



# Bedford Public Schools

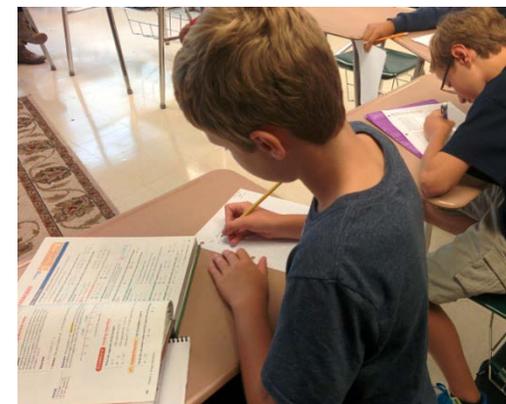
## Grade 6 – Math

In grade 6, instructional time should focus on four critical areas: (1) connecting ratio and rate to whole number multiplication and division, and using concepts of ratio and rate to solve problems; (2) completing understanding of division of fractions and extending the notion of number to the system of rational numbers, which includes negative numbers; (3) writing, interpreting, and using expressions and equations; and (4) developing understanding of statistical thinking.

Students use reasoning about multiplication and division to solve ratio and rate problems about quantities. By viewing equivalent ratios and rates as deriving from, and extending, pairs of rows (or columns) in the multiplication table, and by analyzing simple drawings that indicate the relative size of quantities, students connect their understanding of multiplication and division with ratios and rates. Thus students expand the scope of problems for which they can use multiplication and division to solve problems, and they connect ratios and fractions. Students solve a wide variety of problems involving ratios and rates.

Students use the meaning of fractions, the meanings of multiplication and division, and the relationship between multiplication and division to understand and explain why the procedures for dividing fractions make sense. Students use these operations to solve problems. Students extend their previous understandings of number and the ordering of numbers to the full system of rational numbers, which includes negative rational numbers, and in particular negative integers. They reason about the order and absolute value of rational numbers and about the location of points in all four quadrants of the coordinate plane.

Students understand the use of variables in mathematical expressions. They write expressions and equations that correspond to given situations, evaluate expressions, and use expressions and formulas to solve problems. Students understand that expressions in different forms can be equivalent, and they use



### Learning Expectations

[The Number System](#)

[Ratios and Proportional Relationships](#)

[Geometry](#)

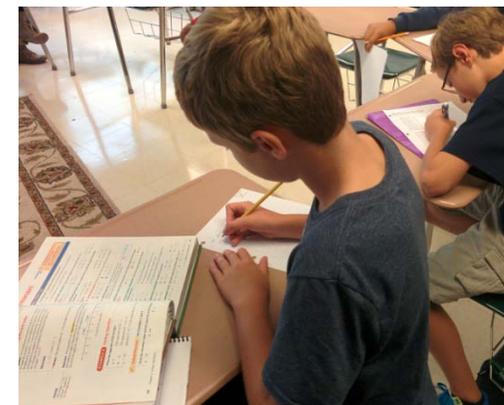
[Statistics and Probability](#)

[Expressions and Equations](#)

the properties of operations to rewrite expressions in equivalent forms. Students know that the solutions of an equation are the values of the variables that make the equation true. Students use properties of operations and the idea of maintaining the equality of both sides of an equation to solve simple one-step equations. Students construct and analyze tables, such as tables of quantities that are in equivalent ratios, and they use equations (such as  $3x = y$ ) to describe relationships between quantities.

Building on and reinforcing their understanding of number, students begin to develop their ability to think statistically. Students recognize that a data distribution may not have a definite center and that different ways to measure center yield different values. The median measures center in the sense that it is roughly the middle value. The mean measures center in the sense that it is the value that each data point would take on if the total of the data values were redistributed equally, and also in the sense that it is a balance point. Students recognize that a measure of variability (interquartile range or mean absolute deviation) can also be useful for summarizing data because two very different sets of data can have the same mean and median yet be distinguished by their variability. Students learn to describe and summarize numerical data sets, identifying clusters, peaks, gaps, and symmetry, considering the context in which the data were collected.

Students in grade 6 also build on their work with area in elementary school by reasoning about relationships among shapes to determine area, surface area, and volume. They find areas of right triangles, other triangles, and special quadrilaterals by decomposing these shapes, rearranging or removing pieces, and relating the shapes to rectangles. Using these methods, students discuss, develop, and justify formulas for areas of triangles and parallelograms. Students find areas of polygons and surface areas of prisms and pyramids by decomposing them into pieces whose area they can determine. They reason about right rectangular prisms with fractional side lengths to extend formulas for the volume of a right rectangular prism to fractional side lengths. They prepare for work on scale drawings and constructions in grade 7 by drawing polygons in the coordinate plane.



