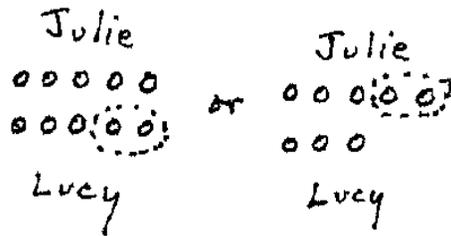


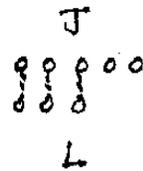
Represent and solve problems involving addition and subtraction within 20 (Standards 1–2, 5–6)	
Standard 1.OA.1 Use addition and subtraction within 20 to solve word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions. <i>For example, use objects, drawings, and equations with a symbol for the unknown number to represent the problem.</i>	
Concepts and Skills to Master	
<ul style="list-style-type: none"> 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) <ul style="list-style-type: none"> 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. <p>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.</p>	
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 1.OA.3 Apply properties of operations as strategies 1.OA.4 Understand subtraction as an unknown-addend problem 1.OA.5 Relate counting to addition and subtraction 1.OA.6a Add and subtract within 20 using a variety of strategies 1.OA.7 Understand the meaning of the equal sign 1.OA.8 Determine the unknown number in an addition or subtraction equation	2.OA.1 – 4 Represent and solve word problems involving addition and subtraction 2.NBT.5 – 9 Use place value understanding and properties of operations to add and subtract 2.MD.5 Solve word problems involving length with addition and subtraction 2.MD.8 Solve word problems involving money 3.OA.3 Use multiplication and division within 100 to solve word problems 3.OA.8 Solve two-step word problems
Critical Background Knowledge from Previous Grade Levels	
<ul style="list-style-type: none"> 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
<p>Problem: Julie has 5 apples. Lucy has 3 apples. How many more apples does Julie have than Lucy?</p> <p>OR</p> <p>How many fewer apples does Lucy have than Julie?</p>	<ul style="list-style-type: none"> • 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

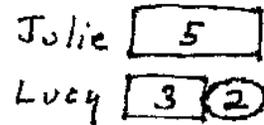
Representing the difference in a Compare problem

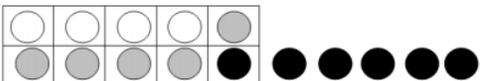
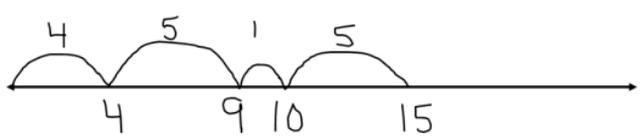


Compare problem solved by matching



Compare problem represented in tape diagram



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. <i>For example, use objects, drawings, and equations with a symbol for the unknown number to represent the problem.</i>	
Concepts and Skills to Master	
<ul style="list-style-type: none"> • 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
<p>1.OA.1 Solve word problems involving addition and subtraction within 20</p> <p>1.OA.3 Apply properties of operations as strategies</p> <p>1.OA.5 Relate counting to addition and subtraction</p> <p>1.OA.6a Add and subtract within 20 using a variety of strategies</p> <p>1.MD.4 Answer questions about the total number of data points from up to three categories</p>	<p>2.OA.1 – 4 Solve problems using addition and subtraction</p> <p>2.NBT.5 – 9 Use place value understanding & properties of operations to add and subtract</p> <p>2.MD.8 Solve word problems involving money</p> <p>3.OA.8 Solve two-step word problems</p>
Critical Background Knowledge from Previous Grade Levels	
<ul style="list-style-type: none"> • 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	Suggested Strategies
<p><u>Example:</u> Mrs. Smith has 4 oatmeal raisin cookies, 5 chocolate chip cookies, and 6 gingerbread cookies. How many cookies does Mrs. Smith have?</p> <p><u>Student A:</u> 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.</p> <div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 5px; margin-right: 20px;"> $4 + 5 + 6 = \text{☀}$ </div>  </div> <p><u>Student B:</u> 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.</p> <div style="display: flex; align-items: center;">  <div style="margin-left: 20px; border: 1px solid black; padding: 5px;"> $4 + 5 + 6 = \text{☀}$ </div> </div>	<ul style="list-style-type: none"> • 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. <i>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.)</i> First grade students need not use formal terms for these properties.	
Concepts and Skills to Master	
<ul style="list-style-type: none"> • 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 1.OA.6 Add and subtract within 20 1.NBT.4 Add within 100 1.NBT.6 Subtract multiples of 10	2.NBT.5, 2.NBT.7 Add and subtract within 100 and within 1,000 2.NBT.6 Add up to 4 two-digit numbers 2.NBT.8 Mentally add and subtract 10 or 100 from a given number 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	
<ul style="list-style-type: none"> • Solve addition and subtraction word problems within 10 (K.OA.2) 	
Academic Vocabulary	
add, subtract, equation, total, difference	
Suggested Strategies	
<ul style="list-style-type: none"> • 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:

