NOBLESVILLE SCHOOLS CURRICULUM

Mathematics

6th Grade Academic-Level Course

The Indiana Academic Standards define what students should know, understand, and be able to do at grade level beginning in kindergarten and progressing through grade twelve. These standards serve as the foundation to our curriculum in Noblesville Schools but are not a curriculum on their own. The Indiana Academic Standards are supported through grade-level, content-area curriculum maps. These curriculum maps and materials are aligned to the Indiana Academic standards while also providing the conditions necessary to be responsive to the needs of all learners. Therefore, these maps are revised on a yearly basis.

In addition to the academic grade level standards for math are the Indiana Mathematics Process Standards. These standards represent the ways k-12 students should develop conceptual understanding of math content and the ways students should apply mathematical skills. For example, process standard 3, “Construct viable arguments and critique the reasoning of others” refers to the critical mathematical skill of explaining one’s own strategies and ideas as well as having discussions with other students who may have used different strategies or arrived at different answers. These skills serve math students at all grades and levels, and are identified here.

- PS.1: Make sense of problems and persevere in solving them.
- PS.2: Reason abstractly and quantitatively.
- PS.3: Construct viable arguments and critique the reasoning of others.
- PS.4: Model with mathematics.
- PS.5. Use appropriate tools strategically.
- PS.6. Attend to precision.
- PS.7. Look for and make use of structure.
- PS.8.Look for and express regularity in repeated reasoning.

In sixth grade, instructional time is focused on both these process standards and the academic standards, which include number sense, computation, algebraic thinking, geometry, measurement, and data analysis. Some key concepts for sixth grade include the following:

- *Expressions and Equations:* Expressions show students how math “works” and can include symbols, numbers, and variables. Students also learn what “like terms” are and spend time on the concept of equations. It is important to model this conceptually for students with algebra tiles, drawings, and scales.

- *Integers:* Students in sixth grade need to know what negative number is in relation to the left side of the zero or the number line.

- *Number Sense:* Sixth grade is a critical time to focus on the relationship between fractions, decimals, and percents. It is important to model what numbers look like across these three representations. Students need fluent knowledge of common fractions with denominators of 2, 3, 4, 5, 8, and 10, along with their decimal and percent equivalents, for example, knowing that ¼ is the same as 25% and .25 *without* a calculator.

A note about unit order: The following units are directly from Amplify Desmos curriculum. Teachers are using the pacing of this curriculum for the first time during the 23-24 school year and may supplement the units with additional lessons or concepts as needed. The unit order and standards alignment will be revisited and revised at the end of the school year.

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The following units are based on Amplify Desmos's recommended unit order, pacing, and areas of focus. Teachers are using the pacing of this curriculum for the first time during the 23-24 school year and may supplement the units with additional lessons or concepts as needed. Families are encouraged to preview units and read through the caregiver resources provided for each unit, which provide additional information, specific vocabulary, and questions to spark mathematical conversation within the unit.

Unit Description	Indiana Academic Standards
Unit One: Area and Surface Area In this unit, students extend their elementary understanding of area as compositions and decompositions for covering, shifting from limited experiences with rectangles and unit-square thinking to more general formulas for parallelograms and triangles. They leverage these in working with three-dimensional figures as well, recognizing surface area as a different measure than volume. **Essential Questions** ● What does it mean when you say two shapes have the same area? ● How is surface area different from volume? *Want to learn more? Click here for family support resources for unit one.*	6.AF.1: Evaluate expressions for specific values of their variables, including expressions with whole-number exponents and those that arise from formulas used in geometry and other real-world problems. 6.C.5: Evaluate positive rational numbers with whole number exponents. 6.C.6: Apply the order of operations and properties of operations (identity, inverse, commutative properties of addition and multiplication, associative properties of addition and multiplication, and distributive property) to evaluate numerical expressions. 6.GM.2: Know that the sum of the interior angles of any triangle is 180° and that the sum of the interior angles of any quadrilateral is 360º. Use this information to solve real-world and mathematical problems. 6.GM.4: Find the area of complex shapes composed of polygons by composing or decomposing into simple shapes; apply this technique to solve real-world and other mathematical problems.

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Unit Description	Indiana Academic Standards
Unit Two: Introducing Ratios In this unit, students understand ratios using three of their five senses. They use written and visual representations to learn the language of ratios, and scale up (with multiplication) or down (with division) to calculate equivalent ratios. Ratios are also used for thinking about constant rates or occurrences happening at the same rate. **Essential Questions** ● What does a ratio say about the relationship between quantities? ● How can ratios reflect fairness? ● How can ratios help you estimate solutions to seemingly impossible real-world problems? *Want to learn more? Click here for family support resources for unit two.*	6.AF.9: 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 6.NS.7: 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 from 1 to 100, with a common factor as a multiple of a sum of two whole numbers with no common factor. 6.NS.8: Interpret, model, and use ratios to show the relative sizes of two quantities. Describe how a ratio shows the relationship between two quantities. Use the following notations: a/b, a to b, a:b. 6.NS.10: Use reasoning involving rates and ratios to model real-world and other mathematical problems (e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations). 6.GM.1: Convert between measurement systems (English to metric and metric to English) given conversion factors, and use these conversions in solving real-world problems.

