



Bedford Public Schools

Grade 7 – Math

In 7th grade, instructional time should focus on four critical areas: (1) developing understanding of and applying proportional relationships; (2) developing understanding of operations with rational numbers and working with expressions and linear equations; (3) solving problems involving scale drawings and informal geometric constructions, and working with two- and three-dimensional shapes to solve problems involving area, surface area, and volume; and (4) drawing inferences about populations based on samples.

Students extend their understanding of ratios and develop understanding of proportionality to solve single- and multi-step problems. Students use their understanding of ratios and proportionality to solve a wide variety of percent problems, including those involving discounts, interest, taxes, tips, and percent increase or decrease. Students solve problems about scale drawings by relating corresponding lengths between the objects or by using the fact that relationships of lengths within an object are preserved in similar objects. Students graph proportional relationships and understand the unit rate informally as a measure of the steepness of the related line, called the slope. They distinguish proportional relationships from other relationships.

Students develop a unified understanding of number, recognizing fractions, decimals (that have a finite or a repeating decimal representation), and percents as different representations of rational numbers. Students extend addition, subtraction, multiplication, and division to all rational numbers, maintaining the properties of operations and the relationships between addition and subtraction, and multiplication and division. By applying these properties, and by viewing negative numbers in terms of everyday contexts (e.g., amounts owed or temperatures below zero), students explain and interpret the rules for adding, subtracting, multiplying, and dividing with negative numbers. They use the arithmetic of rational numbers as they formulate expressions and equations in one variable and use these equations to solve problems.



Learning Expectations

[The Number System](#)

[Ratios and Proportional Relationships](#)

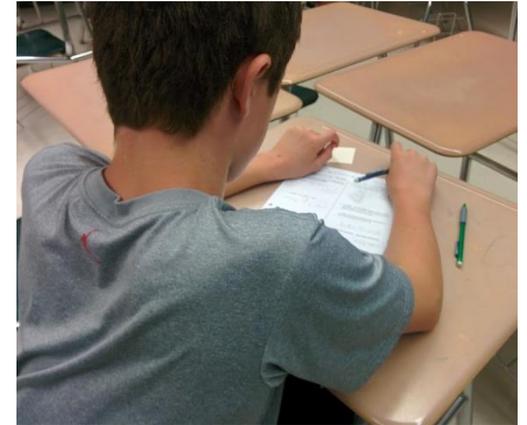
[Geometry](#)

[Statistics and Probability](#)

[Expressions and Equations](#)

Students continue their work with area from grade 6, solving problems involving the area and circumference of a circle and surface area of three-dimensional objects. In preparation for work on congruence and similarity in grade 8 they reason about relationships among two-dimensional figures using scale drawings and informal geometric constructions, and they gain familiarity with the relationships between angles formed by intersecting lines. Students work with three-dimensional figures, relating them to two-dimensional figures by examining cross-sections. They solve real-world and mathematical problems involving area, surface area, and volume of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

Students build on their previous work with single data distributions to compare two data distributions and address questions about differences between populations. They begin informal work with random sampling to generate data sets and learn about the importance of representative samples for drawing inferences.



Learning Expectations

[The Number System](#)

[Ratios and Proportional Relationships](#)

[Geometry](#)

[Statistics and Probability](#)

[Expressions and Equations](#)

