# Bedford Public Schools

## Grade 3 – Math

The third grade curriculum builds on and extends the concepts of number, measurement, data, and geometry begun in earlier grades. Students solidify multi-digit addition and subtraction skills with numbers within 1000 and use these to solve multi-step problems. The main new number focus in third grade is developing an understanding of multiplication and division within 100 and using these in problem solving situations. Students are expected to master all multiplication facts of one digit number pairs up to products of 100 and multiply one-digit numbers by multiples of 10. Students begin to learn and apply various estimation strategies for all four operations. In the area of numbers and operations, students also develop an understanding of fractions, beginning with unit fractions (fractions with one as the numerator). Students solve problems that involve comparing fractions by using visual fraction models and strategies based on noticing equal numerators and denominators. In measurement, students develop an understanding of area in two-dimensional shapes and learn the connection between the concepts of area and multiplication. They also learn the distinction between area and perimeter of 2-D shapes. Students also generate measurement data and display their data by making line plots. Finally, in geometry, students understand that shapes in different categories may share attributes and that the shared attributes can define a larger category. Students explore attributes of different kinds of quadrilaterals.

Throughout all grades, there is an emphasis on the skills of mathematical practice that prepare children to be mathematically proficient students. These skills include making sense of problems and persevering in solving them, assessing how reasonable their answers are, explaining in words (both orally and in writing) their understanding and reasoning, attending to precision in both calculations and in math language, using appropriate math tools, and looking for and extending patterns.

Assessments happen in multiple ways routinely throughout the school year to measure student progress. Assessments consist of informal as well as formal teacher observations, small group interviews, individual interviews and checkpoints, and written tests. Student progress is monitored carefully to ensure proficiency in both the mathematical content and the practice standards that are expected at each grade level.

**Learning Expectations**

## Operations and Algebraic Thinking

| Enduring Understandings<br>In order to meet the standards, the students will need to understand that . . . | Essential Questions<br>In order to understand, students will need to consider questions such as . . . | Knowledge and Skills<br>Learning this material will require students to . . . |
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| **Represent and Solve Problems Involving Multiplication and Division**<br><br>• Repeated addition involving joining equal groups is one way to think about multiplication.<br>• An array involves joining equal groups and is one way to think about multiplication.<br>• Some real-world problems involving joining or separating equal groups or comparison can be solved using multiplication.<br>• Division can be represented by fair share or equal groups situations.<br>• Unknowns can be used in all positions when solving problems.<br>• Multiplication and division have an inverse relationship and can be used to solve problems and check answers.<br>• Multiplication and division problems with whole numbers can be solved by using drawings as well as equations. | • What are different meanings for multiplication?<br>• What are different meanings for division?<br>• What strategies can be used to solve multiplication and division word problems?<br>• How can multiplication and division situations be represented in equations using a symbol for the unknown?<br>• How are multiplication and division related? | • Interpret products of whole numbers (i.e. interpret 5 x 7 as the total number of objects in 5 groups of 7 objects each).<br>• Interpret whole-number quotients of whole numbers (i.e. interpret 56 ÷ 8 as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each).<br>• Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities by using drawings and equations with a symbol for the unknown number to represent the problem.<br>• Determine the unknown whole number in a multiplication or division equation relating three whole numbers. |

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| **Understand Properties of Multiplication and the Relationship Between Multiplication and Division**<br>• For a given set of numbers, there are relationships that are always true called properties. Properties are the rules that govern arithmetic. (ie. The Commutative Property, the Associative Property and the Distributive Property of multiplication are three such properties.)<br>• The inverse relationship between multiplication and division can be used to find unknown factors in division problems. | • What are the properties of multiplication and how can they be applied?<br>• How are multiplication and division related? | • Apply properties of operations as strategies to multiply and divide.<br>• Understand division as an unknown-factor problem (i.e. find 32 ÷ 8 by finding the number that makes 32 when multiplied by 8). |
| **Multiply and Divide Within 100**<br>• Patterns and known facts can be used to find unknown facts.<br>• There are patterns in the products for multiplication facts with factors of 2 or 5, for 9, 0 or 1 and for 10.<br>• Knowing products for multiplication facts with factors of 2 can be useful in learning the 4's and 8's facts.<br>• Knowing products for multiplication facts with factors of 3 can be useful in learning the 6's facts.<br>• The inverse relationship between multiplication and division can be used in learning multiplication and division facts.<br>• Fact families show multiplication and division relationships. | • How can patterns and known facts be used to find unknown facts? | • Fluently * multiply and divide within 100, using strategies such as the relationship between multiplication and division (i.e. knowing that 8 x 5 = 40, one knows 40 ÷ 5 = 8) or properties of operations.<br>• By the end of grade 3, know from memory all products of two one-digit numbers.<br>**Fluently is used in the standards as meaning "fast and accurate". Fluency is a mixture of knowing some answers, knowing some answers from patterns, and knowing some answers from the use of strategies.* |

