

South Carolina College- and Career-Ready Standards for Mathematics



**Support Document
Kindergarten**

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Kindergarten Mathematics Support Document

As support for implementing the *South Carolina College- and Career-Ready Standards for Mathematics*, the standards for each grade K-5 have been grouped into possible units. In the *Table of Contents* below, the titles for those possible units are listed in a column under each grade. To see which standards are addressed in each unit for this grade and to read a brief description of the focus for each unit in this grade, click on the *Overview of Units* in the [Table of Contents](#). The completed units for this grade are hyperlinked from/to the *Table of Contents* and the *Overview of Units*. The purpose of this document is to provide guidance as to how all the standards at this grade may be grouped into units and how those units might look. Since this document is merely guidance, districts should implement the standards in a manner that addresses the district curriculum and the needs of students.

Acknowledgments

“Jean Baptiste Massieu, famous deaf educator, made a statement that is now considered a French proverb. *Gratitude is the memory of the heart*. Indeed, appreciation comes when you feel grateful from the depths of your heart. The head keeps an account of all the benefits you received and gave. But the heart records the feelings of appreciation, humility, and generosity that one feels when someone showers you with kindness.” It is with sincere appreciation that we humbly acknowledge the dedication, hard work and generosity of time provided by the following individuals who are making the K-5 Mathematics Support Document possible. (<http://quotations.about.com/od/ThankYou/a/Gratitude-Quotes.htm>)

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Table of Contents for Grades K-5

	K	1st	2nd	3rd	4th	5th
	Overview of Units	Overview of Units	Overview of Units	Overview of Units	Overview of Units	Overview of Units
Unit 1	Counting and Cardinality	Composing and Decomposing Numbers Through 10	Place Value Concepts	Conceptual Understanding of Multiplication & Division	Place Value, Addition, & Subtraction with Whole Numbers	Expressions, Equations, & the Coordinate Plane
Unit 2	Understanding Relationship of Counting and Quantity	Addition and Subtraction Strategies	Developing Concepts Addition/ Subtraction	Place Value	Algebraic Thinking	Place Value
Unit 3	Count and Compare	Understanding Place Value	Fluency and Word Problems Addition/ Subtraction	Addition & Subtraction	Multiplication & Division of Whole Numbers	Operations with Whole and Decimal Numbers
Unit 4	Composing and Decomposing Numbers	Applying Place Value Concepts	Developing an Understanding of Multiplication	Application of Multiplication & Division	Fraction Equivalence	Adding and Subtracting Fractions
Unit 5	Understanding Measurement and Data	Comparisons and Data	Attributes Polygons and Fractional Parts	Conceptual Understanding of Fractions	Adding, Subtracting, & Multiplying with Fractions	Multiplying with Fractions
Unit 6	Patterns and Positions	Geometry and Equal Shares	Measurement: Length	Data Analysis	Decimal Concepts	Dividing with Fractions
Unit 7	Two Dimensional and Three Dimensional Geometry	Measurement, Time, and Money	Measurement Time and Money	Identification and Classification of Geometric Shapes	Conversions & Problem Solving with Measurement	Classifying 2D Shapes
Unit 8	Addition and Subtraction		Creating and Understanding Data	Problem Solving with Measurement	Geometric Classifications & Line Symmetry	Perimeter, Area, and Volume
				Fluency with Multiplication & Division	Angle Measurement	Converting Measurements within a Single System

Kindergarten Overview of Units

[Click here to return to the K-5 Table of Contents](#)

Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8
Counting and Cardinality	Understanding Relationship of Counting and Quantity	Count and Compare	Composing and Decomposing Numbers	Understanding Measurement and Data	Patterns and Positions	Two Dimensional and Three Dimensional Geometry	Addition and Subtraction
Standards	Standards	Standards	Standards	Standards	Standards	Standards	Standards
K.NS.1 K.NS.2 K.NS.3 K.NS.4 K.NS.5 K.NS.6	K.NS.4 K.NS.5	K.NS.4 (c) K.NS.7 K.NS.8 K.NS.9	K.NS.6 K.NSBT.1 K.ATO.1 K.ATO.3	K.MDA.1 K.MDA.2 K.MDA.3 K.MDA.4	K.ATO.6 K.G.1 K.NS.9	K.G.2 K.G.3 K.G.4 K.G.5	K.ATO.21 K.ATO.3 - (equations) K.ATO.4 K.ATO.5
Unit Focus	Unit Focus	Unit Focus	Unit Focus	Unit Focus	Unit Focus	Unit Focus	Unit Focus
The focus of this unit is for students to understand the relationship between number and quantity. Students will understand that quantities can be counted, represented with a number name and a written numeral is a symbol representing that quantity.	The focus of this unit is for students to develop a sense of quantity and how numbers they count relate to one another. Students will begin to understand the reasonableness of answers, understanding the need to be consistent and accurate when counting.	The main focus of this unit is for students to apply their understanding of counting and quantity to compare sets of objects and written numerals.	This unit focuses on developing the concepts of how numbers can be composed and decomposed in a variety of ways, forming a foundation for number sense in base ten.	The main focus is for students to be exposed to measurement descriptions and describing data. This includes students developing the language necessary to describe attributes of length and weight, similarities, and differences, as well as the language necessary to compare and contrast categories.	The main focus is for students to describe simple repeating patterns and positions of objects. Focus should include simple number patterns.	The main focus is on basic geometrical shapes. Students will develop an understanding of the attributes of 2-dimensional and 3-dimensional shapes. Students will apply number sense to reason about shapes in the environment.	The main focus is for students to build on composing and decomposing strategies which make sense to them to develop the conceptual understanding for the operations of addition and subtraction.

Counting and Cardinality

Content Standards with Clarifying Notes*Open Bullets Indicate Clarifying Notes*

- **K.NS.1** Count forward by ones and tens to 100.
 - Oral Rote counting, say the count sequence
 - Counting by tens is with decade numbers only (e.g. 10, 20, 30, etc.)
 - Students are not expected to write the numerals for this standard.
- **K.NS.2** Count forward by ones beginning from any number less than 100.
 - Oral Rote counting, say the count sequence from any number less than 100.
 - Students are not expected to write the numerals for this standard.
- **K.NS.3** Read numbers from 0 – 20 and represent a number of objects 0 – 20 with a written numeral.
 - Number reversal (writing a 3 backward) is developmentally appropriate at this stage, however students should be corrected so as not to form misconceptions or incorrect habits.
 - When students write the numeral, the order of the digits is important so as not to confuse the value of the number. For example, 31 is not 13 and students should be corrected so as not to form misconceptions or incorrect habits that would impact their beginning understanding of number meaning.
- **K.NS.4** Understand the relationship between number and quantity. Connect counting to cardinality by demonstrating an understanding that:
 - a. the last number said tells the number of objects in the set (cardinality);
 - b. the number of objects is the same regardless of their arrangement or the order in which they are counted (conservation of number);
 - c. each successive number name refers to a quantity that is one more and each previous number name refers to a quantity that is one less.
- **K.NS.5** Count a given number of objects from 1 – 20 and connect this sequence in a one-to-one manner.
 - Say a number name for each object counted.
- **K.NS.6** Recognize a quantity of up to ten objects in an organized arrangement (subitizing).
 - Teacher note: Subitizing is defined as seeing a small amount of objects and knowing how many there are *without counting*. (Carlyle & Mercado 2012), Subitizing should include perceptual and conceptual subitizing. Perceptual subitizing is recognizing the quantity

such as 3 without using any formal mathematical processes. Conceptual subitizing is viewing number and number patterns as units of units. (e.g. On a dominoe or a die student sees 4 dots as 2 dots and 2 dots as 1 unit of 4)(Adapted from http://www.nwaea.k12.ia.us/documents/filelibrary/pdf/connections/Subitizing_B2518BBFE8FCF.pdf)

New Academic Vocabulary for This Unit

- | | | | |
|--|------------|------------|------------|
| ● numeral | ● quantity | ● 1 more | ● how many |
| ● number | ● count | ● 1 less | ● amount |
| ● number names
(e.g. one, two, three, etc.) | ● sequence | ● count on | ● set |

Prior Knowledge Required for This Unit

While students may have had some informal exposure to counting in everyday situations, this may be their first formal introduction to counting and cardinality. Frequent and brief opportunities to count will allow for rote counting concepts to develop over time. Development of meaningful counting, understanding the relationship between numbers, etc., requires intentional activities designed to target understandings such as those set forth in K.NS.4. Children should come to the understanding that number symbols signify the meaning of counting. Many students come to kindergarten knowing the rote count sequence, making adults believe they know how to count, but they are just saying the rote count sequence, they do not have any formal meaning for what they are saying (numbers). For example, when shown a number such as 4, the student doesn't know it's a 4, or doesn't know a quantity of 4 objects, but they can verbalize the rote count sequence, "1,2,3,4,5,6,..."

Subsequent Knowledge Related to This Unit

This unit is the foundation for the more complex stages of number sense:

Hierarchical inclusion: Understanding that smaller numbers are part of bigger numbers. Idea of one more and one less

Part/Whole Relationships: Understanding different ways to make up a given number, composing and decomposing numbers, understanding that 6 is made up of 1 & 5, 3 & 3, 2 & 4.

Compensation: Ability to see the parts of a whole and are able to compensate, so if I know that $5+1=6$, then I also know that $4+2=6$ because 4 is one less than 5 and 2 is one more than 1.

Unitizing: Once students begin to gain a solid understanding of the preceding number sense, then they can construct unitizing as they work with larger numbers. Place value

Unit 1 provides the foundation for student understanding that in the count sequence, the next number is one more, and when counting by tens, the next number is “ten more” (or one more group of 10). As students gain this understanding, they will be prepared to compare numbers in Unit 3. However, those understandings are not innate and students should be given intentional learning opportunities. Students should then be able to apply this knowledge to part/whole relationships, compensate to compose and decompose numbers in Units 3 & 4, as well as develop a foundation for place value and operations with numbers in subsequent units as well as subsequent grade levels.

Students will use their fluency with the count sequence and cardinality to compose and decompose numbers in Unit 4, and then again to model addition and subtraction with story problems in Unit 5.

As students are able to subitize, they will use this skill in addition to cardinality to build single-digit fluency to 5 in Unit 5.

Relationship Among Standards in This Unit

The content standards and the process standards work together in this unit to form the foundation which will enable all students to develop the world class knowledge, skills, and life and career characteristics identified in the *Profile of the South Carolina Graduate*.

The standards in Unit 1 are intertwined and work together to help students build their foundation in the key concepts Number Sense and Number Sense in Base Ten. Counting and Cardinality are about understanding and using numbers. These are both essential foundations for Number Sense in Base Ten. This is the first formal introduction for students to the language of mathematics/ numbers. Frequent and brief opportunities to count will allow for rote counting concepts to develop over time. However, children must be given intentional learning opportunities to understand that number symbols signify the meaning of counting.

When taught simultaneously these standards will develop students’ understanding of number names, the count sequence, quantity, written numerals, and how they are all related; together these will provide a foundation for comparing numbers in Unit 3. The main focus of this unit is for students to use and understand numbers in a variety of ways orally and written so as to master kindergarten standards by the end of the year. Students will count objects in a set, and count out a given number of objects so as to make the connection between counting and cardinality while learning the count sequence and developing one-to-one correspondence, as well as represent quantities. Students will also answer quantitative questions by subitizing, counting and producing sets of a given size.

K.NS.1 and K.NS.2 require students to say the count sequence to 100, by ones, tens, and beginning at any number less than 100. As students learn the count sequence, K.NS.5 requires that they say a number name for each object counted in a set of up to 20 objects. This leads to students understanding of cardinality, K.NS.4. Accuracy in counting relies upon knowing the patterns in the number name, correctly saying one number name to one object, and keeping track of counted and uncounted objects so as not to count an object more than once. Young students benefit

from regularity and rhythm aspects of counting so as to develop one-to-one correspondence. As students begin to make sense of counting, they will be ready to read and write numbers 0-20 to correctly represent a quantity.

Unit 1 provides the foundation for the critical learning phase of counting objects. In this unit, common behaviors of students might be: 1-1 correspondence, keeping track of an unorganized pile, noticing when a recount results in a different number, bothered when counting a group results in the same number after more objects have been added or taken away, spontaneously checking or recounting to see if the result is the same, answering “How many” questions, counting out a specific quantity, showing a reaction to estimate while counting, and adjusting estimate while counting to have a closer estimate. Depending where students are in their development, these behaviors might be observed at different times with different students.

The standards in Units 1-4 are essential to the key concepts Number Sense and Base Ten and Algebraic Thinking and Operations in grades K-5. Meaningful, daily experiences with the standards in Unit 1 should be provided to young students throughout the kindergarten year to set a strong foundation for mathematics success. Students will deepen their understanding of counting and cardinality in Unit 2 as they look more closely at quantities.

Teacher Notes:

Students typically develop number sense through the following progression:

Subitizing ability to see small amounts without counting.

Magnitude ability to tell which of two sets has more without counting.

Counting ability to say the counting sequence, which happens before one-to-one correspondence is fully developed.

One-to-One correspondence is saying one number name for each object counted.

Cardinality is when you count a group of objects, and the last number you say tells how many in all. Students who don't have this, recount objects when asked “how many?”

Hierarchical inclusion understanding that smaller numbers are part of bigger numbers. Idea of one more and one less.

Potential Instructional Strategies/Lessons

Kindergarten is the pivotal grade for creating a mathematical classroom which encourages collaboration and builds community. Students who are college-and-career-ready take a productive and confident approach to mathematics by communicating about mathematics to gain understanding.

Students in kindergarten can begin developing their communication skills by:

- Acting out mathematical scenarios/problems
- Frequently exchanging mathematical ideas and problem solving strategies
- Listening to understand one another. This involves thinking about what a person is saying so that you can explain it yourself or to help them explain it more clearly. It is not just being quiet when someone else is talking. Also, children need to listen so that they can ask a question or help the explainer.
- Utilizing *Math Talk* in the classroom before being asked to follow procedures

Kindergarten students will naturally want to do many things on their own, however it is encouraged to have students begin working in pairs or small groups to build reasoning and communication skills.