### **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><b>Apply and extend previous understandings of multiplication and division to divide fractions by fractions.</b></p> <p><b>Compute fluently with multi-digit numbers and find common factors and multiples.</b></p> <p><b>Apply and extend previous understandings of numbers to the system of rational numbers (including negatives).</b></p> <ul style="list-style-type: none"> <li>• Plot positive and negative points on a coordinate grid and make line graphs.</li> <li>• Add or subtract decimals by lining up the decimal points. Then add or subtract with whole numbers and bring down the decimal point.</li> <li>• Multiply a decimal and a whole number. The number of decimal places in the product is the same as the number of decimal places in the factor.</li> <li>• Use the distributive property to multiply a number and a sum or to multiply a number and a difference.</li> </ul>	<ul style="list-style-type: none"> <li>• What are rational numbers and how do they apply to the coordinate plane?</li> <li>• Why does the procedure for dividing fractions make sense?</li> </ul>	<ul style="list-style-type: none"> <li>• Apply PEMDAS to evaluate numerical expressions</li> <li>• Write and evaluate variable expressions</li> <li>• Evaluate expressions with powers</li> <li>• Write and solve equations using mental math</li> <li>• Use formulas to find unknown values</li> <li>• Study integers</li> <li>• Compare and order integers</li> <li>• Find absolute value</li> <li>• Use the distributive property</li> <li>• Identify and plot points in a coordinate plane</li> <li>• Use formula for perimeter and area of rectangles and triangles</li> <li>• Add, subtract, multiply, and divide using fractions, decimals, or percents.</li> <li>• Convert fractions to decimals to percents and the inverse.</li> <li>• Choose when to represent an answer as a fraction, decimal, or percent.</li> </ul>	<ul style="list-style-type: none"> <li>• 6.NS.1</li> <li>• 6.NS.2</li> <li>• 6.NS.3</li> <li>• 6.NS.4</li> <li>• 6.NS.4.MA.4.a</li> <li>• 6.NS.5</li> <li>• 6.NS.6a</li> <li>• 6.NS.6b</li> <li>• 6.NS.6c</li> <li>• 6.NS.7b</li> <li>• 6.NS.8</li> </ul>

<b>Enduring Understandings</b> In order to meet the standards, the students will need to understand that . . .	<b>Essential Questions</b> In order to understand, students will need to consider questions such as . . .	<b>Knowledge and Skills</b> Learning this material will require students to . . .	<b>Standards and Assessments</b>
<ul style="list-style-type: none"> <li>• Multiply decimals as you do whole numbers and place the decimal point by counting the total number of decimal places in the factors.</li> <li>• Divide a decimal by a whole number and then place the decimal point in the quotient above the decimal point in the dividend. You can write additional zeros in the dividend as needed.</li> <li>• Divide a decimal by a decimal by multiplying the divisor and the dividend by a power of ten to make the divisor a whole number.</li> <li>• To write a whole number's prime factorization, list it as a product of its prime factors.</li> <li>• List all factors or use prime factorization to find the greatest common factor of two or more numbers.</li> <li>• Find the least common multiple by using the least common multiple or prime factorization.</li> <li>• Multiply whole numbers and fractions by writing the product of the whole number and numerator over the denominator. Write the result as a simplified fraction or mixed number.</li> </ul>		<ul style="list-style-type: none"> <li>• Convert between metric units.</li> <li>• Find a number's prime factorization</li> <li>• Find the Greatest Common Factor and Least Common Multiple for a given set of numbers</li> </ul>	

<b>Enduring Understandings</b> In order to meet the standards, the students will need to understand that . . .	<b>Essential Questions</b> In order to understand, students will need to consider questions such as . . .	<b>Knowledge and Skills</b> Learning this material will require students to . . .	<b>Standards and Assessments</b>
<ul style="list-style-type: none"> <li>• Multiply two or more fractions by simplifying common factors and writing the product of the numerators over the product of the denominators.</li> <li>• Multiply mixed numbers by writing them in fraction form.</li> <li>• Divide fractions by using reciprocals. Multiply the dividend by the reciprocal of the divisor.</li> <li>• Divide mixed numbers by using improper fractions and reciprocals.</li> <li>• Use a number line to compare and order integers.</li> <li>• Use number lines and absolute values to understand value of rational numbers.</li> <li>• Understanding positive and negative numbers in real world context.</li> </ul>			

