Coin Conversions

Summary

This activity uses money as a way to introduce the relationship between fractions, decimals and percents.

Materials

For each student:

- *Coin Combinations* worksheet
   Two-sided copy of *Coin Conversions/Price Problem* worksheet
   One set of coin manipulatives (plastic coins or paper copies of 100 pennies, 20 nickels, 10 dimes, and 4 quarters).

Background for Teachers

This activity uses money as a way to introduce the relationship between fractions, decimals, and percents. Most students have a good understanding of money by fifth grade, even if their reading, language, and/or math skills are not at grade level. This lesson works well with photocopies of coins, but if you have access to plastic coins the lesson would be even more lifelike. Students should already have an understanding of fractions as a way to represent parts of a whole, and of how to simplify fractions. They should also be familiar with the concept of decimals and how to read them. This lesson uses math journals, assuming that each student has been using one throughout the year. A math journal is a great way for students to record their thoughts about math lessons, new discoveries, example problems, and math definitions. Any type of notebook works well. If you do not use math journals, students can write the results on a piece of paper.

Intended Learning Outcomes

1. Demonstrate a positive learning attitude toward mathematics.
2. Become mathematical problem solvers.
3. Reason mathematically.
4. Communicate mathematically.
5. Make mathematical connections.

Instructional Procedures

Invitation to Learn

Distribute a *Coin Combinations* worksheet and one set of coin manipulatives to each student. (Students may also work in small groups.) Ask students to find as many combinations of coins as they can to make 50¢ using pennies, nickels, dimes, and/or quarters. Students use the manipulatives and record each combination on the sheet.

Instructional Procedures

Say the following to students:

"Using your manipulatives, show me the way to make 50¢ using only two coins."
"What two coins did you use?"
"Record in your journal the way this amount of money would look on a price tag in a store."
"Good. Money is usually written using decimals. On which side of the decimal would you find the whole dollar amount? On which side of the decimal would you find the coin amount? Today we will be working with digits to the right of the decimal, or the money that is not enough to make a whole dollar."
"I see everyone has two quarters out. How many quarters would it take to make a whole

dollar? (4) And how many quarters are we using right now? (2) Can anyone tell me what fraction of a dollar we're using? Record that fraction right next to your previous answer in your journal. What is that fraction in simplest form?"

Write the percent symbol (%) on the board and say, "Raise your hand if you've seen this symbol before. If you know the name of it, please write that name in your journal. (pause) If you wrote "percent," you are correct. If you didn't, please write this word now. Look at the word and underline a hidden four-letter word that starts with "c." What is that word? Wow, we've just been working with cents! How many cents does it take to make one whole dollar? One way to write the percent of a number is to write how many cents you have. Then we write this percent symbol (%) after the number. Please try to write as a percent the amount of money you have with your two quarters.

"You've just written 50¢ as a decimal, fraction, and percent. Did the amount of money we used change? Can anyone make a mathematical statement about your decimal, fraction, and percent? (They are all equal.) Write that statement in your journals. We can represent parts of a whole as a decimal, fraction, percent, or all three!"

Repeat the steps above asking students to make certain amounts using a different coin each time (e.g., 25¢ cents using quarters = .25, 1/4, and 25%. 10¢ using dimes = .10, 1/10, and 10%, etc.).

Try having students make the same amount using different coins and discussing why the decimal and percent look the same, but the fraction looks different until you simplify (e.g., 80¢ using pennies = .80, 80/100, and 80%, while the same amount using dimes = .80, 8/10, and 80%).

When students are comfortable with this concept, allow them to try the *Coin Conversions* and *Price Problem* worksheets. Most students should be able to work independently, allowing you time to work with those who may still be struggling.

Extensions

For students who have difficulty with the *Price Problem* worksheet, you can have students act it out for the class. Students can make signs advertising each sale, and use their play money to actually make purchases. This may help all students understand that the same amount was spent at each store.

Allow students who were able to solve the challenge question on *Coin Conversions* to present their reasoning to small groups of students who were unable to find the solution.

This type of activity could be used with other money systems, connecting with the fifth grade social studies curriculum. Specifically, the money system used in colonial times, representing farthings, pounds, etc. as fractions, decimals, and percents.

Family Connections

Gather spare change from around the house. Have family members sit around the coins. One person selects some coins. (It is easiest to select only one type of coins, but can be done using a variety.) Have a race to see which family member can write the selected amount as a decimal, fraction, and percent first.

Go shopping with your family. Watch for signs that advertise sales. Does the sign show the discount in decimal, fraction, or percent form? What would the discount be in the other two forms?

Assessment Plan

Keep mental notes during the initial lesson. Which students are not willingly participating in discussion? Which students seem reluctant to write in their journals? Which students were already familiar with the percent symbol? Record these notes immediately following the lesson.

Journals can be collected and reviewed periodically. They should not be tied to a grade, as they are meant to be a means for students to practice and explore. However, a journal is a great assessment tool in which a teacher can observe a student's understanding of mathematical concepts.

- *Coin Conversions*
  is an assessment of a student's ability to independently convert common money-related decimals to fractions and percents.
- *Price Problem*
  is an assessment of a student's ability to apply what s/he learned about equivalent representations, along with problem-solving skills, to obtain a reasonable solution.

Bibliography

Research Basis

Irwin, K.C. (2001). *Using Everyday Knowledge of Decimals to Enhance Understanding*. Journal for Research in Mathematics Education, 32(4), 399-420.
"Half the pairs worked on problems presented in familiar contexts and half worked on problems presented without context." This article presents results of an investigation that showed students who were presented decimal problems in a familiar context succeeded more often than students who were given no context.
Verschaffel, L. & De Corte, E. (1997). Teaching Realistic Mathematics Modeling in the Elementary School: A Teaching Experiment With Fifth Graders. *Journal for Research in Mathematics Education*, 28(5), 577--601.
"Recent research has convincingly documented elementary school childrens' tendency to neglect real-world knowledge and realistic considerations during mathematical modeling …" This article suggests that using real-world modeling can help students have a better disposition toward mathematical concepts.

Authors

Utah LessonPlans