NOBLESVILLE SCHOOLS CURRICULUM

Mathematics

7th Grade

This includes both 6th grade Bridges Accelerated and 7th grade Academic Courses

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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 seventh 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 seventh grade include the following:

- *Solving Two-Step Equations:* Students in 7th grade spend time with two-step equations and inequalities. From Keep Indiana Learning (2022): “The purpose of solving equations is not to solve them using inverse operations; rather, it is to understand the answer to the equation or inequality is the number(s) that makes the equation or inequality true.” Students should also solve equations with tables and graphs from real world models.

- *Proportional Relationships:* In 6th grade, students learn about ratios. In 7th grade, they start to compare them. The relationship between ratios is called a proportion. Students learn about proportions by starting with real-world relationships, such as those with time and distance. Students also work on graphing and rate of change with real-world applications.

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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. Units and pacing will be revised at the end of the year based on feedback from teachers. 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: Scale Drawings Certain objects in our universe exist at sizes and distances that are impossible for our eyes to see (such as a red blood cell, or Jupiter). In Unit 1, students harness the power of scaling–bringing large and small objects to a manageable size without distorting them. **Essential Questions:** ● Why is it important to be precise when making scaled copies? ● Why are lengths and areas affected in different ways when creating scaled copies? ● How do scale models help you make sense of the world around you? *Want to learn more? Click here for family support resources for unit one.*	7.AF.6-Decide whether two quantities are in a proportional relationship (e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin). 7.C.6-Use proportional relationships to solve ratio and percent problems with multiple operations (e.g. simple interest, tax, markups, markdowns, gratuities, conversions within and across measurement systems, and percent increase and decrease). 7.GM.2-Identify and describe similarity relationships of polygons including the angle-angle criterion for similar triangles, and solve problems involving similarity. 7.GM.3-Solve real-world and other mathematical problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing. Create a scale drawing by using proportional reasoning.

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Unit Two: Introducing Proportional Relationships When we exchange money from one currency to another, there is a rate that helps us find the amount of one currency equal in value to the other. In this unit, students see that a rate is at the heart of every proportional relationship as they encounter problems across cultures where two quantities are directly related. **Essential Questions** ● What does it mean for two things to be proportionally related? How can you tell? ● What are the different ways you can represent proportional relationships? How are the representations related? *Want to learn more? Click here for family support resources for unit two.*	7.GM.1-Explore triangles with given conditions from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle. 7.GM.3-Solve real-world and other mathematical problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing. Create a scale drawing by using proportional reasoning. 7.GM.5-Understand the formulas for area and circumference of a circle and use them to solve real-world and other mathematical problems; give an informal derivation of the relationship between circumference and area of a circle. 7.AF.2-Solve equations of the form px + q= r and p(x + q) = r fluently, where p, q, and r are specific rational numbers. Represent real-world problems using equations of these forms and solve such problems. 7.AF.6-Decide whether two quantities are in a proportional relationship (e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin). 7.AF.7-Identify the unit rate or constant of proportionality in tables, graphs, equations, and verbal descriptions of proportional relationships. 7.AF.8-Explain what the coordinates of a point on the graph of a proportional relationship mean in terms of the situation, with special attention to the points (0, 0) and (1,r), where r is the unit rate. 7.AF.9-Represent real-world and other mathematical situations that involve proportional relationships. Write equations and draw graphs to represent these proportional relationships. Recognize that these situations are described by a linear function in the form y = mx, where the unit rate, m, is the slope of the line

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Unit 3: Measuring Circles Identifying a circle may be straightforward, but measuring it is decidedly not. In this unit, students experience both the usefulness and challenges presented by this “perfect” shape. **Essential Questions** ● How do we measure circles when all of our tools are straight? ● What is π and what does it have to do with circles? ● How can squares help you measure the space inside circles? ● (By the way, does π really go on forever?) *Want to learn more? Click here for family support resources for unit three.*	7.GM.1-Explore triangles with given conditions from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle. 7.GM.3-Solve real-world and other mathematical problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing. Create a scale drawing by using proportional reasoning. 7.GM.5-Understand the formulas for area and circumference of a circle and use them to solve real-world and other mathematical problems; give an informal derivation of the relationship between circumference and area of a circle. 7.AF.2-Solve equations of the form px + q= r and p(x + q) = r fluently, where p, q, and r are specific rational numbers. Represent real-world problems using equations of these forms and solve such problems. 7.AF.6-Decide whether two quantities are in a proportional relationship (e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin). 7.AF.7-Identify the unit rate or constant of proportionality in tables, graphs, equations, and verbal descriptions of proportional relationships. 7.AF.8-Explain what the coordinates of a point on the graph of a proportional relationship mean in terms of the situation, with special attention to the points (0, 0) and (1,r), where r is the unit rate. 7.AF.9-Represent real-world and other mathematical situations that involve proportional relationships. Write equations and draw graphs to represent these proportional relationships. Recognize that these situations are described by a linear function in the form y = mx, where the unit rate, m, is the slope of the line.

