

Making Everything Easier!™

Technical Math **FOR** **DUMMIES®**

Learn to:

- Understand mathematical concepts used in the skilled trades and by health care, culinary, and technical professionals
- Use fundamental formulas and methods to excel in the workplace, classrooms, and on job sites
- Apply algebra, geometry, and trigonometry to solve on-the-job problems

Barry Schoenborn

Technical writer

Bradley Simkins

*Math teacher and tutor at the Multimedia
Math Learning Center, American River College*



Get More and Do More at Dummies.com®



Start with **FREE** Cheat Sheets

Cheat Sheets include

- Checklists
- Charts
- Common Instructions
- And Other Good Stuff!

To access the Cheat Sheet created specifically for this book, go to
www.dummies.com/cheatsheet/technicalmath

Get Smart at Dummies.com

Dummies.com makes your life easier with 1,000s of answers on everything from removing wallpaper to using the latest version of Windows.

Check out our

- Videos
- Illustrated Articles
- Step-by-Step Instructions

Plus, each month you can win valuable prizes by entering our Dummies.com sweepstakes.*

Want a weekly dose of Dummies? Sign up for Newsletters on

- Digital Photography
- Microsoft Windows & Office
- Personal Finance & Investing
- Health & Wellness
- Computing, iPods & Cell Phones
- eBay
- Internet
- Food, Home & Garden

Find out “HOW” at Dummies.com

*Sweepstakes not currently available in all countries; visit Dummies.com for official rules.



Technical Math

FOR

DUMMIES®

Technical Math FOR **DUMMIES®**

by Barry Schoenborn and Bradley Simkins



WILEY

Wiley Publishing, Inc.

Technical Math For Dummies®

Published by

Wiley Publishing, Inc.

111 River St.

Hoboken, NJ 07030-5774

www.wiley.com

Copyright © 2010 by Wiley Publishing, Inc., Indianapolis, Indiana

Published by Wiley Publishing, Inc., Indianapolis, Indiana

Published simultaneously in Canada

No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, scanning or otherwise, except as permitted under Sections 107 or 108 of the 1976 United States Copyright Act, without either the prior written permission of the Publisher, or authorization through payment of the appropriate per-copy fee to the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923, (978) 750-8400, fax (978) 646-8600. Requests to the Publisher for permission should be addressed to the Permissions Department, John Wiley & Sons, Inc., 111 River Street, Hoboken, NJ 07030, (201) 748-6011, fax (201) 748-6008, or online at <http://www.wiley.com/go/permissions>.

Trademarks: Wiley, the Wiley Publishing logo, For Dummies, the Dummies Man logo, A Reference for the Rest of Us!, The Dummies Way, Dummies Daily, The Fun and Easy Way, Dummies.com, Making Everything Easier, and related trade dress are trademarks or registered trademarks of John Wiley & Sons, Inc. and/or its affiliates in the United States and other countries, and may not be used without written permission. All other trademarks are the property of their respective owners. Wiley Publishing, Inc., is not associated with any product or vendor mentioned in this book.

LIMIT OF LIABILITY/DISCLAIMER OF WARRANTY: THE PUBLISHER AND THE AUTHOR MAKE NO REPRESENTATIONS OR WARRANTIES WITH RESPECT TO THE ACCURACY OR COMPLETENESS OF THE CONTENTS OF THIS WORK AND SPECIFICALLY DISCLAIM ALL WARRANTIES, INCLUDING WITHOUT LIMITATION WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE. NO WARRANTY MAY BE CREATED OR EXTENDED BY SALES OR PROMOTIONAL MATERIALS. THE ADVICE AND STRATEGIES CONTAINED HEREIN MAY NOT BE SUITABLE FOR EVERY SITUATION. THIS WORK IS SOLD WITH THE UNDERSTANDING THAT THE PUBLISHER IS NOT ENGAGED IN RENDERING LEGAL, ACCOUNTING, OR OTHER PROFESSIONAL SERVICES. IF PROFESSIONAL ASSISTANCE IS REQUIRED, THE SERVICES OF A COMPETENT PROFESSIONAL PERSON SHOULD BE SOUGHT. NEITHER THE PUBLISHER NOR THE AUTHOR SHALL BE LIABLE FOR DAMAGES ARISING HEREFROM. THE FACT THAT AN ORGANIZATION OR WEBSITE IS REFERRED TO IN THIS WORK AS A CITATION AND/OR A POTENTIAL SOURCE OF FURTHER INFORMATION DOES NOT MEAN THAT THE AUTHOR OR THE PUBLISHER ENDORSES THE INFORMATION THE ORGANIZATION OR WEBSITE MAY PROVIDE OR RECOMMENDATIONS IT MAY MAKE. FURTHER, READERS SHOULD BE AWARE THAT INTERNET WEBSITES LISTED IN THIS WORK MAY HAVE CHANGED OR DISAPPEARED BETWEEN WHEN THIS WORK WAS WRITTEN AND WHEN IT IS READ.

