Represent and solve problems involving addition and subtraction within 20

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.

Key Elements: The students must have an understanding of joining groups (add to, put together), separating groups (take from, take apart), and comparing groups (more than, less than, equal to).
*Please Note: First Grade work with one step word problems. Second grade works with one and two step word problems.

Addition and Subtraction situations by grade level

	Result Unknown	Change Unknown	Start Unknown
Add To	*A* bunnies sat on the grass. *B* more bunnies hopped there. How many bunnies are on the grass now? $A + B = \_$	*A* bunnies were sitting on the grass. Some more bunnies hopped there. Then there were *C* bunnies. How many bunnies hopped over to the first *A* bunnies? $A + \_ = C$	Some bunnies were sitting on the grass. *B* more bunnies hopped there. Then there were *C* bunnies. How many bunnies were on the grass before? $\_ + B = C$
Take From	*C* apples were on the table. I ate *B* apples. How many apples are on the table now? $C - B = \_$	*C* apples were on the table. I ate some apples. Then there were *A* apples. How many apples did I eat? $C - \_ = A$	Some apples were on the table. I ate *B* apples. Then there were *A* apples. How many apples were on the table before? $\_ - B = A$
	Total Unknown	**Both Addends Unknown[1]**	**Addend Unknown[2]**
Put Together/ Take Apart	*A* red apples and *B* green apples are on the table. How many apples are on the table? $A + B = \_$	Grandma has *C* flowers. How many can she put in her red vase and how many in her blue vase? $C = \_ + \_$	*C* apples are on the table. *A* are red and the rest are green. How many apples are green? $A + \_ = C$ $C - A = \_$
	Difference Unknown	**Bigger Unknown**	**Smaller Unknown**
Compare	*"How many more?"* version. Lucy has *A* apples. Julie has *C* apples. How many more apples does Julie have than Lucy? *"How many fewer?"* version. Lucy has *A* apples. Julie has *C* apples. How many fewer apples does Lucy have than Julie? $A + \_ = C$ $C - A = \_$	*"More"* version suggests operation. Julie has *B* more apples than Lucy. Lucy has *A* apples. How many apples does Julie have? *"Fewer"* version suggests wrong operation. Lucy has *B* fewer apples than Julie. Lucy has *A* apples. How many apples does Julie have? $A + B = \_$	*"Fewer"* version suggests operation. Lucy has *B* fewer apples than Julie. Julie has *C* apples. How many apples does Lucy have? *"More"* version suggests wrong operation. Julie has B more apples than Lucy. Julie has C apples. How many apples does Lucy have? $C - B = \_$ $\_ + B = C$

White shading indicates the four Kindergarten problem subtypes. Grade 1 and 2 students work with all subtypes and variants. Dark shaded problems are the four difficult subtypes or variants that students should work with in Grade 1 but need not master until Grade 2. Adapted from CCSS, p. 88, which is based on Mathematics Learning in Early Childhood: Paths Toward Excellence and Equity, National Research Council, 2009, pp. 32–33.

[1]This can be used to show all decompositions of a given number, especially important for numbers within 10. Equations with totals on the left help children understand that = does not always mean "makes" or "results in" but always means "is the same number as." Such problems are not a problem subtype with one unknown, as is the Addend Unknown subtype to the right. These problems are a

productive variation with two unknowns that give experience with finding all of the decompositions of a number and reflecting on the patterns involved.
[2]Either addend can be unknown; both variations should be included.

***Add To with Result Unknown and Take From with Result Unknown** highlight situations that are action oriented. These situations are easily modeled. The situations start with an amount that then changes by adding to or taking from the initial amount. The final result is the unknown amount. Students work with small numbers first. As students develop a greater understanding of the problem type they begin to work with larger numbers.

Example: Add to Result Unknown:

Jane sees 5 bunnies sitting on the grass.
3 more bunnies join them.
How many bunnies are sitting on the grass?

5 + 3 = ?

Example: Take From with Result Unknown:

Jane sees 8 bunnies sitting on the grass.
3 bunnies hop away.
How many bunnies are still sitting on the grass?

8 - 3 = ?

