New York State Next Generation Mathematics Learning Standards Unpacking Document (DRAFT)

GRADE: 2	DOMAIN: Operations & Algebraic Thinking

CLUSTER: Represent and solve problems involving addition and subtraction.

Students build fluency and further develop their conceptual understanding of addition and subtraction within 100 by contextualizing their work. Using place value reasoning, properties of operations, mental strategies, and their understanding of renaming, they will represent and solve different situational problem types with unknowns in various positions (i.e., Result Unknown, Change Unknown, Start Unknown).

Grade Level Standard:

NY-2.OA.1a Use addition and subtraction within 100 to solve one-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions.

NY-2.OA.1b Use addition and subtraction within 100 to develop an understanding of solving two-step problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions.

PERFORMANCE/KNOWLEDGE TARGETS
(measurable and observable)

- Solve one-/two-step addition/subtraction word problems within 100 and explain reasoning used.
- Draw visual representations of addition/subtraction word problems within 100.
- Write an addition or subtraction equation to match a word problem.
- Solve a word problem for an unknown in all positions of addition and subtraction equations (by writing an equation with a symbol for the unknown).

ASPECTS OF RIGOR

Procedural Conceptual Application

MATHEMATICAL PRACTICES	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.
FOUNDATIONAL UNDERSTANDING	**NY-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/or comparing, with unknowns in all positions. **NY-1.NBT.4** Add within 100, including: • a two-digit number and a one-digit number; • a two-digit number and a multiple of 10. Use concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction. Understand that in adding two-digit numbers, one adds tens and tens, ones and ones, and sometimes it is necessary to compose a ten. Relate the strategy to a written representation and explain the reasoning used. **NY-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. (When solving any problem, students can choose a strategy).

The following pages contain EXAMPLES to support current instruction of the content standard and may be used at the discretion of the teacher and adapted to best serve the needs of the learners in the classroom.

Students are encouraged to be flexible in their thinking and to use multiple strategies in solving one-/two-step problems. For example, students might use tape diagrams, relating the diagrams to a situation equation (e.g., ____ – 36 = 60) and rewriting it as a result unknown equation (e.g., 60 + 36 = ____); this illustrates the relationship between operations and using this relationship to check their work. Students might also use arrow notation, counting on, place value blocks, ten-frames, hundreds charts, or drawings to support their work. Students should be connecting their model to the operation. This standard supports work with grade-level standards NY-2.NBT.5 and NY-2.NBT.9.

Active engagement in the modeling process is taking place as discussion ensues with each problem solved, with students sharing strategies, analyzing the efficiency of each, defending their work, and/or critiquing or supporting the work of their peers.

One-step word problems use one operation. Two-step word problems use two operations which may include the same operation or opposite operations; however, most work with two-step problems should involve single-digit addends which will allow the focus of the standard to be on the process involved when solving situational problems. See examples of two-step word problems on pg. 18 of the Draft K-5 Counting and Cardinality and Operations and Algebraic Thinking Progressions Document. As stated in the progressions, some problems may be difficult to represent with a single equation and may be better represented by successive drawings or some combination of a diagram for one step and an equation for the other. (Common Core Standards Writing Team. *Progressions for the Common Core State Standards in Mathematics* (2011 May 29 draft). *K, Counting and Cardinality; K–5, Operations and Algebraic Thinking.* Tucson, AZ: Institute for Mathematics and Education, University of Arizona).

In the Common Addition and Subtraction Situations Table below, the four unshaded (white) subtypes are mastered in Kindergarten. Grade 1 and 2 students work with all subtypes. Darker shading indicates the four difficult subtypes that students should work with in Grade 1 but need not master until Grade 2.

Common Addition and Subtraction Situations

		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? $A + B = \square$	*A* bunnies were on the grass. Some more bunnies hopped there. Then there were *C* bunnies. How many bunnies hopped over to the first *A* bunnies? $A + \square = C$	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? $\square + B = C$
Take From		*C* apples were on the table. I ate *B* apples. How many apples are on the table now? $C - B = \square$	*C* apples were on the table. I ate some apples. Then there were *A* apples. How many apples did I eat? $C - \square = A$	Some apples were on the table. I ate *B* apples. Then there were *A* apples. How many apples were on the table before? $\square - B = A$
		Total Unknown	**Both Addends Unknown**	**Addend Unknown**
Put Together/ Take Apart		*A* red apples and *B* green apples are on the table. How many apples are on the table? $A + B = \square$	Grandma has *C* flowers. How many can she put in her red vase and how many in her blue vase? $C = \square + \square$	*C* apples are on the table. *A* are red and the rest are green. How many apples are green? $A + \square = C$ $C - A = \square$
		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?	*Version with "More":* Julie has *B* more apples than Lucy. Lucy has *A* apples. How many apples does Julie have?	*Version with "More":* Julie has *B* more apples than Lucy. Julie has *C* apples. How many apples does Lucy have?
		"How many fewer?" version: Lucy has *A* apples. Julie has *C* apples. How many fewer apples does Lucy have than Julie? $A + \square = C$ $C - A = \square$	*Version with "Fewer":* Lucy has *B* fewer apples than Julie. Lucy has *A* apples. How many apples does Julie have? $A + B = \square$	*Version with "Fewer":* Lucy has *B* fewer apples than Julie. Julie has *C* apples. How many apples does Lucy have? $C - B = \square$ $\square + B = C$

