Mathematics 6 (9060) Course Overview Curriculum Document

Course Description

Grade 6 begins with a unit on reasoning about area and understanding and applying concepts of surface area. It is common to begin the year by reviewing the arithmetic learned in previous grades, but starting instead with a mathematical idea that students haven't seen before sets up opportunities for students to surprise the teacher and themselves with the connections they make. Instead of front-loading review and practice from prior grades, these materials incorporate opportunities to practice elementary arithmetic concepts and skills through warm-ups, in the context of instructional tasks, and in practice problems as they are reinforcing the concepts they are learning in the unit. In this course, students should encounter plenty of examples of a mathematical or statistical idea in various contexts before that idea is named and studied as an object in its own right. In the first unit, students will generalize arithmetic by writing simple expressions like $\frac{1}{2}bh$ and $6s^2$ before they study algebraic expressions as a class of objects in the sixth unit. Sometimes this principle is put into play several units before a concept is developed more fully, and sometimes in the first several lessons of a unit, where students have a chance to explore ideas informally and concretely, building toward a more formal and abstract understanding later in the unit.

Credits	Prerequisites
N.A.	Fifth Grade Math

Board Approved	Revised
June 2023	

Required Assessments

District-wide, standards-based common summative assessments

Textbooks/Resources

Illustrative Mathematics. (2020). *Middle School Math: Grade 6*. Kendall Hunt.
Book 1: Unit 1 - 3, Book 2: Unit 4 - 6, Book 3: Unit 7 - 9

Course Essential Understandings

As a result of successfully completing this course, students will understand that:

- polyhedra nets can be used to determine the surface area
- forming a ratio as a measure of a real-world attribute involves isolating that attribute from other attributes and understanding the effect of changing each quantity on the attribute of interest
- proportional relationships express how quantities change in relationship to each other
- some percentages can be approximated by simple fractions and used to estimate the percent of a number
- division is related to repeated subtraction as multiplication is related to repeated addition
- rational numbers can be represented in multiple ways and are useful when examining situations involving numbers that are not whole
- decimal computation is necessary to solve real world application problems
- Algebraic expressions and equations can help solve real-world application problems
- inequalities are used in real world problems and can be modeled using number lines and solved using different operations
- graphical representations and statistical representations can be used to make interpretations and predictions about real world situations

Course Relevance Questions

What thought-provoking questions will foster inquiry, meaning-making, and transfer?

- How can I use mathematical reasoning to apply math concepts with real-world context?

Unit Overviews

Unit Name	Unit Description	Unit Relevance Question	Instructional Standards	Assessed Standards
Unit 1: Area and Surface Area	In this unit, students learn to find areas of polygons by decomposing, rearranging, and composing shapes. They learn to understand and use the terms "base" and "height," and find areas of parallelograms and triangles. Students approximate areas of non-polygonal regions by polygonal regions. They represent polyhedra with nets and find their surface areas. Lessons included: reasoning to find area, parallelograms, triangles, polygons, surface area, and squares and cubes.	What are area and surface area? How can I use surface area to reason about real-world objects?	6.G.A.1 6.EE.A.2.a 6.EE.A.2.c 6.G.A.4 6.G.A.2 6.EE.A 6.EE.A.1	6.G.A.1 (mid, end) 6.G.A (end) 6.G.A.4 (end) 6.EE.A.1 (end)
Unit 2: Introducing Ratios	In this unit, students learn to understand and use the terms "ratio," "rate," "equivalent ratios," "per," "at this rate," "constant speed," and "constant rate," and to recognize when two ratios are or are not equivalent. They represent ratios as expressions, and represent equivalent ratios with double number line diagrams, tape diagrams, and tables. They use these terms and representations in reasoning about situations involving color mixtures, recipes, unit pricing, and constant speed. Lessons included: what are ratios, representing equivalent ratios, solving ratio and rate problems, and part-part-whole ratios.	What are ratios? How can I solve real-world problems about ratios and rates?	6.RP.A.1 6.RP.A.3 6.RP.A.3.b 6.RP.A.2 6.RP.A.3.a 6.RP.A	6.RP.A.1 6.RP.A.3 6.RP.A.2 6.RP.A.3.b
Unit 3: Unit Rates and Percentages	In this unit, students learn to understand and use the terms "unit rate," "speed," "pace," "percent," and "percentage," and recognize that equivalent ratios have equal unit rates. They represent percentages with tables, tape diagrams, and double number line diagrams, and as expressions. They use these terms and representations in reasoning about situations involving unit price, constant speed, and measurement conversion. Lessons included: units of measurement, unit conversion, rates, and percentages.	What are unit rates and percentages? How can I apply what I have learned about unit rates and percentages to solve problems about percentages?	6.RP.A.2 6.RP.A.3.d 6.RP.A.3.b 6.RP.A.3 6.RP.A.3.c 6.G.A 6.RP.A	6.RP.A.3.c 6.RP.A.3.b 6.RP.A.2 6.RP.A.3.d 6.RP.A.3
Unit 4: Dividing Fractions	In this unit, students examine how the relative sizes of numerator and denominator affect the size of their quotient when numerator or denominator (or both) is a fraction. They acquire the understanding that dividing by has the same outcome as multiplying by , then by . They compute quotients of fractions. They solve problems involving lengths and areas of figures with fractional side lengths and extend the	What is division? How can I use mathematical expressions to represent and solve problems that involve fractions?	6.NS.A.1 6.G.A.1 6.G.A.2	6.NS.A.1 (mid, end) 6.G.A.2 (end)