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| **Solve Problems Involving the Four Operations, and Identify and Explain Patterns in Arithmetic**<br><br>• Operations of addition, subtraction, multiplication and division of whole numbers can be used to solve problems.<br>• Numerical calculations can be approximated by replacing numbers with other numbers that are close and easy to compute. This is called estimation.<br>• Rounding is a process for finding the multiple of 10, 100, etc. closest to a given number.<br>• There is more than one way to estimate a sum, difference, product or quotient. Rounding is a one strategy for estimating.<br>• Using mental computation and estimation strategies including rounding are useful in assessing the reasonableness of an answer.<br>• The Order of Operations is a convention that is used to perform computation problems when no parentheses are used.<br>• Multiple problem-solving strategies can be used to solve problems. The particular strategy to use often depends on the situation in the problem. | • How can sums, differences, products and quotients be used to found to solve problems?<br>• What problem-solving strategies are most helpful for particular problems?<br>• What strategies can be used to assess the reasonableness of an answer?<br>• How can identifying patterns in the addition and multiplication table be helpful in finding answers?<br>• What is the conventional order for performing operations when parentheses are not included? | • Solve two-step word problems using the four operations. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies, including rounding.<br>• Identify arithmetic patterns, including patterns in the addition table or multiplication table and explain them using properties of operations. |

**Numbers and Operations in Base Ten**

| **Enduring Understandings**<br>In order to meet the standards, the students will need to understand that . . . | **Essential Questions**<br>In order to understand, students will need to consider questions such as . . . | **Knowledge and Skills**<br>Learning this material will require students to . . . |
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| **Use Place Value Understanding and Properties of Operations to Perform Multi-Digit Arithmetic**<br><br>• Rounding is a process for finding the multiple of 10, 100, etc. closest to a given number.<br>• There is more than one way to estimate a sum, difference, product or quotient. Rounding is a one strategy for estimating.<br>• Place value, properties of operations and the relationship between addition and subtraction can be used in fluently adding and subtracting numbers within 1,000.<br>• There are a variety of ways to add and subtract multi-digit numbers.<br>• Multiplying by multiples of ten can be easily solved if basic multiplication facts are automatic.<br>• For a given set of numbers, there are relationships that are always true called properties. Properties are the rules that govern arithmetic. (ie. The Commutative Property, the Associative Property and the Distributive Property of multiplication are three such properties.) | • What is rounding?<br>• What are various strategies for adding and subtracting multi-digit numbers?<br>• How does knowing basic multiplication facts and understanding place value help when multiplying one-digit whole numbers by multiples of ten?<br>• How can knowing the properties of operations help in multiplying single-digit numbers by multiples of 10? | • Use place value understanding to round whole numbers to the nearest 10 or 100.<br>• Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.<br>• Multiply one-digit whole numbers by multiples of 10 in the range 10–90 (i.e. 9 x 80, 5 x 60) using strategies based on place value and properties of operations.<br>**Fluently is used in the standards as meaning "fast and accurate". Fluency is a mixture of knowing some answers, knowing some answers from patterns, and knowing some answers from the use of strategies.* |