Differentiation should be considered in the mathematics classroom, even at the kindergarten level where students' background knowledge and experiences vary. Instruction on the count sequence should be scaffolded as students are developmentally ready. (e.g. focus on 1-5, 1-10, then 1-20, etc.)

Possible Strategies:

Students should be provided many, meaningful opportunities to count throughout the day and throughout the kindergarten year. Provide settings which connect mathematical language and symbols to kindergartners' everyday lives. Support the natural ability of young children to mathematize their world.

Number Sense Routines Daily routines that allow children ongoing support with counting, thinking and talking about numbers which help them make sense of numbers and how they work.

A list of possible routines is here <https://gradeKcommoncoremath.wikispaces.hcps.org/Routines>

Introductory Lesson/Strategy

Numbers and Me <http://illuminations.nctm.org/Lesson.aspx?id=910>

- An activity which focuses on the use of numbers in everyday situations and school to introduce teacher and students to each other.

Choral counting

- Count the number of chairs in the room
- Count the number of students today
- Count the number of shoes, papers, pencils, crayons, anything in the classroom
- Count the number of empty chairs in the room
- Count the number of snacks provided
- Count the number of napkins/cups/plates needed for snack
- Count around the circle: Students sit in a circle and pass an object as they count.
- Count the days in school using the number line and/or hundreds chart

Choral Counting <https://www.illustrativemathematics.org/content-standards/K/CC/A/1/tasks/360>

The Counting Jar

- Place objects (same objects at beginning of year such as marbles, color tiles, beans, shells, etc.) in a jar and each day, remove the objects from the jar, asking students to count the objects. At first, the teacher might record the written number, and ask students to find that number on a number line or hundred chart. As students become more fluent with counting and one-to-one correspondence, increase the magnitude of the quantity of objects in the jar.

The Counting Jar <https://www.youtube.com/watch?v=QWoRC3KwB2M>

Read Alouds

- Children's Literature is an effective and engaging way to provide students with the opportunity to understand numbers.

Possible Lesson Using :

Ten Black Dots by Donald Crews <http://www.k-5mathteachingresources.com/support-files/ten-black-dots.pdf>

<https://www.youtube.com/watch?v=h3ePDTSThq0> A recorded read aloud

After listening to the story, this lesson engages students in counting out a specific number of dots to create something. They then complete a sentence frame for a page that can be combined to create a class book.

Ten Black Dots <http://www.scholastic.com/teachers/lesson-plan/ten-black-dots-extension-activities>

- Activities to use with the children's book by Donald Crews.
-

Organization of Numbers

- Five Frames
- Ten Frames
- Dot Cards
- Rekenreks <http://www.k-5mathteachingresources.com/Rekenrek.html>

The rekenrek is a tool to teach students one -to-one correspondence and then more complex counting such as in groups of 5 and ten. Lessons with the rekenrek support students natural concept development of counting.

Five Frame Fill & Ten Frame Fill <http://illuminations.nctm.org/Activity.aspx?id=3565>

- An interactive game using five and ten frames. Several options in the game allow students to count, match a quantity, and identify numbers with quantities. Can be used individually on a computer or projected on Smart Boards for whole group.

Ten Frames and Dot Cards <http://www.k-5mathteachingresources.com/ten-frames.html>

- A variety of lesson ideas for using ten frames and dot cards. Also provides blackline masters of ten frames and dot cards.
- Counting Songs
- Counting rhymes

All About the Number ____ :

- Following the count sequence, create an anchor chart for each number. Asking students, “ What do we know about the number ____?” “How can we show the number____?” “What does it look like as a picture? a word? a symbol?” Post the anchor charts in the classroom to begin building an organic number line with meaning based on what students know about the numbers. As students learn more, they can add to the anchor charts.

Possible Culminating Strategy:

My Counting Book <http://www.k-5mathteachingresources.com/support-files/my-counting-book.pdf>

- Students create their own counting book. A good activity for students to work on over time, especially after reading several counting books as read alouds. Provides opportunity for students to count, draw/represent, and write numbers.

Resources

Teacher Resources:

Number Early Learning Progression <http://nzmaths.co.nz/sites/default/files/Number-Early-Learning-Progression.pdf>

- This chart provides the learning progression for learning numbers and the count sequence.

The Principles of Counting <http://math.about.com/od/counting/a/The-Principles-Of-Counting.htm>

- Explanation of the different aspects of counting such as cardinality, conservation of number, and unitizing.

Mingle and Count game <https://www.teachingchannel.org/videos/mingle-count-a-game-of-number-sense>

- Explains and demonstrates how to play the game

Lesson Planning Resources:

Building Sets of Ten <http://illuminations.nctm.org/Lesson.aspx?id=1649>

- A lesson plan for exploring sets of up to 10 items, and practice writing numbers 0-10.

Tallies, Tens Frames and Baseball Games <http://illuminations.nctm.org/Lesson.aspx?id=3300>

- A lesson plan for reinforcing counting concepts using tally marks, tens frames, and patterning wins and losses for a baseball team. This lesson could be used as a daily support for these concepts. It extends to using operations with the numbers which could be used again in Unit 3 for composing and decomposing numbers and building fluency in Unit 5.

Literature Connections

- *Mouse Count* by Ellen Stoll Walsh
- *Ten Black Dots* by Donald Crews
- *How Many Snails?* by Paul Giganti, Jr.
- *Olly and Me, 1*2*3* by Shirley Hughes, Ten Flashing Fireflies by Philemon Sturges

Howard County Kindergarten Math Wiki <https://gradekcommoncoremath.wikispaces.hcpss.org/kindergarten+home>

- This website has a wide variety of daily number routines, vocabulary cards, lesson plans/activities, and assessment tasks including rubrics for proficiency.

Counting by Tens <https://www.illustrativemathematics.org/content-standards/K/CC/A/1/tasks/754>

- Kinesthetic and auditory lesson to demonstrate the count sequence to 100 when counting by tens.

Number Line Up <https://www.illustrativemathematics.org/content-standards/K/CC/A/2/tasks/401>

- Kinesthetic lesson for students to physically identify numbers and put them in order to form a “human number line”.

Children’s Books for Math <http://www.the-best-childrens-books.org/math-for-kids.html>

- This website has lists of children’s books for different concepts in math that make learning the concepts engaging and relatable to small children.

Interactive Resources

Counting Superhero Song by Harry Kindergarten music <https://www.youtube.com/watch?v=4RhBhzFJ4Ww>

- A counting song and video to practice and reinforce counting by ones to 100.

Find the Numbers 0-5 or 5-10 <https://www.illustrativemathematics.org/content-standards/K/CC/A/tasks/403>

- Game which students can play in groups of 2 or 3 to practice identifying numbers and matching quantities.

Glencoe Virtual Manipulatives http://www.glencoe.com/sites/common_assets/mathematics/ebook_assets/vmf/VMF-Interface.html

- An interactive library of virtual manipulatives which allow teachers to choose grade level, manipulatives (tools) and backgrounds such as storyboards, workmats, and game boards for students to practice. Could be used at individual computers or on an interactive whiteboard. At the kindergarten level, students should first use concrete manipulatives before using digital manipulatives.

National Library of Virtual Manipulatives http://nlvm.usu.edu/en/nav/grade_g_1.html

- A library of virtual manipulatives which allow teachers to engage students in visualizing problems. At the kindergarten level, students should first use concrete manipulatives before using digital manipulatives.

Teddy Numbers <http://www.topmarks.co.uk/learning-to-count/teddy-numbers>

- An interactive counting game that provides practice for young students to count objects by dragging and dropping items onto a teddy bear.

Underwater Counting <http://www.topmarks.co.uk/learning-to-count/underwater-counting>

- An interactive counting game that provides practice for young students to count objects in an underwater scene and click on the corresponding numeral.

Bones <http://colaborativelearning.pbworks.com/w/page/31904645/Kindergarten%20Math>

- An interactive game for students to count to find the location on the hundreds board where the dog bones are hidden. Reinforces using a blank hundreds board and knowing count sequence from 1-100 by ones and tens.

Sample Formative Assessment Tasks/Questions

Assessing Counting Sequences Part 1; <https://www.illustrativemathematics.org/content-standards/K/CC/A/1/tasks/448>

Assessing Counting Sequences Part II <https://www.illustrativemathematics.org/content-standards/K/CC/A/2/tasks/449>

Assessing Reading Numbers to 20 <https://www.illustrativemathematics.org/content-standards/K/CC/A/tasks/450>

Assessing Sequencing Numbers <https://www.illustrativemathematics.org/content-standards/K/CC/A/tasks/451>

Assessing Writing Numbers <https://www.illustrativemathematics.org/content-standards/K/CC/A/3/tasks/452>

Return to [Table of Contents](#)

DRAFT

Understanding Relationship of Counting and Quantity

Content Standards with Clarifying Notes*Open Bullets Indicate Clarifying Notes*

- **K.NS.4** Understand the relationship between number and quantity. Connect counting to cardinality by demonstrating an understanding that:
 - a. the last number said tells the number of objects in the set (cardinality);
 - b. the number of objects is the same regardless of their arrangement or the order in which they are counted (conservation of number);
 - c. each successive number name refers to a quantity that is one more and each previous number name refers to a quantity that is one less.
- **K.NS.5** Count a given number of objects from 1-20 and connect this sequence in a one-to-one manner.

New Academic Vocabulary for This Unit

- | | | | |
|--|------------|------------|------------|
| ● numeral | ● quantity | ● 1 more | ● amount |
| ● number | ● count | ● 1 less | ● sequence |
| ● digit | ● how much | ● count on | ● accuracy |
| ● number names
(e.g. one, two, three, etc.) | ● how many | ● set | ● estimate |

Prior Knowledge Required for This Unit

In Unit 1 students learn the count sequence from 1-100 by ones and tens. In this unit, students continue to build on the count sequence and number names to deepen their understanding that number names and number symbols relate to a quantity and all of these together are the meaning of counting. In Unit 1 students begin to develop one-to-one correspondence, however students will develop this skill up to different magnitudes at their own developmental pace. While one student might have one-to-one correspondence for a small set of objects, another student might be developing one-to-one with a larger set of objects. The same applies to the count sequence, it cannot be forced in a given amount of time.

Subsequent Knowledge Related to This Unit

As students deepen their understanding of numbers and make meaning of counting and cardinality, they will develop beyond rote counting and one-to-one correspondence to more complex phases of meaningful counting. Unit 2 and Unit 3 should be a continuation of Unit 1, building on the development of individual students. Unit 1 provided the foundation for the critical learning phase of counting objects.

Unit 2 provides more time for student understanding that in the count sequence, the next number is one more, and when counting by tens, the next number is “ten more” (or one more group of 10). As students gain this understanding, they will be prepared to compare numbers in Unit 3. However, those understandings are not innate and students should be given intentional learning opportunities. Students should then be able to apply this knowledge to part/whole relationships, compensate to compose and decompose numbers in Units 3 & 4, as well as develop a foundation for place value and operations with numbers in subsequent units as well as subsequent grade levels.

Students will use their fluency with the count sequence and cardinality to compose and decompose numbers in Unit 4, and then again to model addition and subtraction with story problems in Unit 5.

As students are able to subitize, they will use this skill in addition to cardinality to build single-digit fluency to 5 in Unit 5.

Relationship Among Standards in This Unit

The content standards and the process standards work together in this unit to form the foundation which will enable all students to develop the world class knowledge, skills, and life and career characteristics identified in the *Profile of the South Carolina Graduate*.

The standards in this unit work together to deepen students understanding of counting and cardinality, as well as provide more time for students to understand quantities. Building on the foundational standards in Unit 1, the standards in this unit focus on students making meaning of their counting skills. As students develop one-to-one correspondence, they should notice the necessity to keep track when counting, thus students should be able to keep track of an unorganized pile when counting (conservation of number). As students deepen their understanding that the last number said tells the number of objects in the set (cardinality) they should take notice when a recount of objects results in a different number or be bothered when counting a group results in the same number after more objects have been added or taken away.

This is the beginning stage of students reasoning about their counting. As students begin to make meaningful connections between the objects they count, cardinality, and the rote count sequence, they might spontaneously check or recount to see if the result is the same. With K.NS.4 and K.NS.5 students will begin to answer “How many?” questions, as well as be able to count out a specific quantity. Depending where students are in their development, these behaviors might be observed at different times with different students. Providing students with real world, meaningful counting experiences will lend itself to students reasoning about their counting.

The standards in Units 1-4 are essential to the key concepts Number Sense and Base Ten and Algebraic Thinking and Operations in grades K-5. Meaningful, daily experiences with the standards in Unit 2 should be provided to young students to set a strong foundation for mathematics success. Students will build upon their understanding of counting and cardinality in Unit 3 as they count and compare quantities.

Potential Instructional Strategies/Lessons

Kindergarten is the pivotal grade for creating a mathematical classroom which encourages collaboration and builds community. Students who are college-and-career-ready take a productive and confident approach to mathematics by communicating about mathematics to gain understanding. Students in kindergarten can begin developing their communication skills by:

- Acting out mathematical scenarios/problems
- Frequently exchanging mathematical ideas and problem solving strategies
- Listening to understand one another. This involves thinking about what a person is saying so that you can explain it yourself or to help them explain it more clearly. It is not just being quiet when someone else is talking. Also, children need to listen so that they can ask a question or help the explainer.
- Utilizing *Math Talk* in the classroom before being asked to follow procedures

Kindergarten students will naturally want to do many things on their own, however it is encouraged to have students begin working in pairs or small groups to build reasoning and communication skills.

Students should be provided many, meaningful opportunities to count throughout the day. Provide settings which connect mathematical language, quantities, and symbols to kindergartners' everyday lives. Support the natural ability of young children to mathematize their world. Students should be provided with daily, meaningful opportunities to continue counting and demonstrating one-to-one correspondence with concrete objects, in addition to being asked to reason about the quantities they count as well as count sets of objects (organized and unorganized). While students should be provided opportunities to answer questions about "How Many?", they should not be expected to answer how many altogether? How many left? Those questions will be addressed later with operations in Units 4 & 5.

Possible Introductory Lesson

Counting Stories

Standard: K.NS.4 and K.NS.5

Objective: Students will be able to act out number stories using manipulatives to represent the objects in the stories. After students have acted out the stories, they will be able to answer questions about "How Many?" Students will also be able to count the objects in their stories and tell the corresponding number to the quantity counted, justifying their count.