The Number System

Enduring Understandings In order to meet the standards, the students will need to understand that . . .	Essential Questions In order to understand, students will need to consider questions such as . . .	Knowledge and Skills Learning this material will require students to . . .	Standards and Assessments
<p>Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.</p> <ul style="list-style-type: none"> • In order to evaluate numerical expressions, you must use order of operations. • You can use exponents to write repeated multiplication. • Integers represent real world situations involving gains and losses. • Integers operations can be figured out by representing them with real world situations. • Opposite numbers have the same absolute value but different signs • Absolute value is a representation of distance. • Adding integers involves grouping or canceling. • Subtracting integers is the same as adding the opposite. • If the number of negative integers is even (odd), the product is positive (negative) • If any integer is zero, the product is zero. • The rules for dividing integers are the same as multiplying integers. • The Distributive Property provides a process to handle variables in parentheses. 	<ul style="list-style-type: none"> • How would you compare and contrast absolute value and opposite numbers? • How does the sign of a number affect: addition, subtraction, multiplication, and division? • How can you use integers to represent real world situations? • What are the benefits of writing very large numbers and very small numbers using scientific notation? • Why is the concept of an inverse important to the process of dividing fractions? • How is the method of subtracting integers similar to the process of dividing fractions? • When does order matter and when does it not matter? 	<ul style="list-style-type: none"> • Use formulas to find unknown values • Graph and order integers • Find absolute value • Add, subtract, multiply, and divide integers • Use the Distributive Property to evaluate expressions • Identify and plot points in a coordinate plane • Use formula for perimeter and area of rectangles and triangles • Add, subtract, multiply, and divide using fractions, decimals, or percents • Convert fractions to decimals to percents and the inverse • Have automaticity in computing common fractions, decimals, and percents • Convert between Scientific Notation and Standard Form • Convert metric measurements 	<ul style="list-style-type: none"> • Chapter 1 & 2 (Variables, Order of Operations, Scientific Notation, and Metric Units) Test 7.EE.2, 7.EE.4a, 7.EE.4.MA.4.c • Chapter 6 (Integers) Test 7.EE.3, 7.EE.4a, 7.NS.1a, 7.NS.1b, 7.NS.1c 7.NS.1d, 7.NS.2a, 7.NS.2b, 7.NS.2c, 7.NS.2d, 7.NS.3 • Chapter 5 (Fractions) Test 7.NS.1a, 7.NS.1b, 7.NS.1c 7.NS.1d, 7.NS.2a, 7.NS.2b, 7.NS.2c, 7.NS.2d, 7.NS.3

Ratios and Proportional Relationships

Enduring Understandings In order to meet the standards, the students will need to understand that . . .	Essential Questions In order to understand, students will need to consider questions such as . . .	Knowledge and Skills Learning this material will require students to . . .	Standards and Assessments
<p>Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.</p> <ul style="list-style-type: none"> • In order to evaluate numerical expressions, you must use order of operations. • You can use exponents to write repeated multiplication. • Integers represent real world situations involving gains and losses. • Integers operations can be figured out by representing them with real world situations. • Opposite numbers have the same absolute value but different signs • Absolute value is a representation of distance. • Adding integers involves grouping or canceling. • Subtracting integers is the same as adding the opposite. • If the number of negative integers is even (odd), the product is positive (negative) 	<ul style="list-style-type: none"> • How are constants of proportionality reflected in scale factor, slope and the graph of a linear equation? • What happens if the proportionality of a model is not maintained? • How does your understanding of ratios impact your effectiveness as a shopper? • Why are unit rates important for comparisons? • How do you solve a proportion with the cross products property? • How do you find the percent one number is of another number using a proportion? • Why is differentiating between part-to-part ratios and part-to-whole ratios critical for comparisons? • How are ratios and rates similar and different? 	<ul style="list-style-type: none"> • Find ratios and unit rates • Find equivalent rates • Write and solve proportions • Solve percent problems using proportions • Rewrite and convert fractions, decimals, and percents • Order decimals, fractions, and percents • Solve percent problems with percent increase/decrease. • Solve percent problems using the percent equation • Understand and calculate discount, markup, tax, and simple interest • Add, subtract, multiply, and divide using fractions, decimals, or percents • Apply scale factor appropriately to different dimensions (length, area, volume) • Find the equation of a line from a graph, table, point and slope, or two points 	<ul style="list-style-type: none"> • Chapter 8 (Ratios and Proportions) Test 7.RP.1, 7.RP.2.a, 7.RP.2b, 7.RP.2c, 7.RP.3, 7.NS.2d • Chapter 9 (Percents) Test 7.RP.1, 7.RP.2.a, 7.RP.2b, 7.RP.2c, 7.RP.3