**Number and Operations: Fractions**

| **Enduring Understandings**<br>In order to meet the standards, the students will need to understand that . . . | **Essential Questions**<br>In order to understand, students will need to consider questions such as . . . | **Knowledge and Skills**<br>Learning this material will require students to . . . |
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| **Develop Understanding of Fractions as Numbers (Fractions in Grade 3 Are Limited to Denominators With 2, 3, 4, 6, 8 Only)**<br><br>• A region can be divided into equal-sized parts in different ways. Equal-sized parts may have the same area, but may not have the same shape.<br>• A fraction describes the division of a whole (i.e. region, set, segment) into equal parts. The bottom number of a fraction tells how many equal parts the whole is divided into. The top number tells how many equal parts are indicated. A fraction is relative to the size of the whole.<br>• Finding a unit-fractional part (1/b) is the same as dividing the whole by the denominator of the fraction.<br>• The set of real numbers is infinite and ordered. Whole number, integers, and fractions are real numbers. Each real number can be associated with a unique point on a number line.<br>• Some points between whole numbers on a number line can be labeled with fractions or mixed numbers. The denominator of the fraction can be determined by counting the number of equal parts between two consecutive whole numbers. | • What is a fraction?<br>• What are different interpretations of a fraction?<br>• What visual models are most useful when working with fractions?<br>• What are different ways to compare fractions?<br>• What is fraction equivalence and how can it be recognized?<br>• How can whole numbers be expressed as fractions? | • Understand a fraction 1/b as the quantity formed by 1 part when a whole is partitioned into b equal parts; understand a fraction a/b as the quantity formed by a parts of size 1/b.<br>• Understand a fraction as a number on the number line; represent fractions on a number line diagram.<br>• Represent a fraction 1/b on a number line diagram by defining the interval from 0 to 1 as the whole and partitioning it into b equal parts. Recognize that each part has size 1/b and that the endpoint of the part based at 0 locates the number 1/b on the number line.<br>• Represent a fraction a/b on a number line diagram by marking off a lengths 1/b from 0. Recognize that the resulting interval has size a/b and that its endpoint locates the number a/b on a number line.<br>• Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size.<br>• Understand two fractions as equivalent (equal) if they are the same size, or the same point on a number line. |

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| **Fractions (cont.)**<br><br>• If two fractions have the same denominator, the fraction with the greater numerator is the greater fraction. (Fractions relate to the same whole.)<br>• If two fractions have the same numerator, the fraction with the lesser denominator is the greater fraction. (Fractions relate to the same whole.)<br>• Fractions can be compared to each other by comparing them with benchmark numbers such a 0, ½ , and 1.<br>• Number lines can be used to compare fractions with like denominators or like numerators.<br>• A fraction is relative to the size of the whole. Models can be used to compare fractional amounts.<br>• Symbols (i.e. >, < or =) can be used to record the results of comparisons.<br>• Equivalent fractions name the same point on a number line but have different denominators.<br>• If a fraction aligns with a whole number on a number line or to a whole number fraction strip, the whole number is equivalent to that fraction (i.e. 2/2 = 1).<br>• Whole numbers can be expressed as fractions with 1 as the denominator (i.e. 5 = 5/1). | | • Recognize and generate simple equivalent fractions (i.e., 1/2 = 2/4, 4/6 = 2/3). Explain why the fractions are equivalent by using a visual fraction model.<br>• Express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers.<br>• Compare two fractions with the same numerator or the same denominator by reasoning about their size. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions by using a visual fraction model. |

**Measurement and Data**

| **Enduring Understandings**<br>In order to meet the standards, the students will need to understand that . . . | **Essential Questions**<br>In order to understand, students will need to consider questions such as . . . | **Knowledge and Skills**<br>Learning this material will require students to . . . |
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| **Solve Problems Involving Measurement and Estimation of Intervals of Time, Liquid Volume, and Masses of Objects**<br><br>• Time can be measured using different units that are related to one another.<br>• The minute hand takes 5 minutes to move from one number to the next on a typical clock fact. The minute hand takes 1 minute to move from one mark to the next mark on a typical clock face.<br>• The duration of an event can be measured if one knows the start and end times for the event.<br>• Word problems can include time and elapsed time.<br>• Capacity is a measure of the amount of liquid a container can hold.<br>• Mass is a measure of the quantity of matter in an object. Weight and mass are different.<br>• The weight of an object is a measure of how heavy an object is.<br>• Word problems can include capacity and weight. | • How can length of time be measured and found?<br>• What are the customary units for measuring capacity and weight?<br>• What are the metric units for measuring capacity and weight?<br>• What is mass and how does it relate to weight? | • Tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes by representing the problem on a number line diagram.<br>• Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (*l*).<br>• Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units by using drawings, such as a beaker with a measurement scale to represent the problem. |

