DOINGWHATWORKS

SLIDESHOW

Full Details and Transcript

Clock Visual for Fractions

G. Stanley Hall Elementary School, Nebraska
November 2011

Topic IMPROVING MATHEMATICAL PROBLEM SOLVING IN GRADES 4 THROUGH 8

Practice PROBLEM-SOLVING INSTRUCTION

Highlights

- Mathematics games provide a context for problem solving. They support student development of mathematics concepts and foster mathematical communication.
- Students work with fraction concepts while playing Roll Around the Clock, a game using the clock as a visual for fractions.
- Students' experience with the clock gives meaning to adding and comparing fractions with denominators that are factors of 12 (or 60).
- The materials and rules for Roll Around the Clock are shown with an indication of the problem solving involved as students consider which cube to roll and even when to roll a cube.
- Students learn the game by playing several rounds with class against teacher, where the teacher uses a thinkaloud to present game strategies.
- A game variation can include working with positive and negative scoring.

About the Site

G. Stanley Hall Elementary School
La Vista, Nebraska

Demographics

- 76% White
- 9% Hispanic
- 7% Black
- 5% Asian
- 35% Free or Reduced-Price Lunch
- 7% English Language Learners

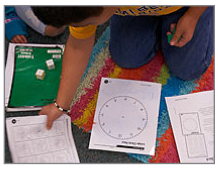
G. Stanley Hall Elementary School in the Papillion-La Vista School District strives to meet all students' needs through a rigorous district math curriculum focusing on:

- Problem solving;
- Using math in everyday situations;
- Communicating mathematical solutions and explaining the reasoning behind these solutions;
- Hands-on experiences using a variety of manipulatives to build math understanding; and
- Asking questions and investigating solutions so students explore and discover in problem situations.

Full Transcript

Clock Visual for Fractions

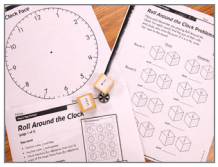
G. Stanley Hall Elementary School, La Vista, NE



On the following slides, fifth-grade teachers Kris Kaiser and Ali Byers share experiences their students have with Roll Around the Clock, a game using the clock as a visual model for working with fractions.

Slide 1: Problem solving in math games

Text: Mathematical games can provide context for problem solving and contribute to the development of mathematical concepts. Problem solving within a game can give students an opportunity to make sense of the mathematics and practice skills. Also, mathematical games foster mathematical communication as students explain and justify their moves.



Slide 2: Roll Around the Clock game setup

Text: At G. Stanley Hall Elementary School, students work with fraction concepts while learning to play Roll Around the Clock. The game board is an analog clock face, and moves are determined by rolling fraction cubes. One cube is labeled with fractions less than 1/2 and the other with fractions greater than or equal to 1/2 but less than 1.

Kris Kaiser talks about how the game works and is set up.

Audio: This is a really fun game. The kids will get into it a lot. They will each get a clock face. What we'll do first is, I think, group them, get them all their materials, and then have them start looking at it. Because when we look at the dice, just have them start seeing what they notice. If we see the one, it's got 1/2, 3/4, 2/3, 7/12. We'll see that those are all greater than 1/2. And we see the other, they're 1/2 and then everything below—1/6, 5/12, 1/3. They're all factors of 12.

Slide 3: Skills in the game

Text: The object of the game is to roll fractions that add up to 1 (or in clock language, 1 hour). The player closest to 1 wins a point. The game uses the visual model of a clock to provide students with practice adding and comparing fractions. The visual supports use of equivalent fractions.

Kris Kaiser talks about how the game builds understanding of fractions. Ali Byers talks about strategies that the students use while playing the game.

Audio:
Kaiser: They use the clock to understand fractions. The students had to figure out how to either shade or move their little piece around the clock to understand how to add fractions with unlike denominators.

Byers: They got in partners and played the game to figure out different strategies to help them understand what fractions are equivalent, like 1/3 being equivalent to 4/12, kind of based on how the clock works.

Slide 4: The clock as a visual

Text: The clock visual lends itself well to representing fractions whose denominators are factors of 12.

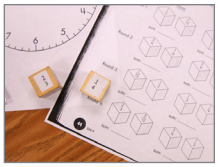
A clock can also be viewed with 60 minutes, so fractions whose denominators are a factor of 60 may be represented on the clock as well.