For general information on our other products and services, please contact our Customer Care Department within the U.S. at 877-762-2974, outside the U.S. at 317-572-3993, or fax 317-572-4002.

For technical support, please visit www.wiley.com/techsupport.

Wiley also publishes its books in a variety of electronic formats. Some content that appears in print may not be available in electronic books.

Library of Congress Control Number: 2010926845

ISBN: 978-0-470-59874-0

Manufactured in the United States of America

10 9 8 7 6 5 4 3 2 1



WILEY

About the Authors

Barry Schoenborn lives in Nevada City, California. He's a longtime technical writer with over 30 years' experience. He's written hundreds of user manuals and (in the early days) worked dozens of part-time jobs that required practical math. He has been a carpenter for the movies, a stage electrician, a movie theater manager, a shipping clerk, an insurance clerk, and a library clerk. He has a bachelor's degree in theatre from California State University, Fullerton.

Recently, his company worked with the California Integrated Waste Management Board to teach scientists and administrators how to write clearly. Barry is the coauthor of *Storage Area Networks: Designing and Implementing a Mass Storage System* (Pearson Education). He was a movie reviewer for the *L.A. Herald-Dispatch* and wrote a monthly political newspaper column for *The Union* of Grass Valley, California, for seven years. Barry's publishing company, Willow Valley Press, published *Dandelion Through the Crack*, which won the William Saroyan International Prize for Writing.

Bradley Simkins was born and raised in Sacramento, California, and became a sixth-generation journeyman plasterer. But it didn't take long (after many hours on construction sites) before he figured out that it was easier to use his brain than his muscles. He has a master's degree in mathematics from California State University, Sacramento. He has taught, assisted, and tutored at the Multimedia Math Learning Center at American River College in Sacramento. He and his family live in Sacramento, where he owns Book Lovers Bookstore, an independent bookstore.

Dedications

Barry: To my teachers at San Juan High School in Citrus Heights, California: Mr. N. E. (Norm) Andersen (math); Mrs. Eada Silverthorne (English); Ms. Susan A. Schwarz (English); Mr. Norman E. Allen (physics); Mr. A. J. Crossfield (chemistry); and Mr. James C. Harvey (biology). They would be surprised and (maybe) pleased.

Bradley: I dedicate my work to my in-laws, Greg and Diane Manolis, who have always extended their hand to help with no complaints, and to my oldest daughter, Ashleigh, who taught me that failing does not make you a failure.

Authors' Acknowledgments

Barry: This book wouldn't have been possible without the efforts of coauthor Bradley Simkins. We were supported by a great team at Wiley Publishing (Natalie Harris, Erin Mooney, and Megan Knoll) who worked hard to make this book a reality. They are the nicest people you'll ever meet! A big thanks, too, to Matt Wagner of Fresh Books Literary Agency, who presented us to Wiley.

Our patient readers were Priscilla Borquez (who is fast, accurate, and sensible, and who also has a great sense of humor); Jim Collins (an excellent and thorough technical communicator); Bill Love (who knows a zillion things about cars, machining, and welding); and Frances Kakugawa (author, poetess, and lecturer to and supporter of Alzheimer's caregivers, who was our poster child for someone who doesn't understand story problems).

Many thanks to Patricia Hartman, who was always encouraging, and to Johna Orzalli, my haircutter, who taught me how to mix hair color. Thanks as well to Jeff Perilman at Dave's Auto Repair for tips about smogging a car and specialized tools. And, finally, thanks and apologies to all the medical and dental staffs I flooded with questions.

