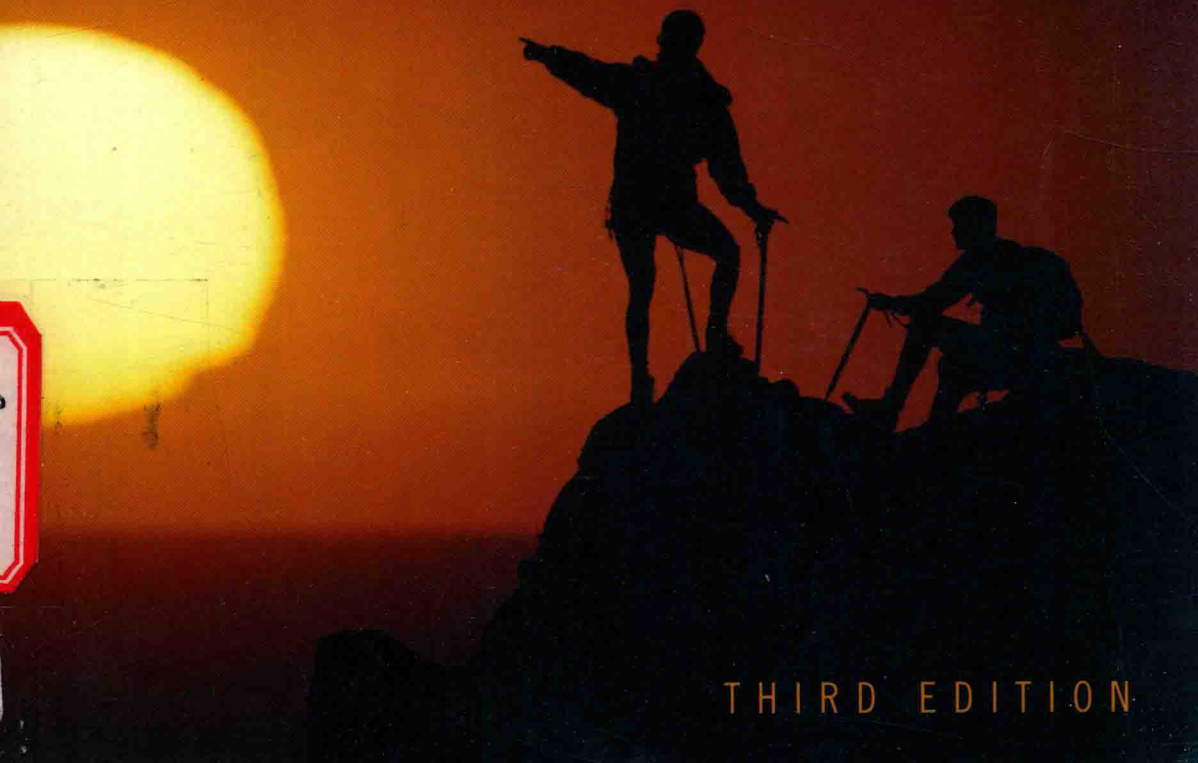


Cynthia Arem

Conquering

Math Anxiety

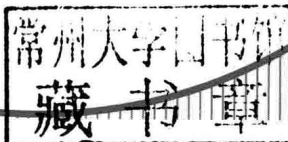


THIRD EDITION

Conquering Math Anxiety

A SELF-HELP WORKBOOK

Cynthia A. Arem, Ph.D.
Pima Community College



THIRD EDITION



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**Conquering Math Anxiety:
A Self-Help Workbook, Third
Edition**

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The Road Map to Success

Have you ever found yourself lost, in a strange or unfamiliar place, without a map to guide you? Did you suddenly feel alone? Did you feel scared, not knowing what to do or which way to turn? Perhaps you stopped to ask for directions, but they were confusing, misguided, or incomprehensible. If the hour was growing late, you might have felt a sense of menace or dread. Perhaps you began to perspire, your muscles tightened, your pulse quickened, your breathing became more rapid, and all your senses heightened, trying to detect if danger was present.

Now let's imagine for a moment you were miraculously given a detailed map of the area, not only showing where you were but also providing explicit instructions for reaching any destination you chose. Every step along the way was made clear, every turn and every landmark carefully spelled out and described. Your map left no stone unturned, no shadow of a doubt as to what direction to take and how to proceed. Wouldn't such a map have made your journey less stressful, more pleasurable, and helped guarantee success in reaching your goal?

