Course Information

Grade(s):	Grade K
Discipline/Course:	Mathematics
Course Title:	Grade K Mathematics
Prerequisite(s):	0-60 months
Course Description: *Program of Studies*	In Kindergarten, instructional time focuses on two critical areas: (1) representing and comparing whole numbers, initially with sets of objects; (2) describing shapes and space. More learning time in Kindergarten is devoted to understanding number than the other topics. Students will develop an understanding of counting: one to one matching, the last number said tells the quantity, there is a sequence to our numbers, and there is a pattern to the underlying structure to our number system. Students will develop an understanding of early number concepts and place value. Students combine and take apart numbers. Students describe their physical world using geometric ideas. Young children are exposed to and explore the power of mathematics to understand and shape their world.
Course Essential Questions:	● Why do we count? ● How are numbers and shapes related to each other? ● What patterns and relationships do we find with numbers when counting?
Course Enduring Understandings:	● There are patterns in our counting sequence and our number system. ● When counting a set, the last number said is the number of objects in a set (Cardinality). ● If there is a corresponding object matched to each object in a set, the totals of the sets are equivalent (one-to-one correspondence). ● Numbers grow by one, and exactly one, each time (Hierarchical Inclusion). ● Ordinal numbers are numbers that are counted once and only once in conventional order. ● Numbers can be composed and decomposed (eg. 5 is 2 and 3). ● Quantities within 10 can be compared using less than, more than or the same.

	● Conservation of number - the arrangement of objects does not affect how many there are. ● Subitizing (perceptual) is the instant recognition of a number of objects. ● Unitizing is recognizing that numbers count not only objects, but groups of objects, e.g. 1 thing, and one group of (10) things. ● Numbers can be combined and separated (eg. Adding 2 more to a group of 3 gives you 5). ● Objects can be described and compared using measurable attributes. ● Objects can be sorted and classified by attributes. ● Shapes can be identified, analyzed and compared. ● Shapes can be combined to make other shapes. ● Objects can be identified by describing their location and relative position.
Course Standards *Note: The Board of Education adopted elementary mathematics standards for this course will remain the same; however, the sequence of units and standards among units may shift over time in response to student performance needs.*	**By the end of this course, students are expected to:** MP.1. Make sense of problems and persevere in solving them. *In Kindergarten, students begin to build the understanding that doing mathematics involves solving problems and discussing how they solved them. Students explain to themselves the meaning of a problem and look for ways to solve it. Younger students may use concrete objects or pictures to help them conceptualize and solve problems. They may check their thinking by asking themselves, "Does this make sense?" or they may try another strategy.* MP.2. Reason abstractly and quantitatively. *Younger students begin to recognize that a number represents a specific quantity. Then, they connect the quantity to written symbols. Quantitative reasoning entails creating representation of a problem while attending to the meanings of the quantities.* MP.3. Construct viable arguments and critique the reasoning of others. *Younger students construct arguments using concrete referents, such as objects, pictures, drawings, and actions. They also begin to develop their mathematical communication skills as they participate in mathematical discussions involving questions like "How did you get that?" and "Why is that true?" They explain their thinking to others and respond to others' thinking.* MP.4. Model with mathematics. *In early grades, students experiment with representing problem situations in multiple ways including numbers, words (mathematical language), drawing pictures, using objects, acting out, making a chart or list, creating equations, etc. Students need opportunities to connect the different representations and explain the connections. They should be able to use all of these representations as needed.* MP.5. Use appropriate tools strategically.

