

Grade K Math Unit 2 - Operations and Algebraic Thinking

UNIT OVERVIEW

In Kindergarten, instructional focus should focus on two critical areas. This unit is connected to Focus #1, Representing and comparing whole numbers, initially with sets of objects. (See Connections for further explanation)

There is only 1 cluster addressed within this unit:

- a. Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from

STANDARDS

CC_Common Core State Standards - Mathematics (2010) - k

Domain K.OA Operations and Algebraic Thinking

Cluster Statement: *Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.*

Standard K.OA.1 Represent addition and subtraction with objects, fingers, mental images, drawings, sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations.

Standard K.OA.2 Solve addition and subtraction word problems, and add and subtract within 10, e.g., by using objects or drawings to represent the problem.

Standard K.OA.3 Decompose numbers less than or equal to 10 into pairs in more than one way, e.g., by using objects or drawings, and record each decomposition by a drawing or equation (e.g., $5 = 2 + 3$ and $5 = 4 + 1$).

Standard K.OA.4 For any number from 1 to 9, find the number that makes 10 when added to the given number, e.g., by using objects or drawings, and record the answer with a drawing or equation.

Standard K.OA.5 Fluently add and subtract within 5.

CONTENT ELABORATIONS

As students work through the OA unit, it is important to note that students should progress from concrete thinking, to pictorial thinking, to abstract thinking. As students progress from working with manipulatives to writing numerical expressions and equations, they need numerous opportunities to use pictorial thinking. If given the opportunity to use pictorial thinking, students are less likely to use finger counting and rote memorization work with addition and subtraction.

K.OA.1 asks students to demonstrate the understanding of how objects can be joined (addition) and separated (subtraction) by representing addition and subtraction situations in various ways. This objective is primarily focused on understanding the concept of addition and subtraction, rather than merely reading and solving addition and subtraction number sentences (equations).

MP.1, MP.2, MP.4, MP.5 should be emphasized.

K.OA.2 asks students to solve problems presented in a story format (context) with a specific emphasis on using objects or drawings to determine the solution. This builds upon the students understanding of addition and subtraction from K.OA.1, to solve problems. Teachers should focus on the 3 types of problems during instruction: *Result Unknown*, *Change Unknown*, and *Start Unknown*. Research has found that *Result Unknown* problems are easier than *Change and Start Unknown* problems. Kindergarten students should have experiences with all 3 types of problems. The level of difficult can be decreased by using smaller numbers (up to 5) or increased by using larger numbers (up to 10). Problem solving should be a part of daily math instruction.

MP.1, MP.2, MP.3, MP.4, MP.5, MP.6 should be emphasized.

K.OA.3	<p>K.OA.3 asks students to understand that a set of (5) objects can be broken into two sets (3 and 2) and still be the same total amount (5). The focus is on number pairs which add to a specified total, 1-10. In addition, this standard asks students to understand that a set of objects (5) can be broken in multiple ways (3 and 2; 4 and 1). Thus when breaking apart a set students develop the understanding that a smaller set of objects exists within that larger set. This should be developed in context before moving into how to represent decomposition with symbols (+, -, =)</p> <p>MP.1, MP.2, MP.4, MP.6, MP.7, MP.8 should be emphasized.</p>
K.OA.4	<p>K.OA.4 builds upon the understanding that a number can be decomposed into parts (K.OA.3). The number pairs that total ten are foundational for students' ability to work fluently within numbers and operations, Different models, such as ten-frames, cubes, two-color counters, etc. assist students in visualizing these number pairs for ten. Once students have had experiences breaking apart ten into various combinations, this asks students to find a missing part of 10.</p> <p>MP.1, MP.2, MP.4, MP.6, MP.7, MP.8 should be emphasized.</p>
K.OA.5	<p>K.OA.5 uses the word fluently, which means accuracy (correct answer), efficiency (a reasonable amount of steps) and flexibility (using varied strategies). Fluency is developed by working with many different kinds of objects over an extended amount of time. This object does not require students to instantly know the answer. Traditional flash cards or timed tests have not been proven as effective instructional strategies for developing fluency.</p> <p>Strategies students may use to develop fluency include: counting on, counting back, counting up to subtract, using doubles, commutative property and fact families.</p> <p>MP.1, MP.2, MP.3, MP.4, MP.5, MP.6, MP.7, MP.8 should be emphasized.</p>

UNIT VOCABULARY

<p>join in all</p>	<p>add plus sign (+)</p>	<p>put together combine total</p>
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BIG IDEAS

<p>ENDURING UNDERSTANDINGS</p>	<p>ESSENTIALS QUESTIONS Choose a few questions based on the needs of your students</p>
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- Addition and subtraction problems are placed in four basic categories: Joining problems, Separating problems, Part-Part Whole problems, and Comparing problems.
- A joining problem involves three quantities involves: the starting amount, the change amount, and the resulting amount.
- A separating problem involves three quantities; the starting amount, the change amount (the amount being removed), and the resulting amount; however, the starting amount is the largest amount with the change amount being removed which leaves the resulting amount.
- Part-Part-Whole problems involve three quantities: two parts that are combined into one whole
- Compare problems involve the comparison between two different quantities. The third quantity does not actually exist but is the difference between the two quantities. When one quantity is compared to another, the first quantity is either more than, less than, or equal to the second quantity.
- Problems can be solved in different ways.
- Problems can be modeled using objects, pictures, and words.
- Various combinations of numbers can be used to represent the same quantity.
- How can we show a number in other ways?
- How can I use objects to add?
- How can I use objects to subtract?

