Solving Contextual Problems: Adding and Subtracting Decimals

Strand: Computation and Estimation

Topic: Solving single-step practical problems using addition and subtraction with decimals through the thousandths.

Primary SOL: 4.6 The student will

      b) solve single-step and multistep practical problems involving addition and subtraction with decimals.

Related SOL: 4.6a

Materials

Problem-solving Graphic Organizer (optional, attached)
Contextual Problem Practice activity sheet (attached)

Vocabulary

difference, decimal, decimal point, estimation, hundredths, leading zero, sum, tenths, thousandths, place value

Student/Teacher Actions: What should students be doing? What should teachers be doing?

1. Begin by asking students to consider how they typically solve a problem in their everyday lives. Do they just do something without thinking, do they get suggestions and opinions from others, do they look at their options? Discuss the importance of connecting the mathematics they are studying to solving real-life situations. Ask students what types of questions they think they need to ask themselves when confronted with a situation that involves numbers and a situation that is considered a mathematics problem. Share with students that when faced with a real-world or contextual problem, one has to analyze and interpret the problem, develop an action plan for how to solve the problem, solve the problem, and then look back to see whether the problem makes sense in the situation.

    Ask how students use the information in the problem or what they think about when solving such problems. Listen to the student responses and capture their ideas to help them realize the key questions to ask themselves often include the following and write them on the board. Teachers may consider creating a poster of the questions to display in class as Problem-solving Questions I Need to Ask Myself.

    a. What do I know?
    b. What do I want to know?
    c. What information given is important to what I want to know?
    d. What can I do to find the answer?
    e. Does the answer make sense for the situation? Why?

2. Use the Problem-solving Questions I Need to Ask Myself as a guide for students. As an option, you may consider using the Problem-solving Graphic Organizer and draw the

graphic organizer on the board to record the important points from the class discussion and have students take notes along with you.

a. Write the following contextual or real-world problem on the board: Sandy and Mary are on the cross-country team. During practice, Sandy ran 3.7 miles on Monday. Mary only ran 2.5 miles during the same practice. How many more miles did Sandy run than Mary? Facilitate a discussion to explore how to use the key questions to help interpret, plan, and solve the problem.

b. What do I know from the statement of the problem? (how many miles Mary and Sandy each ran) Have students write this information in the organizer under "Understand." Encourage children just to write the phrase to capture information given rather than just rewriting the whole sentence from the problem.

c. What are we trying to find out? What is the question asking us? In the same block as "Understand," students are to write what the question is. Strongly encourage children to write this in their own words, rather than just copy it from the problem.

d. Ask what problem-solving strategy could be helpful to solve this problem. If they are unaware of the problem-solving strategies, make a poster to display in the room.

   ▪ Draw a diagram or picture.
   ▪ Act the problem out, step by step.
   ▪ Make a systematic list, chart, or table.
   ▪ Look for a pattern.
   ▪ Simplify the problem (i.e., try it with smaller numbers).
   ▪ Restate the problem in another way, or look for a related problem.
   ▪ Think about "before" and "after" situations.
   ▪ Work backward.
   ▪ Guess and check (i.e., try something and see whether it works).
   ▪ Use a number sentence.

   Discuss with students some of the options that would be good for this problem. Encourage pictorial representations. As this problem-solving process is being modeled, state that your choice would be drawing a picture and using a number sentence. Explain why: For example, it reminds you of a track and you can see the two people starting at the same place but ending at different places.

e. For your information and to help you decide what questions to pose during the discussion, it is helpful for you to know that this type of word problem, as shown in the curriculum framework under "Types of Addition and Subtraction Problems," is a compare, difference-unknown problem. So, pose a question to students, such as: *"We know how far each person ran, but what do we need to know about the distances that each ran?"* Draw a picture in the "Doing" box, such as a line for Mary's run and a line for Sandy's run, one below the other, but one also shorter than the other. Label the first line as Sandy, 3.7 miles; label the second line as Mary, 2.5 miles. In the space left on Sandy's line, write a question mark. Remind the students what they are trying to find, what is the question

asking. Ask students what they will do to find how many more miles Sandy ran than Mary. Show the number sentence and solution in the "Doing" box.

    f.   Under "Explaining", ask students to explain why they think their answer makes sense for the situation.

3. Distribute the Contextual Problem Practice activity sheet and five copies of the Problem-solving Graphic Organizer or show students how to draw the graphic organizer. Students will work independently or in pairs to solve the problems. Circulate around the room to determine how students are solving the problems, who may need some additional attention, and which students you want to share their work with the class. When everyone is finished, have students you identified to work their problem explain their thinking.

Assessment

- **Questions**
  - What is the purpose of the graphic organizer? How does it help you organize your thoughts?
  - How can a picture or pictorial representation be helpful in some situations?
  - How can making an estimate help you understand whether your answer makes sense?

- **Journal/writing prompts**
  - Write a single-step or multistep word problem in your journal, and trade with a friend to solve.
  - Create another process, step by step, that would help you solve practical problems.

- **Other Assessments**
  - Students create another organizer that is beneficial to them.
  - Have students write and solve a contextual problem for each operation.

Extensions and Connections (for all students)

- Provide students contextual problems to solve that involve money.
- Ask students to solve multistep contextual problems.

Strategies for Differentiation

- Students can use grid paper to line up decimals.
- If you use the problem-solving organizer, provide multiple copies so students do not have to re-create it.
- Have number lines available for students to use to help solve number expressions.
- Use larger numbers for students who need a challenge.
- Allow students to use a calculator.

Note: The following pages are intended for classroom use for students as a visual aid to learning.

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Problem-solving Graphic Organizer

Understand (What do I know from the problem?) What are we trying to find out? (What is the question asking us?)	Plan: (How can I solve the problem and answer the question?)
Doing the Work to Solve the Problem:	Explaining why the answer to the problem is correct. (check):

Contextual Problem Practice

Name_____   **Date_____**

Directions: Use the Problem-solving Questions I Need to Ask Myself to help you solve the following problems.

1. Janiya earned 17.2 points for the number of library books she read. She passed a quiz that earned her 43.5 points. How many points does Janiya have now?

2. Bella had some ribbon to make a wreath. She knew she needed a total of 5.1 yards of ribbon to make the wreath. She had to buy 3.9 yards. How many yards did Bella have before she bought any ribbon?

3. Devon is putting up lights on his house for decoration. He has 50.8 feet of red lights. He has 25.7 feet of white lights. How many feet of lights does he have to use to decorate the house?

4. Samantha has worked hard on her science fair project, which measures the growth of her plants. Plant A, watered with plain water, has grown 2.56 inches. Plant B, watered with water and fertilizer, has grown 4.17 inches. How many more inches has Plant B grown than Plant A?

5. Mark helps out at his mother's office, and she is weighing packages for shipping. She asked Mark to record the weights for her and let her know the total, so she can figure the shipping cost. The packages weigh 1.056 pounds, 3.158 pounds, and 2.504 pounds. What is the total weight?