

Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from (Standards K.OA.1–5).

Standard K.OA.1 Represent addition and subtraction with objects, fingers, mental images, simple drawings, or sounds. *For example, use clapping, act out situations, and use verbal explanations, expressions, or equations.*

- Understand addition as putting together or the joining of two sets to create a larger set
- Understand addition as adding to or increasing the amount in a set
- Understand subtraction as taking apart or separating a larger set into two smaller sets
- Understand subtraction as taking from or decreasing the amount in a set

Teacher Note: This standard should be taught by providing students with interactive experiences. “Kindergarten students should see addition and subtraction equations, and student writing of equations in kindergarten is encouraged, but it is not required.” Please note that it is not until First Grade when “Understand the meaning of the equal sign” is an expectation (1.OA.7).
(<http://www.ncpublicschools.org/docs/curriculum/mathematics/scos/kindergarten.pdf>)

<p>K.OA.2 Solve addition and subtraction word problems within 10</p> <p>K.OA.3 Decompose numbers less than or equal to 10</p> <p>K.OA.4 Make sums of ten</p> <p>K.OA.5 Add and subtract within 5</p>	<p>1.OA.1 – 7 Represent and solve problems involving addition and subtraction</p> <p>1.OA.2 Solve word problems with 3 addends</p> <p>1.NBT.4 - 5 Solve addition and subtraction problems using place value</p> <p>2.OA.1 – 4 Represent and solve problems involving addition and subtraction</p> <p>2.NBT.5 – 9 Use place value to solve addition and subtraction problems</p>
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Critical Background Knowledge

- Understand the relationship between numbers and quantities (K.CC.4)
- Use counting to answer questions about “how many” (K.CC.5)
- Identify whether the number of objects in one group is greater, less than, or equal to the number of objects in another group up to 10 (K.CC.6)

join, add, combine, put together, addition, plus, total, separate, equal to, subtract, difference, take away, take apart, compare, more, less

<p>Dice Addition</p> <p>____ + ____ = ____</p> <p>____ + ____ = ____</p>	<p>Dice Subtraction</p> <p>____ - ____ = ____</p> <p>____ - ____ = ____</p>	<p>ten-frame</p> <table border="1" style="width: 100%; height: 40px;"> <tr> <td style="width: 20px; height: 20px;"></td> </tr> <tr> <td style="width: 20px; height: 20px;"></td> </tr> </table>											<ul style="list-style-type: none"> • In the context of stories relevant to the students, role play the actions of putting together, adding to, taking apart, and taking from using various models • Use objects, fingers, mental images, simple drawings, sounds, clapping, and acting out situations • Use dice, ten frames, linking cubes, etc. to practice adding and subtracting objects • Verbally express explanations, expressions, and equations
<p>Connect visual models to physical actions and representations.</p>													

Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from (Standards K.OA.1–5).

Standard K.OA.2 Solve addition and subtraction word problems within 10. Use objects or drawings to represent the problem.

- Understand each set in an addition word problem is represented by a number, and when joined together makes a larger set represented by a larger number
- Understand the set in a subtraction word problem is represented by a larger number and when separated makes two smaller sets represented by two smaller numbers
- Determine the operation based on the actions in the context of a word problem (avoid relying on key word strategies)
- Solve the following addition and subtraction situations (See: TABLE 1. Common addition and subtraction situations)

Add To Result Unknown	Take From Result Unknown	Put Together/Take Apart Total Unknown	Put Together/Take Apart Both Addends Unknown
Two bunnies sat on the grass. Three more bunnies hopped there. How many bunnies are on the grass now? $2 + 3 = ?$	Five apples were on the table. I ate two apples. How many apples are on the table now? $5 - 2 = ?$	Three red apples and two green apples are on the table. How many apples are on the table? $3 + 2 = ?$	Grandma has five flowers. How many can she put in her red vase and how many in her blue vase? $5 = 0 + 5, 5 = 5 + 0$ $5 = 1 + 4, 5 = 4 + 1$ $5 = 2 + 3, 5 = 3 + 2$

Teacher Note: The commutative property of addition is introduced in first grade in 1.OA.3. Kindergarten students may recognize that interchanging addends results in the same total. This should be explored in addition and discussed in subtraction if misconceptions arise with students interchanging numbers in subtraction.