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Unit Four: Percentages From the supermarket to the stock market, percentages are relied upon to communicate quickly about how much something has changed. Students build on their experience with proportional relationships while using percentages to compare quantities within the friendly confines of the number 100. **Essential Questions** How are percentages related to proportional relationships? How are percentages used to represent change? When is it most helpful to use percentages? *Want to learn more? Click here for family support resources for unit four.*	7.AF.1-7.AF.1-Apply the properties of operations (e.g., identity, inverse, commutative, associative, distributive properties) to create equivalent linear expressions, including situations that involve factoring out a common number (e.g., given 2x - 10, create an equivalent expression 2(x - 5)). Justify each step in the process. 7.C.6-Use proportional relationships to solve ratio and percent problems with multiple operations (e.g. simple interest, tax, markups, markdowns, gratuities, conversions within and across measurement systems, and percent increase and decrease).

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Unit Five: Rational Number Arithmetic Students discover the need to work with both positive and negative values to describe the vastness of the world around them. With the entire set of rational numbers and all four operations now at their disposal, the sky (or the sea floor) is the limit. **Essential Questions** How do you represent addition, subtraction, or multiplication of rational numbers on a number line? How is solving problems with rational numbers the same or different from solving problems with only non-negative rational numbers? How can rational numbers be used to represent real-world situations? *Want to learn more? Click here for family support resources for unit five.*	7.AF.2-Solve equations of the form px + q= r and p(x + q) = r fluently, where p, q, and r are specific rational numbers. Represent real-world problems using equations of these forms and solve such problems. 7.AF.4-Define slope as vertical change for each unit of horizontal change and recognize that a constant rate of change or constant slope describes a linear function. Identify and describe situations with constant or varying rates of change. 7.AF.5-Graph a line given its slope and a point on the line. Find the slope of a line given its graph. 7.AF.7-Identify the unit rate or constant of proportionality in tables, graphs, equations, and verbal descriptions of proportional relationships. 7.AF.8-Explain what the coordinates of a point on the graph of a proportional relationship mean in terms of the situation, with special attention to the points (0, 0) and (1,r), where r is the unit rate. 7.AF.9-Represent real-world and other mathematical situations that involve proportional relationships. Write equations and draw graphs to represent these proportional relationships. Recognize that these situations are described by a linear function in the form y = mx, where the unit rate, m, is the slope of the line. 7.C.1-Understand p + q as the number located a distance |q| from p, in the positive or negative direction, depending on whether q is positive or negative. Show on a number line that a number and its opposite have a sum of 0 (are additive inverses). Find and interpret sums of rational numbers in real-world contexts.

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	7.C.2-Understand subtraction of rational numbers as adding the additive inverse, $p – q = p + (–q)$. Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts. 7.C.3-Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as $(–1)(–1) = 1$ and the rules for multiplying signed numbers. 7.C.4-Understand that integers can be divided, provided that the divisor is not zero. Understand that if p and q are integers, then $–(p/q) = (–p)/q = p/(–q)$. 7.C.7-Compute fluently with rational numbers using an algorithmic approach. 7.C.8-Solve real-world problems with rational numbers by using one or two operations.

