MATHEMATICS

UTAH CORE **GUIDES** GRADE **1**

UTAH STATE BOARD OF EDUCATION 250 EAST 500 SOUTH P.O. BOX 144200 SALT LAKE CITY, UTAH 84114-4200 SYDNEE DICKSON, Ed.D., STATE SUPERINTENDENT OF PUBLIC INSTRUCTION

Represent and solve problems involving addition and subtraction within 20 (Standards 1–2, 5–6)

Standard 1.OA.1 Use addition and subtraction within 20 to solve word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions. *For example, use objects, drawings, and equations with a symbol for the unknown number to represent the problem.*

Concepts and Skills to Master

- Determine the operation based on the actions in the context of a word problem (avoid relying on keyword strategies)
- Use numbers and symbols to represent word problems (+, -, =, and a variety of symbols for unknowns)
- Solve the following addition and subtraction situations: (See: TABLE 1. Common addition and subtraction situations)
    - **Add To/Change Unknown** word problems (8 plates of cookies were sold. Each plate had 3 cookies on it. How many cookies were sold)
    - **Take From/Change Unknown** word problems (13 apples were on the the table. I ate some apples. Then there were 6 apples. How many apples did I eat? 13 - ? = 6)
    - **Put Together/Take Apart/Addend Unknown** word problems (10 apples are on the table. 4 are red and the rest are green. How many apples are green? 4 + ? = 10, 10 - 4 = ?)
    - **Compare/Difference Unknown** word problems (Lucy has 3 apples. Julie has Julie has 5 apples. How many more apples does Julie have than Lucy? How many fewer apples does Lucy have than Julie? 3 + ? = 5, 5 -3 = ?)
    - **Compare/Larger Unknown** word problems (Julie has 2 more apples than Lucy. Lucy has 3 apples. How many apples does Julie have? 2 + 3 = ?) Note: The language of "more" is mastered in first grade. The language of "fewer" is introduced in first grade, but mastered in second grade.
    - **Compare/Smaller Unknown** word problems (Lucy has 2 fewer apples than Julie. Julie has 5 apples. How many apples does Lucy have? 5 - 2 = ?) Note: The language of "more" is mastered in first grade. The language of "fewer" is introduced in first grade, but mastered in second grade.

Teacher Note: Add To/Start Unknown, Take From/Start Unknown, Compare/Larger Unknown, Compare/Smaller Unknown situations are introduced in first grade, but need not be mastered until second grade.

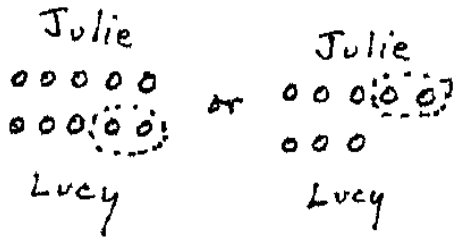
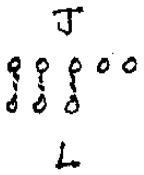
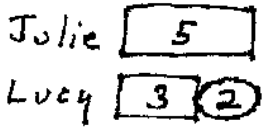
Related Standards: Current Grade Level	Related Standards: Future Grade Levels
1.OA.2 Solve word problems with three addends whose sum is 20 or less	**2.OA.1 – 4** Represent and solve word problems involving addition and subtraction
1.OA.3 Apply properties of operations as strategies	**2.NBT.5 – 9** Use place value understanding and properties of operations to add and subtract
1.OA.4 Understand subtraction as an unknown-addend problem	**2.MD.5** Solve word problems involving length with addition and subtraction
1.OA.5 Relate counting to addition and subtraction	**2.MD.8** Solve word problems involving money
1.OA.6a Add and subtract within 20 using a variety of strategies	**3.OA.3** Use multiplication and division within 100 to solve word problems
1.OA.7 Understand the meaning of the equal sign	**3.OA.8** Solve two-step word problems
1.OA.8 Determine the unknown number in an addition or subtraction equation	

Critical Background Knowledge from Previous Grade Levels

- Solve addition and subtraction word problems within 10 (K.OA.2)

Academic Vocabulary

add, add to, addition, plus, join, combine, put together, sum, subtract, minus, take away, take apart, take from, separate, difference, unknown, equal to, compare, symbol, equal (=), addend

Suggested Models	Suggested Strategies
Problem: Julie has 5 apples. Lucy has 3 apples. How many more apples does Julie have than Lucy? OR How many fewer apples does Lucy have than Julie? **Representing the difference in a Compare problem**  **Compare problem solved by matching**  **Compare problem represented in tape diagram**  	• Counting on method • Making ten method; ten-frames • Decomposing a number leading to a ten • Use the relationship between addition and subtraction • Create equivalent but easier or known sums (doubles, doubles plus/minus one) • Create their own word problems verbally • Use drawings, objects, and equations • Use a bar model • Use Part/Part/Whole

Represent and solve problems involving addition and subtraction within 20 (Standards 1–2, 5–6)

Standard 1.OA.2 Solve word problems that call for addition of three whole numbers whose sum is less than or equal to 20. *For example, use objects, drawings, and equations with a symbol for the unknown number to represent the problem.*

Concepts and Skills to Master

- Use numbers and symbols to represent word problems (+, =, and a variety of symbols for unknowns)
- Extend understanding of word problems involving addition of two whole numbers to solve problems with three whole numbers
- Add 3 whole numbers using objects, drawings and equations

Related Standards: Current Grade Level	Related Standards: Future Grade Levels
1.OA.1 Solve word problems involving addition and subtraction within 20 **1.OA.3** Apply properties of operations as strategies **1.OA.5** Relate counting to addition and subtraction **1.OA.6a** Add and subtract within 20 using a variety of strategies **1.MD.4** Answer questions about the total number of data points from up to three categories	**2.OA.1 – 4** Solve problems using addition and subtraction **2.NBT.5 – 9** Use place value understanding & properties of operations to add and subtract **2.MD.8** Solve word problems involving money **3.OA.8** Solve two-step word problems

Critical Background Knowledge from Previous Grade Levels

- Solve addition and subtraction word problems within 10 (K.OA.2)

Academic Vocabulary

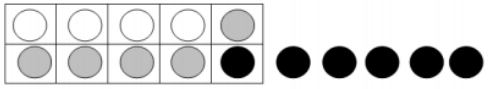
join, add, add to, combine, put together, addition, plus, sum, total, equal to, unknown

Suggested Models

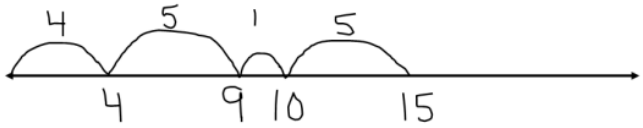
Example: **Mrs. Smith has 4 oatmeal raisin cookies, 5 chocolate chip cookies, and 6 gingerbread cookies. How many cookies does Mrs. Smith have?**

Student A:
I put 4 counters on the Ten Frame for the oatmeal raisin cookies. Then, I put 5 different color counters on the ten frame for the chocolate chip cookies. Then, I put another 6 color counters out for the gingerbread cookies. Only one of the gingerbread cookies fit, so I had 5 leftover. Ten and five more makes 15 cookies. Mrs. Smith has 15 cookies.

4 + 5 + 6 = ☼



Student B:
I used a number line. First I jumped to 4, and then I jumped 5 more. That's 9. I broke up 6 into 1 and 5 so I could jump 1 to make 10. Then, I jumped 5 more and got 15. Mrs. Smith has 15 cookies.



4 + 5 + 6 = ☼

Suggested Strategies

- Counting up
- Counting on
- Making ten
- Decomposing a number leading to a ten
- Use the relationship between addition and subtraction
- Create equivalent but easier or known sums (compensation, doubles plus one, doubles minus one)
- Apply the commutative or associative properties of addition
- Create word problems verbally
- Use drawings, objects, and equations

Image Source: http://www.dpi.state.nc.us/docs/curriculum/mathematics/scos/1.pdf

Understand and apply properties of operations and the relationship between addition and subtraction (Standards 3–4)

Standard 1.OA.3 Apply properties of operations as strategies to add and subtract. *For example: If 8 + 3 = 11 is known, then 3 + 8 = 11 is also known. (Commutative property of addition.) To add 2 + 6 + 4, the second two numbers can be added to make a ten, so 2 + 6 + 4 = 2 + 10 =12. (Associative property of addition.)* First grade students need not use formal terms for these properties.

Concepts and Skills to Master

- Understand the commutative property of addition (8 + 3 = 11 and 3 + 8 = 11)
- Understand that the commutative property does not work with subtraction (8 - 3 = 5, but 3 - 8 does not equal 5)
- Understand the associative property of addition (2 + 6 + 4 = 2 + 10 = 12)
- Understand the additive identity property of zero (8 + 0 = 8)
- Understand the identity property of subtraction (8 - 0 = 8)
- Apply properties listed above as strategies to add and subtract

Teacher Note: Emphasis should be placed on understanding of the properties and why each property applies to a particular operation rather than memorizing names and definitions.