Is dealing with math like being lost in an unfamiliar or strange place? Do you sometimes feel as if you're all alone, no one understands what you're going through, and others' efforts to help are confusing or misleading? When doing math, do you ever feel scared, panicky, or have a sense of dread or impending doom—not knowing which way to turn or where to get the assistance you so desperately need?

Let me assure you that you are not alone. There are many people who have felt the same way at one time or another. Students often describe feelings of devastating failure and utter defeat when it comes to

doing math. Mathematical reasoning and numbers are their nemesis and have been for much of their school lives. They shun exposure to math as if it were a frightening, unknown danger. Whenever possible, they purposely avoid any subject requiring math and choose majors requiring little or preferably no math. In math classes or even in math tutoring sessions, their minds turn off and they become lost, comprehending little of what is explained or taught.

If you are one of these students—lost, feeling alone, apprehensive, shunning math—you have come to the right place. I have written this workbook specifically for you. I've designed it to be your personal, detailed map to help you find your way, to aid you in overcoming your fear of math, and to ensure that you achieve success in math. Included are detailed explanations and exercises all along your path to illuminate your journey and to make it easier and more fulfilling.

As you follow this road map, you will find many important branch points to explore and experience. We begin our journey in Chapter 1 by first discovering whether you really have math anxiety, and then we analyze your math success goal. From there, we'll look at where your math fears and anxieties initially began and why they have persisted.

Chapter 2 asks you to look at your math anxiety history and identify the factors that influenced you as well as the myths, stereotypes, or games that might have affected you. By diagramming the math anxiety process, you can see how previous negative math experiences combined with negative self-talk lead to overwhelming anxieties and fears.

In Chapter 3, you learn how anxiety affects your memory and ways to control and manage anxiety so it can work for you and not against you. You learn how high, uncontrolled anxiety levels lead to panic and the inability to perform, whereas moderate, properly managed anxiety marshals optimal performance, good memory, and clear thinking.

Chapter 4 explores how you deal with problems that arise in your life and how your coping methods can aid or hinder your efforts to overcome math anxiety. The Wall Fantasy is designed to increase your awareness of what you may be doing to impede your success in math. We also assess your math self-concept.

Next, in Chapter 5, we look at the importance of attitudes and ways of changing negative attitudes toward math to positive ones. I

guide you through exercises to help you develop positive, enhancing self-dialogue related to math and your ability to do math.

Then our journey takes us to the very exciting area of “Success in Math” imagery. Research has shown that positive mental imagery can greatly improve the status of our lives mentally, emotionally, and physically. In Chapter 6, you are given excellent visualization techniques to achieve your math goals. You are guided through a beautiful imagery technique that has already advanced the lives of many hundreds of math students who overcame the same math anxieties that you have been experiencing. You will also find this exercise recorded on the accompanying CD.

Chapter 7 looks at your math learning style. Through the use of carefully chosen questions, you are asked to assess the critical factors influencing your ability to learn math. Whether you are a visual, auditory, or kinesthetic/tactile learner, a sequential or global learner, or a deductive or inductive learner, this chapter offers you suggestions for enhancing your learning.

From here, the path leads directly into Chapter 8, where we examine useful math study skills and winning strategies for learning math and reading math textbooks.

Chapter 9, one of the most important in this road map, teaches you how to deal with test anxiety and how to perform your best on math exams. It reviews test preparation and test-taking strategies as well as good nutritional guidelines to follow before exams. This chapter contains a powerful visualization exercise to help you feel alert, clear, calm, confident, and competent on exams. You will also find this exercise recorded on the accompanying CD.

Chapter 10 explores problem-solving approaches and ways to “think like a mathematician.” We end the journey with Chapter 11, a look at your exciting math future.

A special music and dialogue CD accompanies this workbook. It was produced to help you experience some of the wonderful calming and visualization techniques described in this workbook. The Calming Breath and the Deep Abdominal Breath both focus on calming your mind and body. The “Success in Math Visualization” will help you reprogram yourself to succeed in math, and the “Math Test Anxiety Reduction Visualization” will take you through a powerful technique to help you achieve success on math exams.

