Kindergarten - Mathematics

Kentucky Core Academic Standards with Targets

Student Friendly Targets

Pacing Guide

Anderson County Schools

Safe, Prepared, Responsible

College and Career Readiness Anchor Standards for Math

The K-5 standards on the following pages define what students should understand and be able to do by the end of each grade. They correspond to eight mathematical practices: 1) Make sense of problems and persevere in solving them, 2) Reason abstractly and quantitatively, 3) Construct viable arguments and critique the reasoning of others, 4) Model with mathematics, 5) Use appropriate tools strategically, 6) Attend to precision, 7) Look for and make use of structure, and 8) Look for express regularity in repeated reasoning.

Mathematics is divided into five domains: 1) Counting and Cardinality (CC), 2) Operations and Algebraic Thinking (OA), 3) Number and Operations in Base Ten (NBAT), 4) Measurement and Data (MD), Geometry (G).

Development of Pacing Document

During the summer 2011, Anderson County teachers and administrators developed learning targets for each of the Kentucky Core Content Standards. In winter 2012, curriculum resource teachers verified the congruency of the standards and targets and recommended revisions. Teachers refined the work and began planning the development of common assessments to ensure students learn the intended curriculum. Special thanks to Lynn Akins, Jennie Bottom, Natalie Brown, Amanda Cartinhour, Brittany Clancy, Jessica Coon, Dana Dill, Connie Hanks, Sharon Jackman, Steve Karsner, Kim King, Melissa Koger, Melissa Lentz, Melissa Marple, Beth Powers, Robin Ratliff, Jill Rock, and Ginger Yeaste.

North Carolina State Board of Education created a most helpful document entitled "Common Core Instructional Support Tools - Unpacking Standards". The document answers the question "What do the standards mean that a student must know and be able to do?" The "unpacking" is included in our "What Does This Standard Mean?" section. The complete North Carolina document can be found at http://www.dpi.state.nc.us/docs/acre/standards/common-core-tools/unpacking/math/kindergarten.pdf

Coding for Math Document

Domain

Grade Level

Standard Number

KY Core Academic Standard (KCAS) **Bold, 14 pt**

3.OA.7 fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 x 5 = 40, one knows 40 ÷ 5 = 8) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers

Target Type

Knowledge Targets:

☐ Know from memory all products of two one-digit numbers.

I can define "round or rounding in relation to place value.

KDE Target Regular, 12 pt

Reasoning Targets:

Level Standard is Assessed **Highlighted**

☐ Analyze a multiplication or division problem in order to choose an appropriate strategy to fluently multiply or divide within 10.

I can analyze a multiplication or division problem so that can choose a strategy to help me fluently multiply or divide within 10.

AC Target ***Bold, Italics, 12 pt***

Anderson County Elementary
Pacing Guide

Math
Grade K

Counting and Cardinality		
Standard	**What Does This Standard Mean?**	**Dates Taught**
K.CC.1 Count to 100 by ones and by tens. **Knowledge Targets:** ☐ Count (verbal sequence only) to 100 by ones starting at 1. ***I can count to 100.*** ☐ Count (verbal sequence only) to 100 by 10's starting at 10. ***I can count by tens to 100.***	Students rote count by started at one and counting to 100. When students count by tens they are only expected to master counting on the decade (0, 10, 20, 30, 40…). This objective does not require recognition of numerals. It is focused on the rote number sequence.	
K.CC.2 Count forward beginning from a given number within the known sequence (instead of having to begin at 1.) **Knowledge Targets:** ☐ Count forward by 1's beginning with another number other than 1 (verbal sequence only). ***I can count from any number up to 100.***	Students begin a rote forward counting sequence from a number other than 1. Thus, given the number 4, the student would count, "4, 5, 6, 7 …" This objective does not require recognition of numerals. It is focused on the rote number sequence 0-100.	
K.CC.3 Write numbers from 0 to 20. Represent a number of objects with a written numeral 0-20 (with 0 representing a count of no objects). **Knowledge Targets:**	Students write the numerals 0-20 and use the written numerals 0-20 to represent the amount within a set. For example, if the student has counted 9 objects, then the written numeral "9" is recorded. Students can record the quantity of a set by selecting a number card/tile (numeral recognition) or writing the numeral. Students can also create a set of objects based on the numeral presented. For example, if a student	

