Mathematics in Games, Sports, and Gambling—The Games People Play

by Ronald J. Gould

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REVIEWED BY WAYNE L. WINSTON

Teachers of math love math. The problem is that many of our students don't. We believe that if only we can get our students interested, they will appreciate the beauty and elegance of mathematics. Ronald Gould has written a book that should go a long way towards turning many college students on to the wonders of mathematics. *Games, Sports, and Gambling* introduces the reader to many topics in probability, statistics and discrete mathematics through examples from poker, backgammon, Nim, and major league baseball. Many of today's undergraduates are fascinated by these topics so this book is a natural choice for an underclass seminar in mathematics. The book requires a firm grounding in high-school algebra, but is otherwise totally self-contained. The development of topics is careful and clear, and notation is well chosen in even the more difficult examples.

Chapter 1 covers basic probability and combinatorics. The examples are mostly familiar (St. Petersburg Paradox, how many poker-hands, etc.). I would have liked to have seen the brief section on Conditional Expectation expanded.

Chapter 2 builds on the concepts of Chapter 1 and covers many interesting topics including the chances of winning at craps, poker-hand probabilities and the famous Monty Hall Paradox. Again, the discussion is always clear and easy to follow. The discussion of backgammon is a bit complex, but very well done.

Chapter 3 discusses situations with repeated play. This leads us naturally to the binomial random variable, the normal approximation to the binomial (perfect for determining your chances of surviving a night at the craps tables!), and the Gambler's Ruin Problem. Chapter 3 also has several sports examples, including a discussion of team winning streaks and hitting streaks. I would have liked to have seen some discussion of Tversky's "hot hand" research here.

Chapter 4 discusses several card "tricks" that provide a justification for introducing the Pigeon Hole Principle, Principle of Inclusion and Exclusion, and some basic topics in graph theory and matching theory. Gould does a great job in this chapter of developing these topics in the context of interesting examples.

Chapter 5 introduces the reader to several important topics in basic statistics (descriptive statistics, simple linear regression, Simpson's Paradox, and hypothesis testing) in the context of sports examples (mostly baseball). I would like to have seen more basketball, soccer, and football (maybe hockey?) examples in this chapter. It would be nice to teach students how to use Web Queries to download data from the Internet into Excel, so they could test sports related hypotheses with the most recent available data. I would also have taught the students how to use Excel's Trend Curve to fit a straight line to data.

Chapter 6 continues the discussion of hypothesis testing through more interesting sports examples. (Do batters hit significantly worse against pitchers who throw with the same hand as the batter? They do!) I would have liked some discussion of basic sabermetric concepts such as Runs Created and OPS. A gentle introduction to multiple regression would fit well here.

Chapter 7 develops the math needed to understand several well-known games and puzzles such as magic squares, Sudoku, Tower of Hanoi, and the famous Cracker Barrel Peg game. Again, the math is beautifully explained, and the intelligent student will come away with an appreciation of the beauty and elegance of mathematics.

Chapter 8 introduces combinatorial games. In these games, the emphasis is on trying to determine which player (based on the current state of the game) can win, and devising a winning strategy. Gould begins with very simple games (for example, if 17 chips are on a table and each player can pick up 1–3 chips, who wins and how?) and quickly goes on to discuss some fairly complicated games: Nim, Northcott's Game, and Blue-Red Hackenbush. Again, the discussion is well done and teaches the students lots of interesting math (primarily graph theory).

In summary, if you are looking for a "different book" to turn students on to the beauty of math, Gould's book is worthy of your consideration. I believe the first six chapters could be understood by students at just about any school, at any level, but the last two chapters require more sophistication and might be more appropriate for honors seminars.

Kelley School of Business
Indiana University Bloomington
107 S. Indiana Ave.
Bloomington, IN 47405-7000
USA
e-mail: winston@indiana.edu