Materials:

Provide each student with

*connecting cubes (or counters)

*blank paper or blank story setting backgrounds (such as a barn, lake, tree, garden, classroom)

Glencoe Virtual Manipulatives This website has virtual story setting backgrounds

http://www.glencoe.com/sites/common_assets/mathematics/ebook_assets/vmf/VMF-Interface.html

Procedure:

1. Tell students a counting story such as,
“Three children are playing on the slide. Two children are playing in the sandbox. Count the children.”
2. Provide time for students to act out the story placing their counters on the story setting or blank piece of paper.
3. Tell students another counting story, “A mama bear and a daddy bear are walking in the woods with their two babies. Count the bears.
4. Provide time for students to act out the story placing their counters on the story setting or blank piece of paper.
5. Repeat telling stories to students as they act out with the counters.
6. Allow students to make up their own counting stories to have the class act out.

Possible Extensions:

For students who are ready, ask them to write the number that matches how many counters they put out for each object in the story. For example, *“Three children are playing on the slide. Two children are playing in the sandbox. Count the children.”* Children would write 3 and write 2 to represent the children playing, along with placing their counters on the paper. They could also write 5 for the number of children they counted.

Possible Instructional Strategies:

- **Read Alouds and Counting Books**

Book: *The Very Hungry Caterpillar* by Eric Carle <http://www.k-5mathteachingresources.com/support-files/the-very-hungry-caterpillar.pdf>

<https://www.youtube.com/watch?v=vkYmvxPOAJI> The author, Eric Carle reads the book aloud.

Standard: K.NS.4 and K.NS.5

Objective: Students will be able to count a set of objects and match the quantity with a numeral.

Materials:

*Copy of the book *The Very Hungry Caterpillar* to read aloud to the class. If possible, a copy for each pair of students or small group working together as well to refer back to story.

*Counters

Procedure:

1. Build students background knowledge by asking, “What are some foods you like to eat? How much of that food would you eat if you are very hungry?”
2. Tell students you are going to read aloud the story, The Very Hungry Caterpillar by Eric Carle 2 times, the first time you just want them to listen to what is happening in the story.
3. Ask students, “What happened in the story?”
4. Tell students you are going to read the story a second time and this time you want students to listen for the quantity or how many fruits/foods the caterpillar eats on the different days of the week.
5. Ask students to share what they heard for how many fruits the caterpillar ate on different days of the week, refer back to the pictures in the book as necessary for students to see the pictures.
6. Tell students they are going to solve a problem today about the caterpillar’s eating. Show the following problem and read it aloud to students:*The Very Hungry Caterpillar was very hungry so he ate... One apple, two pears, three plums, four strawberries, and five oranges. How many pieces of fruit did he eat?*
7. Provide partners or small groups with counters and ask them to show the number of each fruit with their counters.
8. As students represent the number of fruits with their counters ask them, “How many apples did the caterpillar eat? How many pears? How many _____?” Checking to see if students orally count and use one-to-one correspondence, matching quantities with the objects.
9. Wrap up the lesson by discussing with students how they represented the number of fruits the caterpillar ate. “How does the number you say relate to the quantity of objects you put out?”

Possible Extensions:

- Provide students with a blank BLM with the phrase, “On (day of the week), the caterpillar ate (number) pieces of (name of food). Allow students to insert a day of the week, number, and name of food, then illustrate the page. Combine all the students’ pages into a class book.

- **Grab Bag Counting**

Standard: K.NS.5

Objective: Students will be able to count a set of objects and match the quantity with a numeral.

Materials:

Provide students (individually or in small groups) with

*brown paper bags filled with up to 20 objects to count (pennies, beans, unifix cubes, buttons, anything that can be counted).

*Numeral Cards 1-20 with a picture of the quantity in an organized arrangement one one side of the card and the numeral on the other

Procedure:

1. Student grabs a handful of objects out of the bag, putting the objects on the table in front of them.

2. Student counts the objects
3. Student matches a numeral card with the quantity and verifies the match by using one-to-one correspondence with the cubes and number picture on the back side of the card.
4. Students repeat steps 1-3 taking turns grabbing, counting, matching and verifying.

Possible Extensions:

1. Increase the number of objects in the Grab Bags
2. Have students who are ready write the numerals instead of matching with the card. In order for teacher to verify, have students also draw the correct quantity with the written numeral.

- **Pick a Number**

Standard: K.NS.4 and K.NS.5

Objective: Students will be able to count out a specific number of objects

Materials: Provide students (individually or in small groups) with:

*counting cubes

*paper bags

*Numeral cards 0-20

Procedure:

1. Student picks a number card out of the brown bag
2. Student counts out the number of cubes to match the numeral card drawn and verifies the count by a one-to-one correspondence with the picture on the back of the numeral card.
3. Repeat steps 1-2 for students to take turns.

Possible Extensions:

1. Include higher numbers beyond 20 on the cards and in the bags.
2. In pairs, have one student write a numeral and the partner student counts out the correct number of objects.

- **Favorite Numbers Routine:**

1. Ask students to tell the class their favorite number. Teacher writes the student's name and favorite number on an index card. (Or students write it if able)
2. Teacher places all of the favorite numbers in a jar, and draws one out each day.
3. Each day, when teacher draws out a favorite number, he/she tells the class whose number it is and what number it is.
4. Then teacher asks students to count out the number of objects with the class.

5. As favorite number cards are drawn, teacher can post in classroom to begin creating an organic number line.

Possible Culminating Lesson

The Right Number of Elephants (adapted from Teaching Number Sense in Kindergarten by Chris Confer)

Standards: K.NS.4 and K.NS.5 and Mathematical Processes

Objective: Students will be able to think about numbers of items that might typically be found in the world, such as the number of legs on an animal, the number of pancakes on a plate, or earrings on a person. Students will be able to engage in mathematical discussions about reasonable and unreasonable numbers of things.

Materials:

*Book, The Right Number of Elephants by Jeff Sheppard

*Half sheets of paper containing a descriptive phrase, (pancakes on a plate, feet on an animal, birds in a tree, hair braids, tires on a truck, people in a car, apples in a bowl, books on a table, fingers on a person, buttons on a shirt, etc)

* BLM that says, “The right number of _____ is” (1 per pair of students)

Procedure:

1. Read the story, The Right Number of Elephants by Jeff Sheppard to the class.
2. Discuss how the author of the story wrote the story to be funny, but that there are reasonable or unreasonable numbers of things and it’s our job as mathematicians to decide when a number is “the right number” of objects.
3. Choosing different parts of the story, discuss why the number in the story was the “right” or not right number for those objects.
4. Explain to students they will be illustrating “the right number” of one of the phrases and then you will compile them into a class book.
5. Provide pairs of students with one of the descriptive phrase papers and BLM that says, “The right number of _____ is _____.” instructing students to illustrate and write the number.
6. Combine all pages into a class book and read aloud, then place in classroom library.

Resources

Teacher Resources

Number Early Learning Progression <http://nzmaths.co.nz/sites/default/files/Number-Early-Learning-Progression.pdf>

- This chart provides the learning progression for learning numbers and the count sequence.

The Principles of Counting <http://math.about.com/od/counting/a/The-Principles-Of-Counting.htm>

- Explanation of the different aspects of counting such as cardinality, conservation of number, and unitizing.

Number Talks with Tens Frames and Dot Cards <http://www.cleanvideosearch.com/media/action/yt/watch?v=62epCIFdRa0>

- A video showing a number talk around numbers on tens frames and dot cards

Lesson Planning Resources

K.NS.3 & K.NS.5 Building Sets of Ten <http://illuminations.nctm.org/Lesson.aspx?id=1649>

- A lesson plan for exploring sets of up to 10 items, and practice writing numbers 0-10.

K.NS.3 Building Numbers to Five <http://illuminations.nctm.org/Lesson.aspx?id=1616>

- Detailed lesson plan from NCTM for students to work on building and understanding numbers to 5.

Howard County Kindergarten Math Wiki <https://gradekcommoncoremath.wikispaces.hcpss.org/kindergarten+home>

- This website has a wide variety of daily number routines, vocabulary cards, lesson plans/activities, and assessment tasks including rubrics for proficiency.

Department of Education, Virginia Number and Number Sense Module

http://www.doe.virginia.gov/instruction/mathematics/elementary/number_sense_module/nns_gradeK.pdf

- This is a lesson plan module for Kindergarten teaching number and number sense, it has several lesson ideas and plans.

Children's Books for Math <http://www.the-best-childrens-books.org/math-for-kids.html>

- This website has lists of children's books for different concepts in math that make learning the concepts engaging and relatable to small children.

Interactive Resources

K.NS.4 and K.NS.5 Find the Numbers 0-5 or 5-10 <https://www.illustrativemathematics.org/content-standards/K/CC/A/tasks/403>

- Game which students can play in groups of 2 or 3 to practice identifying numbers and matching quantities.

K.NS.4 and K.NS.5 The Gingerbread Man Game <http://www.topmarks.co.uk/learning-to-count/gingerbread-man-game>

- Interactive game for students to practice counting, match numeral to quantity, and order sets

K.NS.4 and K.NS.5 Ladybird Counting <http://www.topmarks.co.uk/learning-to-count/ladybird-spots>

- Interactive game for students to count, read numerals and number words, and match numeral with quantity by dragging and dropping spots on ladybugs.

Sample Formative Assessment Tasks/Questions

Dots and Numeral Card Match: <https://ccgpsmathematicsk-5.wikispaces.com/file/view/Elementary+FAL+packet+for+fall+2011+1.pdf>

Apples in a Bag:

<http://www.cpalms.org/Public/PreviewResourceAssessment/Preview/36568>

Books and Bookmarks:

<http://www.cpalms.org/Public/PreviewResourceAssessment/Preview/36564>

Return to [Table of Contents](#)

DRAFT

*Count and Compare***Content Standards with Clarifying Notes***Open Bullets Indicate Clarifying Notes*

- K.NS.4 (c) Understand the relationship between number and quantity. Connect counting to cardinality by demonstrating an understanding that:
 - a. last number said tells the number of objects in the set. (cardinality)
 - b. the number of objects is the same regardless of their arrangement or the order in which they are counted. (conservation of number);
 - c. each successive number name refers to a quantity that is one more and each previous number name refers to a quantity that is one less.
- This part of the standard lays the foundation for students to continue building their knowledge when they begin adding and subtracting, (1 more, 1 less)
- K.NS.7 Determine whether the number of up to ten objects in one group is more than, less than, or equal to the number of up to ten objects in another group using matching and counting strategies.
 - This is laying the foundation for students conceptual understanding of more than, less than, equal to using up to 10 objects, therefore words and quantities are most important.
 - Students should use matching and counting strategies to determine which group of objects is more or less, or if the groups are equal.
 - Students are not expected to use symbols in kindergarten (>, <, =)
- K.NS.8 Compare two written numerals up to 10 using more than, less than, or equal to.
 - Students are not expected to write the numerals for this specific standard. They can be shown the written numerals when asked to compare.
 - Students are not expected to use symbols (>, <, =) when comparing written numerals.

New Academic Vocabulary for This Unit

- | | | |
|-----------|----------------|---------------|
| ● compare | ● greater than | ● equal to |
| ● more | ● less than | ● the same as |
| ● less | ● fewer | |

Prior Knowledge Required for This Unit

As students deepen their understanding of numbers and make meaning of counting and cardinality, they will develop beyond rote counting and one-to-one correspondence to more complex phases of meaningful counting. Unit 2 and Unit 3 should be a continuation of Unit 1, building on the development of individual students. Unit 1 provided the foundation for the critical learning phase of counting objects.

Unit 2 provides more time for student understanding that in the count sequence, the next number is one more, and when counting by tens, the next number is “ten more” (or one more group of 10). As students gain this understanding, they will be prepared to compare numbers in Unit 3. However, those understandings are not innate and students should be given intentional learning opportunities.

In order for students to use matching strategies to compare quantities, they need to use one-to-one correspondence when counting objects in one group and comparing them with the objects in another group.

Teacher Note:

Students who are still in the Pre-Operational stages of counting will use their one-to-one correspondence both perceptually and figuratively to compare quantities. Perceptual stage refers to students being able to touch and count objects, while the Figurative stage refers to students being able to visualize a quantity, rather than having to touch, feel, or see the objects to count them.

Subsequent Knowledge Related to This Unit

As students develop their counting skills they will come to understand the increasing/decreasing magnitude principle of counting. Students will apply their pre-operational counting skills as they progress into the operational stage of counting. Students will use their fluency with the count sequence and cardinality to compose and decompose numbers in Unit 4, and then again to model addition and subtraction with story problems in Unit 4. Students should be able to apply this knowledge to part/whole relationships, compensate to compose and decompose numbers in Unit 4. Students will also build on their conceptual understanding of “equal” in first grade to demonstrate understanding of the equal sign (=) to mean that both groups, or both quantities have the same amount. For example, students should focus on comparing the quantity, not comparing the objects. So, 4 circles are the same as 4 circles, 4 circles is more than 2 circles, and 4 circles are less than 6 circles.

Relationship Among Standards in This Unit

The content standards and the process standards work together in this unit to form the foundation which will enable all students to develop the world class knowledge, skills, and life and career characteristics identified in the *Profile of the South Carolina Graduate*.

The standards in this unit work together to deepen students understanding of counting and cardinality, as well as provide more time for students

to understand quantities. Building on the foundational standards in Unit 1 & 2, the standards in this unit focus on students making meaning of their counting skills. As students develop one-to-one correspondence, they should notice the necessity to keep track when counting, thus students should be able to keep track of an unorganized pile when counting (conservation of number). As students deepen their understanding that the last number said tells the number of objects in the set (cardinality) they should take notice when a recount of objects results in a different number or be bothered when counting a group results in the same number after more objects have been added or taken away.

Most students come to kindergarten with a notion of “more”, therefore any student who is shown two sets of objects with an obvious difference in quantity can intuitively tell which set has more objects. The standards in this unit are helping children build on that and refine this basic understanding which links to their ability to count.