☐ Write numerals 0 to 20. ***I can write any number from 0 – 20.*** ☐ Write the number of objects from 0-20. ***I can count how many are in a group and write the number.***	picks up the number card "13", the student then creates a pile of 13 counts. While children may experiment with writing numbers beyond 20, this standard places emphasis on numbers 0-20. Due to varied development of fine motor and visual development, reversal of numerals is anticipated. While reversals should be pointed out to students and correct formation modeled in instruction, the emphasis of this standard is on the use of numerals to represent quantities rather than the correct handwriting formation of the actual numeral itself.	
K.CC4abc 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.** **Knowledge Targets:** ☐ Represent quantities using numbers and represent numbers using quantities. ***I can draw a quantity to show a number. (Underpinning)*** ***I can write the number to show the quantity.*** **Reasoning Targets:** ☐ Match each object with one and only one number name and	Students counts a set of objects and see sets and numerals in relationship to one another. These connections are higher-level skills that require students to analyze, reason about, and explain relationships between numbers and set of objects. The expectation is that students are comfortable with these skills with the numbers 1-20 by the end of Kindergarten. a. Students implement correct counting procedures by pointing to one object at a time (one-to-one correspondence), using one counting word for every object (synchrony/on-to-one tagging), while keeping track of objects that have and have not been counted. This is the foundation of counting. b. Students answer the question "How many are there?' by counting objects in a set and understanding that they last number stated when counting a set (…8, 9, 10) represents the total amount of objects: "There are 10 bears in this pile." (cardinality). Since an important goal for children is to count with meaning, it is important to have children answer the question, "How many do you have?" after they count. Often times, children who have not developed cardinality will count the amount again, not realizing that the 10 they stated means 10 objects in all. Young children believe what they see. Therefore, they may believe that a pile of cubes that they counted may be more if spread apart in a line. As children move towards the developmental milestone of conservation of number, they develop the understanding that the number of objects does not change when the objects are moved, rearranged or hidden. Children need many different experiences with counting	

each number with one and only one object. ***I can match objects to number names.*** ☐ Recognize the number of objects is the same regardless of their arrangement or the order in which they were counted. ***I can recognize that a number of objects are the same in any arrangement or order.*** ☐ Realize that the last number name said tells the number of objects counted. ***I can count objects and tell how many. (Underpinning)*** ☐ Generalizes that each successive number name refers to a quantity that is one larger. ***I can recognize when a quantity is larger. (Underpinning)*** **Performance Skill Targets:** ☐ When counting objects, say the number names in order while matching each object with a number. ***I can match numbers to objects while saying the number names.***	objects, as well as maturation, before they can reach this developmental milestone. c. Another important milestone in counting is inclusion (aka hierarchal inclusion). Inclusion is based on the understanding that numbers build by exactly one each time and that they nest within each other by this amount. For example, a set of three objects is nestled within a set of 4 objects; within this same set of 4 objects is also a set of two objects and a set of one. Using this understanding, if a student has four objects and wants to have 5 objects, the student is able to add one more-knowing that four is within, or a sub-part of 5 (rather than removing all 4 objects and starting over to make a new set of 5). This concepts is critical for the later development of part/whole relationships. Students are asked to understand this concepts with and without (0-20) objects. For example, after counting a set of 8 objects, students answer the question, "How many would there be if we added one more object?"; and answer a similar question when not using objects, by asking hypothetically, "What if we have 5 cubes and added one more. How many cubes would there be then?"	
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. **Knowledge Targets:** ☐ Count up to 20 objects that have been arranged in a line, rectangular array, or circle. ***I can count up to 20 objects in a line, array, or circle.*** ☐ Count as many as 10 items in a scattered configuration. ***I can count as many as 10 items in a collection.*** **Reasoning Targets:** ☐ Match each object with one and only one number name and each number with one and only one object.	In order to answer "how many?" students need to keep track of objects when counting. Keeping track is a method of counting that is used to count each item once and only once when determining how many. After numerous experiences with couting objects, along with the developmental understanding that a group of objects counted multiple times will remain the same amount, students recognize the need for keeping track in order to accurately determine "how many". Depending on the amount of objects to be counted, and the student's confidence with counting a set of objects, students may move the objects as they count each, point to each object as counted, look without touching when counting, or use a combination of these strategies. It is important that children develop a strategy that makes sense to them based on the realization that keeping track is important in order to get an accurate count, as opposed to follow a rule, such as "Line them all up before you count", in order to get the right answer. As children learn to count accurately, they may count a set	