Bradley: First, I thank Barry Schoenborn for all his hard work and dedication to make this work possible and for always going the extra mile to understand when my life became too hectic. I thank my beautiful wife, Audrey, and my beautiful children, Ashleigh, Brayden, Alexander, and Natalie, who make my life worth living. Thanks to Jill Marcai and Jens Lorenz for correcting all of our math mistakes. Last, but certainly not least, many thanks to the team at Wiley Publishing for taking on such goofballs.

Publisher's Acknowledgments

We're proud of this book; please send us your comments at <http://dummies.custhelp.com>. For other comments, please contact our Customer Care Department within the U.S. at 877-762-2974, outside the U.S. at 317-572-3993, or fax 317-572-4002.

Some of the people who helped bring this book to market include the following:

Acquisitions, Editorial, and Media Development

Project Editor: Natalie Harris

Acquisitions Editor: Mike Baker

Copy Editors: Megan Knoll, Caitie Copple

Assistant Editor: Erin Calligan Mooney

Editorial Program Coordinator: Joe Niesen

Technical Editors: Jens Lorenz, Jill Macari

Editorial Manager: Christine Meloy Beck

Senior Editorial Assistant: David Lutton

Editorial Assistants: Rachelle Amick,
Jennette ElNaggar

Art Coordinator: Alicia B. South

Cover Photos: Corbis

Cartoons: Rich Tennant
(www.the5thwave.com)

Composition Services

Project Coordinator: Patrick Redmond

Layout and Graphics: Carrie A. Cesavice

Proofreader: Jennifer Theriot

Indexer: BIM Indexing & Proofreading Services

Publishing and Editorial for Consumer Dummies

Diane Graves Steele, Vice President and Publisher, Consumer Dummies

Kristin Ferguson-Wagstaffe, Product Development Director, Consumer Dummies

Ensley Eikenburg, Associate Publisher, Travel

Kelly Regan, Editorial Director, Travel

Publishing for Technology Dummies

Andy Cummings, Vice President and Publisher, Dummies Technology/General User

Composition Services

Debbie Stailey, Director of Composition Services

Contents at a Glance

<i>Introduction</i>	<i>1</i>
<i>Part I: Basic Math, Basic Tools.....</i>	<i>7</i>
Chapter 1: Math that Works as Hard as You Do	9
Chapter 2: Discovering Technical Math and the Tools of the Trades	17
Chapter 3: Zero to One and Beyond.....	31
Chapter 4: Easy Come, Easy Go: Addition and Subtraction	43
Chapter 5: Multiplication and Division: Everybody Needs Them	57
Chapter 6: Measurement and Conversion	77
Chapter 7: Slaying the Story Problem Dragon.....	95
<i>Part II: Making Non-Basic Math Simple and Easy.....</i>	<i>111</i>
Chapter 8: Fun with Fractions	113
Chapter 9: Decimals: They Have Their Place	135
Chapter 10: Playing with Percentages.....	153
Chapter 11: Tackling Exponents and Square Roots	167
<i>Part III: Basic Algebra, Geometry, and Trigonometry.....</i>	<i>179</i>
Chapter 12: Algebra and the Mystery of X	181
Chapter 13: Formulas (Secret and Otherwise)	199
Chapter 14: Quick-and-Easy Geometry: The Compressed Version	215
Chapter 15: Calculating Areas, Perimeters, and Volumes.....	231
Chapter 16: Trigonometry, the “Mystery Math”	249
<i>Part IV: Math for the Business of Your Work.....</i>	<i>259</i>
Chapter 17: Graphs are Novel and Charts Are Off the Chart.....	261
Chapter 18: Hold on a Second: Time Math	279
Chapter 19: Math for Computer Techs and Users	297
<i>Part V: The Part of Tens</i>	<i>309</i>
Chapter 20: Ten Tips for Solving Any Math Problem.....	311
Chapter 21: Ten Formulas You’ll Use Most Often	317
Chapter 22: Ten Ways to Avoid Everyday Math Stress	325

