

Preface

This book is designed to reach a wide audience. Not only is it written for readers of all ages, from young to old, but it is also targeted to those who have a dislike of maths. The aim is to show just how wonderful maths really is! This book is a compilation of 30 articles that I originally issued as a series entitled “Enjoying Maths” for the Japanese magazine *Rikeieno Sugaku* (“Mathematics for Science”). All articles are independent of each other and readers can move throughout the book as they please, exploring the wonder of maths as they go.

The book contains my original articles as well as references to other unique articles about the use of maths in daily life. In terms of my original articles, learn about boomerangs, one of my lifeworks. Find out why a boomerang comes back to you and follow the instructions on how to make and throw paper boomerangs to explore this practically. In fact, people all over the world have already tried this, as the original article has been translated into 69 languages so far, as can be seen on one of my website’s at

<http://www.kbn3.com/bip/index2.html>.

Also find out why are so many flowers five-petalled. Why do we have five digits on our hands and feet? I will explain my hypothesis about the mysterious occurrences of the number “5” hidden in nature. I also explain the development of a theorem about constructing fixed points and the random-dot pattern that facilitated the invention of this new theorem.

This book also contains unique articles about the use of maths in daily life. Find out the answers to questions such as how can two separate light switches in the hall of our house as well as on the upstairs landing work to turn on and off the same light? Why do some fans appear to rotate backwards? Why are eggs oval shaped? I think about these issues mathematically, and try to pose intriguing questions you won’t find in any textbooks and provide understandable answers. Although the maths community often discusses how to solve problems more efficiently, I like to emphasize the enjoyment and the importance of discovering new mathematics problems in daily life.

Many puzzles dealing with diagrams or numbers are explained. One example is the Block Overhang Problem: Is it Possible to Stagger Building Blocks by More than the Width of One Block? Other examples include why a Mobius strip produces one large loop when cut instead of separating into two pieces. Learn about the new face of hexaflexagons and how they work. Do you know about Miura folding, where a single movement can be used to open and close a sheet of paper? How about the increasing and decreasing of areas in card magic? Do you know how it’s done?

Then try some really fun uses of numbers that will impress your friends. Take any four digits, reorder them into the largest and smallest numbers possible, take the difference between the largest and the smallest, and repeat until the sequence eventually arrives at number 6174. A summary of this article appears on the University of Cambridge website, at

<http://plus.maths.org/issue38/features/nishiyama/>.

Learn about why maths is really useful in everyday life and how it is applied. For example, the planimeter measures areas just by simply tracing a closed curve. So, maths is not just a way some people wile away time. It really does have lots of practical applications. Do you know the inside of random numbers or root of how they are calculated? I hope to open up and explore the black boxes of many such issues.

Many people are put off by mathematical technical terms such as the calculus of variations in the problem of quickest descent, Taylor expansion in Machin 's formula and Pi, group theory in Burnside's lemma and the theory of cyclotomic equations in Gauss' method of constructing a regular heptadecagon. But through this book we can gradually understand the beauty of maths by trying to discover how to view these problems with interest and find fun in studying them.

I also discuss some of the cultural issues surrounding maths: the huge popularity in 2005 of the number game Sudoku, which is especially liked by European people; why Japanese like odd numbers and Westerners emphasize even numbers, which can possibly be explained according to the principle of Yin-Yang in Chinese philosophy; the difference between Japanese and European architecture which can be explained mathematically in terms of curves and straight lines; and the various methods across the globe for starting to count at 'one' with either the index finger, thumb or little finger. All of these differ according to region, ethnicity, and historical period. I hope that your curiosity is awakened by the connections between maths and culture as mine was.

This collection of 30 articles addresses just some of the aspects of maths that I enjoy very much. I hope this book will be enjoyed not only by readers who like maths, but also by those who find it difficult and want to gain some insight into the world of maths and logical thinking.

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