I can match objects to number names. ☐ Conclude that the last number of the counted sequence signifies the quantity of the counted collection. ***I can count how many are in a collection and say how many there are. (Underpinning)*** **Performance Skill Targets:** ☐ Given a number from 1 – 20, count out that many objects. ***I can count any number of objects (up to 20) out of a larger group.***	correctly one time, but not another. Other times they may be able to keep track up to a certain amount, but then lose track from then on. Some arrangements, such as a line or rectangular array, are easier for them to get the correct answer but may limit their flexibility with developing meaningful tracking strategies, so providing multiple arrangements help children learn how to keep track. Since scattered arrangements are the most challenging for students, this standard specifies that students only count up to 10 objects in a scattered arrangement and count up to 20 objects in a line, rectangular array, or circle.	
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. (Groups with up to ten objects) **Knowledge Targets:** ☐ Describe greater than, less than, or equal to. ***I can describe what greater than, less than or equal to means.*** **Reasoning Targets:** ☐ Determine whether a group of 10 or fewer objects is greater than, less than, or equal to another group of 10 or fewer objects. ***I can compare objects in two groups as greater than, less than or equal.***	Students use their counting ability to compare sets of objects (0-10). They may use matching strategies (Student 1), counting strategies (Student 2) or equal shares (Student 3) to determine whether one group is greater than, less than, or equal to the number of objects in another group. Student 1 I lined up one square and one triangle. Since there is one extra triangle, there are more triangles than squares. △△△△△ □□□□ Student 2 I counted the squares and I got 4. Then I counted the triangles and got 5. Since 5 is bigger than 4, there are more triangles than squares. Student 3 I put them in a pile. I then took away objects. Every time I took a square, I also took a triangle. When I had taken almost all of the shapes away, there was still a triangle left. That means that there are more triangles than squares.	
K.CC.7 Compare two numbers between 1 and 10 presented as written numerals. **Knowledge Targets:**	Students apply their understanding of numerals 1-10 to compare one numeral from another. Thus, looking at the numerals 8 and 10, a student is able to recognize that the numeral 10 represents a larger amount than the numeral 8. Students need ample experiences with actual sets of objects	

☐ Know the quantity of each numeral. ***I can explain the quantity of a numeral with objects, fingers, or pictures. (Underpinning)*** **Reasoning Targets:** ☐ Determine whether a written number is greater than, less than, or equal to another written number. ***I can compare written numerals 1-10 as greater than, less than, or equal to.***	(K.CC3 and K.CC.6) before completing this standard with only numerals.	
Operations and Algebraic thinking		
Standard	**What Does This Standard Mean?**	**Dates Taught**
K.OA.1 Represent addition and subtraction with objects, fingers, mental images, drawings2, sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations. (Drawings need not show details, but should show the mathematics in the problem.) **Knowledge Targets:** ☐ Know adding is putting together parts to make the whole. ***I can explain that adding is putting together parts.*** ☐ Know subtracting is taking apart or taking away from the whole to find the other part. ***I can explain that subtracting is taking away from the whole to find the other part.*** ☐ Know the symbols (+, -, =) and the words (plus, minus, equal) for adding and subtracting). ***I can identify the words and symbols for addition and subtraction.*** **Reasoning Targets:**	Students demonstrate the understanding of how objects can be joined (addition) and separated (subtraction) by representing addition and subtraction situations in various ways. This objective is focused on understanding the concept of addition and subtraction, rather than reading and solving addition and subtraction number sentences (equations). Common Core State Standards for Mathematics states, "Kindergarten students should see addition and subtraction equations, and student writing of equations in kindergarten is encouraged, but it is not required." Please not that it is not until First Grade when "Understand the meaning of the equal sign" is an expectation (1.OA.7). Therefore, before introducing symbols (+, -, =) and equation, kindergarteners require numerous experiences using joining (addition) and separating (subtraction) vocabulary in order to attach meaning to the various symbols. For example, when explaining a solution, kindergartens may state, "*Three and two is the same amount as 5.*" While the meaning of the equal sign is not introduced as a standard until First Grade, if equations are going to be modeled and used in Kindergarten, students must connect the symbol (=) with its meaning (is the same amount/quantity as).	Second Nine Weeks

☐ Analyze addition or subtraction problem to determine whether to 'put together' or 'take apart'. ***I can decide whether to put together or take apart when solving a story problem.*** ☐ Model an addition/subtraction problem given a real-life story. ***I can model an addition or subtraction problem when given a real-life story.*** **Performance Skill Targets:** ☐ Represent addition and subtraction with objects, fingers, mental images, drawings, sounds, acting out situations, verbal explanations, expressions, or equations in multiple ways, e.g., 2 + 3 = 5, 5 = 2 + 3, || + ||| = ||||| an vertically. (Writing equations in kindergarten is not required but encouraged.) ***I can use drawings, objects, fingers, or actions to show addition or subtraction.***		
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. **Knowledge Targets:** ☐ Add and subtract within10 (Maximum sum and minuend is 10). ***I can add and subtract within 10.*** **Reasoning Targets:** ☐ Solve addition and subtraction word problems within 10. ***I can solve addition word problems (within 10) by using objects or drawings.*** ☐ Use objects/drawings to represent an addition and subtraction word problem. ***I can solve subtraction word problems (within 10) by***	Kindergarten students solve four types of problems within 10; Result Unknown/Add To; Result Unknown/Take From; Total Unknown/Put Together-Take Apart; and Addend Unknown/Put Together-Take Apart (See **Table 1** at end of document for examples of all problem types). Kindergarteners use counting to solve the four problem types by acting out the situation and/or with objects, fingers, and drawings.	

using objects or drawings.

