

Kentucky Academic Standards for Mathematics: Kindergarten Overview

Counting/Cardinality (CC)	Operations/Algebraic Thinking (OA)	Number and Operations in Base Ten (NBT)	Measurement and Data (MD)	Geometry (G)
<ul style="list-style-type: none"> • Know number names and the count sequence. • Count to tell the number of objects. • Compare numbers. 	<ul style="list-style-type: none"> • Understand addition as putting together and adding to and understand subtraction as taking apart and taking from. 	<ul style="list-style-type: none"> • Work with numbers 11-19 to gain foundations for place value. 	<ul style="list-style-type: none"> • Describe and compare measurable attributes. • Classify objects and count the number of objects in each category. • Identify coins by name. 	<ul style="list-style-type: none"> • Identify and describe shapes (squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders and spheres). • Analyze, compare, create and compose shapes.

In grade K, instructional time should focus on two critical areas:

1. In the Counting and Cardinality and Operations and Algebraic Thinking domains, students will:

- develop a more formal sense of numbers;
- use numbers, including written numerals, to represent quantities and to solve quantitative problems, such as counting objects in a set; counting out a given number of objects; comparing sets or numerals; and modeling simple joining and separating situations with sets of objects, or eventually with equations such as $5 + 2 = 7$ and $7 - 2 = 5$. Note: Kindergarten students should see addition and subtraction equations and student writing of equations in kindergarten is encouraged, but it is not required; and
- choose, combine and apply effective strategies for answering quantitative questions, including quickly recognizing the cardinalities of small sets of objects, counting and producing sets of given sizes, counting the number of objects in combined sets, or counting the number of objects that remain in a set after some are taken away.

2. In the Geometry and Measurement and Data domains, students will:

- describe their physical world using geometric ideas (e.g., shape, orientation, spatial relations) and appropriate vocabulary;
- identify, name and describe basic two-dimensional shapes, such as squares, triangles, circles, rectangles and hexagons, presented in a variety of ways (e.g., with different sizes and orientations), as well as three-dimensional shapes such as cubes, cones, cylinders and spheres; and
- use basic shapes and spatial reasoning to model objects in their everyday environment to create and compose more complex shapes.

Note: More learning time in Kindergarten should be devoted to number than to other topics.

Kentucky Academic Standards for Mathematics: Grade 1 Overview

Operations/Algebraic Thinking (OA)	Number and Operations in Base Ten (NBT)	Measurement and Data (MD)	Geometry (G)
<ul style="list-style-type: none"> • Represent and solve problems involving addition and subtraction. • Understand and apply properties of operations and the relationship between addition and subtraction. • Add and subtract within 20. • Work with addition and subtraction equations. 	<ul style="list-style-type: none"> • Extend the counting sequence. • Understand place value. • Use place value understanding and properties of operations to add and subtract. 	<ul style="list-style-type: none"> • Measure lengths indirectly and by iterating length in units. • Work with time and money. • Understand and apply the statistics process. 	<ul style="list-style-type: none"> • Reason with shapes and their attributes.

In grade 1, instructional time should focus on four critical areas:

1. In the Operations and Algebraic Thinking domain, students will:

- develop strategies for adding and subtracting whole numbers based on their prior work with small numbers;
- use a variety of models, including discrete objects and length-based models (e.g., cubes connected to form lengths), to model add-to, take-from, put-together, take apart and compare situations to develop meaning for the operations of addition and subtraction, and to develop strategies to solve arithmetic problems with these operations;
- understand connections between counting and addition and subtraction (e.g., adding two is the same as counting on two);
- use properties of addition to add whole numbers and to create and use increasingly sophisticated strategies based on these properties (e.g., “making tens”) to solve addition and subtraction problems within 20; and
- build their understanding of the relationship between addition and subtraction by comparing a variety of solution strategies.

2. In the Number and Operations in Base Ten domain, students will:

- develop, discuss and use efficient, accurate and generalizable methods to add within 100 and subtract multiples of 10;
- compare whole numbers (at least to 100) to develop understanding of and solve problems involving their relative sizes;
- think of whole numbers between 10 and 100 in terms of tens and ones (especially recognizing the numbers 11 to 19 as composed of a ten and some ones); and
- understand the order of the counting numbers and their relative magnitudes through activities that build number sense.

3. In the Measurement and Data domain, students will:

- develop an understanding of the meaning and processes of measurement, including underlying concepts such as iterating (the mental activity of building up the length of an object with equal-sized units) and the transitivity principle for indirect measurement.*

4. In the Geometry domain, students will:

- compose and decompose plane or solid figures and build understanding of part-whole relationships as well as the properties of the original and composite shapes;
- recognize them from different perspectives and orientations;
- describe their geometric attributes;
- determine how they are alike and different, to develop the background for measurement and for initial understandings of properties such as congruence and symmetry.

