

Preface

When I arrived on the Yale campus over fifty years ago, I was two months shy of my eighteenth birthday. I had never held a conversation with a mathematician and knew little to nothing about the culture of the mathematics community. But, somehow, I believed that I wanted to be a mathematician. Any savvy observer would have certainly concluded that my prospects were grim. Nonetheless, by hook *and* by crook, I eventually found a path.

I have fashioned a manuscript that I wish had been available to me when I was making my way through high school and dreaming of becoming a mathematician. Of course, I am trusting that such kids still exist. I suspect that many adults who feel that they missed the mathematics boat, and regret it, will find that this book resonates with them. I include what I deem to be mathematical gems and intersperse stories about mathematicians. The working title of this book was “Nursery Rhymes of Mathematics” because I hoped that the book would go a long way in establishing a cultural foundation in mathematics; an introduction to a perspective that most people are currently not exposed to sufficiently early in their lives. Grappling with many of the gems requires various levels of sophistication, but the tools needed are not beyond what many college-bound students will have mastered by twelfth grade. Most of the “nursery rhymes” require only basic high school algebra or geometry. The book is a kind of sampler. The chapters are arranged roughly in the order of difficulty and can be read independently of each other. Some students might take years to peruse all of them, with or without the support of a teacher.

I did not avoid humor in writing *Mathematics: Rhyme and Reason* and I was certainly willing to indulge my sentimental side in certain passages, since this book is also serving as something like a memoir. Topics covered include:

- The Infinitude of Primes
- Infinite Series
- No Four Points in the Plane with Pairwise Distances All Odd
- Magnitudes of Infinity/Existence of Transcendental Numbers
- Sperner’s Lemma/Brouwer Fixed Point Theorem
- Binet’s Formula

- The Euler Line
- Gandhi's Formula for the n^{th} Prime
- Bulgarian Solitaire
- a^b versus b^a
- Sylvester's Problem

There are stories about Paul Erdős, Donald J. Newman, Abel, Yitang Zhang, Euler, J. Ernest Wilkins, Abraham Robinson, and others. Some of the stories are from firsthand knowledge. I believe, of course, that all of them are interesting.

I have always felt a greater kinship with philosophers and linguists than with physical scientists and engineers. Accordingly, the force of language in rigorous argumentation receives a somewhat greater emphasis than the clever use of visual display. I hasten to add that the obvious utility of the visual approach is not neglected.

It is my conviction that real headway in mathematics can only be made by following the aesthetic sense. Wonderful applications are often a byproduct of finding the poetry in the subject. There is a widely held belief that if we can just make it clear to young people how useful mathematics is, then their performance in the subject will improve. As opposed to other academic domains, there is generally no attempt to enhance what I will call an appreciation for mathematics and the culture in which it is embedded. At best, games and user-friendly applications are served up to make the confrontation more palatable. The emphasis is placed on mathematics as a tool, not on its aesthetic value. More often than not, the young person never encounters the humanity that lives in mathematics itself. The small gems and nuggets that are included in this thin volume represent, I hope, one small step toward addressing what I believe is a shortfall in the acculturation of young people in the field of mathematics. The reader will find, sprinkled among these mathematical nursery rhymes, stories about flesh-and-blood creatures, who call themselves mathematicians.

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