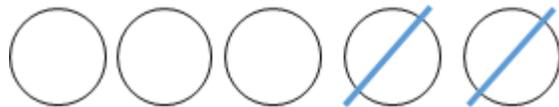
- K.OA.3** Decompose numbers less than or equal to 10
- K.OA.4** Make sums of ten using any number from 1 to 9
- K.OA.5** Fluently add and subtract using numbers within 5

- 1.OA.1** Solve addition and subtraction word problems within 20
- 1.OA.2** Solve word problems with 3 addends
- 2.OA.1** Solve addition and subtraction word problems within 100
- 2.NBT.5** Use addition and subtraction within 100 to solve word problems

Critical Background Knowledge

- Represent addition and subtraction with objects, fingers, mental images, simple drawings, or sounds (K.OA.1)
- Understand the relationship between numbers and quantities (K.CC.4)

join, add, combine, put together, addition, plus, sum, total, separate, equal to, subtract, minus, difference, take away, take apart



- Use objects, fingers, and simple drawings to represent addition and subtraction word problems
- Create word problems verbally
- Use expressions and equations (not required, but recommended)
- Use a bar model
- Part/Part/Whole; Fact Families
- Use word problems to practice adding and subtracting

Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from (Standards K.OA.1–5).

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

- Understand that a larger set can be decomposed into two smaller sets
- Decompose numbers less than or equal to 10 into pairs using objects and drawings
- Record decomposed number pairs with drawings or equations
- Understand part-part-whole relationships
- Use the addition (+) and equal sign (=) correctly when writing an equation

Teacher Note: Students develop an understanding of part-whole relationships as they recognize that a set of objects (5) can be broken into smaller sub-sets (3 and 2) and still remain the total amount (5). In addition, this standard asks students to realize that a set of objects (5) can be broken in multiple ways (3 and 2; 4 and 1). Thus, when breaking apart a set (decompose), students use the understanding that a smaller set of objects exists within that larger set (inclusion). In Kindergarten, students need ample experiences breaking apart numbers and using the vocabulary “and” & “same amount as” before symbols (+, =) and equations ($5 = 3 + 2$) are introduced. If equations are used, a mathematical representation (picture, objects) needs to be present as well.

(<http://www.dpi.state.nc.us/docs/curriculum/mathematics/scos/extended-k.pdf>)

- K.OA.1** Represent addition and subtraction
- K.OA.2** Solve addition and subtraction word problems within 10
- K.OA.4** Make sums of ten
- K.OA.5** Fluently add and subtract using numbers within 5
- K.NBT.1** Compose and decompose numbers from 11-19

- 1.OA.1** Use addition and subtraction to solve word problems with a variety of situations, including putting together and taking apart
- 1.OA.3** Apply properties of operations as strategies to add and subtract
- 1.OA.5** Relate counting to addition and subtraction.
- 1.OA.6** Add and subtract within 20
- 2.OA.1, 2.OA.2,** Use addition and subtraction to solve one-step and two-step word problems

Critical Background Knowledge

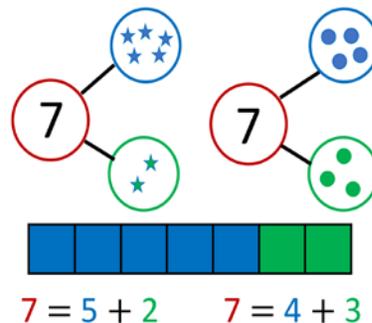
- Represent a number of objects with a written numeral (K.CC.3)
- Understand the relationship between numbers and quantities and count with one-to-one correspondence (K.CC.4, K.CC.5)

equal to, equation, expression, subtract, difference, minus, separate, decompose, total, take apart

Example:
Bobby Bear is missing 7 buttons on his jacket. How many ways can you use blue and red buttons to finish his jacket?

Draw a picture of all your ideas.