	formula for the volume of a right rectangular prism to prisms with fractional edge lengths and use it to solve problems. They use tape diagrams, equations, and expressions to represent situations involving partitive or quotitive interpretations of division with fractions. Given a multiplication or division equation or expression with fractions, they describe a situation that it could represent. They use tape diagrams and equations in reasoning about situations that involve multiplication and division of fractions. Lessons included: making sense of division, meanings of fraction division, algorithm for fraction division, and fractions in lengths, areas, and volumes.			
Unit 5: Arithmetic in Base Ten	In this unit, students compute sums, differences, products, and quotients of multi-digit whole numbers and decimals, using efficient algorithms. They use calculations with whole numbers and decimals to solve problems set in real-world contexts. Lessons included: warming up to decimals, adding and subtracting decimals, and multiplying decimals.	What are decimals? How can I use calculations with decimals to solve problems set in real-world contexts?	6.NS.B.3 6.EE.A 6.NS.B 6.NS.B.2 6.EE.A.4	6.NS.B (mid) 6.NS.B.3 (mid, end) 6.NS.B.2 (end) 6.RP.A.3.b (end)
Unit 6: Expressions and Equations	In this unit, students learn to understand and use the terms “variable,” “coefficient,” “solution,” “equivalent expressions,” “exponent,” “independent variable,” and “dependent variable.” They begin to write coefficients next to variables without a multiplication symbol, e.g., $10x$ rather than $10 \cdot x$, and note that x is $1 \cdot x$. They learn other situations in which the multiplication symbol can be omitted, e.g., $6 \cdot (3 + 2)$ can be written $6(3 + 2)$. They work with expressions that have positive whole-number exponents and whole-number, fraction, or variable bases, using properties of exponents strategically to evaluate these expressions, given a value for the variable. They find solutions for linear equations in one variable and simple equations that include exponents, e.g., $2^x = 32$ and $100 = 2^x$. They use these terms and representations (including expressions with two variables) in reasoning about real-world and geometrical situations, understanding that some values of variables may not make sense in a given context. They represent collections of equivalent ratios as equations and use and make connections between tables, graphs, and linear equations that represent the same relationships. Lessons included: equations in one variable, equal and equivalent, expressions with exponents, and relationships between quantities.	What is a variable and how is a variable used to create an equation?	6.EE.B 6.EE.B.5 6.EE.B.6 6.EE.B.7 6.NS.B.3 6.EE.A.2.a 6.EE.A.2.c 6.RP.A.3.c 6.EE.A.2 6.EE.A.3 6.EE.A.4 6.EE.A.1 6.EE.C.9 6.RP.A.1 6.RP.A.3.a 6.RP.A.3.b	6.EE.B.5 (mid) 6.EE.B.6 (mid) 6.EE.B.7 (mid) 6.EE.A.3 (mid) 6.EE.A.4 (mid) 6.RP.A.3.c (mid) 6.EE.A.2.a (mid) 6.EE.A.1 (end) 6.EE.A.4 (end) 6.EE.A.2.b (end) 6.EE.A.3 (end) 6.RP.A.3.a (end) 6.EE.C.9 (end)
