



# A Mind for Numbers: How to Excel at Math and Science (Even If You Flunked Algebra)

By Barbara Oakley

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## A Mind for Numbers: How to Excel at Math and Science (Even If You Flunked Algebra) By Barbara Oakley

The companion book to COURSERA®'s wildly popular massive open online course "Learning How to Learn"

Whether you are a student struggling to fulfill a math or science requirement, or you are embarking on a career change that requires a new skill set, *A Mind for Numbers* offers the tools you need to get a better grasp of that intimidating material. Engineering professor Barbara Oakley knows firsthand how it feels to struggle with math. She flunked her way through high school math and science courses, before enlisting in the army immediately after graduation. When she saw how her lack of mathematical and technical savvy severely limited her options—both to rise in the military and to explore other careers—she returned to school with a newfound determination to re-tool her brain to master the very subjects that had given her so much trouble throughout her entire life.

In *A Mind for Numbers*, Dr. Oakley lets us in on the secrets to learning effectively—secrets that even dedicated and successful students wish they'd known earlier. Contrary to popular belief, math requires creative, as well as analytical, thinking. Most people think that there's only one way to do a problem, when in actuality, there are often a number of different solutions—you just need the creativity to see them. For example, there are more than three hundred different known proofs of the Pythagorean Theorem. In short, studying a problem in a laser-focused way until you reach a solution is not an effective way to learn. Rather, it involves taking the time to step away from a problem and allow the more relaxed and creative part of the brain to take over. The learning strategies in this book apply not only to math and science, but to any subject in which we struggle. We all have what it takes to excel in areas that don't seem to come naturally to us at first, and learning them does not have to be as painful as we might think!



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### Editorial Review

#### Review

“A good teacher will leave you educated. But a great teacher will leave you curious. Well, Barbara Oakley is a great teacher. Not only does she have a mind for numbers, she has a way with words, and she makes every one of them count.”

—**Mike Rowe, creator and host of Discovery Channel’s “Dirty Jobs” and CEO of mikeroweWORKS**

“If you struggled through math and slept through science, there’s hope. In *A Mind for Numbers*, polymath Barbara Oakley reveals how to unlock the analytic powers of our brains so we can learn how to learn. This book should be required reading for students—and for my mother.”

—**Adam Grant, New York Times-bestselling author of *Give and Take***

“Superb not only for those who are struggling or who are expert at math, but for readers who wish to think and comprehend more efficiently.”

—**Library Journal**

“An ingeniously accessible introduction to the science of human cognition—along with practical advice on how to think better.”

—**James Taranto, The Wall Street Journal**

“In my book *The Math Instinct*, I described how we have known since the early 1990s that all ordinary people can do mathematics, and in *The Math Gene*, I explained why the capacity for mathematical thinking is both a natural consequence of evolution and yet requires effort to unleash it. What I did not do is show how to tap in to that innate ability. Professor Oakley does just that.”

—**Keith Devlin, NPR Weekend Edition’s “Math Guy”**

“A wonderful book! How do you come to *love* math and science, and how do you come to *learn* math and science? Read *A Mind for Numbers*. Barbara Oakley is the magician who will help you do both.”

—**Francisco J. Ayala, University Professor and Donald Bren Professor of Biological Sciences, University of California, Irvine, and former President and Chairman of the Board, American Association for the Advancement of Science**

“Being good at science and mathematics isn’t just something you *are*; it’s something you *become*. This users’ guide to the brain unmasks the mystery around achieving success in mathematics and science. I have seen far too many students opt out when they hit a rough patch. But now that learners have a handy guide for ‘knowing better’ they will also be able to ‘do better.’”

—**Shirley Malcom, Head of Education and Human Resources Programs, American Association for the Advancement of Science**

“*A Mind for Numbers* is an excellent book about how to approach mathematics, science, or any realm where problem solving plays a prominent role.”

—**J. Michael Shaughnessy, Past President of the National Council of Teachers of Mathematics**

“I have not been this excited about a book in a long time. Giving students deep knowledge on *how to learn* will lead to higher retention and student success in every field. It is a gift that will last them a lifetime.”

**—Robert R Gamache, Ph.D., Associate Vice President, Academic Affairs, Student Affairs, and International Relations, University of Massachusetts, Lowell**

"*A Mind for Numbers* helps put students in the driver's seat—empowering them to learn more deeply and easily. This outstanding book is also a useful resource for instructional leaders. Given the urgent need for America to improve its science and math education so it can stay competitive, *A Mind for Numbers* is a welcome find."

**—Geoffrey Canada, President, Harlem Children's Zone**

"It's easy to say 'work smarter, not harder,' but Barbara Oakley actually shows you how to do just that, in a fast-paced and accessible book that collects tips based on experience and sound science. In fact, I'm going to incorporate some of these tips into my own teaching."