This is the beginning stage of students reasoning about their counting. As students begin to make meaningful connections between the objects they count, cardinality, and the rote count sequence, they might spontaneously check or recount to see if the result is the same. With K.NS.4 and K.NS.5 students begin to answer “How many?” questions, as well as be able to count out a specific quantity. Depending where students are in their development, these behaviors might be observed at different times with different students. Providing students with real world, meaningful counting experiences will lend itself to students reasoning about their counting.

The standards in Units 1-4 are essential to the key concepts Number Sense and Base Ten and Algebraic Thinking and Operations in grades K-5. Meaningful, daily experiences with the standards in Unit 3 should be provided to young students to set a strong foundation for mathematics success. While students have all year in kindergarten to master these standards, students who demonstrate a solid understanding in Units 1-3 are developmentally ready to move onto the Operational Stage of counting in Unit 4.

Potential Instructional Strategies/Lessons

Teacher Note:

The concepts of *more* and *less* are very complex for young students, and are not truly understood until students reach a certain level of logical thinking. Therefore, it is imperative children count, match quantities, and have many hands-on experiences with objects to explore this inverse relationship. Students have more experiences with the word, “more” and therefore are more comfortable using it. The word, “less” typically is more challenging for students because they have not had as much interaction with the term, as well as it is more challenging to think about what is “not” there. It is best practice to use the terms, “more” and “less” intentionally when asking students to compare. Any counting activity, can also be followed with the questions, “Which is more?” “Which is less?” “How do you know this is less/more/the same/equal?”

To develop the concept of more/greater than, less than, and equal to students need to construct sets as well as be provided sets to compare. Kindergarten is the pivotal grade for creating a mathematical classroom which encourages collaboration and builds community. Students who are college-and-career-ready take a productive and confident approach to mathematics by communicating about mathematics to gain understanding.

Students in kindergarten can begin developing their communication skills by:

- Acting out mathematical scenarios/problems
- Frequently exchanging mathematical ideas and problem solving strategies
- Listening to understand one another. This involves thinking about what a person is saying so that you can explain it yourself or to help them explain it more clearly. It is not just being quiet when someone else is talking. Also, children need to listen so that they can ask a question or help the explainer.
- Utilizing *Math Talk* in the classroom before being asked to follow procedures

Kindergarten students will naturally want to do many things on their own, however it is encouraged to have students begin working in pairs or small groups to build reasoning and communication skills.

Students should be provided many, meaningful opportunities to count throughout the day. Provide settings which connect mathematical language, quantities, and symbols to kindergartners' everyday lives. Support the natural ability of young children to mathematize their world. Students should be provided with daily, meaningful opportunities to continue counting and demonstrating one-to-one correspondence with concrete objects, in addition to being asked to reason about the quantities they count as well as count sets of objects (organized and unorganized). While students should be provided opportunities to answer questions about "How Many?", they should not be expected to answer how many altogether? How many left? Those questions will be addressed later with operations in Units 4 & 5.

Possible Introductory Lesson:

Counting Stories

Standard: K.NS.4 and K.NS.5

Objective: Students will be able to act out number stories using manipulatives to represent the objects in the stories. After students have acted out the stories, they will be able to answer questions about "How Many?" Students will also be able to count the objects in their stories and tell the corresponding number to the quantity counted, justifying their count. Last, students can compare using the terms *more than*, *less than*, and/or *equal to*.

Materials:

Provide each student with

*connecting cubes (or counters)

*blank paper or blank story setting backgrounds (such as a barn, lake, tree, garden, classroom)

Glencoe Virtual Manipulatives This website has virtual story setting backgrounds

http://www.glencoe.com/sites/common_assets/mathematics/ebook_assets/vmf/VMF-Interface.html

Procedure:

1. Tell students a counting story such as,

“Three children are playing on the slide. Two children are playing in the sandbox. Where are there more children? Where are there less children? How do you know?”

2. Provide time for students to act out the story placing their counters on the story setting or blank piece of paper.
3. Tell students another counting story, provide time for students to act out the story placing their counters on the story setting or blank piece of paper.
4. Repeat telling students stories to act out with the counters.
5. Allow students to make up their own counting stories to have the class act out.

Possible Extensions:

For students who are ready, ask them to write the number that matches how many counters they put out for each object in the story. For example, *“Three children are playing on the slide. Two children are playing in the sandbox. Where are there more children? Where are there less children?”* Children would write 3 and write 2 to represent the children playing, along with placing their counters on the paper.

Possible Instructional Strategies:

Find the Same Amount

Provide students a collection of cards with sets on them. (Dot cards can be used for this as well) Students pick any card and then find another card with the same amount to form a pair. Continuing picking cards until all are in pairs. This can also be altered for students to pick a card and find a card that is “more than” or “less than”. Students can also use counters/objects and a ten frame to make/build a number that is the same as the card drawn. Or if the activity is focused on more or less, students can build the number on a ten frame that is more than the card drawn or less than the card drawn.

Towers, Towers, Towers (Small Group Activity adapted from Kathy Richardson)

Materials: Connecting cubes

Preparation: Make 2 towers of 4 to 10 cubes each.

This activity provides students an opportunity to count as well as use matching strategies to compare two towers of different quantities.

Procedure:

1. Place 1 of the towers in front of students (standing up position) and say, *“Put your thumb up when you think you know how many cubes are in this tower.”*
2. When everyone’s thumb is up, take out the 2nd tower and place it next to the first tower (standing up position) and say, *“Thumbs up when you think you know how many cubes are in this tower.”*
3. When everyone’s thumb is up, ask students to tell you the quantity in each tower.
4. Ask, *“Is it more or less?” “Which tower is more?” “Which tower is less?”*
5. Have students say, *“ ___ is more/less than ___.”*

6. Repeat using more towers of cubes with different quantities of 4 to 10 cubes.
7. Extension: Teacher builds a tower, instructs students to build a tower that is more than/less than/equal to the teacher's tower.

Make Sets of More/Less/Same

Provide about eight cards with pictures of sets of 4 to 12 objects. (can use large dot cards/images); a set of counters; word cards labeled *More*, *Less*, and *Same*; and paper plates or small boxes. Next to each card, have students make three collections of counters: a set that is more than the amount on the card, one that is less, and one that is the same. Students who struggle should start with matching the set that is the same.

Resources

Teacher Resources:

Number Early Learning Progression <http://nzmaths.co.nz/sites/default/files/Number-Early-Learning-Progression.pdf>

- This chart provides the learning progression for learning numbers and the count sequence.

The Principles of Counting <http://math.about.com/od/counting/a/The-Principles-Of-Counting.htm>

- Explanation of the different aspects of counting such as cardinality, conservation of number, and unitizing.

Lesson Planning Resources:

Children's Books for Math <http://www.the-best-childrens-books.org/math-for-kids.html>

- This website has lists of children's books for different concepts in math that make learning the concepts engaging and relatable to small children.

Glencoe Virtual Manipulatives http://www.glencoe.com/sites/common_assets/mathematics/ebook_assets/vmf/VMF-Interface.html

- This website has virtual story setting backgrounds

Who Has More Game: <http://www.k-5mathteachingresources.com/support-files/who-has-more.pdf>

- This is a game that could be played in partners after doing the small group lesson with the teacher. This could also be adapted to play *Who Has Less*.

Making Sets <http://www.k-5mathteachingresources.com/support-files/making-sets-ver.1.pdf>

- This activity can be used as an individual activity for students or partners to practice making sets of more, less, and equal.

More and Less Handfuls <https://www.illustrativemathematics.org/content-standards/K/CC/C/tasks/683>

- This task provides an open ended, differentiated way for students to show their understanding of more, less, and equal.

Georgia Standards of Excellence Framework Unit 2 <https://www.georgiastandards.org/Georgia-Standards/Frameworks/K-Math-Unit-2.pdf>

- Inside this unit are multiple essential questions, big ideas, as well as lessons/tasks for counting and comparing.

Interactive Resources:

Links to a round up of several interactive whiteboard activities <http://www.k-5mathteachingresources.com/K-2-IWB-Resources.html>

Sample Formative Assessment Tasks/Questions

In order to assess student's understanding of *more, less, equal/same* students need to be provided opportunities to compare quantities in a variety of settings. Observing children when they are in these settings is the most beneficial way to determine what they need to learn. These observations should be ongoing as students continue counting quantities in a variety of settings. Questions to ask about your observations might include:

- Can the child compare two groups and describe one group as *more, less, or the same as* the other.
- Does the child have difficulty telling which group has *less*?
- Can the child show a group that has *more or less than* a given amount?

Return to [Table of Contents](#)

*Composing and Decomposing Numbers***Content Standards with Clarifying Notes***Open Bullets Indicate Clarifying Notes*

- K.NS.6 Recognize a quantity of up to ten objects in an organized arrangement (subitizing)
 - In this unit students should move from perceptual subitizing to conceptual subitizing to see how quantities can be grouped to make up a whole quantity.
- K.ATO.1 Model situations that involve addition and subtraction within 10 using objects, fingers, mental images, drawings, acting out situations, verbal explanations, ~~expressions, and equations.~~
 - In this unit the focus is only on students' concrete and representational understanding of composing and decomposing numbers. Unit 5 will address the abstract or symbolic understanding with expressions and equations and that is why that portion of the standard has a line through.
- K.ATO.3 Compose and decompose numbers up to 10 using objects, drawings, and ~~equations.~~
 - In this unit the focus is on students composing and decomposing numbers up to 10 using objects and drawings. Unit 5 will address equations and that is why that portion of the standard has a line through.
- K.NSBT.1 Compose and decompose numbers from 11-19 separating ten ones from the remaining ones using objects and drawings.

New Academic Vocabulary for This Unit

- | | | |
|------------------|------------|-------------|
| ● compose | ● join | ● add to |
| ● decompose | ● separate | ● take from |
| ● same amount as | ● combine | ● bundle |
| | | ● group |

Prior Knowledge Required for This Unit

As students develop their counting skills they will come to understand the increasing/decreasing magnitude principle of counting. Students will apply their pre-operational counting skills as they progress into the operational stage of counting. Students will use their fluency with the count sequence and cardinality to compose and decompose numbers in Unit 4, as well as to model contexts for addition and subtraction. Students will

continue to build on their previous knowledge and understanding of “quantity” to conceptually subitize “groups” that make up a whole number/quantity. For example, In Unit 1 students experienced dot images to perceptually subitize, now dot images can be used for larger quantities than 5 or 6 to help students conceptually subitize quantities that make up larger quantities. Students should be able to apply this knowledge to part/whole relationships, compensate to compose and decompose numbers in Unit 4. Students need to have a solid foundation of “quantity” to be successful in Unit 4 as they begin to explore how quantities can be joined or separated.

Subsequent Knowledge Related to This Unit

In Unit 4 students begin to understand how quantities can be joined or separated in a variety of real life situations. (story problems/real life context). Students will build on their concrete and representational understanding to move into the abstract using symbols for addition and subtraction with expressions and equations in Unit 9. Unit 4 provides students exposure to the teacher modeling written expressions and equations as students model the situation. In Unit 9 students will use this knowledge to be able to write expressions and equations on their own. Students will also build on their conceptual understanding of “equal” in first grade to demonstrate understanding of the equal sign (=) to mean that both groups, or both quantities have the same amount. In first and second grade, students will be expected to solve story problems using addition as a joining action, part-part whole action, and subtraction as a separation action, finding parts of the whole, and as a comparison.

Relationship Among Standards in This Unit

The content standards and the process standards work together in this unit to form the foundation which will enable all students to develop the world class knowledge, skills, and life and career characteristics identified in the *Profile of the South Carolina Graduate*.

The standards in this unit work together to build a conceptual understanding for the operations of addition and subtraction. Students learn to think flexibly about numbers and their relationships as opposed to just memorize facts.

K.NS.6 asks students to recognize an organized arrangement of quantities up to 10. It is important that students be able to not only identify the quantity in an organized arrangement but that they also verbalize/explain how they see it. For example, if a quantity of 7 is displayed, students should be able to immediately recognize the quantity 7 and be able to communicate how they see it – 5 and 2 more – 3 and 4 more, etc. depending on how the quantity is organized (conceptual subitizing). That ability to conceptually subitize lays the foundation for K.ATO.1 and K.ATO.3 which emphasize composing and decomposing numbers through 10 in a variety of ways. K.NSBT.1 builds on that knowledge to compose and decompose numbers 11-19 which lays the foundation for numbers in base ten.

The standards in Units 1-4 are essential to the key concepts Number Sense and Base Ten and Algebraic Thinking and Operations in grades K-5.

Meaningful, daily experiences with the standards in Unit 4 should be provided to young students to set a strong foundation for mathematics success. While students have all year in kindergarten to master these standards, students who demonstrate a solid understanding in Units 1-3 are developmentally ready to move onto the Operational Stage of counting on required in Unit 4.

Potential Instructional Strategies/Lessons

Teacher Note:

“Number sense is defined as ‘good intuition about numbers and their relationships. It develops gradually as a result of exploring numbers, visualizing them in a variety of contexts, and relating them in ways that are not limited by traditional algorithm’(Howden 1989, 11). Unit 4 lays the foundation for understanding operational counting on and back, specifically for adding and subtracting quantities. Therefore, the instructional strategies should focus on development over time, rather than just in this unit. Students who are solid with quantities within 5 should first model situations of addition and subtraction within 5 in a variety of contexts. Then move to quantities within 10. The two big ideas in this unit are for students to understand “Addition can be thought of as physically or conceptually placing two or more quantities together, and Subtraction can be thought of as taking an amount away from a given quantity, comparing two quantities, or finding a missing part given the whole and the other part.” (Van de Walle 2014)

In Units 1-3 the emphasis was on understanding quantities and the relationship to counting, so students should be ready to count quantities beyond 10. In this unit, K.NSBT.1 focuses on composing and decomposing quantities 11-19, **not** the “*place value*” of a specific digit. The conceptual understanding in this standard is for students to understand the quantity of ten and some more. Students who are ready to do this, understand hierarchical inclusion, that is that 8 is made up of 1,2,3,4,5,6,7. At this stage, it’s important that students build on their ability to count single objects through 19, then explore other ways to group and count objects. Students are developing through the part-part whole relationships stage of numeracy. Again, in this unit the focus is on quantities and their relationships, not the formal algorithm of addition and subtraction. In kindergarten students should be exposed to problems involving Part-Part Whole and Change operations, also known as join and separate actions, but all problem structures (start unknown, change unknown, result unknown) are encouraged for students to model.

