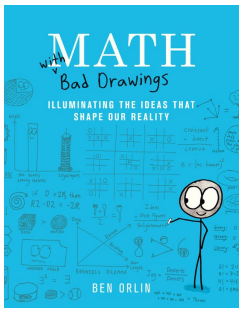
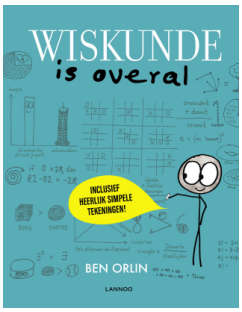
Math with bad drawings, *Ben Orlin*. Black Dog and Leventhal, 2018 (376 p.), isbn: 978-0316509039. **Wiskunde is overal**, Lannoo, 2019 (367 p.), isbn: 978-9401459297.






Ben Orlin

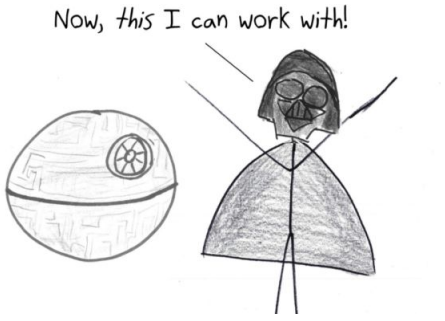
I read this book in the Dutch translation. The title "Wiskunde is overal" (Math is everywhere) is catching the idea that this is another popularizing book on mathematics. The English title refers to the fact that it is amply illustrated with oversimplified cartoons. Showing a head has 2 big eyes and a squiggle as a mouth to express emotions, the body is just sticks. Ben Orlin writes in journals and magazines about mathematics and he is also the brain of a blog with the same title as this book.

This is not the first book that illustrates with tongue-in-cheek-humor how mathematics is involved in everybody's daily life. Orlin treats his readers as totally illiterate about mathematics (he spends quite some time to explain the difference between discrete data and continuously varying variables) but readers are otherwise assumed to be smart enough to understand rather complicated constructs populating the stock market, they should be interested in voting systems, insurance contracts, job interviews, and sports, in short, an average adult.

The book starts with a game (according to Orlin, that is where all mathematicians start). Tic-tac-toe is very simple and boring, but what if you change the rules and make it more complex, then it can become instantly interesting. That is also what happens in mathematics. He then continues by explaining how different groups of people experience mathematics: pupils, mathematicians (average ones and the best), scientists and applied mathematicians, and how they should communicate. This concludes part 1: Thinking like a mathematician.

A second part treats the general topic of "design" and has several applications, starting with applications of geometric ideas. Stress in a loaded beam leads to the I-beam and the design of different kinds of trusses. It is explained why A4 paper format is designed in a ratio of $\sqrt{2}$. The effect of dimension: double the size and the surface multiplies by 4 and the volume by 8. This explains why giants cannot exist, why babies need a blanket, and why ants survive a fall from big heights, but drown in water, and it solves the Olbers's paradox: why it is dark at night if our universe has infinitely many stars. On another level, it is explained how to design a fair die (and how it can be loaded). Finally there is a somewhat longer discussion between Dart Vader and his advisors about how they arrived at the spherical structure of the death star as an optimal one.

In the remainder of the book probability and statistics plays an important role. Part 3 about probability first deals with lotteries: why do people do it if they are almost certain to loose money. Different ways to participate and the psychology behind it, and how tax paying is a kind of participating in a lottery organized by the state, that can only gain by organizing it. Somewhat similar is the idea of insurances, what is the underlying mechanism that reduces the risk. How much can you gain by buying an insurance, and what are the risks of selling them. What is fair in advising or forcing insurance on the population by politicians? Binary coin tossing is applied to the properties inherited from your parents, grand parents etc. This part ends with an

