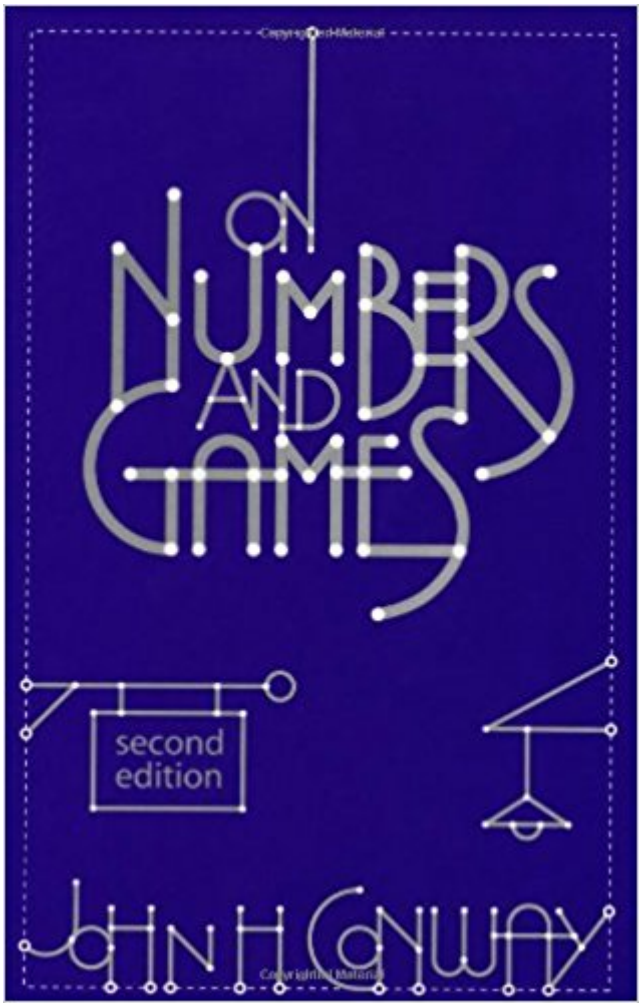
On Numbers And Games



Synopsis

ONAG, as the book is commonly known, is one of those rare publications that sprang to life in a moment of creative energy and has remained influential for over a quarter of a century. Originally written to define the relation between the theories of transfinite numbers and mathematical games, the resulting work is a mathematically sophisticated but eminently enjoyable guide to game theory. By defining numbers as the strengths of positions in certain games, the author arrives at a new class, the surreal numbers, that includes both real numbers and ordinal numbers. These surreal numbers are applied in the author's mathematical analysis of game strategies. The additions to the Second Edition present recent developments in the area of mathematical game theory, with a concentration on surreal numbers and the additive theory of partizan games.

Book Information

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Customer Reviews

I ordered a book. What I got was a stack of crude photocopies of a book, glued between book covers (and badly so; the binding is very stiff, so the book is hard to open). I say "crude" photocopies, because actual photocopies would been vastly superior in print quality. The entire text is rasterized, like a photograph in a newspaper.

Boy, you wanna talk about your _cool_ books. I read this one twenty years ago and never quite got over it. Georg Cantor sure opened a can of worms with all that infinity stuff.John Horton Conway is probably best known as the creator/discoverer of the computer game called "Life," with which he re-founded the entire field of cellular automata. What he does in this book is the _other_ thing he's