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Unit Description	Indiana Academic Standards
Unit Three: Rates and Percentages In this unit, students understand the concept of unit rate in the context of constant price and speed, recognizing that equivalent ratios have the same unit rates. They use several visual and algebraic representations of percentages to determine missing percentages, parts, and wholes. **Essential Questions** ● How are the terms same rate, constant rate, and unit rate similar and different? ● What is the relationship between unit rates and percentages? ● How are percentages used to estimate and compare quantities? *Want to learn more? Click here for family support resources for unit three.*	6.AF.9: 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 6.NS.6: Write an inequality of the form $x > c$, $x \geq c$, $x < c$, or $x \leq c$, where c is a rational number, to represent a constraint or condition in a real-world or other mathematical problem. Recognize inequalities have infinitely many solutions and represent solutions on a number line diagram. 6.NS.9: Understand the concept of a unit rate and use terms related to rate in the context of a ratio relationship. 6.NS.10: Use reasoning involving rates and ratios to model real-world and other mathematical problems (e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations). 6.GM.1: Convert between measurement systems (English to metric and metric to English) given conversion factors, and use these conversions in solving real-world problems.

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Unit Description	Indiana Academic Standards
Unit 4: Dividing Fractions In this unit, students extend their understanding of partitive and quotitive division from whole numbers to fractions. They use this along with the relationship between multiplication and division to construct models and develop an algorithm for dividing fractions, and they apply it to problems involving lengths, areas, and volumes. **Essential Questions** ● How can dividing by the same fraction be interpreted in two different ways? ● How is dividing by a fraction related to multiplying fractions? ● What does it mean when a quantity represents a fractional number of equal-sized groups? *Want to learn more? Click here for family support resources for unit four.*	6.C.4: 4 Compute quotients of positive fractions and solve real-world problems involving division of fractions by fractions. Use a visual fraction model and/or equation to represent these calculations. 6.GM.4: Find the area of complex shapes composed of polygons by composing or decomposing into simple shapes; apply this technique to solve real-world and other mathematical problems. 6.GM.5: Find the volume of a right rectangular prism with fractional edge lengths using unit cubes of the appropriate unit fraction edge lengths (e.g., using technology or concrete materials), and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas V = lwh and V = Bh to find volumes of right rectangular prisms with fractional edge lengths to solve real-world and other mathematical problems.

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Unit Description	Indiana Academic Standards
Unit 5: Arithmetic in Base Ten In this unit, students synthesize previous learning of place value, properties of operations, and relationships between operations to complete their understanding of both the "whys" and "hows" of the four operations with positive rational numbers. They develop general algorithms for working with whole numbers and decimals, containing any arbitrary number of digits. **Essential Questions** ● How can base ten units be composed and decomposed? ● How is the total number of decimal places in two decimal factors related to the total number of decimal places in their product? ● What is similar and different about using related whole-number expressions when multiplying versus dividing decimals? *Want to learn more? Click here for family support resources for unit five.*	6.AF.2: Apply the properties of operations (e.g., identity, inverse, commutative, associative, distributive properties) to create equivalent linear expressions and to justify whether two linear expressions are equivalent when the two expressions name the same number regardless of which value is substituted into them. 6.C.1: Divide multi-digit whole numbers fluently using a standard algorithmic approach. 6.C.2: Compute with positive fractions and positive decimals fluently using a standard algorithmic approach. 6.C.3: 6.C.3 Solve real-world problems with positive fractions and decimals by using one or two operations. 6.NS.5: Know commonly used fractions (halves, thirds, fourths, fifths, eighths, tenths) and their decimal and percent equivalents. Convert between any two representations (fractions, decimals, percents) of positive rational numbers without the use of a calculator.