Related Standards: Current Grade Level	Related Standards: Future Grade Levels
1.OA.4 Understand subtraction as an unknown addend problem	**2.NBT.5, 2.NBT.7** Add and subtract within 100 and within 1,000
1.OA.6 Add and subtract within 20	**2.NBT.6** Add up to 4 two-digit numbers
1.NBT.4 Add within 100	**2.NBT.8** Mentally add and subtract 10 or 100 from a given number
1.NBT.6 Subtract multiples of 10	**2.NBT.9** Explain why addition and subtraction strategies work
	3.OA.5 Apply properties of operations to multiply and divide
	3.NBT.2 Fluently add and subtract within 1,000

Critical Background Knowledge from Previous Grade Levels

- Solve addition and subtraction word problems within 10 (K.OA.2)

Academic Vocabulary

add, subtract, equation, total, difference

Suggested Strategies

- Use objects or drawings to represent properties listed above
- Number bonds, ten-frames, related facts, abacuses
- Use context to interpret the properties (5 green apples and 3 red apples amounts to the same number of apples as 3 green apples and 5 red apples)

Suggested Models

Commutative Property Examples:

Cubes

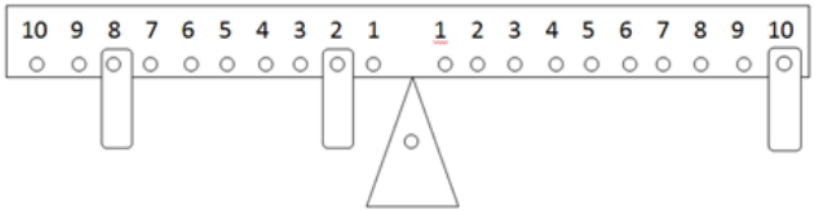
A student uses 2 colors of cubes to make as many different combinations of 8 as possible. When recording the combinations, the student records that 3 green cubes and 5 blue cubes equals 8 cubes in all. In addition, the student notices that 5 green cubes and 3 blue cubes also equals 8 cubes.

3 + 5 = 8

5 + 3 = 8

Number Balance

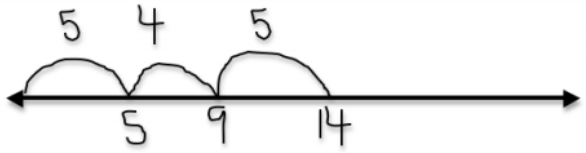
A student uses a number balance to investigate the commutative property. "If 8 and 2 equals 10, then I think that if I put a weight on 2 first this time and then on 8, it'll also be 10."



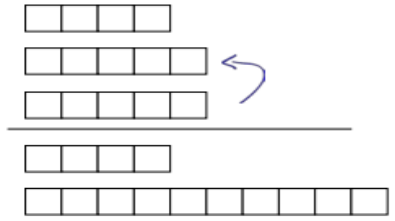
Associative Property Examples:

Number Line: ☐ = **5 + 4 + 5**

Student A: First I jumped to 5. Then, I jumped 4 more, so I landed on 9. Then I jumped 5 more and landed on 14.



Bar model with associative property:



Student B: I got 14, too, but I did it a different way. First I jumped to 5. Then, I jumped 5 again. That's 10. Then, I jumped 4 more. See, 14!

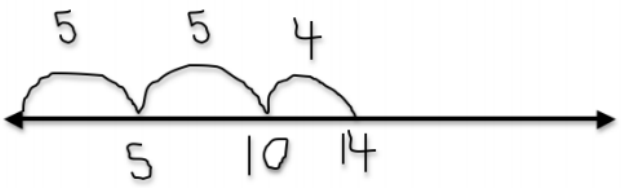
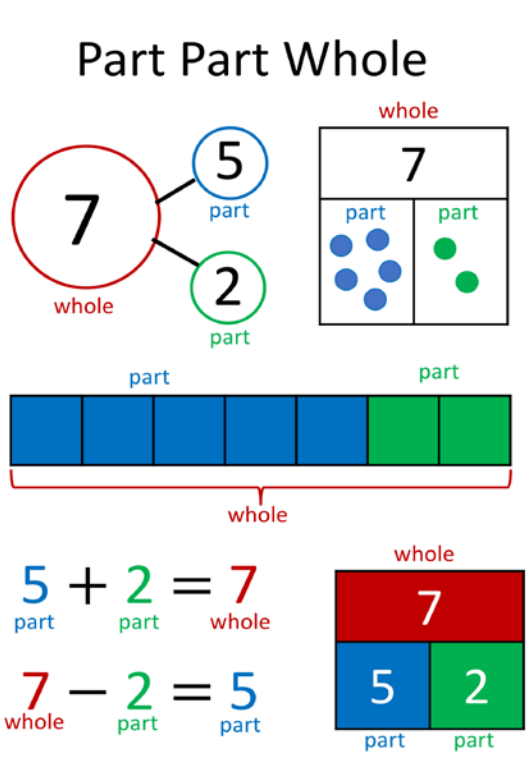


Image Source: http://www.dpi.state.nc.us/docs/curriculum/mathematics/scos/1.pdf

Understand and apply properties of operations and the relationship between addition and subtraction (Standards 3–4)	
Standard 1.OA.4 Understand subtraction as an unknown-addend problem. *For example, subtract 10 – 8 by finding the number that makes 10 when added to 8*.	
Concepts and Skills to Master	
• Understand the relationship between addition and subtraction (understand the relationship between problem sets such as 2 + __ = 5 and 5 - 2 = __) • Understand subtraction as an unknown-addend problem • Write subtraction problems as addition equations with unknown addends	
Related Standards: Current Grade Level	Related Standards: Future Grade Levels
1.OA.1 Use addition and subtraction within 20 with unknowns in all positions. **1.OA.3** Use properties to add and subtract **1.OA.6** Add and subtract within 20 using relationships between addition and subtraction	**2.NBT.7** Add and subtract within 1,000 using strategies based on relationships between addition and subtraction. **2.NBT.9** Explain why addition and subtraction strategies work **3.NBT.2** Fluently add and subtract within 1,000 using relationships between addition and subtraction
Critical Background Knowledge from Previous Grade Levels	
• Solve addition and subtraction problems with 10 (K.OA.2)	
Academic Vocabulary	
related facts, add, addend, subtract, minus, total	

Suggested Models	Suggested Strategies
	**For Sums to 10** Think-Addition uses known addition facts to solve for the unknown part or quantity within a problem. When students use this strategy, they think, "What goes with this part to make the total?" The think-addition strategy is particularly helpful for subtraction facts with sums of 10 or less and can be used for sixty-four of the 100 subtraction facts. Therefore, in order for think-addition to be an effective strategy, students must have mastered addition facts first. For example, when working with the problem 9 - 5 = , First Graders think "Five and what makes nine?", rather than relying on a counting approach in which the student counts 9, counts off 5, and then counts what's left. When subtraction is presented in a way that encourages students to think using addition, they use known addition facts to solve a problem. Example: 10 – 2 = Student: "2 and what make 10? I know that 8 and 2 make 10. So, 10 – 2 = 8." **For Sums Greater than 10** The 36 facts that have sums greater than 10 are often considered the most difficult for students to master. Many students will solve these particular facts with Think-Addition (described above), while other students may use other strategies described below, depending on the fact. Regardless of the strategy used, all strategies focus on the relationship between addition and subtraction and often use 10 as a benchmark number. Build Up Through 10: This strategy is particularly helpful when one of the numbers to be subtracted is 8 or 9. Using 10 as a bridge, either 1 or 2 are added to make 10, and then the remaining amount is added for the final sum. Example: 15 – 9 = Student A: "I'll start with 9. I need one more to make 10. Then, I need 5 more to make 15. That's 1 and 5- so it's 6. 15 – 9 = 6." Student B: "I put 9 counters on the 10 frame. Just looking at it I can tell that I need 1 more to get to 10. Then I need 5 more to get to 15. So, I need 6 counters." **B**ack Down Through 10: This strategy uses take-away and 10 as a bridge. Students take away an amount to make 10, and then take away the rest. It is helpful for facts where the ones digit of the two-digit number is close to the number being subtracted. Example: 16 – 7 = Student A: "I'll start with 16 and take off 6. That makes 10. I'll take one more off and that makes 9. 16 – 7 = 9." Student B: "I used 16 counters to fill one ten frame completely and most of the other one. Then, I can take these 6 off from the 2nd ten frame. Then, I'll take one more from the first ten frame. That leaves 9 on the ten frame."
Image and Text Source: http://www.dpi.state.nc.us/docs/curriculum/mathematics/scos/1.pdf	

Represent and solve problems involving addition and subtraction within 20 (Standards 1–2, 5–6)

Standard 1.OA.5 Relate counting to addition and subtraction. *For example, by counting on 2 to add 2.*

Concepts and Skills to Master

- Understand and use counting on to solve addition problems
- Understand and use counting backward to solve subtraction problems

Teacher Note: When solving addition and subtraction problems to 20, First Graders often use counting strategies, such as counting all, counting on, and counting back, before fully developing the essential strategy of using 10 as a benchmark number. Once students have developed counting strategies to solve addition and subtraction problems, it is very important to move students toward strategies that focus on composing the decomposing numbers using ten as a benchmark number, as discussed in 1.OA.6, particularly since counting becomes a hindrance when working with larger numbers. (http://www.dpi.state.nc.us/docs/curriculum/mathematics/scos/1.pdf)

Related Standards: Current Grade Level	Related Standards: Future Grade Levels
1.OA.1 Use addition and subtraction within 20 **1.OA.6** Add and subtract within 20 **1.NBT.1** Count to 120, starting with any number less than 120	**2.OA.2** Fluently add and subtract within 20 **2.NBT.2** Count within 1,000, skip-count by 5's, 10's, and 100's

Critical Background Knowledge from Previous Grade Levels

- Count to 100 by ones and tens and count forward beginning from any number (K.CC.1, K.CC.2)
- Read and write numerals from 0-20 and represent a number of objects with a written numeral, recognize 0 represents a count of zero (K.CC.3)
- Understand the relationship between numbers and quantities; connect counting to cardinality, understand one-to-one correspondence (K.CC.4)
- Use matching or counting strategies to identify whether the number of objects is greater than, less than, or equal to another group (K.CC.6)
- Solve addition and subtraction word problems within 10 and fluently add and subtract using numbers within 5 (K.OA.2, K.OA.5)