For K.NSBT.1 It is also imperative that students have experiences counting with objects that are proportional, meaning 10 of that object are ten times bigger than 1 of those objects (the “more” meaning from a numerical/quantity perspective such as ten connecting cubes; not from a measurement perspective. Nonproportional objects such as an abacus and money are not appropriate at this stage. In order for students to develop conceptual understanding for base ten, they need to have materials to count that they can group themselves and explore different ways to group objects and count some more. Classroom lessons and discussions should lead students to understand that grouping by 10 is desirable, so that they can count 10 and some more. It is also important for teachers to connect base ten language to the objects and models students use. For example, 1 group of ten and 8 more, $18=10+8$, 1 bundle of 10 and some more, this will allow students to make sense of “pre-grouped” (students did not group

themselves) materials later such as a base ten rod.

Kindergarten is the pivotal grade for creating a mathematical classroom which encourages collaboration and builds community. Students who are college-and-career-ready take a productive and confident approach to mathematics by communicating about mathematics to gain understanding. Students in kindergarten can begin developing their communication skills by:

- Acting out mathematical scenarios/problems
- Frequently exchanging mathematical ideas and problem solving strategies
- Listening to understand one another. This involves thinking about what a person is saying so that you can explain it yourself or to help them explain it more clearly. It is not just being quiet when someone else is talking. Also, children need to listen so that they can ask a question or help the explainer.
- Utilizing *Math Talk* in the classroom before being asked to follow procedures

Kindergarten students will naturally want to do many things on their own, however it is encouraged to have students begin working in pairs or small groups to build reasoning and communication skills.

Possible Introductory Lesson:

Standards K.ATO.1 and K.ATO.3, and K.NSBT.1

The most meaningful way to begin this unit is with contexts involving everyday situations in your students' lives. For example, While passing out snacks, pose the following, "George is passing out our snacks today. He gave Suzie 2 crackers. He gave Billy 3 crackers. How many crackers is that?" Repeat this with concrete objects for various situations.

Subtraction example: "George has 5 crackers. He ate 2 crackers. How many crackers did he not eat?"

Continue stories using numbers 10-19 as well.

Possible Instructional Strategies:

Standards K.ATO. 1 and K.ATO.3

Hiding Bears: This can be used as a lesson, as well as a formative assessment to see what students know and understand about decomposing different quantities. It is also helpful to use to see which quantities students have internalized.

http://www.mathsolutions.com/documents/Hiding_Bears_NL44.pdf

Math Stories: Beginning literacy provides great contexts for modeling story problems. Begin with a children's book that lends itself to joining or separating actions, such as If You Give a Mouse a Cookie by Laura Numeroff.

Standard K.NSBT.1

It is important to note that materials/manipulatives that should be used for this standard in Kindergarten should be objects that students can group and organize into a ten (beans glued on a popsicle stick, Digi Blocks, unifix cubes), rather than pre-grouped materials such as base ten blocks.

On and Off the Frame: (Adapted from North Carolina <http://maccss.ncdpi.wikispaces.net/file/view/CCSSMathTasks-Kindergarten.pdf/466936720/CCSSMathTasks-Kindergarten.pdf>)

Materials: Create a large ten frame on the floor using painter's tape.

Procedure:

1. Gather students as a whole group around large ten frame on the floor.
2. Compose some teen numbers using students as counters on the ten frame. "Let's make the number ten." Call up ten students to fill up the ten frame. "Let's make the number 11" Call up 1 more student to stand off the ten frame.
3. Ask questions, "How many students **on** the ten frame? How many students **off** the ten frame?" "How many students do we have here?"
4. Continue having students model different teen numbers and continue asking the questions about how many students are on the tens frame, off the tens frame, and how many altogether.

Extension: Teacher record on the board "___ is ___ on and ___ off" (example: 14 is 10 on and 4 off)

As students develop, they could be given sentence strips with the sentence frame and build their own teen numbers and write "___ is ___ on and ___ off"

Ten and Some More: In Units 1-3 students should have had experiences with ten frames or rekenreks to create a visual organization of "ten". This lesson will build on students understanding of ten.

Materials: counters, ten frame(1 per student), dice

Procedure:

1. Have students fill their ten frame with counters.
2. Students roll a die to get another number.
3. Tell students to place that many counters outside the ten frame.
4. Ask, "How many are in the ten frame?" "How many are outside the ten frame?" How many counters do you have?
5. Continue this as students roll the dice and compose numbers 11-19.
6. Play again but starting with a number 11-19, and have students roll the die to decided how many counters to take off the mat. Example, Put 14 counters out, roll the die, If 4 is rolled, student takes 4 counters off, then ask, "How many counters are there now on your mat?"

Extension:

As students are ready, have them play Ten and Some More, write the numbers they make. Provide $___ + ___ =$ OR $___ = ___ + ___$ at the bottom of ten frame mats, and have students write the equation to match (For example, if they make 10 in the ten frame and roll a 2, they put out 2 counters, then would write $10+2=12$. Provide frame for subtraction equations to be written as well when students are ready.

Resources**Teacher Resources:**

Engageny <https://www.engageny.org/resource/grade-k-math-compose-and-decompose-kenbt1>

- This is a video of a lesson in a kindergarten class of students composing and decomposing numbers using ten frames.

Decomposing Numbers <http://blog.aimsedu.org/2013/03/21/decomposing-numbers-with-kindergarteners/>

- This comes from AIMS Education and helps explain the importance of developing students understanding of how numbers can be decomposed into different parts to make a whole.

Lesson Planning Resources:

K.OA.1 & K.NSBT.1

Children's Books for Math <http://www.the-best-childrens-books.org/math-for-kids.html>

- This website has lists of children's books for different concepts in math that make learning the concepts engaging and relatable to small children.

Glencoe Virtual Manipulatives http://www.glencoe.com/sites/common_assets/mathematics/ebook_assets/vmf/VMF-Interface.html

- This website has virtual story setting backgrounds

K.OA.1

Ant Math Stories <http://maccss.ncdpi.wikispaces.net/file/view/CCSSMathTasks-Kindergarten.pdf/466936720/CCSSMathTasks-Kindergarten.pdf>

- Students model addition stories by telling a story about ants having a picnic.

K.NSBT.1

Building Teen Numbers <http://maccss.ncdpi.wikispaces.net/file/view/CCSSMathTasks-Kindergarten.pdf/466936720/CCSSMathTasks-Kindergarten.pdf>

- This lesson engages students in filling up a "human" ten frame, then transferring that to build teen numbers on a ten frame. Lesson Plan includes questions for teachers to pose as well as common misconceptions to look for.

Ten and Some More <http://www.cpalms.org/Public/PreviewResourceLesson/Preview/28830>

- This is a sample lesson plan with some guiding questions and ideas for assessment with the lesson Ten and Some More

Ring Around the Ten <http://maccss.ncdpi.wikispaces.net/file/view/CCSSMathTasks-Kindergarten.pdf/466936720/CCSSMathTasks-Kindergarten.pdf>

- This lesson helps move students from using a tens frame to “bundling” or “ringing” a group of ten.

Interactive Resources:

Illustrations Ten Frame Fill <http://illuminations.nctm.org/Activity.aspx?id=3565>

- Students can use this interactive to fill up five and ten frames, count, compose and decompose numbers 5-10

Sample Formative Assessment Tasks/Questions

Hiding Bears: This can be used as a lesson, as well as a formative assessment to see what students know and understand about decomposing different quantities. It is also helpful to use to see which quantities students have internalized.

http://www.mathsolutions.com/documents/Hiding_Bears_NL44.pdf

Ten and Some More (K.NSBT.1):

Directions:

1. Make or have students make a tens stick by snapping together ten snap cubes.
2. Have some other loose snap cubes to represent ones.
3. Distribute one “ten” and nine “ones” to a pair of students.
4. As a pair, draw a number card and represent that number using snap cubes. Watch and record how students create the numbers with the snap cubes.
 - Are they able to count on from ten? Or do they need to count starting at one?
 - Engage in a conversation with them asking them what is one way to show a number such as 14. Do they know how many tens and ones? Do they know how many if you only had ones?

Similar assessment here: <https://gradecommoncoremath.wikispaces.hcpss.org/Assessing+KNBT1>

Return to [Table of Contents](#)

Understanding Measurement and Data

Content Standards with Clarifying Notes

Open Bullets Indicate Clarifying Notes

- K.MDA.1 Identify measurable attributes (length, weight) of an object.
- K.MDA.2 Compare objects using words such as *shorter/longer*, *shorter/taller*, and *lighter/heavier*.
 - In both K.MDA.1 and K.MDA.2 students are developing Conservation of Length, which is the understanding that if one of two objects of equal length are the same length even if one is curved, bent, or in a horizontal versus vertical position.
 - At this level, the focus is not on exact measurements, but rather an informal comparison of length or weight between objects.
- K.MDA.3 Sort and classify data into 2 or 3 categories with data not to exceed 20 items in each category.
 - Students should be given opportunities to sort objects with their own categories as well as opportunities to sort into given categories.
- K.MDA.4 Represent data using object and picture graphs and draw conclusions from the graphs.
 - Object graphs use the actual objects being graphed. Each item can be placed in a square so that comparisons and counts are easily made. Examples include types of shoes, seashells, and books. ([Teaching Student-Centered Mathematics Grades K-3](#) John Van de Walle, 2006)
 - Picture graphs use drawings that represent what is being graphed. Students can make their own drawings, or you can duplicate drawings to be colored or cut out to suit particular needs. ([Teaching Student-Centered Mathematics Grades K-3](#) John Van de Walle, 2006)

New Academic Vocabulary for This Unit

- | | | | |
|-----------|-----------|-----------|-----------------|
| ● measure | ● shorter | ● lighter | ● picture graph |
| ● length | ● taller | ● heavier | ● object graph |
| ● weight | ● longer | ● sort | ● organize |
| | | ● data | |

Prior Knowledge Required for This Unit

Counting quantities and comparing quantities from Units 1-4 are necessary as students begin work in Unit 5. While it is true that many students from an early age have experiences and begin to make meaning of measurement, this is the first formal introduction to the idea that objects have

measurable attributes that can be compared. Students who have attended pre-school will most likely have been exposed to the vocabulary heavy, light, long, short, tall, short, however it should not be assumed that they have or that they understand what those terms mean. Prior experiences using the language to describe those measurable attributes is necessary. For example, “That string is long.” “The book is heavy.” The same can be said for students’ experience with sorting and classifying objects and graphs, some who have attended pre-school may have been exposed, but kindergarten is the first formal introduction.

Subsequent Knowledge Related to This Unit

The measurement standards in kindergarten lay the foundation for more formal measurement in grades 1 and 2 and beyond. In first grade students will begin to estimate lengths and explore why the same unit must be applied when measuring an object using nonstandard units. Students will begin measuring using standard units in grade 2. In grades 2-5 students will interact with measuring in both customary and metric units. Students will continue to build on their knowledge of representing and analyzing data in grades 1-5. In grade 1 students will collect, organize, and represent data in 3 categories, additionally using tallies and bar graphs. In grade 2 students will do the same with 4 categories, as well as generate data about measurements, and represent their findings on a line plot.

Relationship Among Standards in This Unit

The content standards and the process standards work together in this unit to form the foundation which will enable all students to develop the world class knowledge, skills, and life and career characteristics identified in the *Profile of the South Carolina Graduate*. The standards in this unit develop students’ comparison skills. Students will use their understanding of similarities and differences to describe how objects can be measured, as well as compare measurements in length and weight. Students will further develop their counting skills as a way to compare data findings represented on object and picture graphs.

Potential Instructional Strategies/Lessons

Teacher Note:

Like number, measurement concepts are developed based on a child’s experiences, not a specific age, but rather a range of ages that indicate specific developmental benchmarks.

Children’s learning about measurement follows a progression as such:

1. Recognize that objects have measurable properties and know what is meant by “How long?” or “How heavy?” and other expressions referring to properties
2. Make comparisons (*shorter than, longer than, etc.*)
3. Determine an appropriate unit and process for measurement
4. Use standard units of measurement

5. Create and use formulas to help count units
(NCTM 2000)

In Kindergarten, teachers are primarily focused on mastery of the first 2 levels in the progression and can encourage exploration of “units” (for example, “How many blocks long do you think the string is?” or “What could you use to measure how long that string is?”)

In kindergarten students don’t need to use standard measuring tools to measure, however exploring and exposure to rulers and scales is appropriate. Students need to understand that by comparing attributes of an object produces a number we call a measure. This is a foundational concept for measurement understanding.

Data Analysis in kindergarten is not considered a focus that should encompass a lot of time in the classroom, however it is a way to reinforce counting skills and develop students’ problem solving skills, reasoning, and representation processes that are a focus throughout the grades. Therefore, data analysis activities in kindergarten should be connected to the content of numbers, operations, geometry, and measurement as well as contexts kindergarten students are familiar with in their everyday lives such as the number of students who are wearing a certain color or favorite colors; how many students ride the bus, walk, car; how many students have pets, etc.

Kindergarten is the pivotal grade for creating a mathematical classroom which encourages collaboration and builds community. Students who are college-and-career-ready take a productive and confident approach to mathematics by communicating about mathematics to gain understanding.

Students in kindergarten can begin developing their communication skills by:

- Acting out mathematical scenarios/problems
- Frequently exchanging mathematical ideas and problem solving strategies
- Listening to understand one another. This involves thinking about what a person is saying so that you can explain it yourself or to help them explain it more clearly. It is not just being quiet when someone else is talking. Also, children need to listen so that they can ask a question or help the explainer.
- Utilizing *Math Talk* in the classroom before being asked to follow procedures

Kindergarten students will naturally want to do many things on their own, however it is encouraged to have students begin working in pairs or small groups to build reasoning and communication skills.

Possible Introductory Lesson:

K.MDA.1 & K.MDA.2

Materials Needed:

Prepare several different bags with 2 objects of various length, weight, height, and capacity in each bag. (Examples of items include, a box of crayons and a marker, a string and a belt, a plastic cup and an empty plastic bottle)

Introduction:

1. Gather students on the carpet or a large common area, seated in a circle.
2. Ask students, “What do you notice about our friends in the class? How are we alike? How are we different?”