***In Put Together/Take Apart** situations students compose and decompose items depending on the unit given. There is not an actual action that occurs, but an abstract joining of two subcategories (for example seeing boys and girls as children, or seeing two different color groups by the defining characteristic of the main group), or thinking about a number as part of a set. (Example 1: a Set number of students, identify how many of them are girls, identify how many are boys?; Example 2: Set of colored marbles, how many are green? How many are blue?)

Example: Put Together/Take Apart Total Unknown: (Note: The model for this type of problem looks like the model for Add to Result Unknown problems.)

Bobby has 5 red marbles and 3 blue marbles.

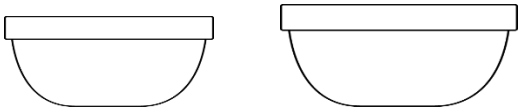
How many marbles does Bobby have?

5 + 3 = ?

Example: Put Together/Take Apart Both Addends Unknown:

Jane has 2 bowls and 8 cherries.

How can she put her cherries in her bowls?



#Add To/Take Apart Change Unknown highlight situations that are action oriented where the change in the action is unknown. These situations are more complex than Add To/Take From Result Unknown problem types. The initial and total amounts are known, but the change amount is not known. These problems can be solved with a situational equation or a solution equation (Situational equations model what problem says. Situation equations are equations that are related to the situation equation but do not exactly model the problem.)

Example Add To Change Unknown:

Jane sees 5 bunnies sitting on the grass.
Some more bunnies come.
Now there are 8 bunnies sitting on the grass.
How many bunnies came to the grass?

Situational Model and Equation:

Solution Model and Equation:

Students often start at the known Amount and count on to get to The total. They record their Thinking by drawing additional quantity to the Circles until they get to the total amount. Students then go back and count how many additional circles drawn to find the changed amount.

Using a solution equation reinforces the relationship between addition and subtraction. Students are able to move the unknown result making it a Result Unknown problem solved by subtraction instead of addition with an unknown addend as indicated by the context of the Problem.

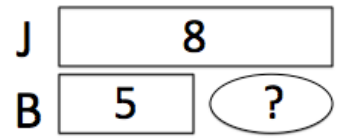
#Put Together/Take Apart Addend Unknown situations do not reflect an action in the quantities. The total amount is given and one part is known. Students solve to find the unknown part within the larger group.

Example Put Together/Take Apart Addend Unknown:

Jane sees 8 bunnies.
5 are brown the rest are white.
How many white bunnies does Jane see?

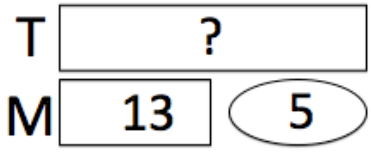
Compare Problems are new to 1st grade students. They involve seeing two different quantities, comparing the quantities to determine which quantity has more or fewer than the other quantity. Both quantities are represented in the situations and models. Students must deal with each quantity as individual and in relationship to the other quantity.

Example Compare Difference Unknown:

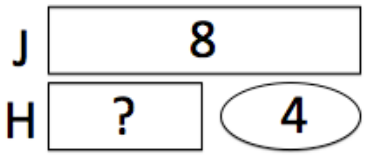


How Many More:
Jane has 5 bunnies.
Bobby has 3 bunnies.
How many more bunnies does
Jane have than Bobby?

How Many Fewer:
Lisa has 12 bows.
Katie has 8 bows.
How many fewer bows does Katie have than Lisa?



Bigger Unknown
Ted has 5 more stickers than Max.
Max has 13 stickers.
How many stickers does Ted have?



Smaller Unknown
Hunter has 4 fewer candy bars than John.
John has 8 candy bars.
How many candy bars does Hunter have?

Another strategy is to teach word problems without numbers. This helps students focus on context of the word problem instead of just grabbing the first two numbers they see and automatically adding them together.

Progression of Word Problems: (for properties, problems and context)

1. Practice with manipulatives (should have been mastered in Kindergarten)
2. Use pictures or models (should have been mastered in Kindergarten)
3. Do equations (they should understand the concept from using manipulatives and pictures before they do equations.) (should have been introduced and practiced in Kindergarten)