Enduring Understandings In order to meet the standards, the students will need to understand that . . .	Essential Questions In order to understand, students will need to consider questions such as . . .	Knowledge and Skills Learning this material will require students to . . .	Standards and Assessments
<ul style="list-style-type: none">• If any integer is zero, the product is zero.• The rules for dividing integers are the same as multiplying integers.• The Distributive Property provides a process to handle variables in parentheses.			

Geometry

Enduring Understandings In order to meet the standards, the students will need to understand that . . .	Essential Questions In order to understand, students will need to consider questions such as . . .	Knowledge and Skills Learning this material will require students to . . .	Standards and Assessment
<p>Draw, construct, and describe geometrical figures and describe the relationships between them.</p> <p>Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.</p> <ul style="list-style-type: none"> • The coordinate plane can be used to rotate, reflect and translate polygons. • Angle and side measurements are used in classifying shapes. • Certain combinations of angles and sides are necessary for creating polygons. • The Pythagorean Theorem is a tool for analyzing triangles. • Relationships exist in triangles that simplify solving for similarity. • Solids can be classified by the number of bases, faces, vertices, and edges. • Various aspects of geometric figures can be measured and calculated using algebra. • Formulas for calculating key aspects of geometric figures can be developed by using existing knowledge of the shapes. 	<ul style="list-style-type: none"> • How could you represent different types of quadrilaterals in a Venn diagram? • What are the methods used to calculate angle measure formed by intersecting lines? • In geometry why is the concept of classifying figures important to giving the best answer? • How can you indirectly measure a distance? • How is the area of a parallelogram or a triangle related to the area of a rectangle? • What is the impact of an object's scale factor on the volume of similar figures? • How are the surface areas of prisms and cylinders similar and different? • What constraints must you consider when constructing a triangle? • Why is pi always an approximation? • Why is it important to use an appropriate symbol for naming and notating points, lines, segments, rays and angles? 	<ul style="list-style-type: none"> • Classify angles by measures • Identify special pairs of angles (complementary, supplementary, vertical, adjacent) and types of lines • Classify triangles • Classify quadrilaterals and other polygons • Use properties of similar and congruent polygons to find unknowns • Identify transformations and symmetry in figures • Recognize tessellations • Graph transformations in the coordinate plane • Solve equations to find angle measures • Classify prisms, pyramids, cylinders, and cones • Find the volume of right prisms with any shape bases, and the surface area of most of these • Determine two-dimensional figures resulting from slicing three-dimensional figures 	<ul style="list-style-type: none"> • Chapter 10 (Angles, Polygons, and Transformations) Test 7.G.1, 7.G.2, 7.G.5 • Chapter 11 (Area, Surface Area and Volume) Test 7.G.3, 7.G.4

