Stacie Edgar

Halloween treats

Halloween is always an exciting time in elementary school. Students' anticipation runs high as they think about their costumes and the treats they will collect on October 31. Teachers often respond to the energy in the air by reading scary stories and spooky poems, and it is always a perfect fit to incorporate problem solving into a math lesson. Every year, I challenge my students to solve the following problem.

Problem scenario

A few years ago, my husband and I were planning a shopping trip to purchase Halloween treats. Because we usually have about 80 Trick-or-Treaters on any given year, we decided to get creative. We purchased boxes of fruit drink pouches and planned to put any leftovers into our children's school lunches. I estimated that we would need 12 boxes of assorted flavors. This year—a snowy, cold Halloween—only a few ghosts and goblins visited us.

See the student **activity sheet** on **p. 135** for the questions.

Classroom setup

This problem encourages students to think in terms of groups as well as fair sharing. To facilitate both their own thinking and their communication with classmates, have the children make pictorial representations of their thinking and ideas. Before beginning the lesson, ensure that math manipulatives are available so that students can work with concrete models, should they chose. Introduce the lesson by explaining the background scenario. Discussing their favorite treats at this point will likely serve to ground them in the context. This problem works well in groups of two or three students. Assign groups according to like abilities. Remind students to support one another's thinking rather than competing for the fastest answer.

Distribute the student activity sheet. Read the problem and the first question together as a class. Give students a few minutes to work on the problem while you circulate and observe each group's ideas. Then, when the majority of students are almost finished, lead a discussion and record on chart paper some of the strategies they used. Emphasize how often a problem has multiple approaches to the same answer to help students develop into confident problem solvers.

Again as a class, introduce the second question. Children may use a number of mental math strategies to determine an answer to this subtraction question. It is the type of problem referred to as *compare/difference unknown* (Carpenter et al. 1999).

For the final question, invite your students to move with their group throughout the room or into the hallway. They must be able to spread out and discuss their ideas freely without listening to other students' conversations around them.

Walk around to the various groups, and observe their different strategies and thinking. Instead of asking questions that would lead them to the correct answer, ask more open-ended questions:

- **What** does that number represent?
- **What** do you need to do next?

Where's the math?

This real-life investigation will encourage students to transfer their understanding of problem solving to other problems. Using manipulatives allows them to visualize several aspects of the problem. It takes true understanding to illustrate a problem in all three ways of knowing—concretely, pictorially, and symbolically. When a student constructs meaning and is able to represent a problem in multiple ways, the symbolic aspect can be generalized to other, more complex problems.

Students at this age should be proficient at using mental math when subtracting two- and three-digit numbers. Subtraction viewed solely as "take away" is difficult in this situation and compels students to use such strategies as partitioning, thinking additively, moving to friendly numbers, adjusting, and so on.

The first question, which deals with multiplying by ten, is a good time to introduce students to the concept of annexing the zero. However, instead of simply telling them why a zero is added, allow students the chance to discover it through solving examples, by using manipulatives, and by drawing pictures. When students discover a new concept in math, it is important for them to visualize the problem, rather than manipulating the numbers until they get the right answer.

- **Do** you all agree? Why, or why not?
- **Is** that what the question asks?

If students are "stuck" at any point, you might ask questions similar to the following:

- **Can** you look at this in a different way?
- **If** I wanted to draw a picture of this, what would it look like?

When I did this activity with my students, I observed three main strategies:

1. Several students divided the number of remaining fruit drink pouches by two—the number of children who would be sharing them. This is representative of the fair-sharing approach.
2. Other students divided the remaining pouches by ten—the number of fruit drinks that would be consumed in one week.
3. Some students divided the remaining pouches by five—the number of days in a week.

Depending on students' choice of strategy to solve the problem, keeping track of what they are doing, and why, can be challenging. Because this problem has several aspects, students might easily leave out a step or forget what the numbers represent. Continue to introduce the same types of problems over the next few weeks to solidify their understanding of this one type of problem. Also invite them to create their own problems, with different numbers, to share as a class.

Differentiation

To use this problem with younger students, you could adjust the problem and have only one child, not two, at home consuming the leftover fruit drink pouches.

Extension

Because using money can support student understanding of the concept of multiplying and dividing decimals, the following questions could be used further into the academic year:

1. Each box of fruit drink pouches costs $1.97; so how much did the boxes cost altogether?
2. If ten pouches are in each box, how much was each pouch worth?
3. How much did the pouches that were given out for Halloween cost?
4. What was the cost of the leftover pouches?

REFERENCE

Carpenter, Thomas P., Elizabeth Fennema, Megan Loef Franke, Linda Levi, and Susan B. Empson. 1999. *Children's Mathematics: Cognitively Guided Instruction.* Portsmouth, NH: Heinemann.

Stacie Edgar, sedgar@wsd1.org, teaches fifth- and sixth-grade mathematics at Brock Corydon School in Winnipeg, Manitoba, Canada. She is interested in how connecting real-life problem solving to her students improves their ability to see math in their everyday lives. Edited by **Coleen Foster, cfoster@wsd1.org**, a grades 3–8 math support teacher for Winnipeg School Division in Manitoba. Each month this section of the Problem Solvers department features a new challenge for students. Readers are encouraged to submit problems to be considered for future Problem Solvers columns. Receipt of problems will not be acknowledged; however, those selected for publication will be credited to the author.

Name_____

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Explain your solutions to the following problems. Use pictorial representations of your thinking.

1. If each box contains 10 pouches, how many drink pouches did we have in total?

2. On October 31, we had only 43 witches and ghouls come to our door. How many drink pouches did we have leftover?

3. If my 2 children share the rest of the drink pouches in their school lunches, how many weeks will the remaining fruit drink pouches last?

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