Add to Result Unknown	Take From Result Unknown
Two bunnies sat on the grass. Three more bunnies hopped there. How many bunnies are on the grass now? 2 + 3 = ?	Five apples were on the table. I ate two apples. How many apples are on the table now? 5 – 2 = ?
Put Together/Take Apart Total Unknown	**Put Together/Take Apart Addend Unknown**
Three red apples and two green apples are on the table. How many apples are on the table? 3 + 2 = ?	Five apples are on the table. Three are red and the rest are green. How many apples are green? 3 + ? = 5, 5 – 3 = ?

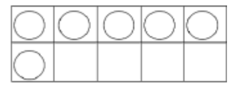
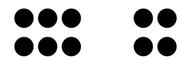
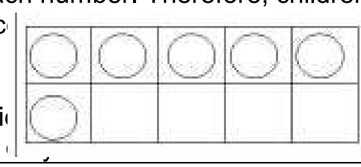
Example: **Nine grapes were in the bowl. I ate 3 grapes. How many grapes are in the bowl now?**
Student: I got 9 “grapes” and put them in my bowl. Then, I took 3 grapes out of the bowl. I counted the grapes still left in the bowl… 1, 2, 3, 4, 4, 5, 6. Six. There are 6 grapes in the bowl.

Example: **Six crayons are in the box. Two are red and the rest are blue. How many blue crayons are in the box?**
Student: I got 6 crayons. I moved these two over and pretended they were red. Then, I counted the “blue” ones... 1, 2, 3, 4. Four. There are 4 blue crayons.

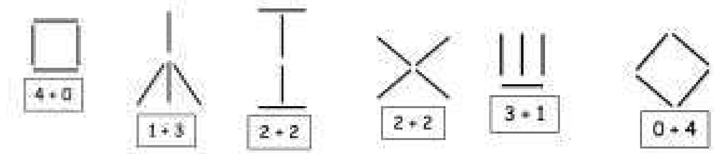
K.OA.3 Decompose numbers less than or equal to 10 into pairs in more than one way, e.g., by using objects or drawings, and record each decomposition by a drawing or equation (e.g., 5 = 2 + 3 and 5 = 4 +

Students develop an understanding of part-whole relationships as they recognize that a set of objects (5) can be broken into smaller sub-sets (3 and 2) and still remain the total amount (5). In addition, this objective asks students to realize that a set of objects (5) can be broken in multiple ways (3 and 2; 4 and 1). Thus, when breaking apart a set (decompose),

1). **Knowledge Targets:** ☐ Solve addition number sentences within 10. ***I can solve addition number sentences within 10.*** **Reasoning Targets:** ☐ Decompose numbers less than or equal to 10 into pairs in more than one way. ***I can decompose (break apart) numbers less than or equal to 10 into pairs in more than one way.*** ☐ Use objects or drawings then record each composition by a drawing or writing an equation. **I can decompose (break apart) numbers to 10 and write or draw about it.**	students use the understanding that a smaller set of objects exists within that larger group (inclusion). Example: **"Bobby Bear is missing 5 buttons on his jacket. How many ways can you use blue and red buttons to finish his jacket? Draw a picture of all your ideas.** Students could draw pictures of: 4 blue and 1 red button 3 blue and 2 red buttons 2 blue and 3 red buttons 1 blue and 4 red buttons. In Kindergarten, students need ample experiences breaking apart numbers and using the vocabulary "and" and "same amount as" before symbols (+, =) and equations (5= 3 + 2) are introduced. If equations are used, a mathematical representation (picture, objects) needs to be present as well.	
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. **Knowledge Targets:** ☐ Know that two numbers can be added together to make ten. ***I can add two numbers together to make ten.*** **Reasoning Targets:** ☐ Using materials or representations, find the number than makes 10 when added to the given number for any number from 1 to 9, and record the answer using materials, representations, or equations. ***I can find the number needed to make 10 when given any number 1-9 using objects, drawings or equation.***	Students build upon the understanding that a number (less than or equal to 10) can be decomposed into parts (K.OA.3) to find a missing part of 10. Through numerous concrete experiences, kindergarteners model the various sub-parts of ten and find the missing part of 10. Example: **When working with 2-color counters, a student determines that 4 more counters are needed to make a total of 10.** ●●●●●● ○○○○ I have 6 counters. I need 4 more counters to have 10 in all. In addition, kindergarteners use various materials to solve tasks that involve decomposing and composing 10. Example: **"A full case of juice boxes has 10 boxes. There are only 6 boxes in this case. How many juice boxes are missing?"** **Student A:** *Using a Ten-* | **Student B:** *Think Addition* | **Student C:** *Fluently*	

