Lesson M2.4
Picking Apples

In this lesson students will be provided with several word problems that have multiple solutions. The goal is to have students recognize that some problems can have multiple solutions and that problems can be solved using multiple strategies. Students will demonstrate and explain how they solve problems using a variety of strategies. Students will engage in flexibility and fluency to experiment with multiple addends or subtrahends (depending on how they solve the problems) that could make a problem true.

Please see pages 60-67 and 74 of the *Math Matters* book for more information related to solution strategies for solving addition and subtraction problems and observing how students solve problems.

CCSS.MATH.CONTENT.2.NBT.B.7
Add and subtract within 1000, 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. Understand that in adding or subtracting three-digit numbers, one adds or subtracts hundreds and hundreds, tens and tens, ones and ones; and sometimes it is necessary to compose or decompose tens or hundreds.

Standards for Mathematical Practice
MP4: Model with Mathematics

Time Frame: ~ 60 minutes
To allow students to investigate the tasks and concepts in this lesson fully, it may take longer than 60 minutes. If the lesson is to extend over two class periods, a good place to pause the lesson is after the **Explain** section. When restarting the lesson, be sure to review briefly the conclusions students came to in the Explain section before they begin the investigation in the Elaborate/ Extend section.

Materials
Chart paper/markers
Personal white boards and markers/clear sleeves
Record Sheets (regular and extend versions)
Manipulatives (as needed)
Digital/displayable versions of the four word problems throughout the lesson

Engage

Project or write the following problem with no numbers on the Interactive White Board (IWB) for all students to see:

> There are lots of apples in the orchard. Your family comes to pick some apples. How many red and green apples did they pick?

Ask students, *What do you notice about this problem?* Give students time to think and then have them turn and talk with a partner about what they noticed. Ask several students to share out their ideas about what they noticed about the problem. As students share ideas, jot down their ideas on a chart or the board.

Additional teacher prompts that can be asked during this time to help facilitate the discussion are as follows (use as needed):
What do we know? What else do we need to know? What information is missing? Was there any information that you did not need? What questions do you have?

During this discussion look for students to recognize the following ideas:
- The context of the problem is that the family is picking apples..
- The problem is asking about how many apples there are and how many get picked.
- There is not enough information presented to actually solve the problem.

Explain to students that it is important to make sense of a problem before trying to solve it and that good problem solvers will ask themselves questions such as those that were discussed before beginning to solve the problem or creating number sentences.

Explore

Project and discuss the following word problem with the students:

> Your family goes to the apple orchard to pick red and green apples. Farmer Brown, who owns the orchard, tells you to pick 20 apples. How many red and how many green apples could you possibly put in your basket?

Students demonstrate fluency when they can find more than one answer. Originality may appear when students find unique ways to solve the problem.

Encourage students to consider the following questions during the discussion:
- *What do you notice about this problem?*
- *Could there be more than one answer? How do you know?*
- *What strategies might we use to solve the problem?*

Ask the students to work on and solve the problem on their whiteboards in a way that demonstrates their strategy. Circulate the classroom and observe the strategies that students are using to solve it.

Look For
- Students who recognize that there is more than one answer to a problem. (Strategic)
- Students who recognize that there is more than one strategy to solve the problem. (Strategic, Creative)
- Students who recognize patterns such as if I increase by one for one color, I can decrease by one for the other color or grouping by 5, 10, 2. (Perceptive)

Students are using flexibility as they engage in understanding multiple solutions and/or strategies.

Explain

Have students choose a partner. Ask groups/partners to compare the number of each color of apples they used to make their total and to compare the strategies they used to solve the problem. Questions might include: *Did you all have the same number of red and green apples? Explain why you may or may not have different numbers of red and green apples. How were your problem solving strategies the same? How were they different?*

You are looking for students to recognize that there can be more than one solution to the problem and multiple strategies can be employed to get there. You want students to recognize these strategies for possible use in the next problems.

Facilitate a discussion to have several groups share out their strategies to show that there are a variety of ways to solve the same problem. Questions that could be asked (as needed) are:
- *What did you notice about how you solved the problem?*
- *What did you notice about your answers to the problem?*
- *What was the same?*
- *What was different?*

Look For
- Students who recognize that there is more than one answer to a problem. (Strategic)
- Students who recognize that the problem can be solved with multiple strategies (e.g., picture, tens and ones, words, number line, tape diagram, expanded form /decomposing) (Perceptive)
- Students who communicate their thinking clearly. (Communicative)
- Students who recognize patterns such as if I increase by one for one color, I can decrease by one for the other color or grouping by 5, 10, 2. (Perceptive)

Students demonstrate fluency when they can find more than one answer. Originality may appear when students find unique ways to solve the problem.

Elaborate/Extend

Target Task

Students will work on solving a problem that builds on the Explore task as they now work with three colors of apples. Project and have students discuss the following problem:

> There are 25 apples in a basket. 15 are red, some are yellow, and some are green. How many apples of each color can be in the basket? How many solutions can you find? Explain your thinking.

Students can be encouraged to use the questions generated earlier in the lesson to discuss this problem.

Provide students with time to work on the problem with a partner or independently (depending on the class/student preference) and record their answers/strategies using the record sheet. Observe for and note the different strategies students use to solve the problem.

Extend the Task

For students who were observed engaging in one of the high-potential behaviors or demonstrated advanced understanding of the concept in the Explore/Explain section of the lesson, this target task can be extended by having the students solve a more complex version of the Target Task.

> There are 36 apples in the basket. Some are red, some are yellow, and some are green. There are more red apples than green apples, and more green apples than yellow apples. How many of each color can be in the basket? Show your thinking.

Note that this is **not** to be done in addition to the Target Task, but rather in place of it. Provide students with time to work on the problem with a partner or independently (depending on the class/student preference) and record their answers/strategies using the record sheet.

Scaffolding and Support

If students seem to need more support with solving these types of problems consider asking the following questions to prompt student thinking:

- *What information do you know?*
- *What do you still need to know?*
- *What strategies have we learned today that might help us?*
- *What has to be true about these numbers?*
- *Would manipulatives or pictures help you to solve?*

Look For

- Students are able to find multiple solutions using patterning. (Perceptive/ strategic)
- Students are able to come up with multiple solutions. (Strategic)
- Students use sample problems or problems from the lesson to complete their problem. (Resourceful)
- Students are able to explain their thinking. (Communicative)

Students are able to elaborate on different strategies used to find more than one solution to the same problem.

Evaluate

Use a gallery walk to share out strategies. Bring students back to the carpet to share their observations during their gallery walk. Note that even though students working on the Extend the Task problem can join in this discussion because it is about the strategies they used, not just the solutions. Some questions may include: *What strategies did you notice? Did anyone come up with more than one strategy? How did you come up with multiple solutions/ strategies?*

Again, you are looking for students to recognize that there can be more than one solution to the problem and multiple strategies can be employed to get there. Not all math problems have only one solution or one way of getting to the solution.

Name: _____

Solve. Be sure to show your thinking and explain.

There are 36 apples in the basket.

Some are red, some are yellow, and some are green.

There are more red apples than green apples, and more green apples than yellow apples.

How many of each color can be in the basket?

Show your thinking.

Picking Apples – Elaborate/ Extend Target Task Record Sheet

Name: _____

Solve. Be sure to show your thinking and explain.

There are 25 apples in the basket.

15 are red, some are yellow, and some are green.

How many apples of each color can be in the basket?

How many solutions can you find? Explain your thinking.