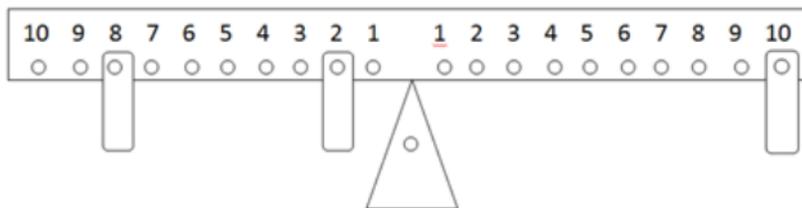
Cubes

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.



Number Balance

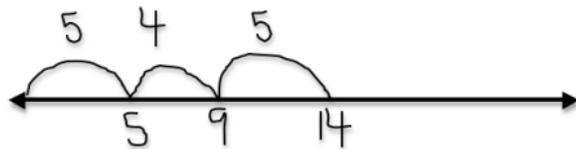
A student uses a number balance to investigate the commutative property. "If 8 and 2 equals 10, then I think that if I put a weight on 2 first this time and then on 8, it'll also be 10."



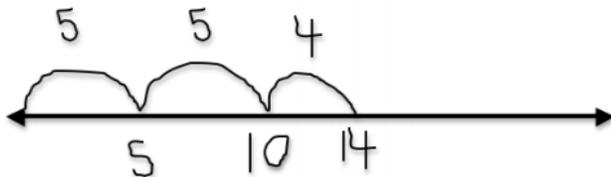
Associative Property Examples:

Number Line: $\square = 5 + 4 + 5$

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.



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!



Bar model with associative property:

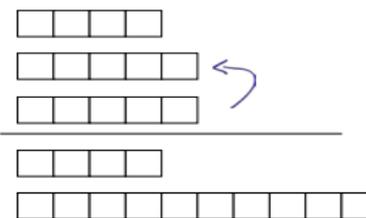
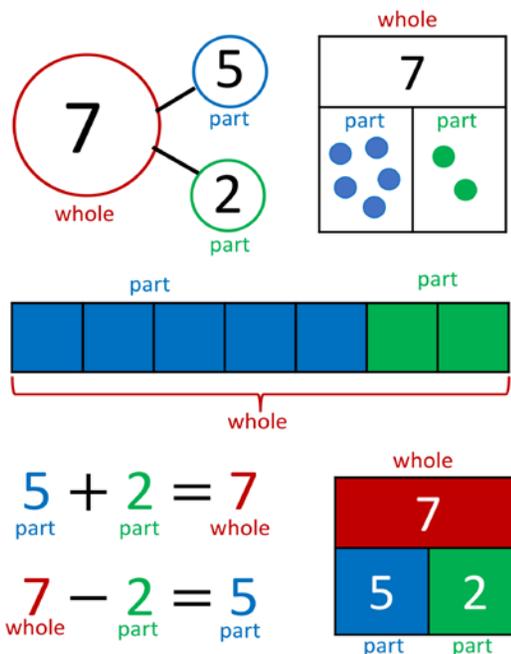


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Understand and apply properties of operations and the relationship between addition and subtraction (Standards 3–4)	
Standard 1.OA.4 Understand subtraction as an unknown-addend problem. <i>For example, subtract $10 - 8$ by finding the number that makes 10 when added to 8.</i>	
Concepts and Skills to Master	
<ul style="list-style-type: none"> • Understand the relationship between addition and subtraction (understand the relationship between problem sets such as $2 + \underline{\quad} = 5$ and $5 - 2 = \underline{\quad}$) • 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
<p>1.OA.1 Use addition and subtraction within 20 with unknowns in all positions.</p> <p>1.OA.3 Use properties to add and subtract</p> <p>1.OA.6 Add and subtract within 20 using relationships between addition and subtraction</p>	<p>2.NBT.7 Add and subtract within 1,000 using strategies based on relationships between addition and subtraction.</p> <p>2.NBT.9 Explain why addition and subtraction strategies work</p> <p>3.NBT.2 Fluently add and subtract within 1,000 using relationships between addition and subtraction</p>
Critical Background Knowledge from Previous Grade Levels	
<ul style="list-style-type: none"> • Solve addition and subtraction problems with 10 (K.OA.2) 	
Academic Vocabulary	
related facts, add, addend, subtract, minus, total	