	Younger students begin to consider the available tools (including estimation) when solving a mathematical problem and decide when certain tools might be helpful. For instance, kindergarteners may decide that it might be advantageous to use linking cubes to represent two quantities and then compare the two representatives side-by-side. MP.6. Attend to precision. *As kindergarteners begin to develop their mathematical communication skills, they try to use clear and precise language in their discussions with others and in their own reasoning.* MP.7. Look for and make use of structure. *Younger students begin to discern a pattern or structure. For instance, students recognize the pattern that exists in the teen numbers; every teen number is written with a 1 (representing one ten) and ends with the digit that is first stated. They also recognize that 3 + 2 = 5 and 2 + 3 = 5.* MP.8. Look for and express regularity in repeated reasoning. *In the early grades, students notice repetitive actions in counting and computation, etc. For example, they may notice that the next number in a counting sequence is one more. When counting by tens, the next number in the sequence is "ten more" (or one more group of ten). In addition, students continually check their work by asking themselves, "Does this make sense?"* *Adapted from Connecticut Standards for Mathematics*
FPS Academic Expectation(s):	**Exploring and Understanding** *When students engage in problem solving situations, they should be able to understand the problem, determine relevant information, and ask relevant additional questions.* **Synthesizing and Evaluating** *Engaging in a problem solving situation, students should be able to analyze the most efficient approach, and reflect on the process used to solve the problem.* **Creating and Constructing** *Engaged in a problem solving situation, students should implement a plan.* **Conveying Ideas** *Students should be able to use correct mathematical language and logically display their work for the desired problem.* **Collaborating Strategically** *Students should be able to work collaboratively to solve problems.* **Using Communication (Media) Tools**

	Students should be able to explore and choose the correct tools to illustrate their mathematical work to solve a specific problem.
Duration:	1 year
Course Materials/Resources:	Bridges 2nd ed. Fairfield Public Schools Math Units
Additional Resources (Optional)	Illustrative Mathematics About Teaching Mathematics, Marilyn Burns Contexts for Learning Mathematics, Fosnot et al.

Unit 1

Unit 1 Counting, Matching Numerals and Comparing Numerals 0-5	The first unit is intended to engage students in thinking mathematically. The lessons focus on learning how to engage one another as mathematicians using 21st century skills. Student discourse is enhanced by using turn & talk, think-pair-share, justify reasoning, and constructing viable arguments for mathematical thinking. Students represent their thinking using mathematical models and numbers, questioning peers for deeper understanding and clarification. The correctness of solutions lies within the logic of the mathematics. The students will focus on the numerals 0-5 with an emphasis on counting and matching numerals. Students will compare sets and numbers to 5 and beyond.
Learning Goals	

Standard(s): *Note: The Board of Education adopted elementary mathematics standards for this course will remain the same; however, the sequence of units and standards among units may shift over time in response to student performance needs.*	**Counting and Cardinality** **Know number names and the count sequence.** K.CC.1. Count to 120 by ones and by tens. K.CC.3. Write numbers from 0 to 30. Represent a number of objects with a written numeral 0-30 (with 0 representing a count of no objects). **Count to tell the number of objects.** K.CC.4. Understand the relationship between numbers and quantities; connect counting to cardinality. a. When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object. b. Understand that the last number name said tells the number of objects counted. The number of objects is the same regardless of their arrangement or the order in which they were counted. c. Understand that each successive number name refers to a quantity that is one larger. **Compare numbers.** K.CC.6. Identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group, e.g., by using matching and counting strategies. K.CC.7. Compare two numbers between 1 and 10 presented as written numerals. **Measurement and Data** **Classify objects and count the number of objects in each category.** K.MD.3. Classify objects into given categories; count the numbers of objects in each category and sort the categories by count.
Essential Question(s):	● How do numerals represent different amounts of objects? ● What patterns do we see in our numbers when we count more and more objects? ● What relationships can we find when counting different sets of objects?

Enduring Understanding(s):	● Counting helps students to understand how numbers are related. ● Numbers can be represented by numerals, sets, and number names. ● Counting objects requires synchrony and tagging (Synchrony: remembering the word that comes next and using only one word for each object. Tagging: touching each object once and only once.) ● Numbers grow by one, and exactly one, each time (Hierarchical Inclusion). ● When counting a set the number they end on is the number of objects in a set (Cardinality). ● One to one correspondence (if there is a corresponding object matched to each object in a set, the sets are equivalent) is necessary to the understanding of equivalency. ● The number of objects in a set remains the same regardless of the arrangement of the set (Conservation of a Number). ● The number of objects can be recognized at a glance without counting (Subitizing).
Learning Goal(s): *Students will be able to use their learning to:*	Develop and use models to represent numerals, sets and number names. Ask questions and investigate how numbers are related and represented. Construct explanations using patterns, structures and relationships of quantities of numbers. Use tools and clear and precise language to defend conservation of a number and cardinality. Trusts the count and, without prompting, choose 'counting' as a way of solving such problems. Investigate, generalize and reason about patterns in numbers, explaining and justifying the conclusions reached.