Some Basic Axioms

In this workbook, I present a comprehensive, well-tested plan for tackling your math fears and anxieties. My approach is based on the following premises:

- As a student, you need not be forever burdened by the negative experiences or unproductive messages from your past.
- You can learn to manage stress and anxiety physiologically so they can be productive rather than destructive aspects of your academic performance.
- By changing negative math self-talk to positive self-talk, you can greatly improve your ability to deal with math.
- Learning how to maintain a positive attitude toward math and toward your ability to do math has a tenfold beneficial effect on your math performance.
- By using visualization techniques, you can reprogram yourself to succeed in math.
- You can increase your ability to learn math by using more appropriate, effective, and efficient study skills and learning-style strategies.
- Conquering math test anxiety is like winning the battle.
- Math can actually begin to be fun and exciting for you!

Guidelines for Using This Workbook

Here are a few suggestions to help you maximize the benefits of the exercises in this workbook:

1. *Give yourself some uninterrupted time.* Set aside a special time and place where you will not be distracted or interrupted. Even if you have only 5 or 10 minutes, make sure it is a private time just for you. Unplug the phone if necessary. Put a note on your bedroom door saying you can't be disturbed for a few minutes.
2. *Work alone and in silence.* You will be able to gain greater self-understanding and insights if you work alone and don't prematurely share your new perceptions with others. There will

be plenty of time later, after completing your work, for you to discuss what you've learned. I encourage you to share your insights with supportive people, such as friends, teachers, or a counselor. They may make your journey easier.

3. *Keep a math journal.* You will probably find it helpful to keep a journal in which you write about the new awareness, sensitivities, and insights you gain. This may be similar to Exercise 2-3 (Chapter 2), or it may be in the form of a traditional diary.
4. *Assume a comfortable position.* Sit quietly, with your eyes closed, in a slightly darkened room when listening to the CD or taking yourself through the anxiety management exercises in Chapter 3, the Wall Fantasy in Chapter 4, the "Success in Math Visualization" in Chapter 6, and the "Math Test Anxiety Reduction Visualization" exercise in Chapter 9. Be sure to arrange to be alone and undisturbed so you attain the full benefit of these experiences.
5. *Be persistent.* The road to success can be achieved only through staying power, resolve, and determination. "Stick-to-it-tiveness" will help you reach your math goal. You must master many steppingstones along the way: from learning how to reduce anxiety to overcoming psychological stumbling blocks; from rewriting disempowering math beliefs to reprogramming yourself to succeed in math; from learning to use effective math study skills to conquering math test anxiety. It will take time and patience. So persevere, stay with it, and you'll conquer your math fears and anxieties.
6. *Be positive.* Know in your heart and mind that **you can and will succeed**. Have faith that you are able to achieve in life what you realistically desire and work toward. Your persistent, positive efforts can and will be rewarded. I've seen it happen for others who have conquered math anxiety. Why not you?
7. *Jump in and start anywhere.* Although I have written this workbook as a detailed road map to help you reach your math success goal, you need not progress through the workbook in sequence. As much as possible, each chapter stands independently of the others. Thus, you may wish to work mainly on those areas that concern you the most.

Summary

Conquering Math Anxiety: A Self-Help Workbook offers you a detailed road map laying out all the steps along the route to overcome math anxiety and ultimately to achieve success in math. Many students have taken this route before you and have succeeded. So can you!

To Arnie

My best friend, confidant, teacher, guardian angel, and nurturer of all my dreams and ambitions—so loving, sensitive, and sincere. Thank you for being there, every step of the way in my life and in my work.

Millions of students in this country are terrified of math. They do whatever they can to avoid numbers and math problems as if they were the plague. In school, they put off taking math as long as possible. And when given the choice, they select majors requiring little or no math. If they do have to take the subject, they dread entering the classroom, let alone taking an exam. One young student described how she panicked in math class to the point that she would run out of the room and vomit uncontrollably. As a child, she often had nightmares about numbers chasing her, wanting to hurt her.

High levels of anxiety can devastate a student's ability to perform, resulting in poor academic progress and high dropout rates. Research among college students has shown math generates anxiety reactions among students who are not necessarily highly anxious in other situations. One study at a large midwest university disclosed one-third of all students who requested behavioral counseling complained of anxiety related to math.

As a college counselor, I've seen hundreds of students each semester who fear math or do their best to avoid taking it. In fact, I believe there are people in all walks of life who are math anxious. Invariably, when I'm at social functions or at meetings, people confide in me about their math woes. They often tell me math has always been their biggest problem in school. They say things such as: "If it weren't for math, I'd be going to school right now." "I'd be making a career change." "I'd be more successful than I am right now." "I'd go back to school and get that degree I always wanted." And on and on.