Suggested Models

Part Part Whole



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, $10 - 2 = 8$.”

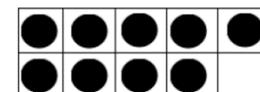
For Sums Greater than 10

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.”

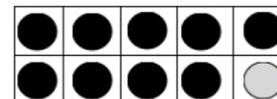


Back Down Through 10: This strategy uses take-away and 10 as a bridge.

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.”

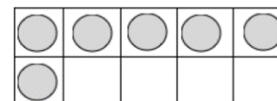


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Represent and solve problems involving addition and subtraction within 20 (Standards 1–2, 5–6)	
Standard 1.OA.5 Relate counting to addition and subtraction. <i>For example, by counting on 2 to add 2.</i>	
Concepts and Skills to Master	
<ul style="list-style-type: none"> • Understand and use counting on to solve addition problems • Understand and use counting backward to solve subtraction problems <p>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)</p>	
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	
<ul style="list-style-type: none"> • 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
<p>Example: $15 + 2 = \underline{\quad}$</p> <p><u>Counting All:</u> 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.</p> <p><u>Counting On:</u> 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.</p> <p><u>Counting All:</u> 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.</p> <p><u>Counting Back:</u> 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 $12 - 3 = 9$.</p>	<ul style="list-style-type: none"> • 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)	
<p>Standard 1.OA.6 Add and subtract within 20.</p> <p>a. Use strategies such as counting on; making ten (<i>for example, $8 + 6 = 8 + 2 + 4 = 10 + 4 = 14$</i>); decomposing a number leading to a ten (<i>for example, $13 - 4 = 13 - 3 - 1 = 10 - 1 = 9$</i>); using the relationship between addition and subtraction (<i>for example, knowing that $8 + 4 = 12$, one knows $12 - 8 = 4$</i>); and creating equivalent but easier or known sums (<i>for example, adding $6 + 7$ by creating the known equivalent $6 + 6 + 1 = 12 + 1 = 13$</i>).</p> <p>b. By the end of Grade 1, demonstrate fluency for addition and subtraction within 10.</p>	
Concepts and Skills to Master	
<ul style="list-style-type: none"> • 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 <p>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.</p>	
Related Standards: Current Grade Level	Related Standards: Future Grade Levels
<p>1.OA.1 Use addition and subtraction within 20 to solve word problems</p> <p>1.OA.2 Solve word problems with three whole number addends</p> <p>1.OA.3 Apply properties of operations to add and subtract</p> <p>1.OA.4 Understand subtraction as an unknown addend problem</p> <p>1.OA.5 Relate counting to addition and subtraction</p> <p>1.NBT.4 Add within 100</p>	<p>2.OA.1 Use addition and subtraction within 100 to solve one-step and two-step problems</p> <p>2.OA.2 Fluently add and subtract within 20</p> <p>2.NBT.5 Fluently add and subtract within 100</p> <p>3.OA.8.a Solve two-step word problems using the four operations</p> <p>3.OA.9 Identify arithmetic patterns including in addition tables</p> <p>3.NBT.2 Fluently add and subtract within 1,000</p>
Critical Background Knowledge from Previous Grade Levels	
<ul style="list-style-type: none"> • 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
<p>Example: $8 + 7 = \underline{\quad}$</p> <p><u>Student 1</u></p> <p>Making 10 and Decomposing a Number</p> <p>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.</p> <p>$8 + 7 = (8 + 2) + 5 = 10 + 5 = 15$</p>	<ul style="list-style-type: none"> • Use models such as linking cubes, number lines, etc. to understand why and how various strategies work • Counting on: $8 + 4 = \square$ (8 ...9, 10, 11, 12) • Counting back: $12 - 4 = \square$ (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: $14 - 6 = \underline{\quad}$

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.