	Frame "I used a ten frame for the case. Then, I put on 6 counters for juice still in the case. There's no juice in these 4 spaces. So, 4 are missing." 	"I counted out 10 counters because I knew there needed to be ten. I pushed these 6 over here because they were in the container. These are left over. So there's 4 missing." 	*add/subtract* "I know that it's 4 because 6 and 4 is the same amount as 10."	
K.OA.5 Fluently add and subtract within 5. **Knowledge Targets:** ☐ Fluently with speed and accuracy add and subtract within 5. ***I can add fluently within 5.*** ***I can subtract fluently within 5.***	Students are fluent when they display accuracy (correct answer), efficiency (a reasonable amount of steps in about 3 seconds without resorting to counting), and flexibility (using strategies such as the distributive property). Students develop fluency by understanding and internalizing the relationships that exist between and among numbers. Often times, when children think of each "fact" as an individual item that does not relate to any other "fact", they are attempting to memorize separate bits of information that can be easily forgotten. Instead, in order to fluently add and subtract, children must first be able to see sub-parts within a number (inclusion, K.CC.4c). Once they have reached this milestone, children need repeated experiences with many different types of concrete materials (such as cubes, chips, and buttons) over an extended amount of time in order to recognize that there are only particular sub-parts for each number. Therefore, children will realize that if 3 and 2 is a c cannot be a combination of 6.  For example, after making vari toothpicks, students learn that			

parts exist within the number 4:



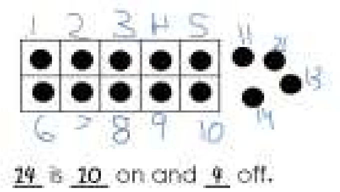
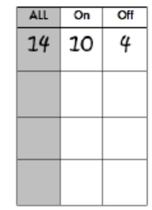
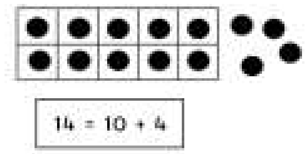
Then, after numerous opportunities to explore, represent and discuss “4”, a student becomes able to fluently answer problems such as, “One bird was on the tree. Three more birds came. How many are on the tree now?”; and “There was one bird on the tree. Some more came. There are now 4 birds on the tree. How many birds came?”.

Traditional flash cards or timed tests have not been proven as effective instructional strategies for developing fluency.* Rather, numerous experiences with breaking apart actual sets of objects help children internalize parts of number.

*Burns (2000) *About Teaching Mathematics*; Fosnot & Dolk (2001) *Young Mathematicians at Work;* Richardson (2002) *Assessing Math Concepts*; Van de Walle & Lovin (2006) *Teaching Student-Centered Mathematics*

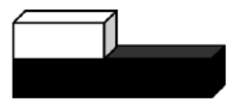
Number and Operations in Base Ten

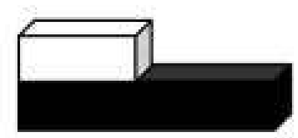
Standard	What Does This Standard Mean?	Dates Taught
K.NBT.1 Compose and decompose numbers from 11 to 19 into ten ones and some further ones, e.g. by using objects and drawings, and record each composition or decomposition by a drawing or equation (e.g., 18 = 10 + 8); understand that these numbers are composed of ten ones and one, two, three, four, five, six, seven, eight, or nine ones. **Knowledge Targets:** ☐ Know that a (spoken) number (11-19) represents a quantity.	Students explore numbers 11-19 using representations, such as manipulatives or drawings. Keeping each count as a single unit, kindergarteners use 10 objects to represent “10” rather than creating a unit called a ten (unitizing) as indicated in the First Grade CCSS standard 1.NBT.1a: 10 can be thought of as a bundle of ten ones — called a “ten.” Example: **Teacher**: “I have some chips here. Do you think they will fit on our ten frame? Why? Why Not?” **Students**: Share thoughts with one another. **Teacher**: “Use your ten frame to investigate.” **Students**: “Look. There’s too many to fit on the ten frame. Only ten chips will fit on it.”	

I can represent a spoken number with a quality. (Underpinning) (numbers 1-10 only for Pre-K) **Reasoning Targets:** ☐ Understand that numbers 11-19 are composed of 10 ones and one, two, three, four, five, six, seven, eight, or nine ones. ***I can compose (build) and decompose (break apart) the numbers 11-19 into a ten and ones by using objects or drawings.*** ☐ Represent compositions or decompositions by a drawing or equation. ***I can compose (build) and decompose (break apart) the numbers 11-19 into a ten and ones and write about it.*** **Performance Skill Targets:** ☐ Compose numbers 11-19 into ten ones an dsome further ones using objects and drawings. ***I can compose numbers 11-19 using ten ones and some more ones using objects and drawings.*** ☐ Decompose numbers 11-19 into ten ones and some further ones using objects and drawings. ***I can decompose numbers 11-19 using ten ones and some more ones using objects and drawings.***	**Teacher**: "So you have some leftovers?" **Students**: "Yes. I'll put them over here next to the ten frame." **Teacher**: "So, how many do you have in all?" **Student A**: "One, two, three, four, five… ten, eleven, twelve, thirteen, fourteen. I have fourteen. Ten fit on and four didn't." **Student B**: Pointing to the ten frame, "See them- that's 10… 11, 12, 13, 14. There's fourteen." **Teacher**: Use your recording sheet (or number sentence cards) to show what you found out. Student Recording Sheets Example: 	