Unit 2

Unit 2 Geometry: Identifying, Describing, Comparing, Analyzing, Composing 2D and 3D shapes	The purpose of this unit is for students to describe their physical world in terms of shape, orientation and spatial relations. They use basic shapes and spatial reasoning to model objects in their environment and construct more complex shapes. They identify, name and describe two dimensional and three dimensional objects in their environment, and describe the relative positions of these objects using terms such as above, below, beside, in front of. Students will analyze and compare two and three dimensional shapes to describe their similarities, differences, parts and other attributes. They will draw and create shapes.
Learning Goals	
Standard(s):	**Measurement and Data** **Describe and compare measurable attributes.** K.MD.2. Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. *For example, directly compare the heights of two children and describe one child as taller/shorter.* **Classify objects and count the number of objects in each category.** K.MD.3. Classify objects into given categories; count the numbers of objects in each category and sort the categories by count. **Geometry** **Identify and describe shapes (squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders, and spheres).** K.G.1. Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as above, below, beside, in front of, behind, and next to. K.G.2. Correctly name shapes regardless of their orientations or overall size.

	K.G.3. Identify shapes as two-dimensional (lying in a plane, "flat") or three-dimensional ("solid"). **Analyze, compare, create, and compose shapes.** K.G.4. Analyze and compare two- and three-dimensional shapes, in different sizes and orientations, using informal language to describe their similarities, differences, parts (e.g., number of sides and vertices/"corners") and other attributes (e.g., having sides of equal length). K.G.5. Model shapes in the world by building shapes from components (e.g., sticks and clay balls) and drawing shapes. K.G.6. Compose simple shapes to form larger shapes. For example, "Can you join these two triangles with full sides touching to make a rectangle?"
Essential Question(s):	● How are 2-D shapes alike and different? ● How are 3-D objects alike and different? ● How are 2-D and 3-D shapes alike and different from each other? ● How can we compose from other shapes? ● How can we decompose shapes into other shapes? ● Where are objects in relationship to each other?
Enduring Understanding(s):	● Shapes can be compared by using a variety of geometric attributes. ● Shapes can be described relative to their position in space. ● Shapes can be seen from different perspectives. ● Shapes are two-dimensional or and objects are three-dimensional. ● Shapes and objects can be described by their attributes. ● Shapes can be constructed and deconstructed into other shapes.

Learning Goal(s): *Students will be able to use their learning to:*	Analyze and interpret how 2-D and 3-D shapes are alike and different using attributes. Develop and use models to compose and decompose shapes into new shapes by drawing and constructing them. Ask questions and investigate the attributes of shapes. Construct explanations to describe relative positions of objects (ex. Above, below, to the left, to the right of, under, etc.).

Unit 3

Unit 3 **Counting and Matching Numerals 6-10 with Comparing Quantities**	The purpose of this unit is to develop an understanding of quantity and number. Students count and match numerals through 10. Students build on the five structure to understand the ten structure. Students compare sets of objects and numbers and develop strategies to determine more, less and the same quantities of objects.
Learning Goals	
Standard(s):	**Counting and Cardinality** **Know number names and the count sequence.** K.CC.1. Count to 120 by ones and by tens. K.CC.3. Write numbers from 0 to 30. Represent a number of objects with a written numeral 0-30 (with 0 representing a count of no objects).