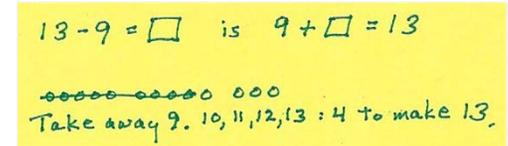
$6 + 8 = 14$ so $14 - 6 = 8$

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

8)

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

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



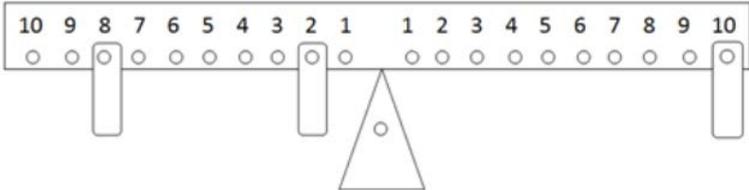
Fluency within 10

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).	
<p>Standard 1.OA.7 Understand the meaning of the equal sign, and determine whether equations involving addition and subtraction are true or false. <i>For example, which of the following equations are true and which are false?</i> $6 = 6$, $7 = 8 - 1$, $5 + 2 = 2 + 5$, $4 + 1 = 5 + 2$.</p>	
<p>Concepts and Skills to Master</p> <ul style="list-style-type: none"> • 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 <p>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)</p>	
<p>Related Standards: Current Grade Level</p> <p>1.OA.1-6 Represent and solve problems involving addition and subtraction within 20</p> <p>1.OA.8 Determine the unknown whole number in an addition or subtraction equation</p>	<p>Related Standards: Future Grade Levels</p> <p>2.OA.1 Use addition and subtraction within 100, use equations with a symbol for the unknown</p> <p>2.OA.3 Write an equation to express an even number as a sum of two equal addends</p> <p>2.OA.4 Write an equation to express the total number of objects arranged in a rectangular array</p> <p>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</p>
<p>Critical Background Knowledge from Previous Grade Levels</p> <ul style="list-style-type: none"> • 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) 	
<p>Academic Vocabulary</p> <p>equal, equation, equal sign, equal symbol, value, balance</p>	
<p>Suggested Models</p>  <p>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:</p> <ul style="list-style-type: none"> • 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 ($5 + 2 = 3 + 3 + 1$, $5 + 2 = 10 - 3$) 	<p>Suggested Strategies</p> <ul style="list-style-type: none"> • 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 ($3 + 4 = __ + 5$)
<p>Image and text from: http://www.dpi.state.nc.us/docs/curriculum/mathematics/scos/1.pdf</p>	

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. <i>For example, determine the unknown number that makes the equation true in each of the equations $8 + ? = 11$, $5 = ? - 3$, $6 + 6 = ?$</i>	
Concepts and Skills to Master	
<ul style="list-style-type: none"> Understand that equations involving addition and subtraction relates three whole numbers in related facts ($3 + \underline{\quad} = 11$; $11 - \underline{\quad} = 3$; $11 - 3 = \underline{\quad}$) 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
<p>1.OA.1 Add and subtract within 20 with unknowns in all positions.</p> <p>1.OA.2 Solve word problems that call for addition of three whole numbers. Use equations with a symbol for the unknown whole number.</p> <p>1.OA.4 Understand subtraction as an unknown-addend problem.</p> <p>1.OA.6 Add and subtract within 20 using the relationship between addition and subtraction</p> <p>1.OA.7 Understand the meaning of the equal sign</p>	<p>2.OA.1 Use addition and subtraction within 100 with unknowns in all position.</p> <p>2.OA.2 Add and subtract within 20 using the relationship between addition and subtraction.</p> <p>2.NBT.5, 2.NBT.7 Fluently add and subtract within 100 and 1,000 using the relationship between addition and subtraction.</p> <p>3.OA.4 Determine the unknown whole number in a multiplication or division equation</p> <p>3.OA.6 Understand division as an unknown-factor problem.</p>
Critical Background Knowledge from Previous Grade Levels	
<ul style="list-style-type: none"> 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 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? $5 = 0 + 5, 5 = 5 + 0$ $5 = 1 + 4, 5 = 4 + 1$ $5 = 2 + 3, 5 = 3 + 2$

	Difference Unknown	Larger Unknown	Smaller Unknown
Compare⁴	(“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.