

Game Theory

Preface to the Second Edition, 2014

This book is intended as an introduction to game theory for undergraduate students. It has many exercises with solutions and so is also suitable for self-study by the student working alone. There is enough material in the text for a year course in game theory. However, for a semester or quarter course, some choice must be made. So several courses may be considered. Part I on combinatorial games is not explicitly used in the the rest of the text and so may be omitted. I suggest three possible courses.

1. Mathematical Games: Part I and the first four or five sections on Part II. The prettiest mathematics appears in this course.

2. Classical Game Theory; All of Part II, possibly with some use of Part I as an introduction. A course on two-person zero-sum games.

3. Standard Game Theory: The first four or five chapters of Part II, plus all of Parts III and IV. A course on general games.

The creation of this book is a project that has been evolving for over 40 years. Back in the 1960's the Mathematics Department at UCLA had a course entitled "Game Theory and Linear Programming" that was taught each quarter. I taught this course from time to time, but since I had a love of game theory, I eventually reduced the Linear Programming part to 4 weeks to allow me to devote six weeks to game theory. (The 4 week course has appeared on my web page as an electronic text under the title "Linear Programming - A Concise Introduction".)

In the 1970s, when the Mathematics Department offered a full quarter course in Game Theory, work on the present text was begun. Various preliminary versions were put on the web, but the "first edition" appeared as a pdf file in 1994 under the simple title "Game Theory". There are advantages for placing the text on the web. First, readers may take the trouble to write to you pointing out errors, misprints, and suggestions for clarity. Second, it allows one to add explanations, replace an example with a more interesting one and add new exercises. The only major change to the first edition occurred in 2003 with the addition of the chapter on Coin-Turning Games.

The "second edition" of this book appeared on my web page in 2014. The main changes made were the following. First, material on the Fictitious Play Algorithm to approximate the value and optimal strategies in two-person zero-sum games has been added in Part II, Chapter 4, Section 6. Second, the material in Part II, Chapter 7 on Poker Models has been

replaced by a more general treatment of Infinite Games, with Poker Models reduced to a single section. Third, the very simple proof of the Minimax Theorem, due to Guillermo Owen, was placed in the Appendix. All other changes made were for correcting simple errors and misprints and for clarification of certain obscurities.

For this we thank many readers. First, there are the many students who took the course and whose suggestions and complaints have improved the readability of the text greatly. Second, there are the many teachers at diverse universities across the country who have used some part of the text in their classrooms, and sent me opinions and suggestions for improvement. Third, there are individual students around the world who saw the text on the web and asked me for help or clarification. To all these, I am very grateful. Finally I had the good fortune to have had Lloyd Shapely as a friend and colleague for many years; I have learned much from him. His influence has shaped much of the outlook on game theory that appears in this book.