**Ratios and Proportional Relationships**

<p><b>Enduring Understandings</b> In order to meet the standards, the students will need to understand that . . .</p>	<p><b>Essential Questions</b> In order to understand, students will need to consider questions such as . . .</p>	<p><b>Knowledge and Skills</b> Learning this material will require students to . . .</p>	<p><b>Standards and Assessments</b></p>
<p><b>Understand ratio concepts and use ratio reasoning to solve problems.</b></p> <ul style="list-style-type: none"> <li>• Measure length using customary and metric units.</li> <li>• Change customary units of measure by multiplying or dividing, or by multiplying by a form of 1.</li> <li>• You can use renaming to add or subtract customary units.</li> <li>• Write ratios and equivalent ratios in different ways (fraction form, decimal form and ratio form).</li> <li>• Use ratios to write rates, equivalent rates and unit rates.</li> <li>• Use the Cross Products Property or equivalent fractions to decide whether two ratios form a proportion or to solve a proportion.</li> <li>• Write a proportion using a measurement from the scale drawing, the scale and the unknown measurement. Then solve the proportion for the unknown measurement.</li> </ul>	<ul style="list-style-type: none"> <li>• How can you use rates and ratios to solve real-world problems?</li> </ul>	<ul style="list-style-type: none"> <li>• Find ratios and unit rates</li> <li>• Find equivalent rates</li> <li>• Write and solve proportions</li> <li>• Solve percent problems using proportions</li> <li>• Rewrite fractions, decimals, and percents</li> <li>• Order decimals, fractions, and percents.</li> <li>• Understand and calculate discount, markup, tax, and simple interest</li> <li>• Add, subtract, multiply, and divide using fractions, decimals, or percents.</li> <li>• Convert fractions to decimals to percents and the inverse.</li> <li>• Choose when to represent an answer as a fraction, decimal, or percent.</li> <li>• Have automaticity in computing common fractions, decimals, and percents.</li> </ul>	<ul style="list-style-type: none"> <li>• 6.RP.1</li> <li>• 6.RP.2</li> <li>• 6.RP.3a (covered in 6.EE section)</li> <li>• 6.RP.3b</li> <li>• 6.RP.3c</li> <li>• 6.RP.3d</li> </ul>

<b>Enduring Understandings</b> In order to meet the standards, the students will need to understand that . . .	<b>Essential Questions</b> In order to understand, students will need to consider questions such as . . .	<b>Knowledge and Skills</b> Learning this material will require students to . . .	<b>Standards and Assessments</b>
<ul style="list-style-type: none"> <li>• Fractions have equivalent decimals and percents.</li> <li>• Decimals have equivalent fractions and percents.</li> <li>• Percents have equivalent decimals and fractions.</li> <li>• Use multiplication to find percent of a number.</li> </ul>		<ul style="list-style-type: none"> <li>• Convert between all types of repeating decimals and fractions.</li> <li>• Measure using customary and metric units.</li> </ul>	

Geometry

<p><b>Enduring Understandings</b> In order to meet the standards, the students will need to understand that . . .</p>	<p><b>Essential Questions</b> In order to understand, students will need to consider questions such as . . .</p>	<p><b>Knowledge and Skills</b> Learning this material will require students to . . .</p>	<p><b>Standards and Assessment</b></p>
<p><b>Solve real-world and mathematical problems involving area, surface area, and volume.</b></p> <ul style="list-style-type: none"> <li>• Use appropriate formulas to find the perimeter and area of parallelograms and trapezoids.</li> <li>• Use the formula <math>A=1/2(b/h)</math> to find area of triangle.</li> <li>• Find circumference of a circle by using formulas: <math>C=d(\pi)</math> and <math>C=2(\pi)r</math>.</li> <li>• Find the area of the circle by using the formula <math>A= (\pi)r^2</math>.</li> <li>• Use the relationship between radius and diameter to solve real world problems.</li> <li>• Find the surface area of rectangular and triangular prisms by adding the areas of its faces.</li> <li>• Use <math>V=lwh</math> to find the volume of a rectangular prism.</li> <li>• Draw and translate figures on a coordinate plane.</li> </ul>	<ul style="list-style-type: none"> <li>• What is the purpose of being able to decompose 3-dimensional shapes?</li> </ul>	<ul style="list-style-type: none"> <li>• Classify angles by the measures</li> <li>• Identify special pairs of angles (complementary, supplementary, vertical, adjacent) and types of lines</li> <li>• Classify triangles</li> <li>• Classify quadrilaterals and other polygons</li> <li>• Use properties of congruent polygons to find unknowns</li> <li>• Identify transformations and symmetry in figures</li> <li>• Recognize tessellations</li> <li>• Graph transformations in the coordinate plane</li> <li>• Solve equations to find angle measures</li> <li>• Apply area and perimeter formulas to triangles</li> <li>• Apply area and perimeter formulas to parallelograms and trapezoids</li> <li>• Apply area and circumference formulas to circles</li> <li>• Find the surface area and volume of rectangular and triangular prisms</li> </ul>	<ul style="list-style-type: none"> <li>• 6.G.1</li> <li>• 6.G.1.MA.1a</li> <li>• 6.G.1.MA.1b</li> <li>• 6.G.2</li> <li>• 6.G.3</li> </ul>