Academic Vocabulary

counting all, counting on, counting backward, add, subtract, sum, addend, numerals

Suggested Models	Suggested Strategies
Example: 15 + 2 = ___ Counting All: The student counts out fifteen counters. Then adds two more counters. The student counts all of the counters starting at 1 (1, 2, 3, 4…14, 15, 16, 17) to find the total amount. Counting On: Holding 15 in their head, the student holds up one finger and says 16, then holds up another finger and says 17. The student knows that 15 + 2 is 17, since she counted on 2 using her fingers. Counting All: The student counts out twelve counters. Then removes 3 of them. To determine the total amount, the student counts each one (1, 2, 3, 4, 5, 6, 7, 8, 9) to find out the final amount. Counting Back: Keeping 12 in his head, the student counts backwards, "11" as he holds up one finger; says "10" as he holds up a second finger, says, "9" as he holds up a third finger. Seeing that he has counted back 3 since he is holding up 3 fingers, the student states that 12 – 3 = 9.	• Counting All: Students count all objects to determine the total amount • Counting on and Counting back: Students hold a "start number" in their head and count on/back from that number • Use counters to model counting on or counting backward • Use base ten blocks • Use hundreds chart

Text Source: http://www.dpi.state.nc.us/docs/curriculum/mathematics/scos/1.pdf

Represent and solve problems involving addition and subtraction within 20 (Standards 1–2, 5–6)

Standard 1.OA.6 Add and subtract within 20.

a. Use strategies such as counting on; making ten *(for example, 8 + 6 = 8 + 2 + 4 = 10 + 4 = 14)*; decomposing a number leading to a ten *(for example, 13 − 4 = 13 – 3 – 1 = 10 – 1= 9)*; using the relationship between addition and subtraction *(for example, knowing that 8 + 4 = 12, one knows 12 – 8 = 4)*; and creating equivalent but easier or known sums (*for example, adding 6 + 7 by creating the known equivalent 6 + 6 + 1 = 12 + 1 =13)*.

b. By the end of Grade 1, demonstrate fluency for addition and subtraction within 10.

Concepts and Skills to Master

- Addition within 20 (totals up to 20)
- Subtraction within 20 (subtract from up to 20)
- Fluently add and subtract within 10 (totals up to 10)
- Use addition and subtraction strategies flexibly, accurately and efficiently

Teacher Note: The standard calls for students to use a variety of reasoning strategies when adding and subtracting numbers within 20. Counting on should be seen as a thinking strategy, not a rote method. It involves seeing the first addend as embedded in the total and it involves a conceptual interplay between counting and the cardinality in the first addend. When working with larger numbers, counting on and counting all are not efficient strategies and may become a hindrance. Students should have ample experiences modeling these operations before working on fluency.

Related Standards: Current Grade Level	Related Standards: Future Grade Levels
1.OA.1 Use addition and subtraction within 20 to solve word problems	**2.OA.1** Use addition and subtraction within 100 to solve one-step and two-step problems
1.OA.2 Solve word problems with three whole number addends	**2.OA.2** Fluently add and subtract within 20
1.OA.3 Apply properties of operations to add and subtract	**2.NBT.5** Fluently add and subtract within 100
1.OA.4 Understand subtraction as an unknown addend problem	**3.OA.8.a** Solve two-step word problems using the four operations
1.OA.5 Relate counting to addition and subtraction	**3.OA.9** Identify arithmetic patterns including in addition tables
1.NBT.4 Add within 100	**3.NBT.2** Fluently add and subtract within 1,000

Critical Background Knowledge from Previous Grade Levels

- Fluently add and subtract using numbers within 5 (K.OA.5)
- Decompose numbers and solve add to and take away situations within 10 (K.OA.2, K.OA.3)
- Represent addition and subtraction within 10 using models (K.OA.1)
- Understand the relationship between numbers and quantities (K.CC.4)

Academic Vocabulary

add, plus, subtract, minus, difference, total, equation, addend

Suggested Models	Suggested Strategies
Example: 8 + 7= __ <u>Student 1</u> Making 10 and Decomposing a Number I know that 8 plus 2 is 10, so I decomposed (broke) the 7 up into a 2 and a 5. First I added 8 and 2 to get 10, and then added the 5 to get 15. 8 + 7 = (8 + 2) + 5 = 10 + 5 = 15	• Use models such as linking cubes, number lines, etc. to understand why and how various strategies work • Counting on: 8 + 4 = □ (8 …9, 10, 11, 12) • Counting back: 12 − 4 = □ (12…11, 10, 9,

Student 2

Creating an Easier Problem with Known Sums

I know 8 is 7 + 1.

I also know that 7 and 7 equal 14 and then I added 1 more to get 15.

8 + 7 = (7 + 7) + 1 = 15

Example: 14 − 6 = __

Student 1

Decomposing the Number You Subtract

I know that 14 minus 4 is 10 so I broke the 6 up into a 4 and a 2. 14 minus 4 is 10. Then I take away 2 more to get 8.

14 − 6 = (14 – 4) − 2 = 10 − 2 = 8

Student 2

Relationship between Addition and Subtraction

6 plus is 14, I know that 6 plus 8 is 14, so that means that 14 minus 6 is 8.

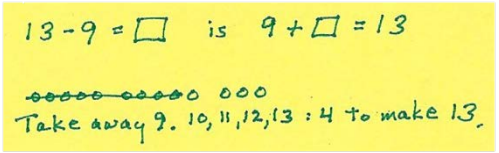
6 + 8 = 14 so 14 – 6 + 8

Algebraic ideas underlie what students are doing when they create equivalent expressions in order to solve.

8)

- Making tens: 5 + 7 = □ (5 = 2 + 3 so 3 + 7 = 10 therefore 10 + 2 = 12)
- Doubles: 6 + 6 = □
- Doubles plus/minus one: 6 + 7 = □ (6 + 6 + 1 or 7 + 7 – 1)
- Decomposing a number leading to a ten: 15 – 7 = □, so 15 – 5 = 10, therefore 10 – 2 = 8)
- Use working knowledge of fact families/related facts: 3 + 9 = 12 so 12 – 9 = □

"Taking away" indicated with horizontal line segment and solving by counting on to 13



Fluency within 10

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.

Numbers within ten include the following facts:

0 + 0	1 + 0	2 + 0	3 + 0	4 + 0	5 + 0	6 + 0	7 + 0	8 + 0	9 + 0	10 + 0	0 – 0	1 – 1	2 – 2	3 – 3	4 – 4	5 – 5	6 – 6	7 – 7	8 – 8	9 – 9	10 – 10
0 + 1	1 + 1	2 + 1	3 + 1	4 + 1	5 + 1	6 + 1	7 + 1	8 + 1	9 + 1			1 – 0	2 – 1	3 – 2	4 – 3	5 – 4	6 – 5	7 – 6	8 – 7	9 – 8	10 – 9
0 + 2	1 + 2	2 + 2	3 + 2	4 + 2	5 + 2	6 + 2	7 + 2	8 + 2					2 – 0	3 – 1	4 – 2	5 – 3	6 – 4	7 – 5	8 – 6	9 – 7	10 – 8
0 + 3	1 + 3	2 + 3	3 + 3	4 + 3	5 + 3	6 + 3	7 + 3							3 – 0	4 – 1	5 – 2	6 – 3	7 – 4	8 – 5	9 – 6	10 – 7
0 + 4	1 + 4	2 + 4	3 + 4	4 + 4	5 + 4	6 + 4									4 – 0	5 – 1	6 – 2	7 – 3	8 – 4	9 – 5	10 – 6
0 + 5	1 + 5	2 + 5	3 + 5	4 + 5	5 + 5											5 – 0	6 – 1	7 – 2	8 – 3	9 – 4	10 – 5
0 + 6	1 + 6	2 + 6	3 + 6	4 + 6													6 – 0	7 – 1	8 – 2	9 – 3	10 – 4
0 + 7	1 + 7	2 + 7	3 + 7															7 – 0	8 – 1	9 – 2	10 – 3
0 + 8	1 + 8	2 + 8																	8 – 0	9 – 1	10 – 2
0 + 9	1 + 9																			9 – 0	10 – 1
0 + 10																					10 – 0

Image and Text Sources: http://www.ncpublicschools.org/docs/curriculum/mathematics/scos/1.pdf; https://commoncoretools.files.wordpress.com/2011/05/ccss_progression_cc_oa_k5_2011_05_302.pdf

Work with addition and subtraction equations (Standards 7–8).

Standard 1.OA.7 Understand the meaning of the equal sign, and determine whether equations involving addition and subtraction are true or false. *For example, which of the following equations are true and which are false?*
6 = 6, 7 = 8 – 1, 5 + 2 = 2 + 5, 4 + 1 = 5 + 2.