3. Ask, “What do you know about measurement?”
4. Tell students that we use measurement as mathematicians to describe objects, and there are different things we can measure about 1 object. “I’m going to pass some objects around, and I want you to think about what we might measure on these objects.”
5. Pass one of the prepared bags around to students.
6. Once the bag has returned, ask students to brainstorm what they noticed about the objects. Record student notices on chart paper.
7. After recording student notices, explain which notices can be measured or are measurable attributes.
8. Pass around another bag of objects for students to observe and notice. Record notices and discuss measurable attributes again. Repeat for the last bag of objects.

Possible Instructional Strategies:

K.MDA.1 and K.MDA.2

3 Act Task Lil Sister <https://gfletchy3act.wordpress.com/lil-sister/> This investigation uses an inquiry approach to let students explore the height of 2 sisters. Act 1 introduces a picture to students and asks, What do you notice? What do you wonder? Act 2 provides students an opportunity to measure using connecting cubes to not only find the height of each sister, but also to compare their heights. This task is a great exploration of measurement as well as a great reinforcement of counting skills and thinking about numbers in relationship to one another. An adaptation would be to use pictures of students in your class to do the comparison.

Measurement Stories

Read *Me and the Measure of Things* by Joan Sweeney. Have students go on a scavenger hunt around the classroom to identify objects to be measured. Students can work in partners to do this, ask each pair to bring something to the carpet, then discuss objects, comparing the various attributes.

Write sentence frames for students to fill in to make a class measurement story.

The _____ is heavier/lighter than the _____.

Our _____ is shorter/longer than our _____.

The _____ is taller/shorter than the _____.

Create a class book by having students draw pictures of the objects, or take pictures of the objects using technology. (Students can take pictures with iPads or tablets)

Possible Introductory Lesson

K.MDA.3 & K.MDA.4

To introduce the concept of sorting and classifying, provide several different objects to students and ask, “How are these alike? How are they different?” Ask students which belong together and which do not. Continue by asking students how they would group the objects. Objects for this can be any commercially produced manipulatives or simple items from the Dollar Store, including attribute blocks, pattern blocks, straws of different colors and lengths, wall paper scraps, counting/color bears, bugs, etc., or anything that has easily identifiable attributes. Children will move into more

classification as they encounter the question, “Can you sort these another way?” For example, provide students with a pile of plastic “bugs” and ask them which have wings and which do not have wings. Watch how they sort them. Then ask, “Can you sort these another way?” Students might sort them by legs and no legs, or color, or bugs that bite and bugs that sting, etc.

Possible Instructional Strategies:

Pose questions to students every day as a way to collect data about the class. Begin with a simple Yes/No answer and progress to actual classification questions. Questions might be: Do you have brothers or sisters? Do you have pets? Do you have pockets? Do your shoes tie? Are you wearing black (or white) socks? Create a T-chart with masking/duct tape on the floor of the classroom and allow students to place a counter under the Yes or No category. Then count how many counters are on the “Yes” and “No” side of the chart. This begins the development of students sorting. As students gain experience with Yes/No, then move into questions such as “How many pets do you have? 1,2,3” and have them place counters under the number that represents the number of pets they have. From there, move students to sorting by type of pet such as cat, dog, fish, and have them place their counter(s) under each category. Still creating an object graph using masking tape/duct tape on the floor of the classroom and progressing to a picture graph using pictures to represent each pet. With each experience, students can be asked questions to analyze the data. Questions might include:

“How are these alike? Different?”

“Why do these belong here? Why does this not belong?” is there anything that doesn’t belong here?”

“What name could you give this group?”

“Which group has the most? Which group has the least? How can you tell without counting?”

What information (or data) can you get from this graph? (ask for both object and picture graphs)

Resources

Teacher Resources:

<https://www.georgiastandards.org/Georgia-Standards/Frameworks/K-Math-Unit-4.pdf>

This unit provides Essential Questions as well as several investigations with measurement that can be adapted to meet the needs of the SCCCR standards.

Lesson Planning Resources:

Teaching Student Centered Mathematics, Van de Walle (2014),

- Crooked Paths pg. 297-298

The Best Bug Parade by Stewart J. Murphy

- This book can be used as a read aloud to then have students measure ribbons of various lengths to determine longer/shorter.

Measurement Book <http://www.k-5mathteachingresources.com/kindergarten-measurement-and-data.html>

- This includes a measurement book template for students to use to compare themselves with other objects.

Ladybug Lengths <http://illuminations.nctm.org/Lesson.aspx?id=697>

- This lesson begins with a read aloud and then provides students the opportunity to “map” the ladybug trails to identify different lengths.

The Weight of Things <http://illuminations.nctm.org/Lesson.aspx?id=713>

- This lesson introduces and provides practice with the measurable attributes of weight.

Alike and Different <http://illuminations.nctm.org/Lesson.aspx?id=2737> (K.MDA.3)

- Students compare objects to identify similarities and differences which is a pre-requisite skill for sorting and classifying.

Grandma’s Button Box <http://illuminations.nctm.org/Lesson.aspx?id=2732> (K.MDA.3)

- Students sort, classify, organize, and analyze data in this lesson.

What’s the Weather <http://illuminations.nctm.org/Lesson.aspx?id=822> (K.MDA. 4)

- Students analyze information presented in pictographs

Interactive Resources:

Clifford Sort it Out <http://www.scholastic.com/clifford/play/sortitout/sortitout.htm> (K.MDA.3)

- This game provides students a read aloud about Clifford and then students sort according to attributes such as color.

Puppy Clifford- Measure Up http://pbskids.org/clifford/games/measuring_up.html (K.MDA.1 and 2)

- This game provides students the opportunity to compare and identify objects according to their attributes.

Sample Formative Assessment Tasks/Questions

(K.MDA.1 and 2) Order from Shortest to Longest/Tallest

Have students sit in a circle. Provide each student with a common classroom object, and challenge the class to put the objects in order from shortest to tallest/longest. Begin by placing the shortest object on the ground, then ask a student to place his/her object down, estimating where it will need to go. The more objects students put down, the more challenging this becomes and they have to problem solve about where to place each object. (This could also be done with fewer objects in small groups). (Idea came from <http://www.kindergartenkindergarten.com/2012/06/problem-solving-measurement.html>)

(K.MDA.3) Sort the Shapes

Call students individually to a “Shape Station”. Place a group of shape blocks in front of the student and say, “Sort these blocks any way you would like.” Record how the student sorts the shapes (for example, Sort into 2 colors, Sort into 3 colors, Sort into squares, not squares, etc) Then ask student to describe their “rule for sorting”. Then take a block from a box and give it to the student, asking, “Which group would you place this block into? Why?” Record student response. (Mathematics Assessment A Practical Handbook For Grades K-2, NCTM, 2003)

Howard County Math Wiki Assessment Tasks

K.MDA.1 <https://gradekcommoncoremath.wikispaces.hcpss.org/Assessing+KMD1>

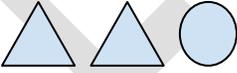
K.MDA.2 <https://gradeKcommoncoremath.wikispaces.hcpss.org/Assessing+KMD2>

K.MDA.3 <https://gradeKcommoncoremath.wikispaces.hcpss.org/Assessing+KMD3>

Return to [Table of Contents](#)

DRAFT

*Patterns***Content Standards with Clarifying Notes***Open Bullets Indicate Clarifying Notes*

- K.ATO.6 Describe simple repeating patterns using AB, AAB, ABB, and ABC type patterns.
 - For this standard, students are not expected to label a pattern using “AB, AAB, ABB, or ABC”.
 - Examples of AB Pattern: “clap, snap”; red, blue; 
 - Examples of AAB Pattern: “clap, clap, snap”; red, red, blue, 
 - Examples of ABC Pattern: “Clap, snap, jump”; red, yellow, blue, 
 - This standard is a beginning for students to begin unitizing by describing something as a “unit” also known as a pattern unit or core; however, they do not need to be explicitly taught “pattern unit.” Students should be able to identify the core of what is repeating.
- K.G.1 Describe positions of objects by appropriately using terms, including *below, above, beside, between, inside, outside, in front of, behind*.
- K.NS.9 Identify first through fifth and last positions in a line of objects.

New Academic Vocabulary for This Unit

- | | |
|-----------|----------|
| ● core | ● first |
| ● repeat | ● second |
| ● pattern | ● third |
| ● unit | ● fourth |
| | ● fifth |
| | ● last |

Prior Knowledge Required for This Unit

Patterns set a foundation for many other aspects of mathematics, such as order and the organization of things. However, kindergarten is the first formal introduction for students. Some students might have been exposed to patterns in preschool or other early childhood experiences. Nursery rhymes, physical movements such as “clap, clap, snap”, are experiences that some children have probably had experience with, so these are a good way to begin.

Subsequent Knowledge Related to This Unit

In first grade students will build on their understanding of repeating patterns to create, extend and explain using pictures and words for:

- a. repeating patterns (e.g., AB, AAB, ABB, and ABC type patterns);
- b. growing patterns (between 2 and 4 terms/figures).

This understanding of patterns will later transfer in students’ algebraic thinking with numbers and operations. In third grade, students will identify a rule for an arithmetic pattern (e.g., patterns in the addition table or multiplication table). **(3.ATO.9)**. In fourth grade, students will generate a number or shape pattern that follows a given rule and determine a term that appears later in the sequence. **(4.ATO.5)**

Relationship Among Standards in This Unit

The content standards and the process standards work together in this unit to form the foundation which will enable all students to develop the world class knowledge, skills, and life and career characteristics identified in the *Profile of the South Carolina Graduate*.

Kindergarten is the pivotal grade for creating a mathematical classroom which encourages collaboration and builds community. Students who are college-and-career-ready take a productive and confident approach to mathematics by communicating about mathematics to gain understanding.

Students in kindergarten can begin developing their communication skills by:

- Acting out mathematical scenarios/problems
- Frequently exchanging mathematical ideas and problem solving strategies
- Listening to understand one another. This involves thinking about what a person is saying so that you can explain it yourself or to help them explain it more clearly. It is not just being quiet when someone else is talking. Also, children need to listen so that they can ask a question or help the explainer.
- Utilizing *Math Talk* in the classroom before being asked to follow procedures

Kindergarten students will naturally want to do many things on their own, however it is encouraged to have students begin working in pairs or small groups to build reasoning and communication skills.

K.ATO.6, K.G.1, and K.NS.9 work together to describe the position of objects in a repeating pattern. Students should be able to describe what comes first in the pattern, what comes last, as well as what might be in between. These standards are not just for students to merely do patterns, but rather

work to provide opportunities for students to look for structure and express regularity in all mathematical situations. (Van de Walle) This knowledge will serve students in higher levels of mathematics.

Potential Instructional Strategies/Lessons

Teacher Note:

"Looking for patterns trains the mind to search out and discover the similarities that bind seemingly unrelated information together in a whole. . . . A child who expects things to 'make sense' looks for the *sense* in things and from this sense develops understanding. A child who does not see patterns often does not *expect* things to make sense and sees all events as discrete, separate, and unrelated." (*About Teaching Mathematics, Marilyn Burns*)

Kindergarten students should be able to identify the core of the pattern by identifying the string of elements that repeats. Pattern recognition and the extension of the pattern allow students to make predictions. Students should understand that patterns are a way to recognize order and organize their world and to predict what comes next in an arrangement. Patterns could include objects, sounds, oral, physical, drawings, shapes, and color, etc.

Examples: "snap, clap, snap, clap", "red, blue, red, blue", Old McDonald "e-i-e-i-o".

Whenever possible, pattern activities should include physical materials such as colored blocks, buttons, connecting cubes, attribute shapes, etc. so that students can be engaged with concrete objects to try and extend patterns and manipulate the objects. There are limitations for students when patterning is done by coloring on a page or extending with only a few spaces on a page. Physical objects allow students to extend and move objects around in a "trial and error" fashion which builds mathematical confidence.

When teaching patterns in this unit, it is recommended to continue building on students knowledge of shapes, colors, and counting to reinforce those concepts.

Possible Lesson

Playdough Kabobs

Materials Needed:

Playdough

Short or long wooden skewers

This lesson can be done to reinforce the concept of patterns, counting, as well as positions first through fifth. Therefore each student should have their own materials.

Introduce:



(Picture source: realmomkitchen.com <http://realmomkitchen.com/2579/brat-kabobs/>)

Show students the picture and ask, “What do you notice? What do you wonder?” (Hopefully students will notice there is a pattern!)

Record student notices and wonders. Then tell students that they are going to pretend to be chefs today. They are going to make kabobs using playdough.

Work time:

Provide students with their materials (playdough and skewers) and let them create patterns. As students work, circulate and ask questions such as:

Can you count your playdough balls on your kebab for me?

How many playdough balls did you use to create your pattern?

What comes first in your pattern?

What is second? third? fourth? fifth? last?

Whole Group Discussion:

Gather students together to a central location and discuss how they created their kebabs/patterns, what they noticed, and ask each student to describe or share their kebab/pattern with the group.

Possible Extension Lesson (In kindergarten, students only need to describe a repeating pattern, but if you have students who can already do that, this is a good way to extend their thinking.

Repeat That Pattern (from Van de Walle)

Materials: buttons, colored blocks, connecting cubes, toothpicks, geometric shapes, any items that can be gathered easily

Students can work in pairs or small groups

Introduce:

For each set of materials, set up three complete repetitions of the pattern (any of the 3 types), For example, a pattern using buttons could be set up at a station, a pattern using connecting cubes at another station, attribute shape blocks could be set up at another station.

Ask students to take a gallery walk around the stations, ask, “What do you notice is set out for you today?” “What are you wondering?”

Record/Discuss student notices and wonders.

Small Group/Partner Work:

Send partners/small groups to the various stations and give them the task to use the materials to extend the pattern they see, and then explain what is repeating. Have students rotate through the stations.

Whole Group Discussion:

After sufficient time, gather students to a carpet or central gathering area to discuss the patterns they extended.

Resources

Teacher Resources

Developing Number Concepts Book 1: Counting, Comparing and Pattern by Kathy Richardson

- Chapter 2 is all about teaching patterns. It has many activities for whole group, small group, and individual practice as well as assessments.