**Statistics and Probability**

<p><b>Enduring Understandings</b> In order to meet the standards, the students will need to understand that . . .</p>	<p><b>Essential Questions</b> In order to understand, students will need to consider questions such as . . .</p>	<p><b>Knowledge and Skills</b> Learning this material will require students to . . .</p>	<p><b>Standards and Assessments</b></p>
<p><b>Develop understanding of statistical variability.</b></p> <p><b>Summarize and describe distributions.</b></p> <ul style="list-style-type: none"> <li>• Frequency tables, box plots, histograms, dot (line) plots can be used to organize data.</li> <li>• Interpret circle graphs and make predictions based on the size of each section.</li> <li>• You can describe data using mean, median, mode, range and absolute mean deviation.</li> <li>• Use diagrams, tables and lists to find and collect outcomes of a data set.</li> <li>• Identify statistical questions as questions that allow for a variety of responses.</li> </ul>	<ul style="list-style-type: none"> <li>• How can you summarize and analyze a data set?</li> </ul>	<ul style="list-style-type: none"> <li>• Count outcomes using an organized list and tree diagrams</li> <li>• Collect and analyze data using a frequency table.</li> <li>• Create box plots to depict a data set.</li> <li>• Create a histogram to depict a data set.</li> <li>• Create a dot (line) plot to depict a data set.</li> <li>• Interpret data represented in a circle graph.</li> <li>• Use mean, median, mode, range and absolute mean deviation to describe a data set.</li> <li>• Identify questions as statistical.</li> </ul>	<ul style="list-style-type: none"> <li>• 6.SP.3</li> <li>• 6.SP.4</li> <li>• 6.SP.4.MA.4.a</li> <li>• 6.SP.5</li> <li>• 6.SP.5a</li> <li>• 6.SP.5b</li> <li>• 6.SP.5d</li> <li>• <b>7.SP.5 (probability)</b></li> </ul>

### 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><b>Apply and extend previous understandings of arithmetic to algebraic expressions.</b></p> <p><b>Reason about and solve one-variable equations and inequalities.</b></p> <p><b>Represent and analyze quantitative relationships between dependent and independent variables.</b></p> <ul style="list-style-type: none"> <li>• The value of the exponent tells you how many times to write the base as a factor.</li> <li>• Use the order of operations to evaluate expressions.</li> <li>• Evaluate a variable expression by substituting a number for each variable. Then evaluate the numerical expression.</li> <li>• Write phrases and sentences as variable expressions or equations.</li> <li>• Solve one-step equations.</li> <li>• Evaluate functions and write function rules.</li> <li>• Make predictions and write a function by using a graph of a linear function in the coordinate plane.</li> </ul>	<ul style="list-style-type: none"> <li>• How do variables allow us to model real world situations using mathematics?</li> <li>• How do you describe relationships between quantities using expressions and equations?</li> </ul>	<ul style="list-style-type: none"> <li>• Apply PEMDAS to evaluate numerical expressions</li> <li>• Write and evaluate variable expressions</li> <li>• Evaluate expressions with powers</li> <li>• Write and solve equations using mental math</li> <li>• Solve equations using addition, subtraction, multiplication, and division</li> <li>• Solve one-step equations</li> <li>• Write a function by using a graph of a linear function.</li> </ul>	<ul style="list-style-type: none"> <li>• 6.EE.1</li> <li>• 6.EE.2.a</li> <li>• 6.EE.2.b</li> <li>• 6.EE.2.c</li> <li>• 6.EE.3</li> <li>• 6.EE.4</li> <li>• 6.EE.6</li> <li>• 6.EE.7</li> <li>• 6.EE.9</li> <li>• 6.RP.3a</li> </ul>