Widely reported studies have shown math serves as a "critical filter" in determining many educational, vocational, and professional

options (National Research Council, 1998; Sells, 1978). Math avoiders are finding themselves shut out of today's most rewarding and profitable careers.

College algebra is a minimum math requirement for a bachelor's degree at almost all undergraduate institutions. At the community college level, we see many students who can't possibly meet this math requirement, either because they had poor math backgrounds to begin with or because they've been out of school so long they've forgotten what they once knew. Often, these students must take four math courses just to meet this university requirement for their major. They need to take fundamentals of math—a course reviewing percentages, decimals, and fractions—before they can go on to take beginning algebra, intermediate algebra, and finally, college algebra. For students who are afraid of math, this is a living nightmare. Furthermore, the news media increasingly point out that the majority of Ph.D. degrees in science and engineering given in this country are being awarded to foreign-born graduates who, presumably, are more comfortable with math than U.S. graduates.

Why is math such a problem for Americans? How can we fully understand this problem? What can be done to overcome the devastating effects of math anxiety and math avoidance? I've designed this workbook to answer these questions.

Conquering Math Anxiety: A Self-Help Workbook presents a comprehensive, multifaceted treatment approach to reduce math anxiety and math avoidance. This unique, carefully outlined methodology involves anxiety management and reduction, reduction of internal psychological stumbling blocks, attitude changing, confidence building, "Success in Math Visualizations," learning-style enhancements, problem-solving strategies, and effective study and test-taking skills. In addition, it teaches winning strategies for overcoming test anxiety on math exams. This workbook provides detailed explanations along with a host of varied exercises, methods, and worksheets for helping math-anxious students deal with and overcome math fears.

The CD accompanying this workbook contains recordings of my favorite and most powerful relaxation and visualization exercises for reducing math anxiety. I've used these exercises successfully for many years with math-anxious students, both in my classes and in counseling.

Although *Conquering Math Anxiety* is based on my experience at the community college level, my primary purpose in writing it is to reach *all* math-anxious individuals. Many are attending universities, community colleges, or high schools. Many are no longer in school but find that math fears continue to interfere with the pursuit of their personal goals, often creating lowered self-esteem, frustration, or dissatisfaction.

Because this workbook is comprehensive in its scope, it is relevant for people at any educational level or in any career. It is designed so the reader can simply jump in and draw from it as little or as much as he or she needs.

No prerequisites are needed for completing the activities in this workbook. Mathematics anxiety can be found at any math level, from the fundamentals of math through statistics and beyond. I've even had students taking calculus simultaneously enrolled in my math anxiety reduction course.

Conquering Math Anxiety uses the analogy of a road map detailing the route to math success, but its individual chapters are like recipes that can be extracted and used entirely on their own according to need. For this reason, the workbook and CD are useful by themselves or as supplements to any mathematics course in which a student or teacher identifies a problem area impeding smooth progress.

My background as a college counselor, teacher, and workshop trainer leads me to speak directly to those with whom I work and to involve them thoroughly in the learning process. Therefore, I have included a maximum number of exercises. Also, throughout the book, I address the reader in the first person. After first analyzing the roots of math anxiety, I detail specific techniques for managing anxiety and overcoming psychological barriers to math. This leads to the critical importance of reversing negative "math self-talk," creating positive attitudes, and building self-confidence. The section on math success visualization is unique. It helps readers reprogram their thinking to promote math success. Then I focus on learning styles, study skills, and problem-solving approaches as they apply specifically to math. The workbook ends with an in-depth look into techniques for conquering math test anxiety and an analysis of the importance of mathematics in all aspects of life. Interspersed throughout the workbook you will find humorous cartoons with a positive slant.

What's New in the Third Edition

The most important changes to this edition are summarized here:

Chapter 2

- New research data have been added to the sections “Poor Teaching Methods” and “Gender Stereotyping and Socialization.”
- The section “Dyscalculia: A Cause or a Symptom?” is new. It discusses dyscalculia and research related to it.
- Figure 2-1 “The Math Anxiety Cycle” is expanded and more comprehensive.