Kentucky Academic Standards for Mathematics: Grade 2 Overview

Operations/Algebraic Thinking (OA)	Number and Operations in Base Ten (NBT)	Measurement and Data (MD)	Geometry (G)
<ul style="list-style-type: none"> • Represent and solve problems involving addition and subtraction. • Add and subtract within 20. • Work with equal groups of objects to gain foundations for multiplication. 	<ul style="list-style-type: none"> • Understand place value. • Use place value understanding and properties of operations to add and subtract. 	<ul style="list-style-type: none"> • Measure and estimate lengths in standard units. • Relate addition and subtraction to length. • Work with time and money. • Understand and apply the statistics process. 	<ul style="list-style-type: none"> • Reason with shapes and their attributes.

In grade 2, instructional time should focus on four critical areas:

1. In the Number and Operations in Base Ten domain, students will:

- extend their understanding of the base-ten system. This includes ideas of counting in fives, tens and multiples of hundreds, tens and ones, as well as number relationships involving these units, including comparing; and
- understand multi-digit numbers (up to 1000) written in base-ten notation, recognizing that the digits in each place represent amounts of thousands, hundreds, tens or ones (e.g., 853 is 8 hundreds + 5 tens + 3 ones).

2. In the Operations and Algebraic Thinking and Numbers and Operations in Base Ten domains, students will:

- use their understanding of addition to develop fluency with addition and subtraction within 100;
- solve problems within 1000 by applying their understanding of models for addition and subtraction, and they develop, discuss and use efficient, accurate and generalizable methods to compute sums and differences of whole numbers in base-ten notation, using their understanding of place value and the properties of operations; and
- select and accurately apply methods that are appropriate for the context and the numbers involved to mentally calculate sums and differences for numbers with only tens or only hundreds.

3. In the Measurement and Data domain, students will:

- recognize the need for standard units of measure (centimeter and inch) and use rulers and other measurement tools with the understanding that linear measure involves an iteration of units; and
- recognize that the smaller the unit, the more iterations needed to cover a given length.

4. In the Geometry domain, students will:

- describe and classify shapes as polygons or non-polygons;
- investigate, describe and reason about decomposing and combining shapes to make other shapes; and
- draw, partition and analyze two-dimensional shapes to develop a foundation for understanding area, congruence, similarity and fractions in later grades.

Kentucky Academic Standards for Mathematics: Grade 3 Overview

Operations/Algebraic Thinking (OA)	Number and Operations in Base Ten (NBT)	Number and Operations Fractions (NF)	Measurement and Data (MD)	Geometry (G)
<ul style="list-style-type: none"> • Represent and solve problems involving multiplication and division. • Understand properties of multiplication and the relationship between multiplication and division. • Multiply and divide within 100. • Solve problems involving the four operations and identify and explain patterns in arithmetic. 	<ul style="list-style-type: none"> • Use place value understanding and properties of operations to perform multi-digit arithmetic. Note: A range of algorithms may be used. 	<ul style="list-style-type: none"> • Develop understanding of fractions as numbers. Note: grade 3 expectations in this domain are limited to fractions with denominators 2, 3, 4, 6, 8. 	<ul style="list-style-type: none"> • Solve problems involving measurement and estimation of intervals of time, liquid volumes and masses of objects. • Understand and apply the statistics process. • Geometric measurement: understand concepts of area and relate area to multiplication and to addition. • Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures. 	<ul style="list-style-type: none"> • Reason with shapes and their attributes.

In grade 3, instructional time should focus on four critical areas:

1. In the Operations and Algebraic Thinking domain, students will:

- develop an understanding of the meanings of multiplication and division of whole numbers through activities and problems involving equal-sized groups, arrays and area models; multiplication is finding an unknown product and division is finding an unknown factor in these situations. For equal-sized group situations, division can require finding the unknown number of groups or the unknown group size;
- use properties of operations to calculate products of whole numbers, using increasingly sophisticated strategies based on these properties to solve multiplication and division problems involving single-digit factors; and
- compare a variety of solution strategies to learn the relationship between multiplication and division.

2. In the Number Sense and Operations—Fractions domain, students will:

- develop an understanding of fractions, beginning with unit fractions;
- view fractions in general as being built out of unit fractions and use fractions along with visual fraction models to represent parts of a whole;
- understand that the size of a fractional part is relative to the size of the whole. Use fractions to represent numbers equal to, less than and greater than one; and
- solve problems that involve comparing fractions by using visual fraction models and strategies based on noticing equal numerators or denominators.

3. In the Measurement and Data domain, students will:

- recognize area as an attribute of two-dimensional regions;
- measure the area of a shape by finding the total number of same-size units of area required to cover the shape without gaps or overlaps, a square with sides of unit length being the standard unit for measuring area; and
- understand that rectangular arrays can be decomposed into identical rows or into identical columns. By decomposing rectangles into rectangular arrays of squares, students connect area to multiplication and justify using multiplication to determine the area of a rectangle.

4. In the Geometry domain, students will:

- compare and classify shapes by their sides and angles; and
- relate their fraction work to geometry by expressing the area of part of a shape as a unit fraction of the whole.

Note: Multiplication, division and fractions are the most important developments in grade 3.