Measurement and Data

Standard	What Does This Standard Mean?	Dates Taught
K.MD.1 Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object. **Knowledge Targets:** ☐ Know that objects have measurable attributes and know	Students describe measurable attributes of objects, such as length, weight, size, and color. For example, a student may describe a shoe with one attribute, "Look! My shoe is blue, too!", or more than one attribute, "This shoe is heavy! It's also really long."	

what they are called, such as length and weight. ***I can tell the correct measurable attribute of objects.*** ☐ Describe an object by using attributes such as width, height, length, weight, etc. **I can describe an object using attributes (width, height, length, weight.)** ☐ Describe more than one measurable attribute of a single object. ***I can describe objects using more than one attribute. (Underpinning) (one or more for Pre-K)***		
K.MD.2 Directly compare two objects with a measureable 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.* **Knowledge Targets:** ☐ Know the meaning of the following words: more/less, taller/shorter, etc. ***I can explain what more/less, taller/shorter and other comparison words mean.*** ☐ Know that two objects can be compared using a particular attribute. ***I can compare two objects using attributes. (Underpinning)*** **Reasoning Targets:** ☐ Compare two objects and determine which has more and which has less of the measurable attribute to describe the difference. ***I can compare two objects using attributes and tell which has more or less of that attribute to show the difference.***	Direct comparisons are made when objects are put next to each other, such as two children, two books, two pencils. For example, a student may line up two blocks and say, "The blue block is a lot longer than the white one." Students are not comparing objects that cannot be moved and lined up next to each other.  Similar to the development of the understanding that keeping track is important to obtain an accurate count, kindergarten students need ample experiences with comparing objects in order to discover the importance of lining up the ends of objects in order to have an accurate measurement.  "Sometimes this block is longer and sometimes it's shorter." As this concept develops, children move from the idea that "Sometimes this block is longer than this one and sometimes it's shorter (depending on how I lay them side by side) and that's okay," to the understanding that "This block is always	

	longer than this block (with each end lined up appropriately).” Since this understanding requires conservation of length, a developmental milestone for young children, kindergarteners need multiple experiences measuring a variety of items and discussing findings with one another.  "The dark block is always longer than this block"	
K.MD.3 Classify objects into given categories; count the numbers of objects in each category and sort the categories by count. (Limit category counts to be less than or equal to 10.) **Knowledge Targets:** ☐ Recognize non-measurable attributes such as shape, color. ***I can identify non-measurable attributes such as shape and color. (Underpinning)*** ☐ Recognize measurable attributes such as length, weight, height. ***I can recognize measurable attributes such as length, weight, and height.*** ☐ Know what classify means. ***I can tell what it means to classify something.*** ☐ Know what sorting means. ***I can tell what it means to sort something. (underpinning)*** ☐ Know that a category is the group that an object belongs to according to a particular, selected attribute. ***I can identify the object that matches a category.*** ☐ Understand one to one correspondence with ten or less objects. ***I can count using one-to-one match. (Underpinning)*** .	Students identify similarities and differences between objects (e.g., size, color, shape) and use the identified attributes to sort a collection of objects. Once the objects are sorted, the student counts the amount in each set. Once each set is counted, then the student is asked to sort (or group) each of the sets by the amount in each set. For example, when exploring a collection of buttons: First, the student separates the buttons into different piles based on color (all the blue buttons are in one pile, all the orange buttons are in a different pile, etc.). Then the student counts the number of buttons in each pile: blue (5), green (4), orange (3), purple (4). Finally, the student organizes the groups by the quantity in each group (Orange buttons (3), Green buttons next (4), Purple buttons with the green buttons because purple also had (4), Blue buttons last (5). This objective helps to build a foundation for data collection in future grades as they create and analyze various graphical representations.	