Chapter 3

- This chapter is renamed *Learn to Manage Anxiety and Improve Working Memory*.
- The section “Anxiety Can Affect Your Long-Term and Working Memory Systems” is new. This section discusses the roles these memory systems have when students learn math and solve problems. It highlights the important research on the devastating effects anxiety has on working memory and math problem solving.
- Figure 3-1 “Working Memory’s Simultaneous Processes Used in Math” is new.

Chapter 4

- The section “Math Self-Concept and Math Self-Efficacy” is new. This section discusses the important roles math self-concept and math self-efficacy have in learning math. Related research data are included.
- Exercise 4-4 “Your Math Self-Concept: A Self-Assessment ” is new.

Chapter 7

- The section “A Sequential versus a Global Learning Style” is new. This section discusses the difference between sequential and global learners. It also provides studying suggestions for both learning styles.
- The section “Personal Thinking Styles” is now renamed “A Deductive versus an Inductive Learning Style,” and it has been moved earlier in the chapter.

- Exercise 7-2 “Collaborative Learning: Share Your Insights on Learning Styles” is new.

Chapter 8

- The section “From Acquisition to Understanding” is new. This section discusses the four stages of learning: acquisition, fluency, adaptation, and generalization. It encourages students to go beyond the mere acquisition of a new math concept to the later learning stages to increase understanding and math proficiency.
- Figure 8-1 “Math Learning Stages and Strategies” is new. This figure provides suggestions on how to successfully accomplish each learning stage and move to the next higher one.
- The section “Clear the Minefield” is new. It discusses how students’ faulty beliefs about studying are really booby traps that prevent them from moving toward their math goal.
- Figure 8-2 “Disarm Your Minefield” is new. It summarizes some common faulty beliefs and offers study strategies for neutralizing them.
- The section “Useful Strategies for Dealing with Dyscalculia” is new. Its title tells it all.
- Figure 8-3 “Suggestions for Dyscalculia Difficulties” is also new. This figure includes suggested strategies to help nine different dyscalculia difficulties.

Chapter 9

- Section “Be Your Own Exam Coach” is new. This section encourages students to be their own coach, give themselves pep talks, keep themselves focused on their task, push away distracting thoughts, and set realistic, positive exam goals.
- Exercise 9-12 “Collaborative Learning: The Best Coaching Practices” is new.
- The section “After Your Next Exam” is new. In this section, students are asked to reflect on what strategies worked best for them on their next exam and what they learned about themselves and their test-taking skills.
- Exercise 9-14 “Characteristics of Optimal Test Performance: A Self-Assessment” is new.

Chapter 10

- The section “Build Metacognitive Strategies” is new. This section asks students to reflect on their own “cognitive” or thinking processes so they can achieve an in-depth understanding of how they learn math and solve problems.
- Exercise 10-3 “Metacognitive Strategies for Success in Math” is new. This exercise provides relevant questions for students to ask themselves at each of the three main stages of metacognition: the planning stage, the monitoring stage, and the reflection/evaluation stage.

Note

Although this book is based on my experience as a community college teacher and counselor, both college and high school teachers are successfully using it in their classes, tutoring, and learning resource centers.

Acknowledgments

I am extremely grateful to those who have assisted me in the development of the ideas presented in this workbook: the many math-anxious students I have counseled and taught, my colleagues who shared ideas and teaching suggestions, and my family and friends who offered support and assistance.

This work would not have been possible if not for the many wonderful students I have worked with over the years—both in counseling sessions and in the math anxiety reduction courses and workshops I have taught. In the process of helping them deal with math anxiety, I have learned much and now feel privileged to be able to share this knowledge with others. My students have been my teachers, and I would like to thank each and every one of them.

The most important person in the development and writing of this book has been my husband, Arnold Arem, M.D. His many hours of dedication to this project have been invaluable to me. To each of the ideas presented here he listened carefully and gave his thoughtful

critique. He read and reread my manuscript at each stage of its development and offered me counsel, detailed editing advice, and much needed emotional support. I am particularly delighted that he developed the ideas for the lighthearted cartoons that appear in this work.

I would also like to thank my daughter, Kimba, for the beautiful, relaxing music she composed for the CD accompanying this workbook. Her caring input has been an inspiration. I also extend my sincere appreciation to my son, Keith, and to PCB Productions for their excellent production of the accompanying CD. Keith's dedication to quality and his hard work have helped produce a superb recording.

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