Kentucky Academic Standards for Mathematics: Grade 4 Overview

Operations/Algebraic Thinking (OA)	Number and Operations in Base Ten (NBT)	Number and Operations Fractions (NF)	Measurement and Data (MD)	Geometry (G)
<ul style="list-style-type: none"> • Use the four operations with whole numbers to solve problems. • Gain familiarity with fractions and multiples. • Generate and analyze patterns. 	<ul style="list-style-type: none"> • Generalize place value understanding for multi-digit whole numbers. • Use place value understanding and properties of operations to perform multi-digit arithmetic. 	<ul style="list-style-type: none"> • Extend understanding of fraction equivalence and ordering. • Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers. • Understand decimal notation for fractions and compare decimal fractions. 	<ul style="list-style-type: none"> • Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit. • Understand and apply the statistics process. • Geometric measurement: understand concepts of angle and angle measurements. 	<ul style="list-style-type: none"> • Draw and identify lines and angles and classify shapes by properties of their lines and angles.

In grade 4, instructional time should focus on three critical areas:

1. In the Number and Operations in Base Ten domain, students will:

- generalize their understanding of place value to 1,000,000, understanding the relative sizes of numbers in each place;
- apply their understanding of models for multiplication (equal-sized groups, arrays, area models), place value and properties of operations, in particular the distributive property, as they develop, discuss and use efficient, accurate and generalizable methods to compute products of multi-digit whole numbers;
- determine and accurately apply appropriate methods to estimate or mentally calculate products;
- develop fluency with efficient procedures for multiplying whole numbers; understand and explain why the procedures work based on place value and properties of operations; and use them to solve problems;
- apply their understanding of models for division, place value, properties of operations and the relationship of division to multiplication as they develop, discuss and use efficient, accurate and generalizable procedures to find quotients involving multi-digit dividends;
- select and accurately apply appropriate methods to estimate and mentally calculate quotients and interpret remainders based upon the context.

2. In the Numbers and Operations--Fractions domain, students will:

- create an understanding of fraction equivalence and operations with fractions;
- recognize that two different fractions can be equal and they develop methods for generating and recognizing equivalent fractions;
- extend previous understandings about how fractions are built from unit fractions, composing fractions from unit fractions; decomposing fractions into unit fractions and using the meaning of fractions and the meaning of multiplication to multiply a fraction by a whole number.

3. In the Geometry domain, students will:

- describe, analyze, compare and classify two-dimensional shapes;
- strengthen their understanding of properties of two-dimensional objects and the use of them to solve problems involving symmetry through building, drawing and analyzing two-dimensional shapes.

Kentucky Academic Standards for Mathematics: Grade 5 Overview

Operations and Algebraic Thinking (OA)	Number and Operations in Base Ten (NBT)	Number and Operations Fractions (NF)	Measurement and Data (MD)	Geometry (G)
<ul style="list-style-type: none"> • Write and interpret numerical expressions. • Analyze patterns and relationships. 	<ul style="list-style-type: none"> • Understand the place value system. • Perform operations with multi-digit whole numbers and with decimals to hundredths. 	<ul style="list-style-type: none"> • Use equivalent fractions as a strategy to add and subtract fractions. • Apply and extend previous understandings of multiplication and division to multiply and divide fractions. 	<ul style="list-style-type: none"> • Convert like measurement units within a given measurement system. • Understand and apply the statistics process. • Geometric measurement: understand concepts of volume and relate volume to multiplications and to addition. 	<ul style="list-style-type: none"> • Graph points on the coordinate plane to solve real-world and mathematical problems. • Classify two-dimensional figures into categories based on their properties.

In grade 5, instructional time should focus on three critical areas:

1. In the Numbers and Operations - Fractions and Operations and Algebraic Thinking domains, students will:

- apply their knowledge of fractions and fraction models to illustrate the addition and subtraction of fractions with unlike denominators as equivalent calculations with like denominators;
- establish fluency in calculating sums and differences with fractions and make a reasonable estimate of those sums and differences;
- use the meaning of fractions, of multiplication and division, and the relationship between those operations to understand and explain why the procedures for multiplying and dividing fractions make sense.

(Note: This is limited to the case of dividing unit fractions by whole numbers and whole numbers by unit fractions.)

2. In the Operations and Algebraic Thinking and Number and Operations in Base Ten, students will:

- develop understanding of why division procedures work based on the meaning of base-ten numerals and properties of operations;
- apply understandings of models for decimals, decimal notation and properties of operations to add and subtract decimals to hundredths;
- develop fluency with decimal computations to hundredths and make reasonable estimates of their computation;
- use the relationship between decimals and fractions, as well as the relationship between finite decimals and whole numbers to understand and explain why the procedures for multiplying and dividing finite decimals make sense.

3. In the Measurement and Data and Geometry domains, students will:

- recognize volume as an attribute of three-dimensional space;
- understand that a 1-unit by 1-unit cube is the standard unit for measuring volume;
- understand that volume can be measured by finding the total number of same-size units of volume required to fill the space without gaps or overlaps;
- choose appropriate units, strategies and tools for solving problems which involve estimating and measuring volume;
- decompose three-dimensional shapes and find volumes of right rectangular prisms by viewing them as decomposed into layers of arrays of cubes;
- measure attributes of shapes in order to determine volumes to solve real world and mathematical problems.