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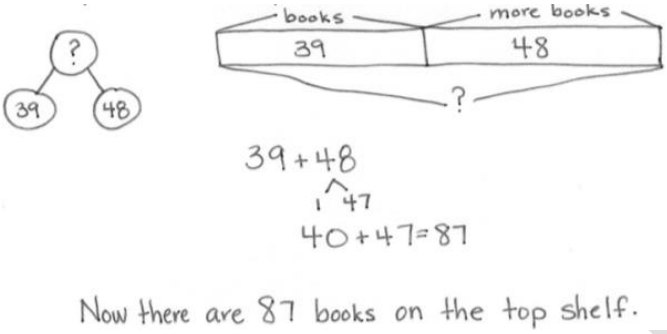
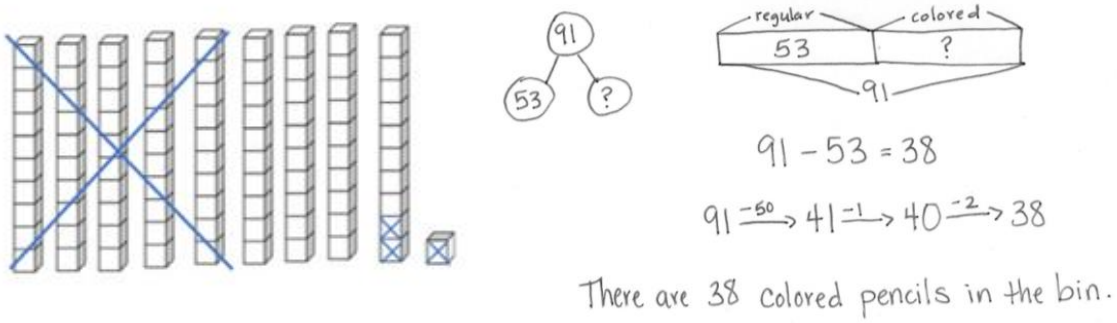
Example1: One-Step Word Problem Strategies
The following is taken from EngageNY Grade 2 Module 4, Lesson 5.
(Result Unknown/Addend Unknown)

- 39 books were on the top bookshelf. Marcy added 48 more books to the top shelf. How many books are on the top shelf now?

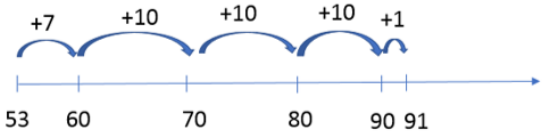


- There are 53 regular pencils and some colored pencils in the bin. There is a total of 91 pencils in the bin. How many colored pencils are in the bin?

  Using place value blocks, a student can start with 91 and take away 51. Student should explain how one of the tens units must be utilized to take away two more ones, so that 38 units in total remain. Students should associate the model with the equation 91-53 = ☐. Pictorial representations are shown below.



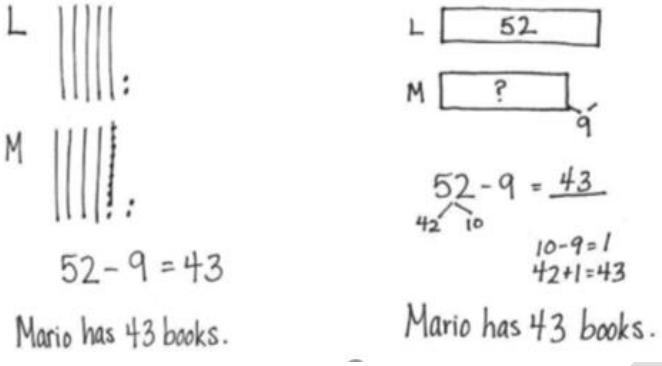
Students may choose to solve using a number line, starting with 53 and counting forward to 91, and answer the question "how many jumps does it take to make 53 become 91?" Students should relate this method to the equation 53 + ☐ = 91.



The following pages contain EXAMPLES to support current instruction of the content standard and may be used at the discretion of the teacher and adapted to best serve the needs of the learners in the classroom.

Example 2: Compare with Smaller Unknown

- Luigi has 9 more books than Mario. Luigi has 52 books. How many books does Mario have?

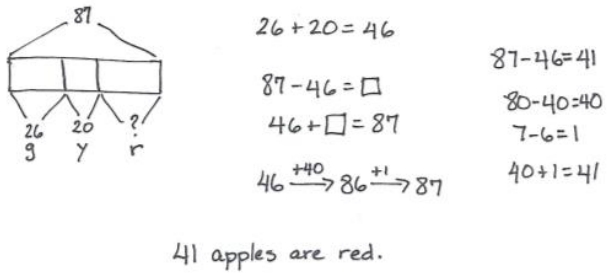


Example 3: Two-Step Word Problem Strategies

- Present students with equations, such as $6 + 7 - 3 =$ ____ or $9 - 7 + 4 =$ ____ and have students create a story for the equations. Students should be presented with a variety of situations where they need to determine the unknown in all positions. For example, for the equation $8 + 8 -$ ____ $= 14$, a student might say, "Bill and Shari each put 8 cookies in a bag. When Shari wasn't looking, Bill ate some of the cookies out of the bag. When Shari counted the cookies in the bag later, there were 14 cookies. How many cookies did Bill eat?"

Students are encouraged to be flexible with their strategies and to use drawings and/or models to explain their thinking. The following are from lesson 16, , EngageNY Grade 2 Module 4.

- Farmer Ben picks 87 apples. 26 apples are green, 20 are yellow, and the rest are red. How many apples are red?



- Andy spent 71 hours studying in November.
  In December, he studied 19 hours less.
  Rachel studied 22 hours more than Andy studied in December.
  How many hours did Rachel study in December?