Students could draw pictures of: 4 blue and 3 red buttons; 5 blue and 2 red buttons; 1 blue and 6 red buttons; 0 blue and 7 red buttons



- Linking cubes
- Five-frames and ten-frames
- Number bonds
- Bar models
- Two-color counters
- Songs
- Games

Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from (Standards K.OA.1–5).

Standard K.OA.4 Make sums of 10 using any number from 1 to 9. *For example, $2 + 8 = 10$.* Use objects or drawings to represent and record the answer.

- Make sums (totals) of 10 using any number from 1 - 9 using objects or drawing
- Understand that numbers are composed of smaller numbers
- Understand part-part-whole relationships
- Understand that two smaller sets join together to make a larger set

Teacher Note: Students build upon the understanding that a number can be decomposed into parts (K.OA.3) to find a missing part of 10. Through numerous concrete experiences, kindergarteners model the various sub-parts of ten and find the missing part of 10.

(<http://www.dpi.state.nc.us/docs/curriculum/mathematics/scos/extended-k.pdf>)

K.OA.1 Represent addition and subtraction
K.OA.2 Solve addition and subtraction word problems within 10
K.OA.3 Decompose numbers less than or equal to 10
K.OA.5 Fluently add and subtract using numbers within 5
K.NBT.1 Compose and decompose numbers from 11-19 into tens and ones

1.OA.1 Use addition and subtraction to solve word problems with a variety of situations
1.OA.3 Apply properties of operations as strategies to add and subtract
1.OA.4 Understand subtraction as an unknown-addend problem
1.OA.6 Add and subtract within 20
1.OA.8 Determine the unknown whole number in an equation with three numbers
2.OA.1, 2.OA.2, Use addition and subtraction to solve one-step and two-step word problems
2.NBT.5, 2.NBT.6, 2.NBT.7 Add and subtract multi-digit numbers

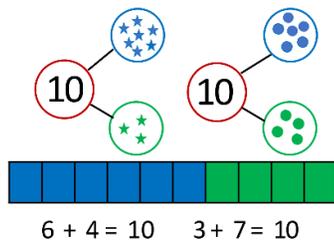
Critical Background Knowledge

- Represent a number of objects with a written numeral (K.CC.3)
- Understand the relationship between numbers and quantities (K.CC.4)
- Counting with one-to-one correspondence (K.CC.5)

add, addend, addition, equal to, equation, expression, plus, combine, put together, total

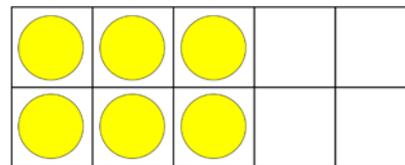
Example with Counters: When working with two-color counters, a student determines that 4 more beans are needed to make a total of 10.

“I have 6 counters. I need 4 more to make 10.”



Example Using a Ten-Frame:

“I used a ten frame for the case. Then, I put on 6 counters for juice still in the case. There is no juice in these 4 spaces. So, 4 are missing.”



- Linking cubes, counters, etc.
- Ten-frames
- Number bonds
- Bar models
- Games

Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from (Standards K.OA.1–5).

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

- Add and subtract using numbers within 5 (totals up to 5) fluently
- Use addition and subtraction strategies flexibly, accurately and efficiently
- Verbally answer addition and subtraction problems

Teacher Note: Oftentimes, when children think of each “fact” as an individual item that does not relate to any other “fact”, they are attempting to memorize separate bits of information that can be easily forgotten. Instead, in order to fluently add and subtract, children must first be able to see sub-parts within a number (inclusion, K.CC.4.c). Traditional flash cards or timed tests have not been proven as effective instructional strategies for developing fluency. Rather, numerous experiences with breaking apart actual sets of objects help children internalize parts of number.