	Count to tell the number of objects. K.CC.4. Understand the relationship between numbers and quantities; connect counting to cardinality. a. When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object. b. Understand that the last number name said tells the number of objects counted. The number of objects is the same regardless of their arrangement or the order in which they were counted. c. Understand that each successive number name refers to a quantity that is one larger. K.CC.5. Count to answer "how many?" questions about as many as 20 things arranged in a line, a rectangular array, or a circle, or as many as 10 things in a scattered configuration; given a number from 1–20, count out that many objects. **Compare numbers.** K.CC.6. Identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group, e.g., by using matching and counting strategies. K.CC.7. Compare two numbers between 1 and 10 presented as written numerals. **Operations and Algebraic Thinking** **Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.** K.OA.4. For any number from 1 to 9, find the number that makes 10 when added to the given number, e.g., by using objects or drawings, and record the answer with a drawing or equation. **Measurement and Data K.MD** **Classify objects and count the number of objects in each category.** K.MD.3. Classify objects into given categories; count the numbers of objects in each category and sort the categories by count.
Essential	• How do we count objects and groups of objects?

Question(s):	● What patterns do we see in our numbers when we count more and more objects? ● What relationships can we find when counting different sets of objects? ● How does the arrangement of objects affect the number of objects when counting?
Enduring Understanding(s):	● Counting helps students to understand how numbers are related. ● Numbers can be represented by numerals, sets, and number names. ● Counting objects requires synchrony and tagging (Synchrony: remembering the word that comes next and using only one word for each object. Tagging: touching each object once and only once.) ● Numbers grow by one, and exactly one, each time (Hierarchical Inclusion). ● When counting a set the number they end on is the number of objects in a set (Cardinality). ● One to one correspondence (if there is a corresponding object matched to each object in a set, the sets are equivalent) is necessary to the understanding of equivalency. ● The number of objects in a set remains the same regardless of the arrangement of the set (Conservation of a Number).
Learning Goal(s): *Students will be able to use their learning to:*	Investigate equivalence through conservation and compensation using tools, models, numbers and pictorial representations. Recognize quantities through groupings and construct explanations using counting strategies. Plan and conduct an investigation of counting a set of objects, determining that the last number said is the number of objects in the set. Investigate how numbers grow by one, and exactly one each time. Look for and make use of the patterns that exists in number combinations to 10.

Unit 4

Unit 4 Counting and Matching Numerals 11 - 20	The purpose of this unit is to develop an understanding of the benchmark numbers 5 and 10 to count and match numerals through 20. Students use benchmark numbers to compose and decompose numbers. They begin using units of 5s and 10s to help determine other quantities. Foundational place value concepts are developed as students begin to build numbers using a group of ten and some ones.
Learning Goals	
Standard(s):	**Counting and Cardinality** **Know number names and the count sequence.** K.CC.1. Count to 120 by ones and by tens. K.CC.2. Count forward beginning from a given number within the known sequence (instead of having to begin at 1). K.CC.3. Write numbers from 0 to 30. Represent a number of objects with a written numeral 0-30 (with 0 representing a count of no objects). **Count to tell the number of objects.** K.CC.4. Understand the relationship between numbers and quantities; connect counting to cardinality. a. When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object. b. Understand that the last number name said tells the number of objects counted. The number of objects is the same regardless of their arrangement or the order in which they were counted. c. Understand that each successive number name refers to a quantity that is one larger. K.CC.5. Count to answer “how many?” questions about as many as 20 things arranged in a line, a rectangular array, or a circle, or as many as 10 things in a scattered configuration; given a number from 1–20, count out that many objects.

Essential Question(s):	● How do we count objects and groups of objects? ● What patterns do we see in our numbers when we count more and more objects? ● What relationships can we find when counting different sets of objects? ● How does the arrangement of objects affect the number of objects when counting? ● How does the 5 and 10 structure help us to understand bigger numbers?
Enduring Understanding(s):	● Children use numbers to count not only objects but also groups- and to count them both simultaneously. ● Teen numbers are a group of 10 and another number. ● Ten objects can be perceived simultaneously as a set of ten objects or as one group of ten (unitizing). ● The order and sequence of numbers is important when counting. ● The positions of digits determine what value they represent. ● Place values patterns occur when making and adding on groups of ten. ● Numbers can be composed and decomposed (11 is 10 plus one more). ● Our number system is built on ten. ● The benchmark of 10 can be used to effectively count on.
Learning Goal(s): *Students will be able to use their learning to:*	Plan and conduct investigations of place value patterns when building teen numbers. Analyze patterns that appear when counting groups of ten. Develop and use models to represent teen numbers by grouping tens and ones. Ask questions and investigate why place value patterns occur when counting ten and more objects. Construct mathematical explanations using patterns, structures and relationships related to place value through 120. Use tools and models to demonstrate and defend reasoning or the reasoning of others related to the

	order and sequence of counting numbers.