Lesson Planning Resources

Mrs. Ricca's Kindergarten Blog <http://mrsriccaskindergarten.blogspot.com/2012/09/patterns-math-stations.html>

- This kindergarten teacher's blog has many different suggestions on patterns lessons as well as stations that students can work in partners on pattern concepts.

Kindergarten, Kindergarten Blog <http://www.kindergartenkindergarten.com/2011/08/math-problem-solving-week-6-more-patterns.html>

- This kindergarten teacher's blog has a nice progression of pattern lessons with samples of questions to ask, as well as student work.

Making a Record of Pattern Cores <http://illuminations.nctm.org/Lesson.aspx?id=1595>

- A lesson that investigates the elements of a pattern core, or pattern unit.

Interactive Resources

PBS That's a Pattern <http://tdcms.ket.org/evlearn/pattern/Pattern.html>

- This interactive provides the opportunity for students to figure out what is missing in the pattern and click on a picture to complete the pattern.

National Library of Virtual Manipulatives http://nlvm.usu.edu/en/nav/grade_g_1.html

- Color Patterns interactive allows students to arrange colors to complete a pattern.

NLVM Attribute Trains http://nlvm.usu.edu/en/nav/frames_asid_271_g_1_t_3.html?open=instructions

- Students can use this interactive to manipulate shapes, colors, and numbers to complete a pattern.

Sample Formative Assessment Tasks/Questions

Pattern Pictures

- Display patterns with objects, and/or pictures of patterns and ask students to describe what they see.
- Check to see if students identify the core of the repeating pattern.

Playdough Kebabs (above) could be used as a formative assessment task

Return to [Table of Contents](#)

DRAFT

*Two Dimensional and Three Dimensional Geometry***Content Standards with Clarifying Notes***Open Bullets Indicate Clarifying Notes*

- K.G.1 Describe positions of objects by appropriately using terms, including *below, above, beside, between, inside, outside, in front of, or behind*.
 - This standard is intended to help students build their geometric/spatial vocabulary to describe objects in their world.
- K.G.2 Identify and describe a given shape and shapes of objects in everyday situations to include two-dimensional shapes (ie. triangle, square, rectangle, hexagon, and circle) and three-dimensional shapes (i.e. cone, cube, cylinder, and sphere).
 - This standard lays the foundation for students to begin looking at attributes of shapes. Students will identify and describe shapes based on what they notice about the shape and its appearance. Kindergarteners are not expected to tell the defining attributes of shapes. For example, kindergarten students might say, “It’s a square because it looks like a square.”
- K.G.3 Classify shapes as two-dimensional/flat and three-dimensional/solid and explain the reasoning used.
 - Students are expected to sort and classify shapes and explain the reasoning used, but are not expected to use formal attributes that define a shape as 2D or 3D. A kindergarten student might say, “ I put all these together because they stack.” or “These shapes go together because they are straight.” This standard is foundational for geometric reasoning.
- K.G.4 Analyze and compare two- and three- dimensional shapes of different sizes and orientations using informal language.
 - Kindergarten students are beginning to develop spatial reasoning, therefore they are expected to sort, classify, compare and contrast shapes using informal language. This is another standard building students vocabulary to reason geometrically and spatially, however the expectation of this standard is not for students to use the terms two- dimensional or three-dimensional.
- K.G.5 Draw two-dimensional shapes (i.e. square, rectangle, triangle, hexagon, and circle) and create models of three-dimensional shapes (i.e. cone, cube, cylinder, and sphere).
 - Students should draw and model the shapes after they have had experiences with concrete two- and three- dimensional shapes. This standard is moving them to a representational level of understanding.

New Academic Vocabulary for This Unit

- below
- above
- beside
- between
- inside
- outside
- in front of
- behind
- flat
- square
- rectangle
- circle
- hexagon
- triangle
- solid
- cone
- cylinder
- sphere
- describe
- same
- different
- sort

Prior Knowledge Required for This Unit

Kindergarten students might come with some knowledge of shape names, but this is the first formal introduction to geometry and spatial reasoning.

Subsequent Knowledge Related to This Unit

This unit is foundational for students developing spatial sense, spatial reasoning, as well as geometry content knowledge for first and second grade. In first grade students are expected to distinguish between a two-dimensional shape's defining (e.g., number of sides) and non-defining attributes (e.g., color). Students will also form new shapes by combining 2-D shapes, then describe the attributes. In second grade, students will build on this basic knowledge of shapes and their attributes to identify and describe polygons.

Relationship Among Standards in This Unit

The content standards and the process standards work together in this unit to form the foundation which will enable all students to develop the world class knowledge, skills, and life and career characteristics identified in the *Profile of the South Carolina Graduate*.

All of these geometry standards work together to provide experiences for students to understand the shapes and spaces in their world, in order to develop spatial sense. "Spatial sense can be defined as an intuition about shapes and the relationships between shapes and is considered a core area of mathematical study in early grades." (Sarama & Clements, 2009) Well-developed spatial sense includes the ability to visualize objects and spatial relationships, as well as being able to mentally move objects around. It also allows one to appreciate geometric form in art, nature, architecture and use these ideas to describe and analyze the world.

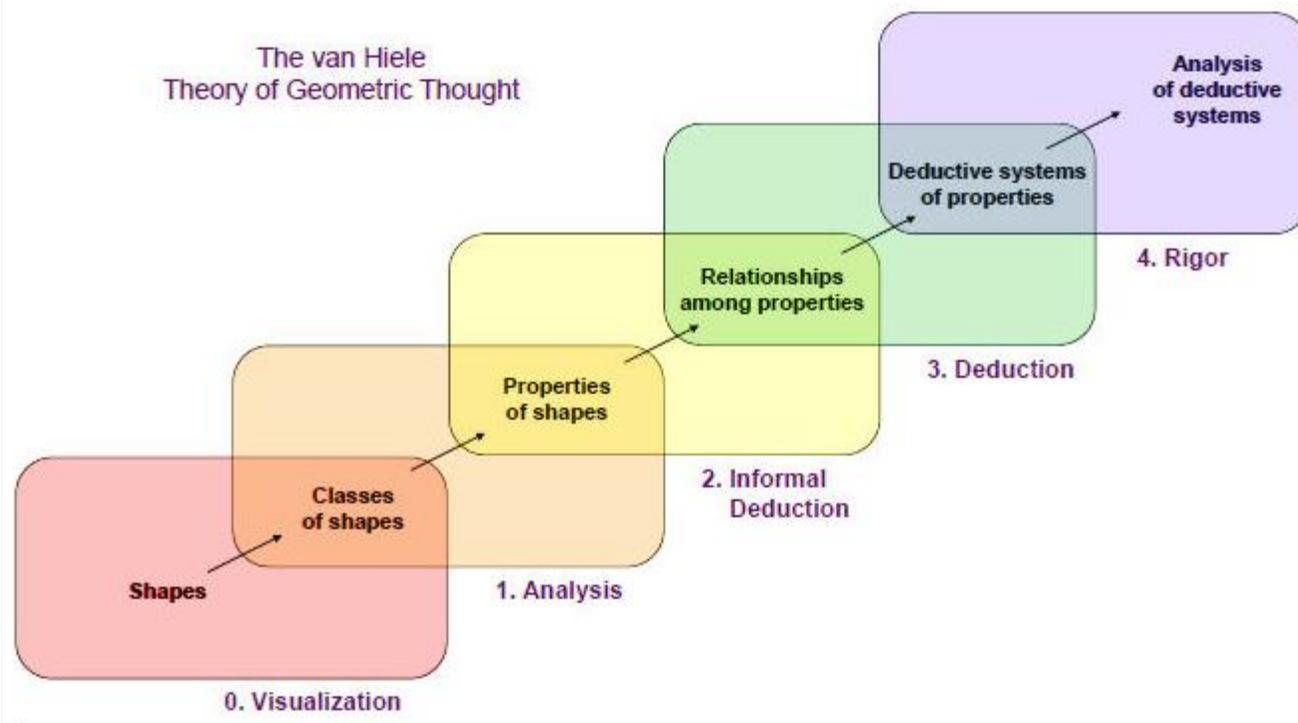
Like number sense, spatial sense does not develop according to age or grade level, it is developed through experiences. The two are significant to one's ability to "mathematize" his/her world.

Geometric Thought is developed in a progression, known as van Hiele Levels of Geometric Thought.

Pre-Recognition: Objects of thought are focused on specific visible or tactile objects. Students are focused on shapes and what they “look like”.

Visualization: Objects of thought are focused on shapes and what they “look like.” Students can group shapes that seem to be alike.

Analysis/Description: Objects of thought are focused on classifying shapes rather than individual shapes. Students can identify properties of shapes.



Potential Instructional Strategies/Lessons

Teacher Note:

Kindergarten students are not expected to use the terms two-dimensional, three-dimensional attribute, or classify. However, in teaching these geometric concepts it’s important as the teacher to use these terms when speaking to students.

Potential Instructional Strategies:

In order to develop strong spatial sense, students should have a variety of meaningful experiences with both two- and three-dimensional shapes. It is important to begin with kindergarten students by informally providing meaningful opportunities for them to describe their everyday environment. This can be done throughout the instructional day by pointing to objects in the environment (school, classroom, etc) and asking, “What do you notice?” Then progress to asking students to find a specific shape in the environment (“Find a rectangle”), and have students describe it using positional words. For example, as the teacher might say, “Find a rectangle.” Student might point to the poster on the wall above a table, and say, “That rectangle is

above the square.” Another example, teacher might say, “Find a circle.” Student might point out the window and say, “The circle on the playground is outside.”

Next progress to hiding shapes around the classroom for students to “hunt”, then ask students to describe where they found the shape using positional words. For example, “ I found a square under the chair.”

Throughout this unit it is important for you, the teacher, to use precise geometric language and students will eventually pick up the terms. It is not important to tell students a vocabulary term and define it for them, but rather use the language in teacher talk and discussions with students.

Possible Introductory Lesson:

Shapes in Our World

Introduce:

Take a picture of the outside of the school or a building/house in the area, and post the picture on your board for students to observe or provide a smaller version to pairs/small groups of students to look at closely.

Ask students, “What do you notice? What do you wonder about what you see in the picture?”

Allow students to Turn and Talk about what they notice/wonder.

Share and record student notices and wonders on chart paper/board.

Teacher might need to guide student questions to be math/shape- related.

Small Group/Partner Work:

Ask the following questions for students to investigate:

“How can we describe shapes in our everyday lives?”

“How can we describe the location or position of a shape or an object?”

Provide students time, tools, and further questioning to investigate using the picture.

Whole Group Discussion:

Have groups share what they discovered.

Pose further questions such as:

“What is different about the windows and doors?”

“Show me a (insert any 2D or 3D shape name from list).”

“Which parts of the building are the same shape?”

This will provide the teacher an opportunity through questioning to assess students’ current level of understanding and knowledge of shapes, shape names, and positional words.

(Adapted from <https://www.georgiastandards.org/Georgia-Standards/Frameworks/K-Math-Unit-3.pdf>)

Sort and Classify (K.G.3)

Materials needed/Pair or small group: Prepare small brown bag with several different objects from the classroom, a few attribute shapes, a few solid shape blocks

Introduce:

Ask:

What are some different shapes we see in our world?

How would you describe a _____?

Where do we see different shapes?

How can shapes be sorted?

How can shapes be described?

Partners/Small Group Work:

Provide each with the prepared brown bag of shapes and ask students to sort what they have in their bag and be prepared to share why they sorted the objects that way.

Whole Group Discussion:

*Option 1: Take a gallery walk and allow students to look at the different group's sortings. As students gather around ask "What do you notice about how this group sorted their objects?" Would this group please share how you sorted your shapes?"

*Option 2: Come back as a whole group on a central gathering carpet or space in the classroom and put one group's bag of objects in the middle and ask the group to describe their shapes and how they sorted them. (Repeat for as many groups as time allows)

Wrap up by charting similarities and differences of objects described and sorted. Then close with a summary of two-dimensional shapes and three-dimensional shapes. For example, "So we discovered that some of our shapes are flat and can be drawn easily, while others

Touch It, Count It, Chart It! (K.G.4)

This task begins with a read aloud of the book Captain Invincible and the Space Shapes by Stewart J. Murphy, then moves to an exploration of shapes (2D and 3D) for students to feel and describe what they feel. Students then have an opportunity to hunt for solid shapes in the classroom, count faces, and vertices, , and then describe how they know the shapes are solid (3D) in comparison with the concrete solid shape blocks they touched..

<https://www.georgiastandards.org/Georgia-Standards/Frameworks/K-Math-Unit-3.pdf>

Resources

Teacher Resources:

Linking the van Hiele Theory to Instruction by Tashana D. Howse and Mark E. Howse, NCTM Teaching Children Mathematics December 2014

<http://www.nctm.org/Publications/teaching-children-mathematics/2014/Vol21/Issue5/Linking-the-Van-Hiele-Theory-to-Instruction/>

This article describes the van Hiele progression of spatial sense and reasoning and links it to classroom instruction.

Lesson Planning Resources:

Georgia Frameworks <https://www.georgiastandards.org/Georgia-Standards/Frameworks/K-Math-Unit-3.pdf>

- This unit provides Essential Questions as well as several investigations with geometry that can be adapted to meet the needs of the SCCR standards.

Kindergarten, Kindergarten Blog <http://www.kindergartenkindergarten.com/sorting-by-attributes/>

- This kindergarten teacher has provided an introductory lesson for attributes and sorting using all kinds of different balls.