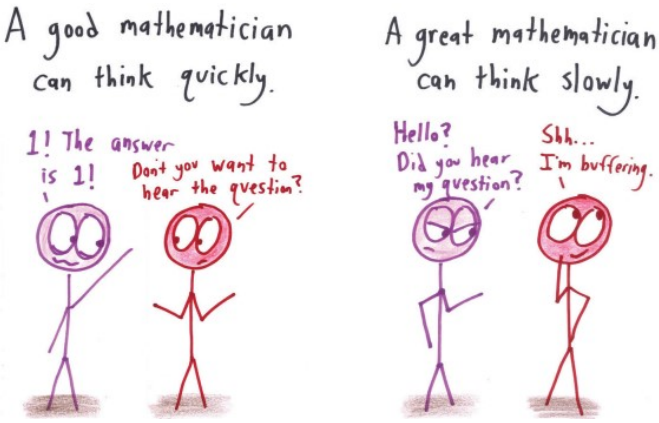


©Ben Orlin
Typical Orlin cartoon.
Death star and Darth Vader

explanation of the 2008 worldwide financial crisis.

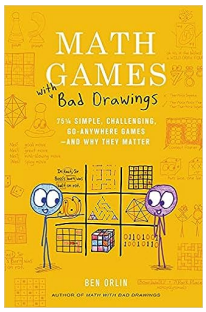
Part 4 is dealing more particularly with statistics. Several ways to characterize statistics distributions are defined: mean, median, mode, percentile, percent difference, range, variance and standard deviation, correlation coefficient. What do they mean, when are they used, and what are their deficiencies? There is also a chapter on statistics as they are applied in baseball. How the rules were adapted because of statistics, and other changes. The problem of false positives or negatives and outliers lead to Bayesian statistics. Much depends on what and how something is measured: the number of clicks on a website, how to define the best teacher or salesmanager, or how to decide when someone is poor or rich? What can be derived by analysing the digitized texts of novels? Can you recognize an author, or the gender of the author, or deduce a masterpiece from junk literature?

The final part 5 has a vague subject of "turning points". It starts with a chapter on pricing systems. Why is a piece of compressed carbon, also known as diamond, so much more expensive than life saving water? Therefor is a theory of Léon Walras who defined the marginal theory of value and (along with William Stanley Jevons and Carl Menger) the general theory of equilibrium. This is also applied to the tax brackets. These different levels are a form of discretisation of a continuous variety on possible income. It is explained that by introducing more of these levels, one approaches a continuous progressive system. Somewhat similar is the American voting system of the winner-takes-it-all result in so-called red, blue, and swing states. And at the end we learn about chaotic systems or at least situations where prediction is difficult. We meet the double pendulum, the game of life by Conway, and fractals. These are however treated only briefly.

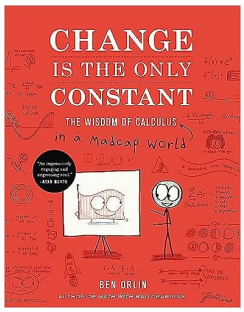


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The book has an appendix with notes, references, and jokes that are too strange or would be disrupting the main text when included there.



Math games with bad drawings (2022)



Change is the only constant (2019)



Tr.: Wat een hond ons over wiskunde kan leren (2021)

It is a bit unfortunate that much of the examples are related to the US (voting system, baseball, taxes,...). Nevertheless, this is a quite funny book about mathematics without ever including the mathematics itself. It gives a much broader view, placing the application of the math in the context where it is applied. That also includes economic, mechanical, political, social, behavioural, and even psychological aspects. Sometimes unexpected links and parallels are made between seemingly unrelated topics. The mathematician will not learn much, but I would highly recommend this for a non-mathematician who would like to learn how and where mathematics is used, without having to go through the burden of learning the mathematics.

To conclude, I would like to mention that Ben Orlin has published two other books in a similar style: *Change is the only constant* (translated in Dutch as *Wat een hond ons over wiskunde kan leren*) and most recently *Math games with bad drawings*.

Adhemar Bultheel