Unit 5

Unit 5: Addition and Subtraction within 5	The purpose of the unit is for the students to understand that addition is putting together and adding to and subtraction is taking apart and taking from. Students will work with groups up to 5 to develop part whole relationships. Students solve addition and subtraction word problems and represent their thinking through verbal explanations, expressions, equations and acting out a situation. They compose and decompose numbers using different number combinations.
Learning Goals	
Standard(s):	**Counting and Cardinality** **Know number names and the count sequence.** K.CC.1. Count to 120 by ones and by tens. K.CC.2. Count forward beginning from a given number within the known sequence (instead of having to begin at 1). K.CC.3. Write numbers from 0 to 30. Represent a number of objects with a written numeral 0-30 (with 0 representing a count of no objects). **Count to tell the number of objects.** K.CC.4. Understand the relationship between numbers and quantities; connect counting to cardinality. a. When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object. b. Understand that the last number name said tells the number of objects counted. The number of objects is the same regardless of their arrangement or the order in which they were counted. c. Understand that each successive number name refers to a quantity that is one larger. K.CC.5. Count to answer “how many?” questions about as many as 20 things arranged in a line, a

	rectangular array, or a circle, or as many as 10 things in a scattered configuration; given a number from 1–20, count out that many objects. **Operations and Algebraic Thinking** **Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.** K.OA.1. Represent addition and subtraction with objects, fingers, mental images, drawings, sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations. K.OA.2. Solve addition and subtraction word problems, and add and subtract within 10, e.g., by using objects or drawings to represent the problem. K.OA.3. Decompose numbers less than or equal to 10 into pairs in more than one way, e.g., by using objects or drawings, and record each decomposition by a drawing or equation (e.g., 5 = 2 + 3 and 5 = 4 + 1). K.OA.4. For any number from 1 to 9, find the number that makes 10 when added to the given number, e.g., by using objects or drawings, and record the answer with a drawing or equation. K.OA.5. Fluently add and subtract within 5.
Essential Question(s):	● What happens to the amount of objects when you combine two or more sets of objects? ● What happens to the amount of objects when you take away an object or set of objects? ● How is adding to or taking away a set of objects different from composing and decomposing a set of objects? ● What strategies can help us think about how to combine or take away objects?
Enduring Understanding(s):	● Addition is combining numbers (joining). ● Addition means the whole in terms of combining parts. ● Subtraction is taking apart numbers (separating). ● Subtraction names a missing part.

	● Addition and subtraction are related. ● Sets and numbers can be composed and decomposed. ● Manipulatives can illustrate the process of addition or subtraction. ● Addition and subtraction can be represented by equations (number sentences).
Learning Goal(s): *Students will be able to use their learning to:*	Analyze and interpret the relationships between numbers and quantities (ex. Cardinality, hierarchical inclusion, one to one correspondence). Develop and use models such as objects, fingers, and acting it out, to represent how to solve an addition or subtraction word problems. Ask questions and investigate how to compose and decompose numbers to 10 in different ways.

Unit 6

Unit 6 **Unitizing Ten and Place Value Concepts**	The purpose of this unit is to work with numbers 11-30 to compose and decompose these numbers to gain foundational concepts for place value. Students build larger numbers by counting and grouping quantities over 100. They compose and decompose numbers and build an understanding of number relationship and relative magnitude.
Learning Goals	
Standard(s):	**Counting and Cardinality** **Know number names and the count sequence.** K.CC.1. Count to 120 by ones and by tens. K.CC.2. Count forward beginning from a given number within the known sequence (instead of having to begin at 1).