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| **Represent and Interpret Data**<br><br>• Some questions can be answered by collecting and analyzing data.<br>• Data can be represented visually using line plots and graphs.<br>• A line plot can be used as a visual representation of the relative length of objects.<br>• Rulers marked in halves and fourths of an inch can be used to measure lengths.<br>• The type of data determines the best type of visual representation.<br>• Pictographs and bar graphs make it easy to compare data.<br>• The key for a pictograph determines the number of pictures needed to represent each number in a set of data.<br>• The scale for a bar graph determines how long the bar needs to be to represent each number in a set of data.<br>• Scaled pictographs can be used in word problems to indicate comparisons between different sets of data. | • How can data be represented, interpreted and analyzed?<br>• How can lengths be measured with rulers marked off in halves and fourths? | • Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step “how many more” and “how many less” problems using information presented in scaled bar graphs. (i.e Draw a bar graph in which each square in the bar graph might represent 5 pets.)<br>• Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units, such as whole numbers, halves, or quarters. |

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| **Geometric Measurement: Understand Concepts of Area and Relate Area to Multiplication and to Addition**<br><br>• The amount of space inside a shape is its area, and area can be estimated or found using square units.<br>• Square units can be used to create shapes with given areas.<br>• Standard measurement units are used for consistency in finding and communicating measurements.<br>• The area of some rectangles can be used to model the Distributive Property.<br>• The area of irregular shapes can be found by breaking apart the original shape into other shapes for which areas can be found. | • What is area?<br>• What are different ways to find the area of a shape?<br>• How is area related to the operations of multiplication and addition?<br>• How can visual models be used to help understand and calculate area and perimeter?<br>• How can area of some rectangles be used to model the Distributive Property? | • Recognize area as an attribute of plane figures and understand concepts of area measurement.<br>• Know that a square with side length 1 unit, called “a unit square,” has “one square unit” of area, and can be used to measure area.<br>• Know that a plane figure, which can be covered without gaps or overlaps by n unit squares has an area of n square units.<br>• Measure areas by counting unit squares (i.e. square cm, square m, square in, square ft, and improvised units).<br>• Relate area to multiplication and addition.<br>• Find the area of a rectangle with whole-number side lengths by tiling it, and show that the area is the same as would be found by multiplying the side lengths.<br>• Multiply side lengths to find areas of rectangles with whole-number side lengths in the context of solving real-world mathematical problems, and represent whole-number products as rectangular areas in mathematical reasoning.<br>• Use tiling to show in a concrete case that the area of a rectangle with whole-number side lengths a and b + c is the sum of a x b and a x c.<br>• Use area models to represent the distributive property in mathematical reasoning.<br>• Recognize area as additive. Find areas of rectilinear figures by decomposing them into non-overlapping rectangles and adding the areas of the non-overlapping parts, applying this technique to solve real-world problems. |

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|---|---|---|
| **Geometric Measurement: Recognize Perimeter as an Attribute of Plane Figures and Distinguish Between Linear and Area Measures**<br><br>• There are relationships between the perimeter and the area of a polygon.<br>• The distance around a figure is its perimeter. To find the perimeter of a polygon, add the lengths of the sides.<br>• In a given measurement situation, the type of measuring tool and the measurement units it contains determine the appropriateness of the tool.<br>• Shapes can be made with a given perimeter. Different shapes can have the same perimeter. | • What is perimeter?<br>• How can the perimeter of an object be measured and found? | • Solve real-world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters. |

## Geometry

| **Enduring Understandings**<br>In order to meet the standards, the students will need to understand that . . . | **Essential Questions**<br>In order to understand, students will need to consider questions such as . . . | **Knowledge and Skills**<br>Learning this material will require students to . . . |
|---|---|---|
| **Reason With Shapes and Their Attributes**<br>• Two and three-dimensional objects with or without curved surfaces can be described, classified, and analyzed by their attributes.<br>• Line and line segments are sets of points in space that can be used to describe parts of other geometric lines, shapes and solids.<br>• An angle is formed by two rays with a common endpoint. Angles can be classified by their size.<br>• Plane shapes have many properties that make them different from one another.<br>• Polygons can be described and classified by their sides and angles.<br>• Polygons can be put together or taken apart to make other polygons.<br>• Shapes can be partitioned into parts with equal areas. Each part can be expressed as a unit fraction (1/b). | • How can two-dimensional shapes be described, analyzed and classified?<br>• How can equal areas of parts of a shape be expressed? | • Understand that shapes in different categories (i.e. rhombuses, rectangles, and others) may share attributes (i.e. having four sides), and that the shared attributes can define a larger category (i.e. quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.<br>• Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. (ie. Partition a shape into 4 parts with equal areas and describe the area of each part as ¼ of the area of the shape.) |