Sample Formative Assessment Tasks/Questions

Howard County Math Wiki Assessment Tasks

K.G.1 <https://gradeKcommoncoremath.wikispaces.hcpss.org/Assessing+KG1>

Return to [Table of Contents](#)

*Addition and Subtraction***Content Standards with Clarifying Notes***Open Bullets Indicate Clarifying Notes*

- K.ATO.1 Model situations that involve addition and subtraction within 10 using objects, fingers, mental images, drawings, acting out situations, verbal explanations, expressions, and equations.
 - This standard was introduced initially in Unit 4 using objects, fingers, mental images, drawings, acting out situations, verbal explanations, and now this unit will address modeling using expressions, and equations.
 - The difference between an expression and an equation: An equation has a left side, a right side, and is separated by an equal sign. An expression does not have any “sides” and doesn’t have an equal sign. Example of an equation is $3+1=4$. Example of an expression is $3+1$
- K.ATO.2 Solve real world/story problems using objects and drawings to find sums up to 10 and differences within 10.
- K.ATO.3 Compose and decompose numbers up to 10 using objects, drawings, and **equations**.
 - This standard was also addressed in Unit 4 using objects and drawings. The emphasis in this unit is for students to compose and decompose numbers up to 10 using equations.
- K.ATO.4 Create a sum of 10 using objects and drawings when given one of two addends 1-9.
- K.ATO.5 Add and subtract fluently within 5.
 - Fluently and fluency describe a student’s ability to compute with accuracy, flexibility, and efficiency. (Kilpatrick, Swafford, and Findell, 2001) Speed and time are not fluency.
 - This standard is the abstract level of thinking in a concrete-representational-abstract progression, therefore students will develop at different rates. Some might reach fluency earlier than others.
 - This standard is embedded in the above, therefore no separate assessment or tests should be given for isolated fluency.

New Academic Vocabulary for This Unit

- | | | |
|---------------|--------------|-------------|
| ● add | ● sum | ● minus |
| ● addition | ● difference | ● ten frame |
| ● subtract | ● equal | |
| ● subtraction | | |

Prior Knowledge Required for This Unit

Units 1-4 lay the foundation in counting and quantities that will enable students to progress to operations. In Unit 4 students began composing and decomposing numbers, as well as modeling situations for addition and subtraction. This unit builds on that knowledge and moves students toward a more abstract level of thinking, known as operational counting, and additive thinking. This is students' first formal introduction to the operations of addition and subtraction using expressions and equations. Therefore, it is important that students are ready to think abstractly with symbols, but if they are not, it is okay to continue using concrete and representational models for adding and subtracting.

Subsequent Knowledge Related to This Unit

This unit builds the foundation for the operations to come in first grade and beyond. Students will develop strategies for adding and subtracting whole numbers based on their work in this unit with smaller numbers. Students need to understand connections between counting and addition and subtraction (e.g., adding two is the same as counting on two). Once students understand the meaning for the operations of addition and subtraction they are ready to extend their thinking and begin demonstrating fluency. Students will use their algebraic thinking and reasoning about a problem situation to make informed decisions about which operation to use in a problem. In first grade students will be introduced to unknowns in all positions in addition and subtraction expressions and equations.

Relationship Among Standards in This Unit

The content standards and the process standards work together in this unit to form the foundation which will enable all students to develop the world class knowledge, skills, and life and career characteristics identified in the *Profile of the South Carolina Graduate*.

Kindergarten is the pivotal grade for creating a mathematical classroom which encourages collaboration and builds community. Students who are college-and-career-ready take a productive and confident approach to mathematics by communicating about mathematics to gain understanding.

Students in kindergarten can begin developing their communication skills by:

- Acting out mathematical scenarios/problems
- Frequently exchanging mathematical ideas and problem solving strategies
- Listening to understand one another. This involves thinking about what a person is saying so that you can explain it yourself or to help them explain it more clearly. It is not just being quiet when someone else is talking. Also, children need to listen so that they can ask a question or help the explainer.
- Utilizing *Math Talk* in the classroom before being asked to follow procedures

Kindergarten students will naturally want to do many things on their own, however it is encouraged to have students begin working in pairs or small groups to build reasoning and communication skills.

K.ATO.1 and K.ATO.2 are the concrete stages of understanding addition and subtraction. As students develop this concrete understanding they will progress to a more representational, sometimes known as pictorial stage of understanding where they will want to represent their thinking with

drawings. K.ATO. 3, K.ATO.4, and K.ATO.5 move students through a representational stage of understanding to a more abstract level of thinking and understanding how contexts and real life situations can also be represented using a combination of mathematical symbols, known as expressions or equations.

Potential Instructional Strategies/Lessons

Teacher Note:

While students are not formally assessed on different problem types until first grade, it's important for kindergarten students to experience contexts dealing with each problem type for addition and subtraction.

Kindergarten students should see addition and subtraction equations, and student writing of equations is encouraged, but only as students are developmentally ready to use symbols to represent quantities and actions taking place such as putting together, subtracting, or having parts and a whole. In First grade students are expected to understand the meaning of the equal sign, so invented equations are still acceptable in kindergarten. Teaching students about the operations of addition and subtraction should always include a context (story problem) that is relevant to the lives of kindergarteners. Contexts might be found in children's literature, as well as the stories that your students love to tell every day.

It is a common misconception that word problems can be solved using key words. Not all situations of addition represent *altogether*, just as not all situations of subtraction represent *take away* or *how many left*. "When children are learning about the operations of addition and subtraction, it is helpful for them to see the connection between these processes and the world around them. Word problems accustom children to looking at groups of people or objects, help them see the actions of joining and separating, and give them experience figuring out sums and differences." (Burns 2006)

	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? $2 + 3 = ?$	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? $2 + ? = 5$	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? $? + 3 = 5$
Take from	Five apples were on the table. I ate two apples. How many apples are on the table now? $5 - 2 = ?$	Five apples were on the table. I ate some apples. Then there were three apples. How many apples did I eat? $5 - ? = 3$	Some apples were on the table. I ate two apples. Then there were three apples. How many apples were on the table before? $? - 2 = 3$
	Total Unknown	Addend Unknown	Both Addends Unknown ¹
Put Together/ Take Apart ²	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? $3 + ? = 5$, $5 - 3 = ?$	Grandma has five flowers. How many can she put in her red vase and how many in her blue vase? $5 = 0 + 5$, $5 = 5 + 0$ $5 = 1 + 4$, $5 = 4 + 1$ $5 = 2 + 3$, $5 = 3 + 2$
	Difference Unknown	Bigger Unknown	Smaller Unknown
Compare ³	(“How many more?” version): Lucy has two apples. Julie has five apples. How many more apples does Julie have than Lucy? (“How many fewer?” version): Lucy has two apples. Julie has five apples. How many fewer apples does Lucy have than Julie? $2 + ? = 5$, $5 - 2 = ?$	(Version with “more”): Julie has three more apples than Lucy. Lucy has two apples. How many apples does Julie have? (Version with “fewer”): Lucy has 3 fewer apples than Julie. Lucy has two apples. How many apples does Julie have? $2 + 3 = ?$, $3 + 2 = ?$	(Version with “more”): Julie has three more apples than Lucy. Julie has five apples. How many apples does Lucy have? (Version with “fewer”): Lucy has 3 fewer apples than Julie. Julie has five apples. How many apples does Lucy have? $5 - 3 = ?$, $? + 3 = 5$

¹These take apart situations can be used to show all the decompositions of a given number. The associated equations, which have the total on the left of the equal sign, help children understand that the = sign does not always mean makes or results in but always does mean is the same number as.

²Either addend can be unknown, so there are three variations of these problem situations. Both Addends Unknown is a productive extension of this basic situation, especially for small numbers less than or equal to 10.

³For the Bigger Unknown or Smaller Unknown situations, one version directs the correct operation (the version using more for the bigger unknown and using less for the smaller unknown). The other versions are more difficult.

Possible Lesson(s):

K.ATO. 1, K.ATO.2, & K.ATO.3

Mathematical Stories in Our Lives

Use real life stories throughout this unit for students to model the situation, draw pictures to represent the situation, and/or write equations for the situation.

Children’s literature is another great way to incorporate problem solving using contexts with which kindergarten students are familiar.

It is important to use contexts that are rich and truly problematic for students to construct their own knowledge, generate and explore mathematical ideas, and that can be entered at many levels. The more open the task, the better.

Here is a sample task, but teachers should create their own based on the lives of their students.

“Our class is going to have a basket of our Top Ten books. I want each of you to be able to share your favorite book at some time this school year. Every week we will switch out the books of our friends. On Monday we will have some books in the basket. By Friday we will have 10 books in the basket. What do you notice? What do you wonder?”

Solicit and record student notices and wonders

Provide manipulatives and time for students to investigate the questions, “How many books might be in the basket on Monday?” “How many books will we add each day?”

Wrap up the task by having students share their thinking and strategies.

This task could be repeated by putting in different combinations to make ten, using the different problem types (part part whole, joining, take from, separating, comparing)

K.ATO. 3, K.ATO.5

Shake and Spill (Adapted from Marilyn Burns)

https://center.uoregon.edu/StartingStrong/uploads/STARTINGSTRONG2015/HANDOUTS/KEY_6087/ShakeandSpill.pdf

http://elementarymathematics.pds-hrd.wikispaces.net/file/view/Shake%26Spill_K.OA.1.5.pdf

This lesson can be modeled as a whole group, then scaffolded for students to play in partners or small groups. The activity focuses students’ attention on composing and decomposing numbers to 10. The lesson can be scaffolded so that students work within 5 first, then 10, or differentiate numbers of counters in the cup based on students’ levels of understanding.

K.ATO.4

Materials Needed:

Counters for each student or pairs of students

*Tens Frames would be a good organizational tool if students want to use it with their counters.

Introduce:

Read the story, *Ten Sly Piranhas* by William Wise. <https://www.youtube.com/watch?v=LN0eYUgx4u0>

Begin by just showing the pictures if you have access to the book. Ask students “What do you notice?” “How many piranhas do you see?” “How many animals do you see?”

Pose questions to students in the form of “If _____, then _____.”

For example, “If there are 10 sly piranhas in the river, then 1 sly piranha jumps out. How many sly piranhas now?” (Repeat these statements using different combinations to make 10)

Resources

Teacher Resources:

The following table shows strategies for addition and subtraction that kindergarten students will develop as they develop fluency within 5. These strategies do not need to be directly taught, but students should be guided to use them as they are developmentally ready.

Addition and Subtraction Strategies

<u>One/Two More/Less</u> These facts are a direct application of the One/Two More/ Less than relationships	<u>Make a Ten</u> Use a quantity from one addend to give to another to make a ten then add the remainder. $9 + 7 = 10 + 6$	<u>Near Doubles</u> Using the doubles anchor and combining it with 1 and 2 more/less.
<u>Facts with Zero</u> Need to be introduced so that students don't overgeneralize that answers to addition are always greater.	<u>Doubles</u> Many times students will use doubles as an anchor when adding and subtracting.	

Teaching Channel Video for Quick Images using Tens Frames <https://www.teachingchannel.org/videos/visualizing-number-combinations>

- This video shows how to use tens frame quick images in the kindergarten class to help students visualize combinations of numbers to 10.

Is It Counting or Adding? <http://www.nctm.org/Publications/teaching-children-mathematics/2014/Vol20/Issue8/Is-It-Counting,-or-Is-It-Adding/>

- This article shows the connection between counting and adding through the lens of early number progression.

Engage NY <https://www.engageny.org/resource/grade-k-math-compose-and-decompose-kenbt1>

- This is a video of a lesson in a kindergarten class of students composing and decomposing numbers using ten frames.

Decomposing Numbers <http://blog.aimsedu.org/2013/03/21/decomposing-numbers-with-kindergarteners/>

- This comes from AIMS Education and helps explain the importance of developing students understanding of how numbers can be decomposed into different parts to make a whole.

Lesson Planning Resources:

NC Kindergarten Addition and Subtraction Unit

<http://maccss.ncdpi.wikispaces.net/file/view/Kindergarten%20Unit.pdf/522861944/Kindergarten%20Unit.pdf>

- This unit from North Carolina has many lessons to introduce the concepts of joining (addition) and separating (subtraction) in the context of word problems that kindergarteners relate to and enjoy.

Georgia Unit on Investigating Addition and Subtraction <https://www.georgiastandards.org/Georgia-Standards/Frameworks/K-Math-Unit-5.pdf>

- In this unit students investigate situations of addition as putting together, and adding to, and situations of subtraction as taking apart and taking from.

Do It With Dominoes <https://illuminations.nctm.org/unit.aspx?id=6141>

- This unit is a compilation of lessons for students to explore 4 models of addition.

Links Away <https://illuminations.nctm.org/unit.aspx?id=6134>

- This unit is a compilation of lessons using 4 models of subtraction.

Try for Five <https://illuminations.nctm.org/Lesson.aspx?id=409>

- In this lesson, students explore the many ways to decompose numbers, and they build on their knowledge of addition and subtraction to find missing addends.

Inside Mathematics Kindergarten Problems <http://www.insidemathematics.org/common-core-resources/mathematical-content-standards/standards-by-grade/kindergarten>

- A collection of leveled (from easier to more challenging) tasks that could be posed to a whole group of kindergarteners or in small teacher led groups.

Kindergarten Word Problems (result unknown types) <http://www.k-5mathteachingresources.com/support-files/add-to-result-unknown-within-10.pdf>

- Different word problems for the result unknown type of adding to problems.

Kindergarten Word Problems (both addends unknown types) <http://www.k-5mathteachingresources.com/support-files/put-together-both-addends-unknown-within-10.pdf>

- Different word problems for the type of addition problems where both addends are unknown.

Children's Books for Math <http://www.the-best-childrens-books.org/math-for-kids.html>

- This website has lists of children's books for different concepts in math that make learning the concepts engaging and relatable to small children.

Glencoe Virtual Manipulatives http://www.glencoe.com/sites/common_assets/mathematics/ebook_assets/vmf/VMF-Interface.html

- This website has virtual story setting backgrounds

Interactive Resources:

Illuminations Ten Frame Fill <http://illuminations.nctm.org/Activity.aspx?id=3565>

- Students can use this interactive to fill up five and ten frames, count, compose and decompose numbers 5-10

Sample Formative Assessment Tasks/Questions

Decomposing Numbers Formative Assessment from Kentucky https://ccgpsmathematicsk-5.wikispaces.com/file/view/decomposing_numbers_operations_and_algebraic_thinking_kindergarten_spring_2012_revised_4-25-12.pdf/480464968/decomposing_numbers_operations_and_algebraic_thinking_kindergarten_spring_2012_revised_4-25-12.pdf

- This lesson is intended to help you assess how well students are able to decompose numbers less than or equal to 10 into pairs in more than one way. It will help you to identify students who have the following difficulties:
 - Anchoring to 5 and 10
 - Identify different representations of a number sentence
 - One to one correspondence
 - Structuring numbers
 - Addition

Return to [Table of Contents](#)