Reasoning Targets: ☐ Classify objects into categories by particular attributes. ***I can sort objects into given categories by their attributes.*** **Performance Skill Targets:** ☐ Count objects in a given group. Note: This is addressed in another content standard K.CC.5. It is important to integrate standards to assist students with making connections and building deeper understanding.. ***I can count objects in a given group.*** ☐ Sort objects into categories then determine the order by number of objects in each category (limit category counts to be less than or equal to ten). For example, if M & M's are categorized by the attribute of color, then are "sorted" or ordered by the number in each group (there are more red than green, the blue group has fewer than the green.) ***I can count the number in each group and order them by amount.***		

Geometry

Standard	What Does This Standard Mean?	Dates Taught
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*. **Knowledge Targets:** ☐ Describe positions such as above, below, beside, in front of, behind, and next to. ***I can describe positions using position words. (Underpinning)*** **Reasoning Targets:**	Students locate and identify shapes in their environment. For example, a student may look at the tile pattern arrangement on the hall floor and say, "Look! I see squares! They are next to the triangle." Students use positional words (such as those italicized in the standard) to describe objects in the environment. Kindergarten students need numerous experiences identifying the location and position of actual two-and-three dimensional objects in their classroom/school prior to describing location and position of two-and-three dimension representations on paper.	Third Nine Weeks

☐ Determine the relative position of the 2-dimensional or 3-dimensional shapes within the environment, using the appropriate positional words. ***I can use position words to describe the location of 2-dimensionial and 3-dimensional shapes.***		
K.G. 2 Correctly name shapes regardless of their orientations or overall size. **Knowledge Targets:** ☐ Know that size does not affect the name of the shape. ***I can identify shapes of all sizes. (4 basic shapes for Pre-K).*** ☐ Know that orientation does not affect the name of the shape. ***I can identify shapes in any position.***	Through numerous experiences exploring and discussing shapes, students begin to understand that certain attributes define what a shape is called (number of sides, number of angles, etc.) and that other attributes do not (color, size, orientation). As the teacher facilitates discussions about shapes ("Is it still a triangle if I turn it like this?"), children question what they "see" and begin to focus on the geometric attributes. Kindergarten students typically do not yet recognize triangles that are turned upside down as triangles, since they don't "look like" triangles. Students need ample experiences manipulating shapes and looking at shapes with various typical and atypical orientations. Through these experiences, students will begin to move beyond what a shape "looks like" to identifying particular geometric attributes that define a shape.	
K.G.3 Identify shapes as two-dimensional (lying in a plane, "flat") or three-dimensional ("solid"). **Knowledge Targets:** ☐ Identify 2-dimensional shapes as lying in a plane and flat. ☐ Identify 3-dimensional shapes as a solid. ***I can identify whether shapes are two-dimensional (flat) or three-dimensional.***	Students identify objects as flat (2 dimensional) or solid (3 dimensional). As the teacher embeds the vocabulary into students' exploration of various shapes, students use the terms two-dimensional and three-dimensional as they discuss the properties of various 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).	Students relate one shape to another as they note similarities and differences between and among 2-D and 3-D shapes using informal language. For example, when comparing a triangle and a square, they note that they both have sides, but the triangle has 3 sides while the square has 4. Or, when building in the Block Center, they notice that the faces on the cube are all square shapes.	

Knowledge Targets: ☐ Identify and count number of sides, vertices/"corners", and other attributes of shapes. ***I can count and identify the number of sides, corners and other attributes of a shape. (Underpinning)*** **Reasoning Targets:** ☐ Describe similarities of various two- and three-dimensional shapes. ***I can tell how two- and three-dimensional shapes are the same.*** ☐ Describe differences of various two- and three-dimensional shapes. ***I can tell the differences between two- and three-dimensional shapes.*** ☐ Analyze and compare two-dimensional shapes, in different sizes and orientations, using informal language to describe their similarities, differences, and other attributes (e.g., having sides of equal length). ***I can compare two-dimensional shapes in different sizes and orientations to describe how they are alike and different by their attributes.*** ☐ Analyze and compare three-dimensional shapes, in different sizes and orientations, using informal language to describe their similarities, differences, and other attributes (e.g., having sides of equal length). ***I can compare three-dimensional shapes in different sizes and orientations to describe how they are alike and different by their attributes.***		
K.G.5 Model shapes in the world by building shapes from components (e.g., sticks and clay balls) and drawing shapes.	Students apply their understanding of geometric attributes of shapes in order to create given shapes. For example, students may roll a clump of play-doh into a sphere or use their finger to draw a triangle in the sand table, recalling various attributes in order to create that particular	

