

FOCUS is published by the Mathematical Association of America in January, February, March, April, May/June, August/September, October, November, and December.

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Periodicals postage paid at Washington, DC and additional mailing offices. **Postmaster:** Send address changes to FOCUS, Mathematical Association of America, P.O. Box 90973, Washington, DC 20090-0973.

ISSN: 0731-2040; Printed in the United States of America.



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Math Youth Days at the Ballpark

By Gene Abrams

About 100 times bigger, and about 100 times louder! That's how I'd compare the environment at the four recent *Sky Sox Math Youth Days* to the environment of my typical math classrooms.

For the fourth consecutive year, the math department at the University of Colorado at Colorado Springs has partnered with the Colorado Springs Sky Sox baseball team and Agilent Technologies to provide mathematics-based activities for kids at the ballpark. The general idea of Math Youth Days is this: throughout the academic year, students in grades 4 through 8 from schools throughout the Pikes Peak region complete various activities which connect mathematics to baseball (samples given below). The culmination of those activities is that the kids (and their teachers) get to spend a whole school day at a real baseball game! (The games have an unusual 10:35 AM start time to accommodate the school schedule.)

There are two math activities that we deliver at the ballpark. The first is called the *Mound Master Competition*. About 30 minutes before the start of the game, eight kids from eight different schools are randomly chosen to come down on the field to participate in this single-elimination contest. Each pair of students is asked a question; the first one to raise her/his hand and give the correct answer moves on to the next round. (If both kids answer incorrectly then the one whose answer is closest to the correct answer moves on. Kids must answer using 'mental math'; no calculators allowed here!) The quizmaster has use of a wireless microphone, so questions can be heard clearly by everyone in the stadium. Students in the stands are encouraged to play along (without shouting out answers), and to root for their classmates! Some sample Mound Master questions are



Students enjoying a day of baseball and mathematics.

given below. Why "Mound Master"? Because the student who wins the contest gets to throw out the ceremonial first pitch of the ballgame!!

The second activity is called the *Stat Star* competition. As students enter the stadium they are given an 8 1/2 x 14 inch sheet which contains information about that day's game, and about baseball in general. One section contains up-to-date player statistics, including such quantities as batting average, home runs, runs batted in (for hitters), and innings pitched, strikeouts, earned run average (for pitchers). Player names and uniform numbers are listed so that kids can keep track of who is on the field during the game. A second section of the Stat Star Sheet contains a handful of information items regarding how some of these statistics are computed. They might specify, for example, that the distance between bases is 90 feet. Or they might be more complex:

A pitcher's Earned Run Average (ERA) is: $(R / IP) \times 9$ where R = number of runs allowed and IP = number of innings pitched. Earned Run Average is expressed to two places of accuracy. So, for instance, if a pitcher has allowed 50 runs, and has pitched 150 innings, then his Earned Run Average is $(50 / 150) \times 9 = 3.00$. [The idea

expressed by ERA is: if the pitcher pitches a lot of complete 9 inning games, how many runs would we expect him to allow each game? About 3.]

The contest works as follows. Starting with the break between the first and second innings, and continuing for the next five half-inning breaks, one of our UCCS math students stands on top of the Sky Sox dugout with the wireless microphone and reads a question. The question is clearly heard by everyone in the stadium. Simultaneously,

an abbreviated version of the question appears on the scoreboard. The schoolchildren are encouraged to work together, work with their teachers, use calculators if necessary, in order to come up with the correct answer. Here are some sample Stat Star questions:

1. Last season my favorite Sky Sox pitcher gave up 90 earned runs in 180 innings pitched. What was his Earned Run Average last season?
2. Henry Aaron holds the major league record for career home runs with 755. In actually circling the bases during those 755 home runs, how many miles did he run? (Give your answer to the nearest mile.)
3. Sky Sox pitcher Jason Young's curveball travels sixty feet to home plate in half a second. How many miles per hour is that? (Give your answer to the nearest m.p.h.)

As you can see, students need to bring some of their own knowledge to the question (e.g. number of feet in a mile), as well as some knowledge of baseball (which they get from the information sheets). Once all five questions have been announced, students are given an inning to complete their answers and write them in the space provided at the bottom of the sheet. They then write their names

next to the answers, tear these off from the bottom of the sheet, and put them in boxes which are circulated through the stands by the UCCS students. Our UCCS students then sort through these answers, distill from them those which have all five answers correct, and place correct answers in a box. The winner of the Stat Star competition is chosen at random from among the correct responses. The winner's name is announced, and s/he gets to come on top of the dugout and receive prizes from both the Sky Sox and from UCCS. More importantly, the winner is showered with wild cheers from her/his classmates! After the game, the Stat Star questions (and answers) are posted at the Sky Sox website at <http://www.skysox.com> for students, teachers, and parents to use as a part of follow-up activities.

All in all, the day is fun and exciting for the school kids (more than 12,000 this year!), their teachers, and the volunteers from UCCS. Both the Sky Sox and UCCS have gotten significant positive feedback regarding all of the activities. The UCCS volunteers provide a valuable community service in an enjoyable environment. The school teachers not only have a good time, but also are able to provide valuable mathematics lessons for their kids. Of course the kids get

the chance to experience, in yet another venue, how mathematics really is all around us.



The Sky Sox mascot looks on as winners from the Stat Star contest are announced.

Over and above all of these positive aspects of the day, in my opinion perhaps the most important thing the kids take away from the day is the following. In large part due to our desire to help destroy harmful stereotypes regarding mathematics ability, prior to each of the Stat Star questions a Sky Sox representative gives a brief introduction of the UCCS math student who will read that question. I believe it makes an extremely

powerful impression on kids when they find out that the reader is "...a captain in the Air Force and a master's degree student in Applied Math at UCCS..." or "... a young woman with a 3.9 GPA. as a

mathematics major, who is attending her first ever baseball game today ...", or "... a high school student who just this morning took a final exam in calculus, and will attend college next year as a math major ...", or, perhaps most compellingly, "... a second year math major and mother of two young students who are in the ballpark today ..."!

Gene Abrams, is Professor of Mathematics at the University of Colorado at Colorado Springs. He has been a faculty member at UCCS since 1983. He is the author of more than two dozen research articles in mathematics. Along with his col-

league Jeremy Haefner, Abrams co-developed the MathOnline program at UCCS in 1998. In 1988 he was named the UCCS campuswide Teacher of the Year. In 1996 he earned lifelong designation as a University of Colorado systemwide President's Teaching Scholar. In 2002 he received the annual Burton W. Jones Outstanding Teaching Award from the Rocky Mountain Section of the Mathematical Association of America.

Sample yearlong class or individual projects

Calculate the total distance traveled by the team for the away games played during last year's Sky Sox season.

Research the salaries of major league baseball players today, including the Colorado Rockies. Compare the salaries of early players (e.g. Babe Ruth) to those of today's players. Make a chart of graph showing salary increases or decreases.

Measure and calculate the average distance your classmates can throw a baseball. (Three throws each.) Make a list of the average distances.

Sample Mound Master Questions

If a batter hits a home run, he runs 360 feet around the bases. If he only hits a double (and runs to second base), how far does he run?

The Sky Sox expect 5,000 fans at the ballgame today. If the Sky Sox play 70 home games, and they draw this many fans to each game, how many fans will have attended a Sky Sox game by the end of the season?

The Sky Sox play at the AAA level, one step below the major leagues. Over the years, 75% of Sky Sox players have gone on to the majors. If the Sky Sox currently have 24 men on their roster, how many of the current players would we expect to go on to the majors?