	K.CC.3. Write numbers from 0 to 30. Represent a number of objects with a written numeral 0-30 (with 0 representing a count of no objects). Count to tell the number of objects. K.CC.4. Understand the relationship between numbers and quantities; connect counting to cardinality. a. When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object. b. Understand that the last number name said tells the number of objects counted. The number of objects is the same regardless of their arrangement or the order in which they were counted. c. Understand that each successive number name refers to a quantity that is one larger. K.CC.5. Count to answer "how many?" questions about as many as 20 things arranged in a line, a rectangular array, or a circle, or as many as 10 things in a scattered configuration; given a number from 1–20, count out that many objects. **Operations and Algebraic Thinking** **Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.** K.OA.1. Represent addition and subtraction with objects, fingers, mental images, drawings, sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations. Number and **Operations in Base Ten** **Work with numbers 11-19 to gain foundations for place value.** K.NBT.1. Compose and decompose numbers from 11 to 19 into ten ones and some further ones, e.g., by using objects or drawings, and record each composition or decomposition by a drawing or equation (such as 18 = 10 + 8); understand that these numbers are composed of ten ones and one, two, three, four, five, six, seven, eight, or nine ones.
Essential Question(s):	● How does the location of the numeral (digit) affect its value? ● What patterns do we see in our numbers when we count by fives, tens, and ones? ● How can we represent equal sets of objects differently and how can we represent a set of objects

	differently? ● How does the arrangement of objects affect the number of objects when counting? ● How can we compose and decompose numbers to help us to understand numbers and number relationships better?
Enduring Understanding(s):	● Quantities can be grouped into units (unitizing). Those units can be composed and decomposed into other numbers. The units can be counted in the same way units can be counted. There are patterns in our number system. ● Counting helps students to understand how numbers are related and that each successive number named refers to a quantity that is one larger. ● Teen numbers are 10 plus another number. ● Ten is found within every 2 digit number. ● A set of ten can be perceived as a single unit (Unitizing). ● The positions of digits determine what value they represent. ● Place values patterns occur when making and adding on groups of ten. ● Two-digit numbers can be composed and decomposed. ● There are multiple ways to take apart and combine any given set of numbers. ● Our number system is structured around multiples of ten. ● Skip counting allows students to count sets of objects with the same number of items. ● Benchmark numbers help us to mentally think about quantities.
Learning Goal(s): *Students will be able to use their learning to:*	Investigate the relationship between groups of 1's, 5's and 10's. Use clear and precise language to defend efficient strategies for counting quantities. Recognize that there is a pattern in two-digit numbers and the position of the digits determine its value. Use appropriate tools and models to represent quantities of ten and more.

Unit 7

Unit 7 Measurement by Direct Comparison	The purpose of this unit is to describe measurable attributes of objects and to estimate and measure using non-standard units. Students will compare these attributes, such as length, width, height, and weight. Students use direct comparisons of the length of objects and develop strategies to determine more of, less of, or the same.
Learning Goals	
Standard(s):	**Measurement and Data** **Describe and compare measurable attributes.** K.MD.1. Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object. K.MD.2. Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. For example, directly compare the heights of two children and describe one child as taller/shorter.
Essential Question(s):	● Why do we measure? ● How can we compare the measurement of objects? ● How do we decide which unit to use to measure an object? ● How can we estimate a measurement? ● How do you know if your estimation is reasonable?
Enduring Understanding(s):	● Measurement involves a comparison of an attribute of an item or situation with a standard or non-standard unit of measure. ● Objects can be measured. ● Non-standard units can be used to measure. ● There is a purpose for measurement. ● Estimation is a way to determine if the answer is reasonable.

Learning Goal(s): *Students will be able to use their learning to:*	Analyze and interpret different measurement tools. Use tools and clear and precise language to directly compare two objects with a measurable attribute in common. Plan and conduct measurement investigations using non-standard units of measure. Select which tool is most appropriate for a given measurement task.