<i>Glossary.....</i>	<i>333</i>
<i>Index</i>	<i>345</i>

Table of Contents

***Introduction* 1**

About This Book	1
Conventions Used in This Book	2
What You're Not to Read	2
Foolish Assumptions	3
How This Book Is Organized	3
Part I: Basic Math, Basic Tools	3
Part II: Making Non-Basic Math Simple and Easy	4
Part III: Basic Algebra, Geometry, and Trigonometry	4
Part IV: Math for the Business of Your Work	4
Part V: The Part of Tens	5
Icons Used in This Book	5
Where to Go from Here	6

***Part 1: Basic Math, Basic Tools* 7**

Chapter 1: Math that Works as Hard as You Do 9

Discovering the Benefits of a Technical Math Book	10
The Basics Are Basically Basic	10
Meeting Measurement and Conversions and Studying	
Story Problem Strategies	11
Using Workhorse Math	12
Building Your Knowledge of the Branches of Math	13
Life Math Isn't Classroom Math	14

Chapter 2: Discovering Technical Math and the Tools of the Trades 17

Busting Myths about Math	18
"I don't need to use it."	18
"It's too hard."	19
"I have a phobia."	19
Remember: Somebody Else Already Did the Hard Work	20
The Trades, They Are A-Changing	21
Math Devices That Can Help You Do Your Job	22
Pocket (or phone, or computer) calculators	23
Specialty calculators	25
Thermometers and sphygmomanometers	26
Micrometers, calipers, and gauges	27
Automotive tools	28
Carpentry tools	29
Bricklaying tools	30

Chapter 3: Zero to One and Beyond. 31

Looking at the Numbers that Count: Natural Numbers.....	32
Integers: Counting numbers with extras.....	32
Zero: Making math easier	33
Going Backward: Negative Numbers.....	35
Working with negative numbers	35
Traveling down the number line.....	35
Getting Between the Integers: Fractions, Decimals, and More.....	36
Our fractional friends	36
The rational numbers (and their irrational friends)	37
Taking a Look at the Lesser-Known Numbers	38
Real numbers.....	38
Imaginary numbers.....	39
Complex numbers.....	39
Nominal numbers.....	39
Handling Numerical Story Problems.....	40
Example: Automotive tech — a slippery task	40
Example: Getting the order right	42

Chapter 4: Easy Come, Easy Go: Addition and Subtraction 43

Making Everything Add Up.....	44
Adding numbers in a column	45
Adding zero.....	46
Adding negative numbers	46
Carrying the extra.....	47
Checking your work.....	48
Subtraction: Just Another Kind of Addition.....	49
Subtracting a positive is the same as adding a negative	50
Subtracting negative numbers	50
Subtracting zero.....	50
Subtracting multiple items	50
Borrowing when you have to	52
Checking your work.....	53
Example: Flour Power	54
Example: Sheep on Trucking.....	55

Chapter 5: Multiplication and Division: Everybody Needs Them . . . 57

Go Forth and Multiply!	58
Mastering multiplication terminology.....	58
Memorizing multiplication tables: Faster than a calculator.....	59
Doing Simple Multiplication Like Your Grandfather Did It	61
Checking your work.....	65
Easy Street: Multiplying by 0, 1, and 10	65
A zero pulse: Multiplying by 0.....	66
One is the loneliest number: Multiplying by 1	66
Multiplying by 10	66

Divide and Conquer.....	67
Dealing with division definitions.....	68
Dividing by using the inverse.....	69
Doing short division.....	69
Going long (division).....	71
Checking your work.....	73
Shortcuts: Dividing into 0 and by 0, 1, 10, and the dividend.....	73
Example: In the Machine Shop.....	74

Chapter 6: Measurement and Conversion77

Main (And Not So Main) Systems of Measurement.....	77
The metric system.....	78
The American system.....	79
The imperial system, or the modern English system.....	81
Troy weight: Just for bullets and bullion.....	82
Apothecaries' system: Not a grain of value any more.....	82
Other legitimate but specialized measurements.....	83
Converting Length, Weight, and Volume.....	85
The rules of conversion.....	85
American units to American units.....	86
American to metric and back again.....	89
Converting metric to metric.....	91
Example: Don't Get Bored by Board Feet.....	92
Example: Getting the Dosage Right.....	93