Concepts and Skills to Master

- Understand the meaning of the equal sign as a concept of balance
- Understand the equal sign represents an equivalent relationship where the left side of an equation has the same value as the right side of the equation
- Apply the meaning of the equal sign to determine if equations are true or false

Teacher Note: Some care should be taken with the equal sign as it is a relational symbol, not an operations symbol (like + and -). The equal sign means "is the same as." However, most children come to think of it as a symbol that tells you that the "answer is coming up." Students often interpret the equal symbol in much the same way as the = on a calculator. That is, it is the key you press to get the answer. An equation such as 4 + 8 = 3 + 9 has no "answer" and is still true because both sides stand for the same quantity. A good idea is to often use the phrase "is the same as" in place of or in conjunction with "equals" as you record and read equations with students. (Van de Walle, pp. 154)

Related Standards: Current Grade Level	Related Standards: Future Grade Levels
1.OA.1-6 Represent and solve problems involving addition and subtraction within 20 **1.OA.8** Determine the unknown whole number in an addition or subtraction equation	**2.OA.1** Use addition and subtraction within 100, use equations with a symbol for the unknown **2.OA.3** Write an equation to express an even number as a sum of two equal addends **2.OA.4** Write an equation to express the total number of objects arranged in a rectangular array **3.OA.3, 3.OA.4, 3.OA.5** Write equations to represent and solve multiplication and division problems with a symbol for the unknown

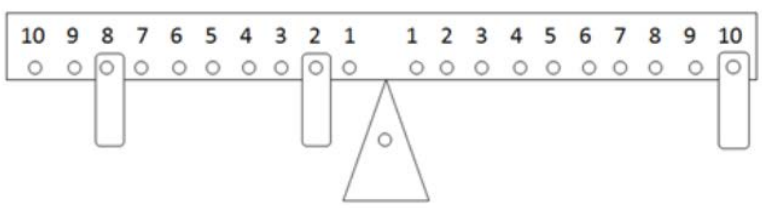
Critical Background Knowledge from Previous Grade Levels

- Solve addition and subtraction word problems within 10 (K.OA.2)
- Decompose numbers less than or equal to 10 into pairs. Record decompositions with equations (K.OA.3)
- Make sums of 10 using any number from 1 to 9 (K.OA.4)

Academic Vocabulary

equal, equation, equal sign, equal symbol, value, balance

Suggested Models



When students understand that an equation needs to "balance," with equal quantities on both sides of the equal sign, they understand various representations of equations, such as:

- an operation on the left side of the equal sign and the answer on the right side (5 + 8 = 13, 13 - 8 = 5)
- an operation on the right side of the equal sign and the answer on the left side (13 = 5 + 8, 5 = 13 - 8)
- numbers on both sides of the equal sign (6 = 6)
- operations on both sides of the equal sign (5 + 2 = 3 + 3 + 1, 5 + 2 = 10 - 3)

Suggested Strategies

- Use a variety of balance scales to represent equations with numbers and operations on both sides of the equal sign
- Use balance scales to create equations that are true and equations that are false
- Use drawings to represent the balance of the quantities on both sides of the equal sign
- Determine if given equations are true or false (True or False: 5 + 1 = 4 + 2; 2 + 3 = 2 + 4)
- Given a false equation, rewrite the equation to make it true
- Balance equations with unknowns (3 + 4 =__ + 5)

Image and text from: http://www.dpi.state.nc.us/docs/curriculum/mathematics/scos/1.pdf

Work with addition and subtraction equations (Standards 7–8).	
Standard 1.OA.8 Determine the unknown whole number in an addition or subtraction equation relating three whole numbers. *For example, determine the unknown number that makes the equation true in each of the equations 8 + ? = 11, 5 = ? – 3, 6 + 6 = ?*	
Concepts and Skills to Master	
• Understand that equations involving addition and subtraction relates three whole numbers in related facts (3 + __ = 11; 11 - __ = 3; 11 - 3 = __) • Determine and represent an unknown whole number in an addition and subtraction equation, using three whole numbers	
Related Standards: Current Grade Level	Related Standards: Future Grade Levels
1.OA.1 Add and subtract within 20 with unknowns in all positions. **1.OA.2** Solve word problems that call for addition of three whole numbers. Use equations with a symbol for the unknown whole number. **1.OA.4** Understand subtraction as an unknown-addend problem. **1.OA.6** Add and subtract within 20 using the relationship between addition and subtraction **1.OA.7** Understand the meaning of the equal sign	**2.OA.1** Use addition and subtraction within 100 with unknowns in all position. **2.OA.2** Add and subtract within 20 using the relationship between addition and subtraction. **2.NBT.5, 2.NBT.7** Fluently add and subtract within 100 and 1,000 using the relationship between addition and subtraction. **3.OA.4** Determine the unknown whole number in a multiplication or division equation **3.OA.6** Understand division as an unknown-factor problem.
Critical Background Knowledge from Previous Grade Levels	
• Add and subtract within 10 (K.OA.2) • Decompose numbers less than or equal to 10 (K.OA.3) • Make sums of 10 using any number from 1 to 9 (K.OA.4) • Fluently add and subtract within 5 (K.OA.5)	
Academic Vocabulary	
related facts, add, addend, subtract, minus, total, equal, equation, unknown number	
Suggested Models	Suggested Strategies
See Suggested Models and Suggested Strategies for Standard 1.OA.4.	

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 Apart[3]	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	Larger Unknown	Smaller Unknown
Compare[4]	("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

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.

Extend the counting sequence (Standard 1)

Standard 1.NBT.1 Count to 120, starting at any number less than 120. In this range, read and write numerals and represent a number of objects with a written numeral.

Concepts and Skills to Master

- Understand there is an ordered sequence of counting numbers
- Say counting numbers in the correct sequence from 1 to 120
- Say counting numbers in the correct sequence starting at any number less than 120
- Recognize and write numerals 0 - 120
- Represent a number of objects with a written numeral, not necessarily counting to name the quantity
- Write a numeral given the name

Related Standards: Current Grade Level	Related Standards: Future Grade Levels
1.NBT.2 Understand that the two digits of a two-digit number represent amounts of tens and ones **1.OA.5** Relate counting to addition and subtraction (for example, by counting on 2 to add 2)	**2.NBT.1** Understand that the three digits of a three-digit number represents amounts of hundreds, tens and ones **2.NBT.2** Count within 1,000; skip-counting by fives, tens, and hundreds **2.NBT.3** Read and write numbers to 1,000 using base-ten numerals, number names, and expanded form

Critical Background Knowledge from Previous Grade Levels

- Count to 100 by ones and tens (K.CC.1)
- Count forward beginning from any number (K.CC.2)
- Read and write numerals from 0-20 (K.CC.3)
- Represent a number of objects with a written numeral, recognize 0 represents a count of zero (K.CC.3)
- Understand the relationship between numbers and quantities; connect counting to cardinality, understand one-to-one correspondence (K.CC.4)

Academic Vocabulary

counting numbers 1–120, hundred, tens, ones, quantity, numeral, number, sequence, represent, how many

Suggested Models

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110
111	112	113	114	115	116	117	118	119	120

34

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43

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Suggested Strategies

- Use a 120 chart to identify numbers and patterns
- Use base-ten rods and unit cubes while counting
- Use a partially completed hundreds chart and fill in missing numbers using counting and patterns
- Discuss the difference between reversed numbers, such as 34 and 43

Understand place value (Standards 2–3)

Standard 1.NBT.2 Understand that the two digits of a two-digit number represent amounts of tens and ones. Understand the following as special cases:
a. 10 can be thought of as a bundle of ten ones, called a "ten."
b. The numbers from 11 to 19 are composed of a ten and one, two, three, four, five, six, seven, eight, or nine ones.
c. The numbers 10, 20, 30, 40, 50, 60, 70, 80, 90 refer to one, two, three, four, five, six, seven, eight, or nine tens (and 0 ones).

Concepts and Skills to Master

- Understand that 10 can be represented as a bundle of ten ones-called a “ten.” This is known as unitizing
- Understand that in place value a specific digit represents how many tens or how many ones compose the number
- Use place value language to describe amounts of tens and ones. For example, 42 is four tens and two ones
- Identify decade numbers (10, 20, 30, 40, 50, 60, 70, 80, 90) as groups of ten with no ones leftover

Teacher Note: In kindergarten, students compose and decompose numbers from 11–19 into ten ones and some further ones. They do not unitize a group of ten ones as a “ten.” In first grade, students extend this understanding to unitize a group of ten ones as a “ten.” They also understand two-digit numbers as having multiple “tens.”