Ali Byers talks about the long-term benefit of the activity.

Audio: The actual going around the clock to do it can take them further than more of, like, a life skill, if you will. Something a little bit quicker and visual—visually that will help them, you know, as they go throughout fractions, it's something they'll remember.

Slide 5: Students' prior experience

Text: Students' prior experience with a clock and with time make 1/2, 1/4, and 3/4 easier fractions to represent. In order for students to understand other clock fractions, they do an exercise labeling clock fractions with twelfths, sixths, fourths, thirds, and halves.



Slide 6: Game preparation

Text: Materials for the game include a large analog clock face without hands and two fraction cubes.

- One cube with faces labeled 1/12, 1/6, 1/4, 1/3, 5/12, and 1/2.
- A second cube with faces labeled 1/2, 7/12, 2/3, 3/4, 5/6, and 11/12.

Slide 7: Object of the game

Text: The object of this game is to roll fractions whose sum is 1 (once around the clock, or 1 hour). The person closest to 1 after all players have a turn gets a point.

Slide 8: Rules of the game

Text: The game is played with two or three players. Players take turns and alternate who goes first in a round. On his or her turn, a player chooses a fraction cube to roll and records the result by moving a marker on the clock face and recording the fraction on paper. The player may roll up to three times on a turn. The player who has a sum closest to 1 scores a point for the round. After a predetermined number of rounds, the player with the highest score wins the game.

Kris Kaiser talks about student buy-in and collaboration.

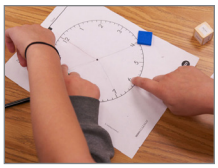
Audio: The students really buy into the games, because there's been multiple games that we've played, even with fractions. And they really buy into the idea of not giving answers and helping each other out, working through the problem together. I didn't see them going through and just telling the answers, just telling, "Well, you need to move it to the 4 because of this." They said, "Use your tools that you have. Work through that together."

Slide 9: Learning the game

Text: Students play several rounds of the game with the class against the teacher to learn the game. In this activity, the teacher reviews adding and comparing fractions with the help of the clock model. The teacher uses a thinkaloud during this game to illustrate it is okay for a player's sum to be more than 1 and how he or she thinks about which cube to roll.

Kris Kaiser talks about using thinkalouds.

Audio: One thing I always think about when modeling the problem-solving strategy, or the strategy we're using that day, is to really think out loud and really explain why we're doing it. I do use the term *thinkaloud* when I think about something, and I like to really work through the thinking process. And sometimes I'll start and I sort of play dumb and say, you know, "Look at this problem. My first thought is this, but why is that wrong?" And I'll have the students help me, understand where my misconception is that I'm thinking. So, really thinking about, "Well, I know what this means, so I'm able to think through it this way."



Slide 10: Problem solving in the game

Text: During the game, students often face a problem of deciding which cube to roll or even whether to roll a cube again on their turn.

- I got 1/3 on the first roll. Which cube should I roll next so that I am likely to get close to 1?
- I rolled 1/12 and then 1/2. Which cube should I roll next to get close to 1?
- I rolled 1/12 and then 2/3. Should I stop here or should I roll one more time?

Kris Kaiser talks about choices the students must make as they play the game.

Audio: The game focused on problem solving. The students had choices to make as they played the game. The two dice were different. One had greater than 1/2 fractions, the other had fractions that were less than 1/2. And they had to decide once they rolled the first die, then they had to make a decision, "Do I want to roll the same die again, or roll the greater fraction die?" And they could help each other out with that. So there was a dialogue going on between the students on which die to roll—"Do I want to roll it again? Do I want to stop?"—depending on how far they were away from 1.

Slide 11: Game variation

Text: The game may be played with positive and negative scoring, so that if a player's sum is greater than 1, the score is positive, and if it is less than 1, the score is negative. In this version, the winner is the player with a score closest to 0.

This project has been funded at least in part with Federal funds from the U.S. Department of Education under contract number ED-PEP-11-C-0068. The content of this publication does not necessarily reflect the views or policies of the U.S. Department of Education nor does mention of trade names, commercial products, or organizations imply endorsement by the U.S. Government.