Kindergarten Mathematics, Quarter 1, Unit 1.1

Counting, Classifying, and Number Sense

Overview

Number of instructional days: 15 (1 day = 45–60 minutes)

Content to be learned

- Count orally from 1–20.
- Say the number names in the standard order when counting objects.
- Count orally, pairing each object with one and only one number (i.e., one-to-one correspondence)
- Count each object only one time.
- Count the objects in a set and state that the last number name said tells how many objects are in the set.
- Sort objects by a designated criteria.

Mathematical practices to be integrated

Make sense of problems and persevere in solving them.

- Use concrete objects or pictures to conceptualize and solve a problem.

Construct viable arguments and critique the reasoning of others.

- Use concrete objects or drawings to solve problems.
- Justify conclusions and communicate them to others.

Essential questions

- How can you be sure you counted correctly?
- How do you know how many objects are in a set?
- How can you sort these objects? Explain your thinking.
- How many objects are in each set?

Written Curriculum

Common Core State Standards for Mathematical Content

Counting and Cardinality K.CC

Know number names and the count sequence.

K.CC.1 Count ~~to 100~~ by ones ~~and by tens~~.

Count to tell the number of objects.

K.CC.4 Understand the relationship between numbers and quantities; connect counting to cardinality.

a. When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object.

b. Understand that the last number name said tells the number of objects counted. ~~The number of objects is the same regardless of their arrangement or the order in which they were counted.~~

Measurement and Data K.MD

Classify objects and count the number of objects in each category.

K.MD.3 Classify objects into given categories; count the numbers of objects in each category ~~and sort the categories by count.~~[3]

[3] ~~Limit category counts to be less than or equal to 10.~~

Common Core Standards for Mathematical Practice

1 Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

3 Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

Clarifying the Standards

Prior Learning

Students may enter kindergarten knowing the counting words and able to do some basic counting in sequence. They may have some prior understanding of what distinguishes a number from a shape or a letter. According to the Rhode Island Early Learning Standards (www.ride.ri.gov/els/resource.asp), students entering kindergarten may begin to ”use numbers to count as a means for solving problems, predicting, and measuring quantity.” They may be able to use one-to-one correspondence in counting objects and match groups of objects. They may begin to associate the number of objects with the names and symbols for numbers.

Current Learning

Students count orally from 1–20 by ones and learn the standard order of numbers orally. They count with one-to-one correspondence and they understand that the last number counted tells how many are in the set. Students classify objects into given categories and count how many objects are in each category.

Later in the year, students count up to 50 by ones, then to 100 by ones and tens. They learn to count forward from a number other than number one. When counting objects, they learn that the number of objects remains the same regardless of the order in which they are counted or how they are arranged.

Future Learning

In grade 1, students will count to 120, starting at any number less than 120. They will read and write numerals and represent a number of objects with written numerals. Students will organize, represent, and interpret data with up to three categories. They will answer questions about how many are in each category, and how many more or less are in one category than in another.

Additional Findings

According to *Principles and Standards for School Mathematics*:

Concrete models can help students represent numbers and develop number sense; they can also help bring meaning to students use of written symbols and can be useful in building place-value concepts. But using materials, especially in rote manner, does not ensure understanding. Teachers should try to uncover students' thinking as they work with concrete materials by asking questions that elicit students' thinking and reasoning (p. 80).

With this in mind, instruction must include not only rote counting but also must make connections that represent an understanding of one-to-one correspondence (such as ***** represents the number 5).

Kindergarten Mathematics, Quarter 1, Unit 1.2

Identify, Describe, and Locate Shapes in the Environment

Overview

Number of instructional days: 10 (1 day = 45–60 minutes)

Content to be learned

- Describe objects in the environment using names of shapes.
- Describe the location of objects using the positional words *above, below, beside, in front of, behind*, and *next to*.
- Correctly name shapes regardless of overall size.

Mathematical practices to be integrated

Construct viable arguments and critique the reasoning of others.

- Construct arguments using concrete referents such as objects, drawings, diagrams, and actions.
- Listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

Essential questions

- What words can you use to describe where an object is?
- How can you show me (above, below, top, bottom, under, over, etc.) with a certain object?
- How can you tell if something in your home/classroom is a triangle, square, or rectangle?

Written Curriculum

Common Core State Standards for Mathematical Content

Geometry	K.G

Identify and describe shapes (squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders, and spheres).

K.G.1 Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as *above, below, beside, in front of, behind*, and *next to*.

K.G.2 Correctly name shapes regardless of ~~their orientations or~~ overall size.

Common Core Standards for Mathematical Practice

3 Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

Clarifying the Standards

Prior Learning

Students may enter kindergarten with a basic understanding of some positional words. According to the Rhode Island Early Learning Standards (www.ride.ri.gov/els/resources.asp), young students may "use language to understand the arrangement, order, and position of objects that are on top of, next to, on the bottom of, underneath, beside, and in front of other objects."

Students entering kindergarten are expected to recognize similarities and difference among everyday objects. According to the Rhode Island Early Learning Standards (www.ride.ri.gov/els/resources.asp), they may also "describe and name common shapes found in the natural environment."

Current Learning

Kindergarteners name and locate polygons and/or circles in the classroom and in other environments. Later in the year, students will name shapes regardless of their orientations. They will also identify shapes in the environment as two-dimensional or three-dimensional. According to Bloom's Taxonomy, students' level of response in this unit will be at the knowledge level (describing, drawing, finding, and matching).

Counting is embedded throughout daily activities as a routine.