best known for: he shows how to construct the "surreal numbers" (they were actually named by Donald Knuth).Conway’s method employs something like Dedekind cuts (the objects Richard Dedekind used to construct the real numbers from the rationals), but more general and much more powerful. Conway starts with the empty set and proceeds to construct the entire system of surreals, conjuring them forth from the void using a handful of recursive rules.The idea is that we imagine numbers created on successive "days". On the first day, there’s 0; on the next, -1 and +1; on the next, 2, 1/2, -1/2, and -2; on the next, 3, 3/4, 1/4, -1/4, -3/4, and -3; and so on. In the first countably-infinite round, we get all the numbers that can be written as a fraction whose denominator is a power of two (including, obviously, all the whole numbers). We can get as close to any other real number as we like, but they haven’t actually been created yet at this point.But we’re just getting started. Once we get out past the first infinity, things really get weird. By the time we’re through, which technically is "never," Conway’s method has generated not only all the real numbers but way, way, way more besides (including more infinities than you’ve ever dreamed of). His system is so powerful that it includes the "hyperreal" numbers (infinitesimals and such) that emerge (by a very different route, of course) from Abraham Robinson’s nonstandard analysis as a trivial special case.So there’s a lot here to get your mind around, and it’s a lot of fun for readers who like to watch numbers being created out of nothing. But wait -- there’s more.See, the _full_ title of the book includes not only "numbers" but also "games". And that’s the rest of the story. Conway noticed that in the board game of Go, there were certain patterns in the endgames such that each "game" looked like it could be constructed out of smaller "games". It turns out that something similar is true of all games that have certain properties, and that his surreal numbers tie into such games very nicely; "numbers" (and their generalizations) represent strategies in those games. So in the remainder of the book Conway spells this stuff out and revolutionizes the subject of game theory while he’s at it.Well, there must be maybe two or three people in the world to whom this all sounds very cool and yet who haven’t already heard of this book. To you I say: read it before you die, and see how God created math.

A profound rethinking of what it means to count and characterize by numbers and choices.

This book looks and feels like it is printed on recycled newspaper. The print quality is terrible. A total injustice for a work as great as ONAG.

This was a gift for a grandson, he was excited to get it.

Great insight

This is not a book for mathematical beginners, even though it starts from literally nothing. But readers who have learned enough traditional math to understand the point of set theory and who have a solid grasp of the real number system are in for a wild ride, and will never look at numbers, or games, in the same way again.Conway is the most original mathematician on the planet, as well as a remarkably witty and vivid writer, who combines wordplay and logic better than anyone since Lewis Carroll. The book is far too densely packed to summarize in a short review. All I can say is that it’s practically inexhaustible; like all good math books, what you get out is proportional to the effort you make while reading it, but the amount of effort it will repay is a hundred times as much as for an ordinary book.This is an all-time classic, a "desert island book". Even though this new edition differs from the old one in very minor ways, I bought it immediately because my 1978 copy was falling apart from extreme overuse. (My other "desert island math book" is Cohen’s "Set Theory and the Continuum Hypothesis".)

Conway deals with a certain type of game: games with no element of chance (no dice), the players have complete knowledge about the state of the game (no hidden hand signs like scissors-paper-stone) and where the last player to move wins (though that can be stretched to include Dots and Boxes and endgames from Go - though not in this book).Conway defines a bunch of mathematical objects. He defines mathematical operations on these objects such as addition and multiplication. The whole work looks suspiciously like a way to define the integers and arithmetic starting from set theory. But we soon see that his construction allows for all sorts of things beyond just integers. We quickly get to fractions and irrationals and we see that he has given us a wonderful new way to construct the real line. Then we discover infinities and all sorts of weird new numbers called nimbers that have fascinating properties.It all looks a bit abstract until you get to part two (well, he actually starts at part zero so I mean part one). At this point you discover that these objects are in fact positions in games and that the ordinary everyday numbers we know so well are in fact special types of games. Ordinary operations like addition, subtraction and comparison turn out to have interpretations that are game theoretical. So in fact Conway has found a whole new way to think about numbers that is beautiful and completely different to the standard constructions. Even better, you can use this new found knowledge to find ways to win at a whole lot of games.It’s not every day that someone can make a connection like this between two separate branches of

mathematics so I consider this book to be nothing less than a work of genius.BTW This is the Conway who invented (the cellular automaton) the Game of Life and came up with the Monstrous Moonshine Conjectures (whose proof by Borcherds recently won the Fields Medal in mathematics).

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