions with decimals to percentages
- Solve problems the require the use of percentages and proportions
- Solve one-variable equations
- Solve one-variable inequalities
- Analyze the relationship between independent and dependent variables
- Use area, surface area, and volume to solve real-world problems
- Utilize negative and positive numbers to appropriately describe quantities
- Compare and order integers
- Compare and order rational numbers
- Understand absolute value
- Plot ordered pairs on a coordinate plane in all four quadrants
- Reflect ordered pairs within the coordinate plane
- Drawing geometric figures within a coordinate plane
- Apply understanding of coordinate geometry to calculate the distance between points
- Write inequalities and their solutions on a number line
- Summarize data distributions using shape, center, and spread

Discipline Standards of Practice:
MP.1: Make sense of problems and persevere in solving them
MP.2: Reason abstractly and quantitatively
MP.3: Construct viable arguments
MP.4: Model with Mathematics
MP.5: Use appropriate tools strategically
MP.6: Attend to precision
MP.7: Look for and make use of structure
MP.8: Look for and express regularity in repeated reasoning

Instructional Resources and Materials
Whole class resources have been identified with an asterisk.

Resources
Big Ideas Math Modeling Real Life - Grade 6, Larson and Boswell, National Geographic Learning, 2018*

Materials
- Scientific Calculator
- Desmos Graphing Calculator
- Graph paper

Assessment Strategies

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Assessment is designed to measure a student's mastery of a course standard and learning objective. Assessment can be used for both instructional purposes (formative assessment) and for evaluative purposes (summative assessment).

The following is a general list of the many forms assessment may take in learning.
- Tests
- Quizzes
- Projects
- Unit Assessments