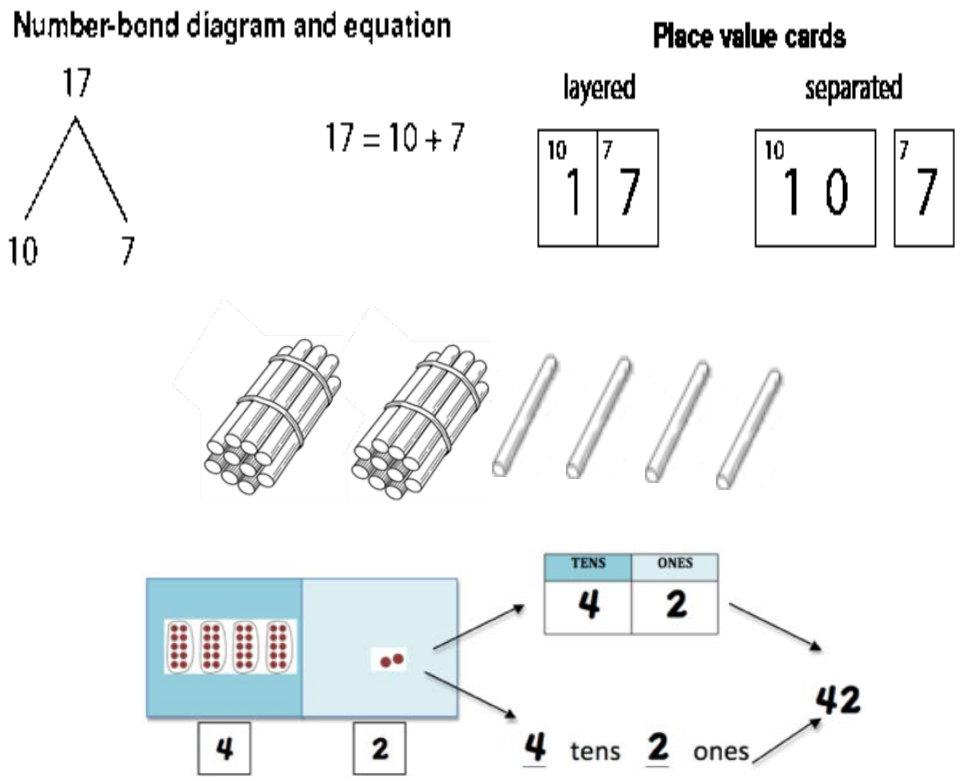
Related Standards: Current Grade Level	Related Standards: Future Grade Levels
1.NBT.3 Compare two two-digit numbers based on meanings of the tens and ones digits **1.NBT.4** Add within 100, using concrete models or drawings based on place value; Understand that it is sometimes necessary to compose a ten **1.NBT.5** Given a two-digit number, mentally find 10 more or 10 less than the number without having to count **1.NBT.6** Subtract multiples of 10 in the range 10-90 from multiples of 10 in the range 10-90	**2.NBT.1** Understand that the three digits of a three-digit number represent amounts of hundreds, tens, and ones **2.NBT.2** Count within 1,000; skip count by fives, tens, and hundreds **2.NBT.3** Read and write numbers to 1000 using base-ten numerals, number names, and expanded form **2.NBT.4** Compare two three digit numbers based on the meanings of the hundreds, tens, and ones **3.NBT.1** Use place value understanding to round whole numbers to the nearest 10 or 100

Critical Background Knowledge from Previous Grade Levels

- Compose and decompose numbers from 11–19 into ten ones and some further ones. Use objects or drawings and record each composition or decomposition by a drawing or equation (K.NBT.1)
- Count to 100 by ones and tens (K.CC.1)
- Read and write numbers using base ten numerals from 0–20. Represent a number of objects with a written numeral. (K.CC.3)

Academic Vocabulary

“a ten”, tens, ones, digit(s), decade number, decompose, compose, bundle, number names 1-99, place value

Suggested Models	Suggested Strategies
 Also see Suggested Models for Standards K.NBT.1	• Use a variety of groupable objects such as counters with cups, linking cubes, and bundles of sticks to represent a number from 11-99 • Use ten frames to represent a number from 11-19 and multiple ten frames to represent numbers 20-99 • Use a variety of pre-grouped base-ten objects such as base-ten blocks and pre-grouped bundles and linking cubes • Use place value mats and drawings to represent a number from 11-99 • Use place value cards to help students identify the value of the number in the tens place and the value of the number in the ones place and represent it in expanded form • Write expanded form equations based on physical and visual representations • Move from counting all to recognizing tens and some more ones • Move from groupable objects to pre-grouped base ten objects (cups of beans to base ten blocks) • Use number lines and hundreds charts to represent a number from 11–99.
Images Sources: http://www.dpi.state.nc.us/docs/curriculum/mathematics/scos/1.pdf ; http://commoncoretools.me/wp-content/uploads/2015/03/ccss_progression_nbp_k5_2015_03_16.pdf	

Understand place value (Standards 2–3)

Standard 1.NBT.3 Compare two two-digit numbers based on meanings of the tens and ones digits, recording the results of comparisons with the symbols >, =, and <.

Concepts and Skills to Master

- Understand that when comparing two numbers, one looks at the whole number, not just individual digits
- Understand that a number (greater than 0) in the tens place always has a greater value than the number in the ones place
- Generalize that the number with the most tens is greater
- Understand that when comparing two numbers if the number of tens is the same, the number with more ones is greater
- Use terms including greater than, more than, less than, fewer than, equal to, and same as, to describe comparisons
- Understand the meaning of the symbols >, =, and < and use them to correctly to compare two-digit numbers
- Understand that two two-digit numbers that have equal value are represented by the equal sign

Teacher Note: In kindergarten, students use verbal language to identify whether groups of objects or numerals are greater than, less than or equal to other groups of objects or numerals. First grade is the first time students are introduced to using the symbols to record comparisons. Emphasis should be placed on the meaning of quantities rather than tricks such as "the alligator eats the bigger number," etc. The inequality symbols (<, >) are shortcuts for identifying the relationship between two numbers where one is greater or smaller than the other. The statements are read from left to right (15 < 28 is read "fifteen is less than twenty-eight").

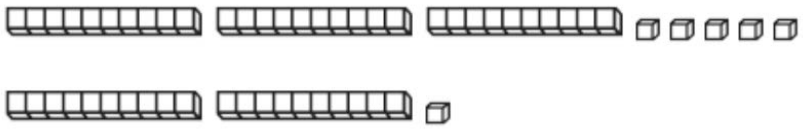
Related Standards: Current Grade Level	Related Standards: Future Grade Level
1.NBT.2 Understand that the two digits of a two-digit number represent amounts of tens and ones **1.OA.7** Understand the meaning of the equal sign	**2.NBT.1** Understand that the three digits of a three-digit number represent amounts of hundreds, tens, and ones **2.NBT.3** Read and write numbers to 1,000 using base-ten numerals, number names and expanded form **2. NBT.4** Compare two three-digit numbers based on meanings of the meanings of the hundreds, tens, and ones digits, using >, =, and <, symbols to record the results of comparisons

Critical Background Knowledge from Previous Grade Levels

- Compose and decompose numbers from 11-19 into ten ones and some further ones (K.NBT.1)
- Identify whether the number of objects in one group is greater than, less than or equal to the number of objects in another group (K.CC.6)
- Compare two numbers between 1 and 10 presented as written numerals using "great than," "less than," or "equal to." (K.CC.7)

Academic Vocabulary

compare, more, greater than (>), more than, most, less, less than (<), fewer, least, equal (=), same as

Suggested Models	Suggested Strategies
 **35 > 21 or 21 < 35**	• Use concrete models such as objects on place value charts, tens frames, base-ten blocks, hundreds chart, and number lines to compare two 2-digit numbers • Write two two-digit numbers in expanded form and compare the value of the tens

Use place value understanding and properties of operations to add and subtract (Standards 4–6).

Standard 1.NBT.4 Add within 100, including adding a two-digit number and a one-digit number, and adding a two-digit number and a multiple of 10, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used. Understand that in adding two-digit numbers, one adds tens to tens and ones to ones, and that it is sometimes necessary to compose a ten.

Concepts and Skills to Master

- Use place value understanding to compute sums within 100 using concrete objects, place value cards, or drawings
- Add a two-digit number and a one-digit number using a variety of strategies
- Add a two-digit number and a multiple of 10 using a variety of strategies
- Use the commutative property when adding (students may, but need not use formal term)
- Connect physical representations (objects) to visual representations (drawings)
- Connect physical and visual representations to written methods (expressions, equations, expanded from, etc.) and explain the reasoning used when adding
- Understand that in adding two-digit numbers, one adds tens to tens and ones to ones
- Understand that it is sometimes necessary to compose a ten (regroup)
- Identify when it is necessary to compose a ten (regroup) (45+7= 52 When adding the 5 ones to the 7 ones, a new ten is composed which makes 12. 40 and 12 have a total of 52.)

Teacher Note: The standard algorithm of "carrying or borrowing" is neither an expectation nor a focus in first grade. Students use a variety of strategies for addition and subtraction in grades K-3. By the end of third grade students use a range of algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction to fluently add and subtract within 1,000.

Related Standards: Current Grade Level	Related Standards: Future Grade Levels
1.OA.1 Use addition and subtraction within 20 to solve word problems by using objects, drawings, and equations with a symbol for the unknown number to represent the problem **1.OA.3** Apply properties of operations as strategies to add such as the commutative and associative properties of addition **1.OA.5** Relate counting to addition and subtraction. For example, by counting on 2 to add 2. **1.OA.6** Add and subtract within 20, demonstrate fluency for addition and subtraction within 10 **1.NBT.5** Given a two-digit number, mentally find 10 more than the number, without having to count; explain the reasoning used.	**2.NBT.5** Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction **2.OA.1** Use addition and subtraction within 100 to solve one- and two-step word problems **2.MD.5** Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units **2.MD.8** Solve word problems involving dollar bills, quarters, dimes, nickels, and pennies **3.NBT.2** Fluently add and subtract within 1,000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction

Critical Background Knowledge from Previous Grade Levels

- Understand that the two digits of a two-digit number represent amounts of tens and ones (1.NBT.2)
- Solve addition and subtraction word problems within 10 (K.OA.2)
- Make sums of 10 using any number from 1 to 9 (K.OA.4)
- Compose and decompose numbers from 11–19 into ten ones and some further ones (K.NBT.1)

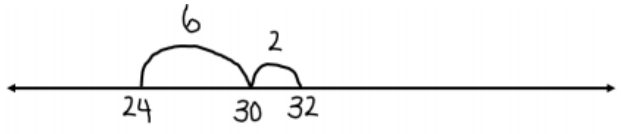
Academic Vocabulary
place value, one, tens, add, compose (regroup), decompose, digit(s)

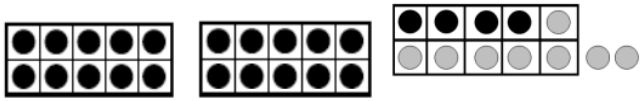
Suggested Models	Suggested Strategies

Example: 24 + 8 = ?