Statistics and Probability

Enduring Understandings In order to meet the standards, the students will need to understand that . . .	Essential Questions In order to understand, students will need to consider questions such as . . .	Knowledge and Skills Learning this material will require students to . . .	Standards and Assessments
<p>Use random sampling to draw inferences about a population. Draw informal comparative inferences about two populations.</p> <ul style="list-style-type: none"> All data and statistics are biased. Data can be biased by many different elements, including questions and sampling methods. Bias comes from many different sources, and is inherent in human work. Populations can be represented by samples. Some ways of representing data are more effective than others for different data and/or results. <p>Investigate chance processes and develop, use, and evaluate probability models.</p> <ul style="list-style-type: none"> The probability of an event occurring can often be determined mathematically. Actual outcomes may not match mathematically predicted outcomes. 	<ul style="list-style-type: none"> What is the best and most useful strategy for solving probability problems? Why does the world not conform to probability all of the time? How does the relationship between two or more events affect the probability of their outcomes? 	<ul style="list-style-type: none"> Count outcomes using an organized list, tree diagrams, and the counting principle Understand and calculate the number of permutations and combinations for an event Determine probability using tree diagrams Determine favorable outcomes of an event Represent probability as a fraction, decimal, or percent. Understand permutations and combinations Analyze situations involving independent and dependent events using many tools, including counting trees and multiplication Explain the connections between different methods of solving probability problems Express both theoretical and experimental probability Simulate a probability situation. Determine the expected value of a chance situation 	<ul style="list-style-type: none"> Chapter 13 (Probability) Test 7.SP.1, 7.SP.2, 7.SP.3, 7.SP.4, 7.SP.5, 7.SP.6, 7.SP.7.a, 7.SP.7.b

Enduring Understandings In order to meet the standards, the students will need to understand that . . .	Essential Questions In order to understand, students will need to consider questions such as . . .	Knowledge and Skills Learning this material will require students to . . .	Standards and Assessments
<ul style="list-style-type: none"> • Counting and probability can be used to solve many real world problems. • Probability explains how things will tend to act over many trials. • Events can be dependent or independent of each other. Some will only happen if another happens first. Some may happen anyway. • Probability can be represented in many ways. 		<ul style="list-style-type: none"> • Solve for the probability of a compound event 	

Expressions and Equations

Enduring Understandings In order to meet the standards, the students will need to understand that . . .	Essential Questions In order to understand, students will need to consider questions such as . . .	Knowledge and Skills Learning this material will require students to . . .	Standards and Assessments
<p>Use properties of operations to generate equivalent expressions. Solve real-life and mathematical problems using numerical and algebraic expressions and equations.</p> <ul style="list-style-type: none"> • Patterns can come in a model that creates a line on a graph. • In order to evaluate numerical expressions, you must use order of operations. • Many different real-world situations can be represented using linear models. • Lines have specific properties that relate to information about the situation represented. • Variables represent unknown numbers that can be solved for, with sufficient information. • A function expresses a relationship between an input and it's only output. Lines are an example of functions. • Functions can be manipulated like other algebraic equations - by replacing a representation of a value with the value. 	<ul style="list-style-type: none"> • How is math a language? • Why are variables necessary? • What is a reasonable answer? • How do you represent numbers and their relationships to each other? • How are variables and constants in equations reflected in real life problems? • How is order of operations like the instruction manual for math? • How can a problem be solved with an equation, a graph and in a table? • How do lines on a coordinate plane convey information? • How does the concept of equivalent equations guide the process of solving equations? • How are distance, rate and time related? • How does the graph of an inequality differ from the graph of an equation? • How are the limits of an inequality expressed? • Why should you check a solution? • Why is it possible to solve an equation in different ways? • Why does an equation with two variables have infinite number of solutions? 	<ul style="list-style-type: none"> • Apply PEMDAS to evaluate numerical expressions • Write and evaluate variable expressions • Evaluate expressions with powers • Use formulas to find unknown values • Use a problem solving plan to solve problems • Solve equations using addition, subtraction, multiplication, and division • Solve two-step equations • Solve and graph linear inequalities. • Analyze lines to solve real world problems. • Manipulate variables in multi-step equations to solve for a given variable. 	<ul style="list-style-type: none"> • Chapter 6 (Integers) Test 7.EE.1, 7.EE.2, 7.EE.3, 7.EE.4a, 7.NS.1a, 7.NS.1b, 7.NS.1c 7.NS.1d, 7.NS.2a, 7.NS.2b, 7.NS.2c, 7.NS.2d, 7.NS.3 • Chapters 6, 7, 11 (Distributive Property, Solving Two-Step Equations, Pythagorean Theorem) Test 7.G.4, 7.EE.4a, 7.EE.4b