The Decimal Dimension

Summary

This activity demonstrates how decimals lead to estimation in the real world, especially when dealing with multiplying or dividing numbers with decimals.

Materials

Invitation to Learn

- *Decimal!*

Instructional Procedures

- *Think #3*
- *Estimation Station*
- *Keep It Simple #1*
- *Keep It Simple #2*
- *Fast Freddie #3*
- *My Favorite Strategy*

Overhead Base Ten Blocks
Base Ten Blocks
Overhead Money
Money
Multiplication T's

Background for Teachers

Teaching students to estimate answers provides insight into students understanding of place value. Estimation, using easy to handle parts of the problem prior to decimal computation, is a checking strategy that allows the student to still work in the place value of the given number. Although students are working with parts of whole numbers with multiplication and division, they need to understand that they are working with grouping and partitioning numbers. By computing an estimate, they solve a simpler problem that will be close to the actual decimal answer.

Instructional Procedures

Invitation to Learn

Students must first identify words, pictures and symbols that represent decimal numbers. Students will play Decimal! a game of comparing decimals, cents, and standard form.

Before starting the game students must regard the 100's block of the base ten blocks as one whole. They will regard a ten stick as one tenth and one cube as one hundredth. In money, one dollar will be the whole, ten cents represents one tenth, and one cent will represent one hundredth.

Rules:

The object of this game is to be the first person with no cards. The game is played in pairs.
During a player's turn, they can lay down matches they have in their hand or add to matches that have already been laid down.
Each player draws seven cards.
The rest of the cards are turned face down. This becomes the draw pile.
Turn the first card from the draw pile face up. Players will either add to the card turned over, or place the matches that they have in their hands down.
Both players look at their hand to see if they have an equivalent representation for the number. For example: From the draw pile, you draw twenty cents. The student who has the card that

reads *two tenths*, .2, or the base ten representation, can match the card.

All matches are laid out on the table so that other players can add to them.

If a player does not have a match, they have to draw from the discard pile.

A player wins the game:

When all the cards from the discard pile are used, the player with the least amount of cards in their hands will win.

Getting rid of all cards in their hand and yelling DECIMAL! before anyone else.

Instructional Procedures

This lesson activity, including the invitation to learn, should take three to four days. Don't try to introduce every idea at once. The ideas build upon one other. Present a few ideas per day and make sure students are invited to share their problem solving ideas as the problems are solved.

After the students play the Decimal game, tell the students that they can use these manipulatives to multiply and divide decimal problems. Give a group of students money. To another group, give base ten blocks. Have them use what they know to solve the first problem from the *"Think" #3* page.

Example: Twelve students in Ms. Christensen's class earned 25 cents each for collecting box tops for her class. How much money did they earn all together?

Walk around the room. Visit each group as they are working on the problem. Discuss ideas and possible solutions. Then have students come up to the overhead and model possible solutions to the question.

Have the groups of students trade their manipulatives so that they are working with the manipulatives that they haven't used before. Have students solve the second problem. Altogether, the seven students in Mrs. Beckstrand's class earned forty-nine dollars and twenty-one cents. What did each student individually earn if they each have the same amount?

Have groups of students solve the problem. Again, visit individual groups and discuss their ideas of possible solutions. Then have groups of students model problem solutions for the class.

As a class, discuss the problem solving experience. Ask students, "How did we solve the problem?" After they give their answers, point out that, even if they were adding or subtracting, grouping or partitioning, the process was still a form of multiplying or dividing. Ask them, "Was it easy or hard to multiply or divide decimals?" "Why or why not?" "What were some important things to remember as you solved the problem?" "How did you know where to put the decimal point in your answer?"

The next day, refer to the story problems that you multiplied or divided with decimals. Talk to the students about solving problems in daily life. "You will not always have base ten blocks or money to help. How can you always make sure your answer has the decimal point in the right place?"

Have them practice estimating decimal numbers to the nearest whole number. Estimating the answer will help them determine where to place the decimal.

Example:

Number	Estimation
3.4	3
2.351	2
4.56	5
.77	1

Hand out the Estimation Station sheet. Have students practice estimating decimal numbers to the nearest whole numbers.

Give the students *Keep It Simple #1*. Students will practice estimating the answer to the nearest whole amount. Have the students multiply without the decimal. After they find the numerical answer, they will use estimation to help place the decimal. Remember to take one to two days to

complete this assignment. Practice two to three problems each day. If students choose, allow them to use manipulatives when solving these problems.

Pass out *Keep It Simple #2*. This page deals with estimation and division problems. Have students complete this page using partial quotients with decimal numbers. Have students divide the numbers using the money system. If students choose, allow them to use dollars and cents as a way of tracking the portioning of parts of whole numbers.

Strategies for Diverse Learners

Always allow special needs learners to use models to facilitate their thinking with the problems. Have counters (base ten blocks) or money readily available.

Using partial quotients to teach division of repeating decimals is not suggested. It is difficult to represent the partial place value answers in the division process.

Extensions

Family Connections

Have the students write a letter to a parent, brother, or sister explaining the importance of the different multiplication and division strategies you have been using in class. Tell the person you are writing about something new you discovered. Why does this discovery interest you? Which is your favorite strategy? How do you expect to use it?

Assessment Plan

- *My Favorite Strategy*

- Have students use their favorite strategies to help solve multiplication/ division problems. Have them discuss their favorite method and why they like it so much.

Have students assess a problem from *Fast Freddy #3*. Tell the students that Fast Freddy loves recess. He is a good student most of the time, but when the recess bell rings he sometimes gets careless in his work. Show a problem that Fast Freddy tried to complete as the recess bell rang. Have students write about his process and answer. Was he correct in his thinking?

Example problem:

"Ring." Fast Freddy heard the recess bell and decided he needed to work a little faster. He had one estimation problem left. His problem read 35.16. He estimated that the answer would be close to 36 whole numbers. Was Tommy correct? Explain how you know? *The problem asked him to round 35.16 to the nearest whole number. "Ring" Terrible Tommy heard the recess bell and decided he needed to work a little faster. He had two division problems left before he had to go outside. He starts to use the Lucky Seven method to solve his problem 24.24÷12. Tommy decides that 200 can be divided into 24.24. Will Tommy find the correct answer to his problem? Explain how you know?

Bibliography

Rubenstein, R.N., (2001). Mental Mathematics beyond the Middle School: Why? What? How?

"One simple reason to emphasize mental math is that it is useful for workers, consumers, and citizens. In daily life, adults use estimation more often than exact computation." Estimating is a daily tool in buying groceries, budgeting, and providing for others. It allows us to know "about how much" before we ever know the exact amount of what will be needed (Rubenstein, 2001).

Fitzgerald, W.M., Bouck, M.K., (1992). Insights from Research on Mathematical Problem Solving in the Middle Grades

Students need to have more than just computational knowledge in order to solve problems. In the complexities of finding solutions, students will call upon their concept, linguistic, and algorithmic knowledge. It is important to use real life applications for students to engage in finding solutions.

Authors

Karen Krier