24 + 6 = 30

30 + 2 = 32

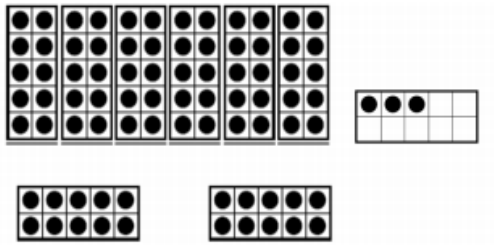




Example: 63+20=?

63 + 10 = 73

73 + 10 = 83



1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

- Use a hundreds chart to add
- Use an open number line to add
- Make the next ten to add a two digit number to a one digit number (24+8 by using 6 ones from the 8 ones and adding it to 24 to make the next ten which is 30. Then add 30 to the remaining 2 ones to get 32)
- Use both vertical and horizontal formats when writing equations
- Use mental computation strategies to develop number sense

Suggested Models (continued)

Compose 10 ones:

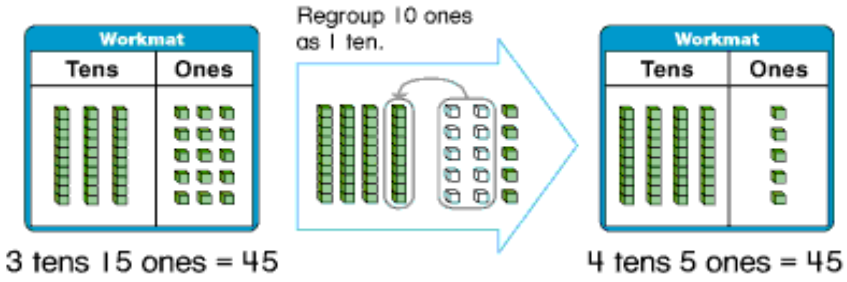


Image sources: http://www.dpi.state.nc.us/docs/curriculum/mathematics/scos/1.pdf, https://www.eduplace.com/math/mw/background/2/06/te_2_06_overview.html

1.NBT.4

Use place value understanding and properties of operations to add and subtract (Standards 4–6).

Standard 1.NBT.5 Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used.

Concepts and Skills to Master

- Use mental calculation in finding 10 more or 10 less than a given two-digit number without having to count by ones
- Explain the reasoning used in finding 10 more or 10 less
- Understand that only the tens place changes when mentally finding ten more or ten less

Related Standards: Current Grade Level	Related Standards: Future Grade Levels
1.NBT.2 Understand that the two digits of a two-digit number represent amounts of tens and ones **1.NBT.4** Add within 100, including adding a two-digit number and a one-digit number, and adding a two-digit number and a multiple of 10 **1.NBT.6** Subtract multiples of 10 in the range 10–90 from multiples of 10 in the range 10–90	**2.NBT.5, 2.MD.5** Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction **2.NBT.8** Mentally add 10 or 100 to a given number 100-900, and mentally subtract 10 or 100 from a given number 100-900 **2.MD.8** Solve word problems involving dollar bills, quarters, dimes, nickels, and pennies **3.NBT.2** Fluently add and subtract within 1,000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction

Critical Background Knowledge from Previous Grade Levels

- Relate counting to addition and subtraction (1.OA.5)
- Solve addition and subtraction word problems within 10 (K.OA.2)

Academic Vocabulary

more, less, add, subtract, ten, digit(s)

Suggested Models

There are 74 birds in the park. 10 birds fly away. How many birds are in the park now?

Student A

I thought about a number line. I started at 74. Then, because 10 birds flew away, I took a leap of 10. I landed on 64. So, there are birds left in the park.

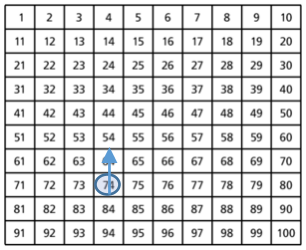
Student B

I pictured 7 ten frames and 4 left over in my head. Since 10 birds flew away, I took one of the ten frames away. That left 6 ten frames and 4 left over. So, there are 64 birds left in the park.

Student C

I know that 10 less than 74 is 64, so there are 64 birds in the park.

Students may use a hundreds chart to locate 74, then move up one row to 64 to show ten less.



1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Suggested Strategies

- Mentally picture a number line or hundred chart
- Mentally picture ten frames
- Mentally subtract or add 10 without having to count by ones
- Use drawings and layered cards to explain mental computations

Suggested Models (continued)

Place a figure like this on a hundreds chart to identify 10 more and 10 less. Students may also create an image like this to represent a portion of a hundreds chart to solve for 10 more and 10 less.

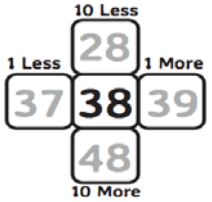


Image Source: http://www.dpi.state.nc.us/docs/curriculum/mathematics/scos/1.pdf

Use place value understanding and properties of operations to add and subtract (Standards 4–6).

Standard 1.NBT.6 Subtract multiples of 10 in the range 10–90 from multiples of 10 in the range 10–90 (positive or zero differences), using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.

Concepts and Skills to Master

- Subtract multiples of 10 from multiples of 10 in the range 10–90 to find the difference (70 – 40 = 30)
- Use concrete models or drawings to represent differences of multiples of 10
- Use strategies based on place value to subtract multiples of ten (7 tens minus 4 tens)
- Use strategies based on properties of operations and/or the relationship between addition and subtraction to subtract multiples of ten (80 - 70 as an unknown addend addition problem, 70 + ? = 80, reason that one ten must be added to 70 to make 80, so 80 - 70 = 10)
- Connect the strategy used to a written method and explain the reasoning used when subtracting multiples of 10

Teacher Note: First graders are not expected to compute differences of two digit numbers other than multiples of ten (decade numbers including 10, 20, 30, 40, 50, 60, 70, 80, 90).

Related Standards: Current Grade Level	Related Standards: Future Grade Level
1.NBT.2 Understand that the two digits of a two-digit number represent amounts of tens and ones **1.NBT.4** Add within 100, including adding a two-digit number and a one-digit number, and adding a two-digit number and a multiple of 10 **1.NBT.5** Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used. **1.OA.4** Understand subtraction as an unknown-addend problems	**2.NBT.5** Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction **2.NBT.8** Mentally add 10 or 100 to a given number 100-900, and mentally subtract 10 or 100 from a given number 100-900 **2.MD.8** Solve word problems involving dollar bills, quarters, dimes, nickels, and pennies **3.NBT.2** Fluently add and subtract within 1,000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction

Critical Background Knowledge from Previous Grade Levels

- Relate counting to addition and subtraction (1.OA.5)
- Solve addition and subtraction word problems within 10 (K.OA.2)

Academic Vocabulary

less, difference, ten, digit(s), subtract, decade numbers

Suggested Strategies

- Use concrete models such as hundred charts, base ten blocks, and ten frames to subtract multiples of 10 from decade numbers
- Use drawings such as number lines to subtract multiples of 10 from decade numbers
- Use place value strategies to subtract multiples of 10 from decade numbers
- Use related addition facts to subtract multiples of 10 from decade numbers

Suggested Models

Example: There are 60 students in the gym. 30 students leave. How many students are still in the gym?

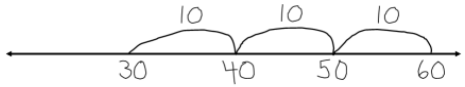
Student A

I used a number line. I started at 60 and moved back 3 jumps of 10 and landed on 30. There are 30 students left.

60 – 10 = 50

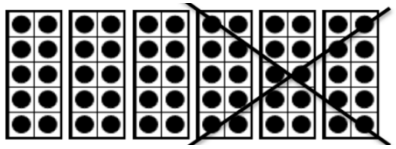
50 – 10 = 40

40 – 10 = 30



Student B

I had 6 ten frames- that's 60. I removed three ten frames because 30 students left the gym. There are 30 students left in the gym.



60 – 30 = 30

Student C

I thought, "30 and what makes 60?". I know 3 and 3 is 6. So, I thought that 30 and 30 makes 60. There are 30 students still in the gym.

Image and text source: http://www.dpi.state.nc.us/docs/curriculum/mathematics/scos/1.pdf

Measure lengths indirectly and by iterating length units (Standards 1–2).

Standard 1.MD.1 Order three objects by length; compare the lengths of two objects indirectly by using a third object.

Concepts and Skills to Master

- Understand that three objects can be compared with common measurable attributes
- Order objects from longest/tallest to shortest, or shortest to longest/tallest
- Directly compare two objects to a third object. Use those comparisons to indirectly compare the two objects. (The book is longer than the pencil. The crayon is shorter than the pencil. Therefore, the crayon is shorter than the book.)

Teacher Note: First grade students continue to use direct comparison to compare lengths. Direct comparison means that students compare the amount of an attribute in two objects without using a standard measuring tool. For example, two students may stand back to back to determine who is taller. Sometimes a third object can be used as an intermediary, allowing indirect comparison. For example, students may find objects in the classroom that are the same length as, longer than, and shorter than their forearm. They will know that the objects longer than their forearm are also longer than the objects shorter than their forearm.

