#### Solving Two-Step Problems

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| In this lesson, students solve two-step word problems using addition, subtraction, and multiplication, using appropriate strategies and assessing the reasonableness of their answers. |

**NC Mathematics Standard(s):**

**Solve two-step problems.**

**NC.3.OA.8** Solve two-step word problems using addition, subtraction, and multiplication, representing problems using equations with a symbol for the unknown number.

**Standards for Mathematical Practice:**

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 appropriately tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

**Student Outcomes:**

* I can solve two-step word problems using two of three operations for whole numbers. (addition, subtraction, multiplication)
* I can assess the reasonableness of answers using mental computation and estimation strategies.
* I can use models and drawings to represent and solve two-step word problems.
* I can explain/justify my solution strategies to other students.
* I can write equations with a letter standing for the unknown quantity.
* I can use a variety of solution strategies to solve problems.
* I can make sense of word problems by carefully reading each problem, using numbers to solve the problem and reread the problem again to determine if the answer makes sense.
* I can find solutions, label steps and label my answer.

**Materials:**

* Two-step problems (handout)
* Blank paper or graph paper for solving problems
* Document Camera or overhead
* Pencils/markers
* Manipulatives (cubes, tiles, counters and other tools for problem solving)

**Advance Preparation:**

* Students have prior experiences relating a one-step word problem to an equation and writing and reading equations with a letter standing for an unknown quantity.
* Students have prior experiences when fluently adding and subtracting within 100.
* Students have prior experiences with one-step multiplication problems within 100, working flexibly, accurately, and efficiently.
* Students have practice with multiple solution strategies.
* Students have opportunities to assess the reasonableness of answers using mental computation and estimation strategies.
* Suggested Vocabulary for Students: addend, sum, round, estimate, equation, difference, multiplication, factor, product, array, multiples, reasonableness, symbol, multi-step problems

**Directions:**

* The problems included in this lesson are not in any order.
  + The problems are examples of two-step problems.
  + Teacher may select one or two problems for students to solve.
  + Students share their solution strategies with partners, small groups, and whole class.
  + Provide time for students to practice identifying the critical information without actually solving problems.
  + Students in grade 3 should use solution strategies that do not include traditional algorithms. Instead, they use ideas of place value, properties of operations, compensation, known facts, landmark numbers, finding patterns, drawing, creating a table, using models, etc.
  + Students need opportunities to solve problems in more than one way and may work with a partner.
  + Provide time for students to show and explain how they solved a problem in two or more ways, using models, drawings, numbers, etc.
  + After students have solved many two-step problems, ask partners or small groups to write their own two-step problems.
  + Using the document camera or overhead, students share strategies for assigned problem(s).

**Questions to Pose:**

Before:

* + What are examples of a whole number?
  + What do you think is meant by a multi-step problem? A whole number answer?
  + What are the four operations we might use when solving problems?
  + Can anyone give an example of a two-step problem?
  + What operation(s) did you use in your problem? Ask for other examples.
  + Can anyone give an example of a two-step problem using two different operations? During:
  + Will someone share an example of a two-step problem?
  + Can you identify the operations used in the two-step problems?
  + Which operation did you use first? Explain your strategy.
  + What whole number(s) did you use? What did you do next? Explain.
  + What label did you use for your answer?
  + Can you describe how you were able to identify the unknown quantity?
  + Are you willing to share the equation you wrote?
  + Can you explain why you chose this equation? What do the numbers in the equation represent?

After:

* + Who is willing to share the share their solution strategies? Explain answers.
  + What questions can you ask to support your learning and learning of others?
  + What strategies did you use first? Next?
  + Will you share your equation with a letter standing for the unknown quantity and explain/relate your equation to the problem?
  + How might working with other students and sharing solution strategies support your learning?

**Possible Misconceptions/Suggestions:**

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| **Possible Misconceptions** | **Suggestions** |
| Students have difficulty reading and making sense of two-step problems.  Students may solve problems separately and not understand which answer addresses the problem.  Students may not understand which unknown quantity is the final answer. | When working in small mixed groups of 3 or 4 students, ask a student to read the problem aloud. Members of the group discuss the problem in small groups or with a partner.  Members in each group discuss and record each step.  All members of the group solve the problem on paper. |

**Special Notes:**

It is important to support the “range of learners” including struggling students as well as students who may need extensions. Problems may be differentiated to support a range of students. All students are expected to share solution strategies with partners, in small groups or whole groups.

#### Solving Two-Step Problems

1. The owner of a box store has 400 books to pack into boxes. On Monday he packs 236 books and on Tuesday he packs 148 books. How many more books does the owner need to pack into the boxes?

\_\_\_\_\_\_\_\_\_\_\_\_\_ books

* + Write an equation with a letter standing for the unknown quantity.
  + Show how you found your answer.

1. Marcus had 100 marbles. He gave away 9 marbles to each of 4 friends. How many marbles did Marcus have left?

marbles

* + Write an equation with a letter standing for the unknown quantity.
  + Show how you found your answer.

**Solving Two-Step Problems**

1. Sydney wants to buy a soccer ball worth $95 and a bike worth $349. If Sydney only has $375, how much more money does she need?

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* + Write an equation with a letter standing for the unknown quantity.
  + Show how you found your answer.

1. Maria was baking cupcakes for the bake sale. On Thursday, she baked 7 batches of 9 cupcakes each. On Friday, she baked 158 more cupcakes. How many cupcakes did she bake in all?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_ cupcakes

* + Write an equation with a letter standing for the unknown quantity.
  + Show how you found your answer.

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**Solving Two-Step Problems**

1. Susan needed 75 cupcakes for the bake sale. She made 6 batches of 8 cupcakes each. How many more cupcakes did she need?

cupcakes

* + Write an equation with a letter standing for the unknown quantity.
  + Show how you found your answer.

1. Marcus threw a football 9 yards. David threw a football 24 feet. There are three feet in a yard. Which boy threw the football the greatest distance?

How much further? ft.

* + Write an equation with a letter standing for the unknown quantity.
  + Show how you found your answer in two different ways.

**Solving Two-Step Problems**

1. Jonah and his friends picked 284 strawberries. They ate 196 strawberries and then they picked 398 more. How many strawberries do they have now?

strawberries

* + Write an equation with a letter standing for the unknown quantity.
  + Show how you found your answer.

1. Gary earned 331 points at school last week. This week, Gary earned 79 points. Gary decides he wants to use 60 points to earn free time on a computer. How many points will Gary have left?

Points

* + Write an equation with a letter standing for the unknown quantity.
  + Show how you found your answer.

**Solving Two-Step Problems**

1. There are 50 apple stickers in a pack. Sam has 3 packs. Tracy has 5 packs. How many apple stickers do they have altogether?

stickers

* + Write an equation with a letter standing for the unknown quantity.

* + Show how you found your answer.

1. Jason has 38 video games. His brother, Chase has 9 boxes of video games with 5 games in each box. How many video games do they have all together?

video games

* + Write an equation with a letter standing for the unknown quantity.
  + Show how you found your answer.