Cluster 5: Number Relationship between and among 1-10

Duration: 4- 6 weeks

Content Standards:
This list includes standards addressed in this cluster, but not necessarily mastered, since all standards are benchmarks for the end of the year. Note strikethroughs and recommendations in the Important Considerations section for more information.

NC.K.CC.1
Know number names and recognize patterns in the counting sequence by:
- Counting 100 by ones.
- Counting to 100 by tens.

NC.K.CC.2
Count forward beginning from a given number within the known sequence, instead of having to begin at 1.

NC.K.CC.5
Count to answer "How many?" in the following situations:
- Given a number from 1-20, count out that many objects.
- Given up to 20 objects, name the next successive number when an object is added, recognizing the quantity is one more/greater.
- Given 20 objects arranged in a line, a rectangular array, and a circle, identify how many.
- Given 10 objects in a scattered arrangement, identify how many.

NC.K.CC.6
Identify whether the number of objects, within 10, in one group is greater than, less than, or equal to the number of objects in another group, by using matching and counting strategies.

NC.K.CC.7
Compare two numbers, within 10, presented as written numerals.

NC.K.OA.1 Represent addition and ~~subtraction~~, within 10:
- Use a variety of representations such as objects, fingers, mental images, drawings, sounds, acting out situations, verbal explanations, or expressions.
- Demonstrate understanding of addition and ~~subtraction~~ by making connections among representations.

NC.K.OA.3
Decompose numbers less than or equal to 10 into pairs in more than one way using objects or drawings, and record each decomposition by a drawing or expression.

NC.K.OA.4
For any number from 0 to 10, find the number that makes 10 when added to the given number using objects or drawings, and record the answer with a drawing or expression.

NC.K.OA.6
Recognize and combine groups with totals up to 5 (conceptual subitizing).

Mathematical Practices:
1. Make sense of problems and persevere in solving them
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others
4. Model with mathematics
5. Use appropriate tools strategically
6. Attend to precision
7. Look for and make use of structure

8. Look for and express regularity in repeated reasoning.

What is the Mathematics?
The mathematical discourse established in Cluster 1 should continue to be embedded and utilized throughout each successive cluster.

Students work with key number relationships including:
- Number ranges listed in the standards (rote counting to 100 and understanding relationships between numbers and quantities to 20) are goals to be mastered by the end of the year. In Cluster 2, the focus was first on the numbers 0-5 and then 6-10. In this cluster, students will build on this understanding to rote count to 100, count with objects up to 20, and understand number relationships to 10. Note that depending on experience, some students may still need time on counting and comparing objects 0-10. Many activities can be differentiated simply by changing the number ranges so that all students can move forward from the point at which you assess them during your observations in previous clusters.
- *Conceptual subitizing* provides a context for exploring number relationships, the basis for addition and subtraction. This standard leads directly to the first grade standard of composing and decomposing numbers 0 - 10 fluently.
  - Students visually see subgroups of quantities within a larger quantity and learn that the subgroups can be combined to compose a whole (ex. I saw a group of 4 dots and 2 dots on the card. There are six dots!)
- *Conceptual* subitizing involves not only recognizing the subgroups, but also combining them to compose a whole.
  - Students understand pattern arrangements of numbers as in subitizing activities to discover properties and concepts such as conservation, compensation, unitizing, (such as counting using numbers other than one, e.g., 2s, 5s, 10s) counting on, composing and decomposing numbers, as well as an understanding of arithmetic and place value.
- Students develop an understanding that each successive number name refers to a quantity that is one greater in value than the previous number (inclusion). They begin to count on from numbers other than one (ex. What comes before 8? 7 and 6 and 5 and 4 and 3 and 2 and 1; What comes after 8? 9 and 10.)
- By giving students varied experiences with counting/creating sets and counting forward from a given number, students are able to tell the total if one more were added or if one were taken away (one more/one less) (ex. Showing dot card with six dots. "I wish I had 7, how many more dots do I need?"; "I have 6 chips and I want to give one away, how many would I still have?" When shown a ten frame with 7 dots, students are able to explain how many when adding one more dot or taking 1 dot away.).
- Students will build upon their subitizing skills to compose and decompose benchmark numbers 5 and 10 (benchmark numbers: 5 & 10). This is an important step that will lead to a deeper understanding of joining and separating in Cluster 6. Students may learn to visualize 5 and 10 as anchor numbers through the use of the five frames and 10 frames. (ex. Using 5 and 10 frames or a rekenrek-- 6 is 5 and 1 more, 7 is 5 and 2 more, 7 is also three less than 10). Students build on conceptual subitizing and other number relationship experiences to explore breaking a quantity into parts and examining whether the total amount is still the same(part-part-whole) (ex."My toothpick picture has three at the top and 2 at the bottom. There are 5 toothpicks so 5 can be three and two!"; One student shows 8 on their ten frame with 5 dots on the top row and 3 dots on the bottom row. Another student shows 8 with 4 dots on the top row and 4 dots on the bottom row. "There are 8 dots on both of our ten frames!").
- Students develop an understanding that numbers can be decomposed in different ways and still have the same amount (sense of equality) (ex. Continuing from the part-part-whole

example above —My toothpick picture has 4 and 1 and yours has 3 and 2 and his has 1 and 1 and 1 and 1 and 1. They are all the same as five. Let's try them on the number balance to see if they are really the same.).

Students compare quantities by:
- Students will additionally compare quantities within 10 presented as written numerals. (This is a continuation of the comparisons of quantities completed in cluster 3.)

Important Considerations:
- At this point in the learning sequence, students should be able to quickly recognize small groups of numbers (0-5) in a variety of arrangements (perceptual subitizing). We now need to move forward from perceptual subitizing to conceptual subitizing to help students understand that smaller groups of numbers can be joined to make a larger number.
- The emphasis of **K.OA.1** in this cluster is for students to *represent* the addition situations of putting together and adding to. Students may record addition situations as concrete (cubes, counters, etc.) or often pictorial (drawings, pictures, etc.) representations. Subtraction will be addressed later. During this exploration of addition, it is important to remember to solve addition situations within the range 0-5.
- Students should continue to use geometry and measurement as contexts for number relationships (ex. Find a collection of shapes that would have 10 sides. [1 square and 2 triangles or 1 hexagon and 1 square]; Find two objects that would be as long as 8 cubes.). This will build on the foundation established in Clusters 1-4 (NC.K.MD.1, NC.K.MD.2.NC.K.MD.3, NC.K.G.1, NC.K.G.2, NC.K.G.6).
- Students should have varied representations of composing and decomposing numbers 5 and 10 (snap cubes, shape puzzles, toothpick pictures, five and ten frames, dot cards, rekenreks, pattern block puzzles). In addition, they can make observations in the classroom or world (ex. At my table, 3 people have velcro shoes and 2 people have tie shoes).
- When discussing the subject of equality teachers should take care to use the concept of equals to mean "has the same value as" instead of a cue to do an operation.
- No symbols, other than numerals, are expected to be used at this point by students. It is important to remember that very young children do not need to understand the symbols +, -, or = to begin to learn how to compose and decompose numbers. Symbols for addition, subtraction, and equals should be introduced only after students have internalized the number relationships and when the vocabulary of those relationships (more, less, and, is, etc.) is freely used. This typically occurs at the end of the year or even in first grade.