Related Standards: Current Grade Level	Related Standards: Future Grade Levels
1.MD.2 Express the length of an object as a whole number of length units by laying multiple copies of a shorter object end to end **1.MD.4** Organize, represent and interpret data with up to three data points. Ask and answer questions about how many more or less in one category than in another	**2.MD.1** Measure the length of an object by selecting and using appropriate tools **2.MD.4** Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard length unit **3.MD.4** Generate measurement data by measuring lengths

Critical Background Knowledge from Previous Grade Levels

- Describe measurable attributes of objects, such as length (K.MD.1)
- Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. For example, directly compare the length of two pencils and describe one as shorter or longer (K.MD.2)

Academic Vocabulary

measure, order, first, second, third, length, height, more, less, longer than, taller than, shorter than, compare

Suggested Models	Suggested Strategies
Sample Question: The snake handler is trying to put the snakes in order from shortest to longest. She knows that the red snake is longer than the green snake. She also knows that the green snake is longer than the blue snake. In what order should she put the snakes?	● Given three objects order them from the tallest to shortest and shortest to tallest ● Compare heights of three classmates ● Build objects that are longer or shorter than a given object ● Use tape on the floor, a line on a page, or string to measure and compare objects

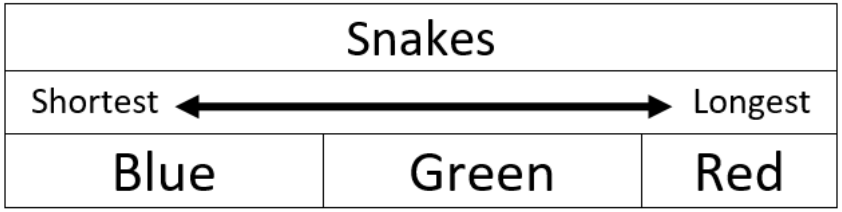


Image Source: http://www.dpi.state.nc.us/docs/curriculum/mathematics/scos/1.pdf

Measure lengths indirectly and by iterating length units (Standards 1–2).

Standard 1.MD.2 Express the length of an object as a whole number of length units, by laying multiple copies of a shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps. *Limit to contexts where the object being measured is spanned by a whole number of length units with no gaps or overlaps.*

Concepts and Skills to Master

- Understand that to measure an object, one must use the same unit of measurement, end-to-end, with no gaps or overlaps
- Measure the length of a variety of objects using non-standard tools such as paper clips, linking cubes, circle counters, etc.
- Record the length of objects with a whole number and label of an appropriate nonstandard unit

Teacher Note: Though this standard does not directly address comparison, students may use the same unit to measure both items, and use the information to draw conclusions about the length of the two objects. Students are not expected to measure with standard units until second grade.

Related Standards: Current Grade Level	Related Standards: Future Grade Levels
1.MD.1 Order three objects by length; compare the lengths of two objects indirectly by using a third object **1.NBT.1** Count to 120, represent a number of objects with a written numeral	**2.MD.1, 2.MD.2, 2.MD.3, 2.MD.4** Measure and estimate lengths in standard units **2.MD.5, 2.MD.6** Relate addition and subtraction to length; Represent lengths on a number line **2.MD.9, 3.MD.4** Generate measurement data by measuring lengths of several objects **3.MD.6** Measure area by counting unit squares

Critical Background Knowledge from Previous Grade Levels

- Describe measurable attributes of objects, such as length or weight (K.MD.1)
- Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute (K.MD.2)
- Understand the relationship between numbers and quantities connect counting to cardinality (K.CC.4)

Academic Vocabulary

unit, measure, gap, overlap, length

Suggested Models

Example: Which row is longer?

Student Incorrect Response: The row with 6 sticks is longer. Row B is longer.
Student Correct Response: They are both the same length. See, they match up end to end.

Researchers showed children two rows of matches. Although, from the adult perspective, the lengths of the rows were the same, many children argued that the row with 6 matches was longer because it had more matches. They counted units (matches), assigning a number to a discrete attribute (cardinality). In measuring continuous attributes, the sizes of the units (white and dark matches) must be considered. First grade students can learn that objects used as basic units of measurement must be the same size.

Suggested Strategies

- Use a variety of manipulatives (paper clips, linking cubes, teddy bear counters, etc.) as tools when measuring objects

- Measure the same object using different nonstandard units
- Have students use their own feet to measure distance (see the book, “How Big is a Foot?”)

Image Source: http://www.dpi.state.nc.us/docs/curriculum/mathematics/scos/1.pdf

Tell and write time (Standard 3).	
Standard 1.MD.3 Tell and write time in hours and half-hours using analog and digital clocks.	
Concepts and Skills to Master	
● Distinguish the difference between the minute and hour hands on an analog clock ● Tell time on analog and digital clocks to the hour and half hour ● Understand the relationship between the hour and minute hands as they move around the clock ● Represent time displayed in a digital format on an analog clock and time displayed on an analog in a digital format	
Related Standards: Current Grade Level	Related Standards: Future Grade Level
1.G.3 Partition circles into two equal shares. Describe the shares using the word halves	**2. MD.7** Tell and write time from analog and digital clocks to the nearest five minutes, using a.m. and p.m. **3.MD.1** Tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes, for example, by representing the problem on a number line diagram
Critical Background Knowledge	
• Students are initially introduced to time in first grade. There are no kindergarten standards related to time. • Students may have had informal experience with time in relation to daily activities (morning, afternoon, night, “we go to bed at 8 o’clock,” etc.)	
Academic Vocabulary	
time, hour, half hour, minute, minute hand, hour hand, analog clock, digital clock, o’clock, thirty (for example, “six”-thirty, “seven”-thirty), half past	
Suggested Models	Suggested Strategies
 All of these clocks indicte the hour of “two”, although they look slightly different. This is an important idea for students as they learn to tell time.	● Manipulate a physical clock to represent time in hours and half hours ● Manipulate a virtual clock to represent time in hours and half hours ● Match times on digital and analog clocks ● Apply time to real world situations (class schedule, school events, etc.)
Image Source: http://www.dpi.state.nc.us/docs/curriculum/mathematics/scos/1.pdf	

Represent and interpret data (Standard 4).

Standard 1.MD.4 Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.

Concepts and Skills to Master

- Organize given data with up to three categories (see Suggested Models below)
- Represent data with up to three categories
- Interpret data with up to three categories
- Ask and answer questions about the total number of data points (For example, How many in each category? How many more or less are in one category than in another?).
- Use measurement vocabulary to analyze data (see Academic Vocabulary below)

Teacher Note: There is no single correct way to represent categorical data. First grade students are not required to use any specific format. However, students should be familiar with mark schemes such as tally marks, pictorial representations, etc. A format that might be useful in first grade is a picture graph in which one picture represents one object. The Standards in grades 1–3 do not require students to gather categorical data.

Related Standards: Current Grade Level	Related Standards: Future Grade Levels
1.OA.1 Use addition and subtraction within 20 to solve word problems **1.OA.2** Solve word problems that call for addition of three whole numbers whose sum is less than or equal to 20	**2.MD.10** Draw a picture graph and a bar graph with single-unit scale to represent a data set with up to four categories **2.OA.1** Use addition and subtraction within 100 to solve one- and two-step word problems

Critical Background Knowledge from Previous Grade Levels

- Understand the relationship between numbers and quantities; connect counting to cardinality (K.CC.4)
- Count to answer how many up to 20 (K.CC.5)

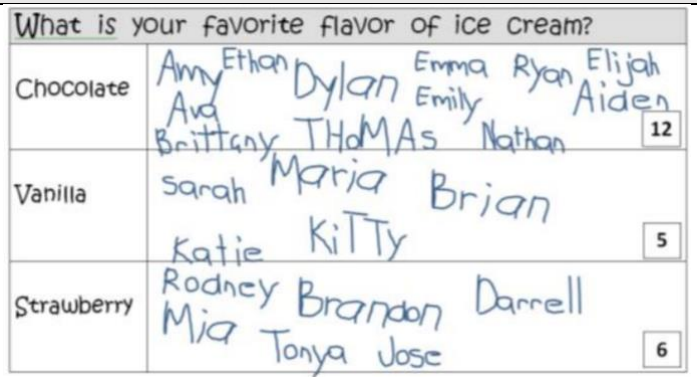
Academic Vocabulary

organize, sort, classify, group, graph, category, attribute, less than, more than, fewer, title, labels, data, most, least

Suggested Models

Sorting Categorical Data

The marks represent individual data points. The two category counts, 7and 8, are a numerical summary of the data.



12 people liked chocolate. Chocolate has the most votes. Vanilla has 5 votes. 1 more vote and it can tie with strawberry.

Suggested Strategies

- Think about survey questions to pose and limit responses to three categories (see Suggested Model on the left)
- Create a table or chart to organize data
- Use tally marks to collect data
- Ask questions to each other about data collected

Image Sources: http://www.dpi.state.nc.us/docs/curriculum/mathematics/scos/1.pdf; https://commoncoretools.files.wordpress.com/2011/06/ccss_progression_md_k5_2011_06_20.pdf

Identify the value of coins (Standard 5).	
Standard 1.MD.5 Identify the values of pennies, nickels, dimes and quarters and know their comparative values. *(For example, a dime is of greater value than a nickel.)* Use appropriate notation to designate a coin's value. *(For example, 5¢.)*	
Concepts and Skills to Master	
● Recognize names and identify values of pennies, nickels, dimes, and quarters ● Compare values of coins (a penny is of less value than a quarter, etc.) ● Use the cents symbol to write the value of a penny, a nickel, a dime, and a quarter (1¢, 5¢, 10¢, 25¢)	
Related Standards: Current Grade Level	Related Standards: Future Grade Levels
1.NBT.3 Compare numbers using the symbols >, =, and <	**2.MD.8** Solve word problems involving dollar bills, quarters, dimes, nickels, and pennies, using $ and ¢ symbols appropriately. *For example, if you have 2 dimes and 3 pennies, how many cents do you have?* • The context of money will be use when working on operations in all future grade levels
Critical Background Knowledge from Previous Grade Levels	
● Students are initially introduced to money in first grade. There are not any kindergarten standards related to money. ● Students may have had informal experience with money in relation to daily activities (counting change in a piggy bank, buying candy at the store, etc.) ● Compare two numbers using "greater than," "less than," or "equal to" (K.CC.7)	
Academic Vocabulary	
penny, nickel, dime, quarter, coin, cents, ¢, value, compare, greater, less	
Suggested Models	Suggested Strategies
● Expose students to older and newer physical coins  ● Expose students to the front and back sides of the coins 	● Relate physical coins to images of coins ● Match coins' notations and values to images of coins or physical coins ● Use physical coins to compare images, size, and color

Reason with shapes and their attributes (Standards 1–3).