**—Glenn Harlan Reynolds, Beauchamp Brogan Distinguished Professor of Law, The University of Tennessee**

"*A Mind for Numbers* is a splendid resource for how to approach mathematics learning and in fact learning in any area. Barbara Oakley's authoritative guide is based on the latest research in the cognitive sciences, and provides a clear, concise, and entertaining roadmap for how to get the most out of learning. This is a must-read for anyone who has struggled with mathematics and anyone interested in enhancing their learning experience."

**—David C. Geary, Curators' Professor of Psychological Sciences and Interdisciplinary Neuroscience, University of Missouri**

"For students afraid of math and science and for those who love the subjects, this engaging book provides guidance in establishing study habits that take advantage of how the brain works."

**—Deborah Schifter, Principal Research Scientist, Science and Mathematics Programs, Education Development Center, Inc.**

"*A Mind for Numbers* explains the process of learning in a fascinating and utterly memorable way. This book is a classic, not only for learners of all ages, but for teachers of all kinds."

**—Frances R. Spielhagen, Ph.D., Director, Center for Adolescent Research and Development, Mount Saint Mary College**

#### About the Author

**Barbara Oakley** is a professor of engineering at Oakland University in Rochester, Michigan. Her research has been termed "revolutionary" by the *Wall Street Journal*. She has received many national awards for her teaching, including the American Society of Engineering Education Chester F. Carlson Award for outstanding technical innovation in STEM pedagogy and the Theo L. Pilkington Award for exemplary work in bioengineering education. Her Coursera-UC San Diego course *Learning How to Learn*, created with her co-instructor Terrence Sejnowski, the Francis Crick Professor at the Salk Institute, is the most popular online course in the world, with nearly 1.4 million students to date.

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Thomas Edison is one of the most prolific inventors in history, with over one thousand patents to his name. *Nothing* got in the way of his creativity. Even as his lab was burning to the ground in a horrific accidental fire, Edison was excitedly sketching up plans for a new lab, even bigger and better than before. How could Edison be so phenomenally creative? The answer, as you'll see, relates to his unusual tricks for shifting his mode of thinking.

## Shifting between the focused and diffuse modes

For most people, shifting from focused to diffuse mode happens naturally if you distract yourself and then allow a little time to pass. You can go for a walk, take a nap, or go to the gym. Or you can work on something that occupies other parts of your brain: listening to music, conjugating Spanish verbs, or cleaning your gerbil cage *The key is to do something else until your brain is consciously free of any thought of the problem.* Unless other tricks are brought into play, this generally takes several hours. You may say – *I don't have that kind of time.* You do, however, if you simply switch your focus to other things you need to do, and mix in a little relaxing break time.

Creativity expert Howard Gruber has suggested that one of the three "B's" usually seems to do the trick: the bed, the bath, or the bus. One remarkably inventive chemist of the mid-1800s, Alexander Williamson, observed that a solitary walk was worth a week in the laboratory in helping him progress in his work. (Lucky for him there were no smartphones then.) Walking spurs creativity in many fields; a number of famous writers, for example, including Jane Austen, Carl Sandburg, and Charles Dickens, found inspiration during their frequent long walks.

**Once you are distracted from the problem at hand, the diffuse mode has access and can begin pinging about in its big-picture way to settle on a solution.** After your break, when you return to the problem at hand, you will often be surprised at how easily the solution pops into place. Even if the solution doesn't appear, you will often be further along in your understanding. It can take a lot of hard, focused mode work beforehand, but the sudden, unexpected solution that emerges from the diffuse mode can make it feel almost like the "Ah-hah!" mode.

## Users Review

### From reader reviews:

#### Sandra Conaway:

What do you think of book? It is just for students since they are still students or that for all people in the world, the actual best subject for that? Only you can be answered for that question above. Every person has different personality and hobby for every other. Don't to be compelled someone or something that they don't wish do that. You must know how great and important the book *A Mind for Numbers: How to Excel at Math and Science (Even If You Flunked Algebra)*. All type of book is it possible to see on many solutions. You can look for the internet resources or other social media.

#### Paul Jones:

In this 21st millennium, people become competitive in every single way. By being competitive at this point, people have do something to make them survives, being in the middle of the actual crowded place and notice through surrounding. One thing that oftentimes many people have underestimated this for a while is reading. Sure, by reading a reserve your ability to survive boost then having chance to stand up than other is high. For you who want to start reading any book, we give you this kind of *A Mind for Numbers: How to Excel at Math and Science (Even If You Flunked Algebra)* book as starter and daily reading reserve. Why, because this book is usually more than just a book.

**Stacia Cobb:**

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**Harold Phillips:**

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