Unit 7: Rational Numbers	In this unit, students interpret signed numbers in contexts (e.g., temperature above or below zero, elevation above or below sea level). They understand and use the terms “positive number,” “negative number,” “rational number,” “opposite,” “sign,” “absolute value,” “a solution to an inequality,” “less than,” “greater than,” and the corresponding symbols. They plot points with signed rational number coordinates on the number line, and recognize and use the connection between relative position of two points on the number line and inequalities involving the coordinates of the points. (These are limited to strict inequalities rather than inequalities such as $2 \leq x$ which occur in grade 7.) They understand and use absolute value notation, understanding that the absolute value of a number as its distance from zero on the number line. Students graph inequalities in one variable on number line diagrams, using a circle or disk to indicate when a given point is, respectively, excluded or included. They solve simple inequalities, understanding that there may be infinitely many solutions, and show solutions symbolically and on the number line. They interpret solutions of inequalities in contexts, understanding that some solutions do not make sense in some contexts. Students plot pairs of signed number coordinates in the plane, understanding the relationship between the signs of a pair of coordinates and the quadrant of the corresponding point, and use coordinates to calculate horizontal and vertical distances between two points. Students understand and use the terms “common factor,” “greatest common factor,” “common multiple,” and “least common multiple,” and solve problems set in real-world contexts in which common factors or multiples occur. Lessons included: negative numbers and absolute value, inequalities, the coordinate plane, and common factors and common multiples.	What are signed numbers and plot points? What is a rational number? How can I use rational numbers and opposite and negative numbers in real-world contexts?	6.NS.C.5 6.NS.C 6.NS.C.6 6.NS.C.6.a 6.NS.C.6.c 6.NS.C.7 6.NS.C.7.a 6.NS.C.7.b 6.NS.C.7.c 6.NS.C.7.d 6.EE.B.6 6.EE.B.8 6.EE.B.5 6.EE.A.2.b 6.NS.C.6.b 6.NS.C.8 6.G.A.3 6.NS.B.4	6.NS.C.6.c 6.EE.B.8 6.NS.B.4 6.NS.C.7 6.NS.C.5 6.NS.C.7.b 6.G.A.3 6.NS.C.8
Unit 8: Data Sets and Distributions	In this unit, students learn about populations and study variables associated with a population. They understand and use the terms “numerical data,” “categorical data,” “survey” (as noun and verb), “statistical question,” “variability,” “distribution,” and “frequency.” They make and interpret histograms, bar graphs, tables of frequencies, and box plots. They describe distributions (shown on graphical displays) using terms such as “symmetrical,” "peaks," “gaps,” and “clusters.” They work with measures of center—understanding and using the terms “mean,” “average,” and “median.” They work with measures of variability—understanding and using the terms “range,” ”mean absolute deviation” or MAD, “quartile,” and “interquartile range” or IQR. They interpret measurements of center and variability in contexts Lessons include: data, variability and statistical questions; dot plots and histograms, measures of center and variability, and median and IQR.	What are data sets and how can I use data? How can the collection, organization, interpretation, and display of data be used to answer questions, solve problems, or make effective predictions?	6.SP.B 6.SP.A 6.SP.A.1 6.SP.B.5.b 6.SP.B.4 6.SP.B.5.a 6.SP.A.2 6.SP.A.3 6.SP.B.5.c 6.NS.B.3 6.SP.B.5.d 6.SP.B.5	6.SP.A.1 (mid) 6.RP.A.3.c (mid) 6.SP.B.4 (mid, end) 6.SP.B.5.a (mid) 6.SP.A.3 (mid) 6.SP.B.5.c (mid, end) 6.SP.B.5 (end) 6.SP.A.2 (end) 6.SP.A.3 (end) 6.SP.B.5.a (end) 6.SP.B.5.d (end)