Standard 1.G.1 Distinguish between defining attributes *(for example, triangles are closed and three-sided)* versus non-defining attributes *(for example, color, orientation, overall size)*; build and draw shapes that possess defining attributes.

Concepts and Skills to Master

- Distinguish between examples of geometric shapes (closed figures) and non-geometric shapes (open figures)
- Understand that defining attributes are those that determine the name of the shape (number of sides/angles, etc.)
- Understand that non-defining attributes have no impact on the name of the shape (color, orientation, overall size, etc.)
- Identify shapes (see Academic Vocabulary below for list of shapes) by their defining attributes as opposed to their non-defining attributes
- Draw and build shapes (accuracy of drawings may be limited by a student's fine motor skills; students are not expected to draw three-dimensional shapes)

Related Standards: Current Grade Level	Related Standards: Future Grade Levels
1.G.2 Compose 2-D and 3-D shapes to create composite shapes **1.G.3** Partition circles and rectangles into two and four equal shares	**2.G.1** Recognize and draw shapes having specified attributes **3.G.1** Understand that shapes in different categories may share attributes, and that the shared attributes can define a larger category

Critical Background Knowledge from Previous Grade Levels

- Correctly name shapes regardless of their orientations or overall sizes (K.G.2)
- Analyze, compare, and sort two- and three-dimensional shapes (K.G.4)
- Model and create shapes (K.G.5)
- Students work with squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders, and spheres in kindergarten

Academic Vocabulary

square, circle, triangle, rectangle, hexagon, cube, cone, cylinder, sphere, flat, solid, two-dimensional, three-dimensional, build, create, draw, attribute, defining attribute, non-defining attribute, closed figure, sides, corners/vertices, straight, round
Shapes new to first grade: trapezoid, half-circle, quarter-circle, rectangular prism

Suggested Models	Suggested Strategies
 Student may say, "I know that this shape is a triangle because it has 3 sides. It's also closed, not open."	• Draw/reproduce shapes in the air, in sand, in clay, etc. or model with components such as geoboards, sticks, marshmallows, pipe cleaners, etc. given a defining attribute • Move flexibly between shape names, defining attributes, shape pictures, and physical shape models • View similar shapes represented in various orientations, sizes, colors. Discuss the similar defining attributes which allows shapes to be identified by their name, regardless of their non-defining attributes • Create student-generated rules for sorting shapes using defining attributes. Have students share sorting rules with classmates and provide additional examples that support their rules

Image source: http://www.dpi.state.nc.us/docs/curriculum/mathematics/scos/1.pdf

Reason with shapes and their attributes (Standards 1–3).

Standard 1.G.2 Compose shapes.

a. Compose two-dimensional shapes (rectangles, squares, trapezoids, triangles, half circles, and quarter-circles) to create a composite shape, and compose new shapes from the composite shape.

b. Compose three-dimensional shapes (cubes, right rectangular prisms, right circular cones, and right circular cylinders) to create a composite shape, and compose new shapes from the composite shape. First grade students do not need to learn formal names such as "right rectangular prism."

Concepts and Skills to Master

- Create composite shapes (shapes built from more than one shape) made up of two or more geometric shapes
- Use composite shapes to create new composite shapes (add additional triangles to a rectangle created from two triangles to create a trapezoid, see below)
- Notice smaller shapes within a larger existing shape (see how two triangles make a square); relate composite shapes to part-whole relationships
- Describe properties of original and composite shapes using informal language such as corner, point, side, etc.
- Perceive a combination of shapes as a single new shape (identify a composite shape as a unit created from smaller units)

Teacher Note: This is a concrete standard. Students should informally explore combining physical objects through trial and error. Composing shapes supports measurement concepts and provides students with opportunities to informally examine attributes such as equal side lengths or angle sizes. Composing shapes supports composing and decomposing numbers (as six triangles compose a hexagon, ten ones compose a ten). Composing shapes also supports partitioning shapes for development of fraction understanding.

Related Standards: Current Grade Level	Related Standards: Future Grade Levels
1.G.1 Build and draw shapes that possess defining attributes **1.G.3** Partition circles and rectangles into two and four equal shares; describe the shares as halves, fourths, and quarters **1.MD.2** Measure length by iteration	**2.G.2** Partition into rows and columns and count to find the total **2.G.3** Partition circles and rectangles into two, three, and four equal shares; describe the shares as halves, thirds, half of, etc. **3.G.2** Partition shapes into parts with equal areas and express the area of each part as a unit fraction of the whole

Critical Background Knowledge from Previous Grade Levels

- Compose simple shapes to form larger shapes (K.G.6)
- Identify and describe shapes, including squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders, and spheres (K.G.1–3)

Academic Vocabulary

compose, two-dimensional, three-dimensional, rectangle, square, trapezoid, triangle, half circle, quarter-circle, cube, rectangular prism, cone, cylinder

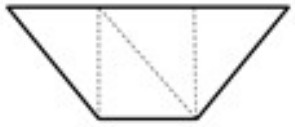
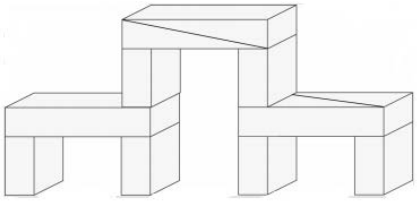
Suggested Models	Suggested Strategies
 	• Use manipulatives such as pattern blocks, tangrams, paper shapes or blocks to create, build, and add to shapes • Solve puzzles or create pictures from various two-dimensional and three-dimensional shapes

Image sources: http://commoncoretools.me/wp-content/uploads/2014/12/ccss_progression_gk6_2014_12_27.pdf
http://www.ncpublicschools.org/docs/curriculum/mathematics/scos/1.pdf

Reason with shapes and their attributes (Standards 1–3).

Standard 1.G.3 Partition circles and rectangles into two and four equal shares; describe the shares using the words halves, fourths, and quarters; and use the phrases half of, fourth of, and quarter of. Describe the whole as two or four of the shares. Understand that, for these examples, decomposing into more equal shares creates smaller shares.

Concepts and Skills to Master

- Recognize when shares are and are not equal
- Partition circles and rectangles into two equal shares or four equal shares
- Describe the whole as two shares when working with halves or as four shares when working with fourths/quarters
- Understand that the word halves is used to describe two equal shares that compose the whole (meaning that there are two parts and those two parts must be equal in size)
- Understand that the words fourths and quarters are used to describe four equal shares that compose the whole (meaning that there are four parts and those four parts must be equal in size)
- Reason that as the number of equal shares in the whole increases, the size of the share decreases (fourths/quarters are smaller than halves because the whole has been partitioned into more equal parts)

Teacher Note: Students need only explore fraction concepts using rectangles and circles. First grade students verbally use the words partition (not divide), halves, fourths, and quarters and the phrases half of, quarter of to describe their thinking. First grade students are not expected to use or recognize fraction notation (such as ¼). Fractional notation begins in third grade. Emphasis should be placed upon the relationship between the shares and the whole. Students should be given extensive opportunities to partition circles and rectangles rather than just identifying shares of pre-partitioned shapes.

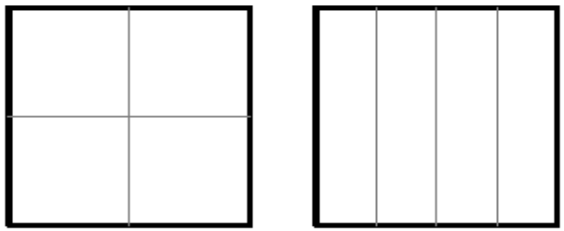
Related Standards: Current Grade Level	Related Standards: Future Grade Levels
1.G.2 Compose two- and three-dimensional shapes to create a composite shape **1.MD.3** Tell and write time in hours and half-hours	**2.G.3** Partition circles and rectangles into two, three, and four equal shares; describe the shares **3.NF.1** Understand unit fractions **3.NF.2** Understand a fraction as a number on the number line. **3.NF.3** Explain equivalence of fractions and compare fractions by reasoning about their size **3.G.2** Partition shapes into parts with equal areas and express each part as a unit fraction

Critical Background Knowledge from Previous Grade Levels

- Compose simple shapes to form larger shapes (K.G.6)
- Identify and describe shapes including squares, circles, triangles, rectangles (K.G.1–3)
- Notice smaller shapes within a larger existing shape (see how two triangles make a square) (1.G.2)

Academic Vocabulary

circle, rectangle, partition, decompose, shares, equal shares, halves, fourths, quarters, half of, fourth of, quarter of, whole

Suggested Models	Suggested Strategies
	• Partition regions into equal shares using a context (for example: cookies, pies, pizza, brownies, crackers, grass area) • Sort shapes that are partitioned into equal shares and shares that are not equal • Use manipulatives such as geoboards, paper rectangles and circles, food, etc. to partition shapes • Use context to compare the relative size of halves and fourths (Would you rather have half of this candy bar or a fourth of the same candy bar?)