Knowledge Targets: ☐ Recognize and identify (square, circles, triangles, rectangles, hexagons, cubes, cones, cylinders, spheres. ***I can recognize and identify shapes. (Underpinning) (4 basic shapes for Pre-K)*** ☐ Identify shapes in the real world. *I can identify shapes in my world.* ***(Underpinning) (4 basic shapes for Pre-K)*** **Reasoning Targets:** ☐ Analyze the attributes of real world objects to identify shapes**.** ***I can identify the attributes of shapes in real world objects.*** **Product Targets:** ☐ Construct shapes from components (e.g., sticks and clay balls). ***I can build shapes from other materials (sticks, clay balls). (Underpinning)*** ☐ Draw shapes. ***I can draw shapes. (Underpinning)***	shape.	
K.G.6 Compose simple shapes to form larger shapes. *For example, "Can you join these two triangles with full sides touching a make a rectangle?"* **Knowledge Targets:** ☐ Identify simple shapes (squares, triangles, rectangles, hexagons). ***I can identify simple shapes. (Underpinning)***	This standard moves beyond identifying and classifying simple shapes to manipulating two or more shapes to create a new shape. This concept begins to develop as students move, rotate, flip, and arrange puzzle pieces to complete a puzzle. Kindergarteners use their experiences with puzzles to use simple shapes to create different shapes. For example, when using basic shapes to create a picture, a student flips and turns triangles to make a rectangular house.	

Reasoning Targets: ☐ Analyze how to put simple shapes together to compose a new or larger shape. ***I can use simple shapes to make larger shapes.*** **Performance Skill Targets:** ☐ Compose a new or larger shape using more than one simple shape. ***I can draw or build a shape using more than one shape.***		

Some examples used in this document are from the Arizona Mathematics Education Department

Standards	***Mathematical Practices***
Students are expected to:	
K.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.
K.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 a representation of a problem while attending to the meanings of the quantities.
K.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.
K.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.
K.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 representations side-by-side.
K.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.
K.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.
K.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?”

Math Accountable Talk

Teach students to use one of the following when discussing each other's math work.

I agree with _____________ because ________________.

I like the way ___________ used ____________ because as his/her reader, it helps me _______________.

I disagree with _____________ because __________________.

I got a different answer than _______________ because ___________________.

I can add to ___________________'s thoughts: ____________________

I got the same answer as _____________________ but my strategy was different.

I have a question for ___________________________.

I don't understand why _________________ got the answer of ________________ because ________________.

Glossary

Table 1 Common addition and subtraction situations **(adapted from Box 2-4 of Mathematics Learning in Early Childhood, National Research Council (2009, pp.32-33.)**

	Result Unknown	**Change Unknown**	**Start Unknown**
Add to	Two bunnies sat on the grass. Three more bunnies hopped there. How many bunnies are on the grass now? 2 + 3 = ? **(K)**	Two bunnies were sitting on the grass. Some more bunnies hopped there. Then there were five bunnies. How many bunnies hopped over to the first two? 2 + ? = 5 **(1st)**	Some bunnies were sitting on the grass. Three more bunnies hopped there. Then there were five bunnies. How many bunnies were on the grass before? ? + 3 = 5 **(2nd)**
Take from	Five apples were on the table. I ate two apples. How many apples are on the table now? 5 – 2 = ? **(K)**	Five apples were on the table. I ate some apples. Then there were three apples. How many apples did I eat? 5 – ? = 3 **(1st)**	Some apples were on the table. I ate two apples. Then there were three apples. How many apples were on the table before? ? – 2 = 3 **(2nd)**
	Total Unknown	**Addend Unknown**	**Both Addends Unknown**
Put together/Take apart	Three red apples and two green apples are on the table. How many apples are on the table? 3 + 2 = ? **(K)**	Five apples are on the table. Three are red and the rest are green. How many apples are green? 3 + ? = 5, 5 – 3 = ? **(K)**	Grandma has five flowers. How many can she put in her red vase and how many in her blue vase? 5 = 0 + 5, 5 = 5 + 0 5 = 1 + 4, 5 = 4 + 1 5 = 2 + 3, 5 = 3 + 2 **(1st)**
	Difference Unknown	**Bigger Unknown**	**Smaller Unknown**
Compare	(“How many more?” version) Lucy has two apples. Julie has five apples. How many more apples does Julie have than Lucy? **(1st)** (“How many fewer?” version): Lucy has two apples. Julie has five apples. How many fewer apples does Lucy have than Julie? 2 + ? = 5, 5 – 2 = ? **(1st)**	(Version with “more”) Julie has three more apples than Lucy. Lucy has two apples. How many apples does Julie have? **(1st)** (Version with “fewer”): Lucy has 3 fewer apples than Julie. Lucy has two apples. How many apples does Julie have? 2 + 3 = ?, 3 + 2 = ? **(1st)**	(Version with “more”): Julie has three more apples than Lucy. Julie has five apples. How many apples does Lucy have? **(1st)** (Version with “fewer”): Lucy has 3 fewer apples than Julie. Julie has five apples. How many apples does Lucy have? 5 – 3 = ?, ? + 3 = 5 **(2nd)**

K: Problem types to be mastered by the end of the Kindergarten year.

1st: Problem types to be mastered by the end of the First Grade year, including problem types from the previous year(s). However, first grade students should have experiences with all 12 problem types.
2nd: Problem types to be mastered by the end of the second grade year, including problem types from the previous year(s).

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