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Unit Description	Indiana Academic Standards
Unit 6: Expressions and Equations In this unit, students discover that the equal sign is more than a prompt, it's also a way to indicate balance–a critical understanding that allows them to move beyond the strictly numeric world and into the realm of algebra. **Essential Questions** ● What does it mean for an equation to be true? Can an equation be false? ● How can two quantities be equal when one is partially or totally unknown? ● What does it mean for two expressions to be equal? Equivalent? Is there a difference? *Want to learn more? Click here for family support resources for unit six.*	6.AF.1: Evaluate expressions for specific values of their variables, including expressions with whole-number exponents and those that arise from formulas used in geometry and other real-world problems. 6.AF.2: Apply the properties of operations (e.g., identity, inverse, commutative, associative, distributive properties) to create equivalent linear expressions and to justify whether two linear expressions are equivalent when the two expressions name the same number regardless of which value is substituted into them. 6.AF.3: Define and use multiple variables when writing expressions to represent real-world and other mathematical problems, and evaluate them for given values. 6.AF.4: Understand that solving an equation or inequality is the process of answering the following 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.AF.5: Solve equations of the form x + p = q, x - p = q, px = q, and x/p = q fluently for cases in which p, q and x are all nonnegative rational numbers. Represent real-world problems using equations of these forms and solve such problems 6.AF.9: 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. 6.10.6: Use variables to represent two quantities in a proportional relationship in a real-world problem; write an equation to express one quantity, the dependent variable, in terms of the other quantity, the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. 6.C.5: Evaluate positive rational numbers with whole number exponents. 6.C.6: Apply the order of operations and properties of operations (identity, inverse, commutative properties of addition and multiplication, associative properties of addition and multiplication, and distributive property) to evaluate numerical expressions with nonnegative rational numbers, including those using grouping symbols, such as parentheses, and involving whole number exponents. 6.NS.8: Interpret, model, and use ratios to show the relative sizes of two quantities. Describe how a ratio shows the relationship between two quantities. Use the following notations: a/b, a to b, a:b. 6.NS.9: Understand the concept of a unit rate and use terms related to rate in the context of a ratio relationship.

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Unit 7: Rational Numbers In this unit, students recognize a need to expand their concept of number to represent both magnitude and direction, extending the number line and coordinate plane to include negative rational numbers. They compare these numbers, as well as their absolute values, and write inequality statements using variables. **Essential Questions** ● What does it mean for a value to be less than zero? ● How can a number be closer to zero and have a greater value? ● How can two objects move the same distance, but end up in different places? *Want to learn more? Click here for family support resources for unit seven.*	6.NS.1: Understand that positive and negative numbers are used 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 and compare quantities in real-world contexts, explaining the meaning of 0 in each situation. 6.NS.2: 2 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. 6.NS.3: Compare and order rational numbers and plot them on a number line. Write, interpret, and explain statements of order for rational numbers in real-world contexts. 6.NS.4: Understand that the absolute value of a number is the distance from zero on a number line. Find the absolute value of real numbers and know that the distance between two numbers on the number line is the absolute value of their difference. Interpret absolute value as magnitude for a positive or negative quantity in a real-world situation. 6.AF.4: Understand that solving equation/ inequality is the process of answering the following 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.AF.6: Write an inequality of the form $x > c$, $x \geq c$, $x < c$, or $x \leq c$, where c is a rational number, to represent a constraint or condition in a real-world or other mathematical problem. Recognize inequalities have infinitely many solutions and represent solutions on a number line diagram. 6.AF.7: Understand that signs of numbers in ordered pairs indicate the quadrant containing the point. Identify rules or patterns in the signs as they relate to the quadrants Graph points with rational number coordinates on a coordinate plane. 6.AF.8: Solve real-world and other mathematical problems by graphing points with rational number coordinates on a coordinate plane. Include the use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate 6.GM.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 to solve real-world and other mathematical problems.

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Unit 8: Data Sets and Distributions In this unit, students learn about populations and study variables associated with a population, focusing on populations of animal species and their respective endangerment classifications. They distinguish numerical and categorical data, relative to survey and statistical questions, and represent and describe the distributions of response data. Students first interpret frequency tables, dot plots, and histograms, before calculating measures of center–mean and median—and measures of variability–mean absolute deviation (MAD), range, and interquartile range (IQR). They then construct box plots in addition to interpreting these measures in context, and relating the shape and features of a distribution to the best choice measures. **Essential Questions** ● What makes a question statistical? ● What does a measure of center tell you about a distribution? ● What does a measure of variability tell you about a distinction? *Want to learn more? Click here for family support resources for unit eight*	6.DS.1: Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for the variability in the answers. 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.DS.2: Select, create, and interpret graphical representations of numerical data, including line plots, histograms, and box plots. 6.DS.3: Formulate statistical questions; collect and organize the data (e.g., using technology); display and interpret the data with graphical representations (e.g., using technology). 6.DS.4: Summarize numerical data sets in relation to their context in multiple ways, such as: a. report the number of observations b. describe the nature of the attribute under investigation, including how it was measured and its units of measurement c. determine quantitative measures of center (mean and/or median) and spread (range and interquartile range) d. describe any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered e. relate the choice of measures of center and spread to the shape of the data distribution and the context in which the data were gathered