## Sports Math

Summary
Students will use sports to learn about fractions, decimals and percents.

## Materials

For each group:
Basketball and hoop

- Set of number cards

10 pieces of scrap paper
Garbage can
For each student:

- Sports Math worksheet


## Background for Teachers

This activity should be used after Coin Conversions, or after an introduction to the concept that parts of a whole can be represented as decimals, fractions, and percents. This lesson uses real basketballs and hoops, but can easily be adapted for use inside the classroom using small balls and garbage cans. Make sure when you are doing the paper/garbage can demo, that the can is close enough to you that you can "rig" the number of shots made. This example should be very simple so that all students are successful, and don't get scared right away with more difficult problems.

## Intended Learning Outcomes

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

Instructional Procedures

## Invitation to Learn

Have students brainstorm names of sports and athletes they enjoy playing or watching. Share their results in small groups. Hopefully, all students will be able to list at least one. After the discussion, tell them they will be learning how math is used in sports.
Instructional Procedures
Say the following to students:
"How many of you consider yourself a true sports fan?"
"Does anyone keep track of a favorite athlete's stats?"
"The word "stats" is short for statistics, which are used in sports to keep track, mathematically, of how well athletes are playing."
"Today we are all going to be athletes and we are going to record some stats for ourselves and our classmates. Before we can do that, we need to learn some skills we'll need to keep accurate stats."
"Let's start with something easy. I am going to toss some paper into the garbage can. I need one volunteer to crumple up these ten sheets of paper, and another volunteer to tally on the board all the shots I make." Make 5 out of the 10 shots, with students counting aloud and someone tallying on the board.
"How many total shots did I take?"
"How many were successful shots?"
"Please represent my shots as a fraction in your math journal."
"Good, $5 / 10$ is correct. Did anyone write this fraction in simplest form?"
"Who can think of a way to represent my number of shots as a decimal?"
"And as a percent?"
Discuss, and make sure all students know the correct answers. "That was pretty simple. It seems we're all pretty familiar with the fact that $1 / 2=.50=50 \%$. But sometimes athletes' stats get a little more complicated and can't be so easily computed mentally."
"I'm going to show you how to take any fraction, no matter how difficult it looks, and represent it as a decimal and a percent."
Demonstrate how to convert a fraction to a decimal, reminding students that the fraction bar is really just a division symbol. If they remember that, the fraction tells them what to do. Review the division process, and how a decimal must be placed if the divisor is larger than the dividend. Point out that the answer can be rounded, or can be represented with a repeat bar. In baseball, batting averages are always represented as decimals rounded to the nearest thousandths place. Write on the board some common decimals/percent equivalencies such as $.25=25 \%$, and $.50=$ $50 \%$. Ask students if they see a pattern, or if they can explain the difference. They should reply with such answers as, "One has a decimal and one has a percent sign," or, "The decimal disappears when it becomes a percent." Remind students that all whole numbers could have a decimal after them, but we don't usually write it if there are no digits after the decimal. So actually, $25 \%$ could be written as $25.0 \%$.
Say to the class:
"When we change from a decimal to a percent, we actually multiply the decimal by a number, and that gives us our percent. What kind of number do you think we could multiply by and keep the digits the same, but scoot the decimal over two places to the right?" Let the kids explore, then explain the reason we multiply by one hundred is because a percent is a portion of one hundred. Do several exercises together as a class.
Give directions for the basketball activity. Each group will receive one set of number cards, a Sports Math worksheet for each student, and one basketball. Each student selects a card-- the number on the card tells them how many shots they get to try. Each student must tally the shots of every other student in his/her group. The scores must be represented as fractions, decimals, and percents. When everyone has made their shots (outside or in the gym), they return to class to complete their calculations and the rest of the problems. After students have had a chance to complete the worksheet, discuss the results as a class. Let students explain whether or not they think the total number of shots attempted matters to an athlete. Did the student who got four tries have as good of a chance as the student who got six tries?

## Extensions

During physical education, assign different students to keep stats for players in the games. This can be done with almost any sport. Rotate the students so they all get a chance to keep stats. This is a great opportunity to discuss appropriate calculator usage. After students have had lots of practice converting manually, allow them to compute stats with a calculator. This will act as a fun extension for quick learners, and as a helpful tool for struggling learners.
Family Connections
Encourage students to have a family basketball game, with the student keeping stats for each player. Afterward, the student can present a homemade trophy to the player with the best percentage of shots.
If someone in a student's family collects baseball cards, the student can compare batting averages of each player, and convert them to percents.

## Assessment Plan

Take notes during the basketball activity. Which students appear confident in their ability to record their shots as fractions? Are students displaying a positive attitude toward the assignment?
The Sports Math worksheet should be completed with accuracy. The questions at the end assess a student's understanding of not just how to convert, but the concept of how percentages work.

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.

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