CONNECTIONS

Critical Focus #1 in Kindergarten requires students to use numbers, including written numerals, to represent quantities and to solve quantitative problems, such as counting objects; comparing sets or numerals; and modeling simple joining and separating situations with sets of objects, or eventually with equations such as $5+2=7$ and $7-2=5$. (Kindergarten students should see addition and subtraction equations, and student writing of equations in kindergarten is encouraged, but it is not required.) Students choose, combine and apply effective strategies for answering quantitative questions, including quickly recognizing the cardinalities of small sets of objects, counting and producing sets of given sizes, counting the number of objects in combined sets, or counting the number of objects that remain in a set after some are take away.

* All standards in this cluster should only include numbers through 10.

Standards for Mathematical Practice (SMP)

MP.1 Make sense of problems and persevere in solving them

MP.2 Reason abstractly and quantitatively

MP.3 Construct viable arguments and critique the reasoning of others

MP.4 Model with mathematics

MP.5 Use appropriate tools strategically

MP.6 Attend to precision

MP.7 Look for and make use of structure (Deductive reasoning)

MP.8 Look for and express regularity in repeated reasoning (Inductive Reasoning)

UNDERSTAND ADDITION AS PUTTING TOGETHER AND ADDING TO, AND UNDERSTAND SUBTRACTION AS TAKING APART AND TAKING FROM

CONTENT

SKILLS

K.OA.1	Represent addition and subtraction	Demonstrate understanding of addition within 10 <ol style="list-style-type: none"> 1. Use objects to represent addition within 5 2. Use drawings to represent addition within 5 3. Use verbal explanations to represent addition within 5 4. Use expressions or equations to represent addition within 5 5. Use objects and drawings to represent addition within 10 6. Use verbal explanations and equations to represent addition within 10 7. Use terminology that includes add, join, put together, plus, combine and total to describe addition
K.OA.1	Demonstrate understanding of subtraction within 10	Demonstrate understanding of subtraction within 10 <ol style="list-style-type: none"> 1. Use objects to represent subtraction within 5 2. Use drawings to represent subtraction within 5 3. Use verbal explanations to represent subtraction within 5 4. Use expressions or equations to represent subtraction within 5 5. Use objects or drawings to represent subtraction within 10 6. Use verbal explanations and equations to represent subtraction within 10 7. Use terminology that includes minus, take away, separate, difference and compare to describe subtraction
K.OA.2	Solve addition and subtraction word problems within 10	Solve addition and subtraction word problems within 10 <ol style="list-style-type: none"> 1. Solve Result Unknown addition and subtraction word problems using objects or drawings to represent thinking 2. Solve Change Unknown addition and subtraction word problems using objects or drawings to represent thinking 3. Solve Start Unknown addition and subtraction word problems using objects or drawings to represent thinking
K.OA.3	Decompose numbers less than or equal to 10 into pairs in more than one way	Decompose numbers less than or equal to 10 into pairs in more than one way <ol style="list-style-type: none"> 1. Given a context, use objects to decompose a number 2. Use a picture or drawing to record the decomposition of a number 3. Use numbers to record the decomposition of a number 4. Connect drawings and numbers with symbols and equations
K.OA.4	For any number 1-9, find the number that makes 10 when added to the given number	For any number 1-9, find the number that makes 10 when added to the given number <ol style="list-style-type: none"> 1. Given a context, use ten-frames, counters or snap cubes, etc. to find the missing part of 10 2. Record the missing part of 10 problem using a drawing 3. Connect drawing with numbers, symbols and equation

K.OA.5	Fluently add and subtract within 5	Fluently add and subtract within 5 1. Count on to add 2. Count back to subtract 3. Count up to subtract 4. Use doubles to add 5. Use the commutative property to add 6. Use fact families to add or subtract 7. Accurately add and subtract within 5 8. Efficiently add and subtract within 5 9. Flexibly use strategies to add and subtract within 5
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UNIT RESOURCES

McGraw-Hill, **My Math** Chapter 4-6

Number Talks by Sherry Parrish

Georgia Math frameworks Grade K Unit 5 & 6

Common core Model Curriculum

Debbie Diller Math Work Stations materials and process

Manipulatives – including, but not exclusively: pattern blocks, snap cubes, counting disks, counting bears, a variety of counters, buttons, base ten blocks, dot dice, numeral dice, spinners, number cards, five and ten frames, dominoes