(<http://www.dpi.state.nc.us/docs/curriculum/mathematics/scos/extended-k.pdf>; Burns (2000) About Teaching Mathematics; Fosnot & Dolk (2001) Young Mathematicians at Work; Richardson (2002) Assessing Math Concepts; Van de Walle & Lovin (2006) Teaching Student-Centered Mathematics Number)

<p>K.OA.2 Solve addition and subtraction word problems within 10 K.OA.3 Decompose numbers less than or equal to 10</p>	<p>1.OA.6.b Fluently add and subtract within 10 1.OA.1, 1.OA.6, 1.NBT.4 Add and subtract within 20 and 100 2.OA.2 Fluently add and subtract within 20 2.NBT.5 Fluently add and subtract within 100</p>
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Critical Background Knowledge

- Represent addition and subtraction with models (K.OA.1)
- Understanding of the relationship between numbers and quantities (K.CC.4)
- Decompose numbers and solve add to and take away situations (K.OA.2, K.OA.3)

add, subtract, total, difference, plus, minus

<p>Fluency in each grade involves a mixture of just knowing some answers, knowing some answers from patterns (for example, adding 0 yields the same number), and knowing some answers from the use of strategies. It is important to push sensitively and encouragingly toward fluency of the designated numbers at each grade level, recognizing that fluency will be a mixture of these kinds of thinking which may differ across students.</p> <p>Numbers within five include the following facts:</p> <table style="margin-left: 40px;"> <tr> <td>0+0</td><td>1+0</td><td>2+0</td><td>3+0</td><td>4+0</td><td>5+0</td><td>0-0</td><td>1-1</td><td>2-2</td><td>3-3</td><td>4-4</td><td>5-5</td> </tr> <tr> <td>0+1</td><td>1+1</td><td>2+1</td><td>3+1</td><td>4+1</td><td></td><td>1-0</td><td>2-1</td><td>3-2</td><td>4-3</td><td>5-4</td><td></td> </tr> <tr> <td>0+2</td><td>1+2</td><td>2+2</td><td>3+2</td><td></td><td></td><td>2-0</td><td>3-1</td><td>4-2</td><td>5-3</td><td></td><td></td> </tr> <tr> <td>0+3</td><td>1+3</td><td>2+3</td><td></td><td></td><td></td><td>3-0</td><td>4-1</td><td>5-2</td><td></td><td></td><td></td> </tr> <tr> <td>0+4</td><td>1+4</td><td></td><td></td><td></td><td></td><td>4-0</td><td>5-1</td><td></td><td></td><td></td><td></td> </tr> <tr> <td>0+5</td><td></td><td></td><td></td><td></td><td></td><td></td><td>5-0</td><td></td><td></td><td></td><td></td> </tr> </table>	0+0	1+0	2+0	3+0	4+0	5+0	0-0	1-1	2-2	3-3	4-4	5-5	0+1	1+1	2+1	3+1	4+1		1-0	2-1	3-2	4-3	5-4		0+2	1+2	2+2	3+2			2-0	3-1	4-2	5-3			0+3	1+3	2+3				3-0	4-1	5-2				0+4	1+4					4-0	5-1					0+5							5-0					<ul style="list-style-type: none"> • Practice targeting specific strategies, making a five for addition can be embedded in problem-solving tasks and games • Number lines • Five-frames • Use strategies such as counting on • Part/Part/Whole
0+0	1+0	2+0	3+0	4+0	5+0	0-0	1-1	2-2	3-3	4-4	5-5																																																														
0+1	1+1	2+1	3+1	4+1		1-0	2-1	3-2	4-3	5-4																																																															
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0+5							5-0																																																																		

TABLE 1. Common addition and subtraction situations.¹

	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
Put Together/Take Apart³	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? $5 = 0 + 5, 5 = 5 + 0$ $5 = 1 + 4, 5 = 4 + 1$ $5 = 2 + 3, 5 = 3 + 2$

Darker shading indicates the four Kindergarten problem subtypes. Grade 1 and 2 students work with all subtypes and variants. Unshaded (white) problems are the four difficult subtypes or variants that students should work with in Grade 1 but need not master until Grade 2.

¹ Adapted from Box 2-4 of "Mathematics Learning in Early Childhood," National Research Council (2009, pp. 32, 33).

² These *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*.

³ Either 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.

⁴ For 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.