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Unit Six: Expressions, Equations, and Inequalities In this unit, students return to the study of algebra and focus on how representation plays such a large role in communicating mathematical ideas. In this unit, the symbols, language, and drawings students use will help them tell the stories they see in the numbers. **Essential Questions** ● Which representations best help you make sense of certain mathematical scenarios? ● Which strategies that worked for solving simple equations or inequalities can be put to use when solving more complex ones? ● How can you increase your efficiency when solving mathematical problems? *Want to learn more? Click here for family support resources for unit six.*	7.AF.1-Apply the properties of operations (e.g., identity, inverse, commutative, associative, distributive properties) to create equivalent linear expressions, including situations that involve factoring out a common number (e.g., given 2x - 10, create an equivalent expression 2(x - 5)). Justify each step in the process. 7.AF.2-Solve equations of the form px + q= r and p(x + q) = r fluently, where p, q, and r are specific rational numbers. Represent real-world problems using equations of these forms and solve such problems. 7.AF.3-Solve inequalities of the form px +q (> or ≥) r or px + q (< or ≤) r, where p, q, and r are specific rational numbers. Represent real-world problems using inequalities of these forms and solve such problems. Graph the solution set of the inequality and interpret it in the context of the problem. 7.C.2-Understand subtraction of rational numbers as adding the additive inverse, p – q = p + (–q). Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts. 7.C.8-Solve real-world problems with rational numbers by using one or two operations. 7.NS.1-Find the prime factorization of whole numbers and write the results using exponents. 7.NS.2-Understand the inverse relationship between squaring and finding the square root of a perfect square whole number. Find square roots of perfect square whole numbers. 7.NS.3-Know there are rational and irrational numbers. Identify, compare, and order rational and irrational numbers (e.g. √2, √3, √5, ∏) and plot them on a number line.

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Unit Seven: Angles, Triangles, and Prisms This unit is all about the math of what can be seen and what can be held. Through constructing and drawing, students explore relationships among angles, lines, surfaces, and solids. **Essential Questions** When do certain combinations of angles form special angles? Given certain segments and angles, how many unique polygons can be made? What shapes can be seen when you slice through solid figures? *Want to learn more? Click here for family support resources for unit seven.*	7.AF.2-Solve equations of the form px + q= r and p(x + q) = r fluently, where p, q, and r are specific rational numbers. Represent real-world problems using equations of these forms and solve such problems. 7.AF.9-Represent real-world and other mathematical situations that involve proportional relationships. Write equations and draw graphs to represent these proportional relationships. Recognize that these situations are described by a linear function in the form y = mx, where the unit rate, m, is the slope of the line. 7.C.5-Compute unit rates associated with ratios of fractions, including ratios of lengths, areas, and other quantities measured in like or different units. 7.GM.4-Solve real-world and other mathematical problems using facts about vertical, adjacent, complementary, and supplementary angles. 7.G.6-Solve real-world and other mathematical problems involving volume of cylinders and three-dimensional objects composed of right rectangular prisms. 7.G.7-Construct nets for right rectangular prisms and cylinders and use the nets to compute the surface area; apply this technique to solve real-world and other mathematical problems.

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Unit 8: Probability and Sampling For the first time, students encounter how to quantify the chances of something happening. Though the future is unwritten, probability and statistics help us make better predictions and thus better decisions. **Essential Questions** When faced with more than one possibility, how can we figure out which thing is more likely to happen? Our world is really complex–how can we simulate parts of it to make better predictions? When is a sample *not* representative of a population? *Want to learn more? Click here for family support resources for unit eight.*	7.DSP.1-Understand that statistics can be used to gain information about a population by examining a sample of the population. Understand that conclusions and generalizations about a population from a sample are valid only if the sample is representative of that population and that random sampling tends to produce representative samples and support valid inferences. 7.DSP.2-Use data from a random sample to draw inferences about a population. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions. 7.DSP.3-Find, use, and interpret measures of center (mean and median) and measures of spread (range, interquartile range, and mean absolute deviation) for numerical data from random samples to draw comparative inferences about two populations. 7.DSP.4-Make observations about the degree of visual overlap of two numerical data distributions represented in line plots or box plots. Describe how data, particularly outliers, added to a data set may affect the mean and/or median. 7.DSP.5-Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Understand that a probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event. Understand that a probability of 1 indicates an event certain to occur and a probability of 0 indicates an event impossible to occur. Identify probabilities of events as impossible, unlikely, equally likely, likely, or certain. 7.DSP.6-Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its relative frequency from a large sample.

	7.DSP.7-Develop probability models that include the sample space and probabilities of outcomes to represent simple events with equally likely outcomes. Predict the approximate relative frequency of the event based on the model. Compare probabilities from the model to observed frequencies; evaluate the level of agreement and explain possible sources of discrepancy.