Future Learning

In grade 1, students will differentiate between defining attributes (e.g., triangles are closed and three-sided) and non-defining attributes (e.g., color, orientation, overall size) and they will build and draw shapes with defining attributes. It is essential that students have a good understanding of non-defining attributes (orientation, overall size), as it is not revisited as a unit in first grade.

Additional Findings

Science for All Americans states, "spatial patterns can be represented by a fairly small collection of fundamental geometrical shapes and relationships that have corresponding symbolic representation. To make sense of the world, the human mind relies heavily on its perception of shapes and patterns" (p. 134).

According to *Benchmarks for Science Literacy,* "by the end of second grade, students should know that circles, squares, triangles, and other shapes can be found in things in nature and in things that people build" (p. 26). In addition, "by the end of fifth grade, students should know that mathematics is the study of many kinds of patterns, including numbers and shapes and operations on them" (p. 27).

Principles and Standards of School Mathematics states that,

PreK–2 geometry begins with describing and naming shapes. Young students begin to use their own vocabulary to describe objects talking about how they are alike and how they are different. Teachers must help students gradually incorporate conventional terminology into their description of two- and three-dimensional shapes. However, terminology should not be the focus of preK–2 geometry programs. The goal is that early experiences with geometry lay the foundation for more formal geometry in later years (p. 97).

And *A Research Companion to Principles and Standards of School Mathematics* says,

Piaget and Inhelder's first theme that children's representation of space is constructed from active manipulation of their spatial environment has been supported. Children's ideas about shapes do not come from passive looking. Instead, they come as children's bodies, hands, eyes, and minds engage in active construction. Children need to explore shapes extensively to fully understand them. Merely seeing and naming a picture is not sufficient. Finally, they have to explore the parts and attributes of shapes (p. 152).

Kindergarten Mathematics, Quarter 1, Unit 1.3

Counting and Labeling Sets up to 10 Objects

Overview

Number of instructional days: 15 (1 day = 45–60 minutes)

Content to be learned

- Count the objects in a set and state that the last number name said tells how many objects are in the set.
- Understand that the number of objects stays the same regardless of their arrangement or order in which they are counted.
- Count to answer "how many?" questions about as many as 10 objects arranged in various configurations.
- Given a number from 1–10, count out a set of objects.
- Represent a set of up to 10 objects with a written numeral.

Mathematical practices to be integrated

Construct viable arguments and critique the reasoning of others.

- Construct arguments using concrete referents such as objects, drawing, diagrams, and actions.
- Listen to the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

Model with mathematics.

- Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later.
- They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

Essential questions

- How can you be sure you are counting correctly?
- When counting objects (set, collection, group), what does the last number you say tell you?
- What happens to the number of objects in a set when the objects are arranged in different ways (line, rectangular array, circle, scattered configuration)?
- How can you count out a set of objects to match this number?
- How can you tell which number matches this set of objects?
- How can you record how many objects are in this set?

Written Curriculum

Common Core State Standards for Mathematical Content

Counting and Cardinality K.CC

Count to tell the number of objects.

K.CC.4 Understand the relationship between numbers and quantities; connect counting to cardinality.

b. Understand that the last number name said tells the number of objects counted. The number of objects is the same regardless of their arrangement or the order in which they were counted.

Count to tell the number of objects.

K.CC.5 Count to answer "how many?" questions about ~~as many as 20~~ things arranged in a line, a rectangular array, or a circle, or as many as 10 things in a scattered configuration; given a number from 1–~~20~~, count out that many objects.

Know number names and the count sequence.

K.CC.3 Write numbers from 0 to 20. Represent a number of objects with a written numeral ~~0–20~~ (with 0 representing a count of no objects).

Common Core Standards for Mathematical Practice

3 Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

4 Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

Clarifying the Standards

Prior Learning

Children may enter kindergarten with an awareness of numbers and an ability to count them. According to the Rhode Island Early Learning Standards (www.ride.ri.gov/els/resources.asp), beginning kindergarten students may "use words such as more than, less than, and add/subtract to express some number concepts." They may begin to "use numbers and counting as a means for solving problems, predicting, and measuring quantity." They may be able to "use one-to-one correspondence in counting objects and matching groups of objects and begin to associate a number of objects with names and symbols for numbers.

Current Learning

Students understand that the last number named tells the number of objects counted and that the number of objects remains the same regardless of their arrangement or the order in which they are counted. They are able to name the correct number to correspond with a set of up to 10 objects counted, whether arranged in various ways or in scattered configurations. When given a specific number, they are able to count and show a matching set of objects. They are able to show a written numeral to represent the number of objects counted. Later in the year, students will continue working with counting up to 20 objects.

Routines—counting continues to be embedded throughout daily activities as well as the use of positional words to describe locations.

Future Learning

In grade 1, students will relate counting to addition and subtraction (e.g., counting on 2 to add 2). They will count, read, and write numerals and represent a number of objects up to 120.

Additional Findings

According to *Principles and Standards for School Mathematics,* "preschool and kindergarten teachers should use naturally occurring opportunities to help students develop number concepts by posing questions such as, 'How many pencils do we need at this table?,' 'Shall we count how many steps to the playground?,' and 'Who is third in line?'" (p. 80). The book further states: "understanding of numbers develops in prekindergarten through grade 2 as children count and learn to recognize 'how many' in sets of objects.

Concrete models can help students represent numbers and develop number sense; they can also help bring meaning to students' use of written symbols and can be useful in building place-value concepts. But using materials, especially in rote manner, does not ensure understanding. Teachers should try to uncover students' thinking as they work with concrete materials by asking questions that elicit students' thinking and reasoning (p. 80).

With this in mind, instruction must include not only rote counting but also must make connections that represent an understanding of one-to-one correspondence (such as ***** represents the number 5).