Chapter 7: Slaying the Story Problem Dragon.95

Removing the Mystery from Story Problems.....	96
How to approach a story problem: A real-life example.....	96
The secret formula inside every story problem.....	98
The Step-by-Step Story Problem Solution.....	100
1. Read the problem.....	100
2. List the facts.....	101
3. Figure out exactly what the problem is asking for.....	102
4. Eliminate excess information.....	102
5. See what information is missing.....	103
6. Find the keywords.....	103
7. Pay attention to units.....	104
8. Convert information supplied into information needed.....	104
9. Draw a diagram.....	105
10. Find or develop a formula.....	105
11. Consult a reference.....	106
12. Do the math and check your answer to see whether it's reasonable.....	106
Example: Furring Strips.....	107
Example: And Now, from the Banks of the Nile.....	108

Part II: Making Non-Basic Math Simple and Easy 111**Chapter 8: Fun with Fractions113**

Meeting the Numerator and Denominator: Best Friends Forever	114
Taking a look at numerators.....	115
Defining denominators	118
Dealing with special cases	118
Tackling the Different Types of Fractions	119
Proper and improper fractions	120
Mixed numbers	120
Ratios.....	122
Performing Math Operations with Fractions	123
Multiplying fractions	124
Dividing fractions.....	125
Adding fractions.....	126
Subtracting fractions	128
Example: Dividing and Selling a Cheesecake	129
Pricing your cake wholesale.....	130
Pricing your cake retail.....	130
Example: Cutting Fire Stops for Framing Carpentry	131

Chapter 9: Decimals: They Have Their Place135

Diving into Decimal Basics	136
Pointing out decimal points and places.....	137
Precision, pennies, and parsing.....	138
The Four Ops: Working with Decimals in Four Math Operations	140
Adding excitement.....	140
Subtraction gives satisfaction	141
Multiply with abandon	142
Division is an important decision.....	144
Decimal Conversion	145
Converting fractions to decimals.....	145
Converting decimals to fractions.....	146
Round, Round, Get Around, I Get Around	147
Making Change and Charging Sales Tax	148
Making change.....	148
Charging sales tax.....	149
Example: A Journey to Office Supply Heaven	150

Chapter 10: Playing with Percentages153

Pinpointing Percentages: Half a Glass Is Still 50 Percent Full	153
A percentage is a fraction, but the denominator never changes.....	154
A percentage is a ratio, too.....	156

Percentages Are Good Converts.....	156
Converting percentages to decimals.....	156
Turning decimals into percentages.....	157
Going from percentages to fractions.....	158
Transforming fractions to percentages	158
Calculating Percentage Increases and Decreases	159
Percentage increases: You get 10 percent more!.....	159
Percentage decreases: You save 10 percent!.....	159
The 100 percent increase: You must be 100 percent satisfied!.....	160
Dividing a Pie Using Percentages	160
Example: The World of Pralines	163
Example: Oily to Bed and Oily to Rise	165

Chapter 11: Tackling Exponents and Square Roots 167

Exponentiation: The Power of Powers.....	168
The basics of the base.....	168
Moving beyond 2 or 3.....	169
Different faces of special bases.....	170
Exponentiation math	173
Getting Back to Your (Square) Roots.....	175
Square roots the hard way	176
Square roots the easy way.....	176
Square roots the effortless way	177
Example: Finding the Bytes On a Disk	177

Part III: Basic Algebra, Geometry, and Trigonometry... 179

Chapter 12: Algebra and the Mystery of X 181

Variables: Letters Represent Numbers, but the Math Is the Same.....	182
Understanding variables.....	182
Corralling constants	182
Examining expressions.....	183
Getting a handle on equations	183
Taking time for terms	184
Variable Relationships: X and Her Friends.....	185
Best friends forever: The constant and the variable.....	185
Simplifying variables: Variables of a feather flock together.....	187
Math Operations with Variables.....	187
Adding variables	188
Subtracting variables	190
Multiplying variables	191
Dividing variables	193

Example: How Many Oranges Are In That Orange Juice?.....	195
Example: Medications In the Pillbox.....	197

Chapter 13: Formulas (Secret and Otherwise)199

Following the Formula for Building a Formula	200
Property A: Associativity	201
Property C: Commutativity.....	201
Property D: Distributivity	202
Working from a Formula to a Solution	203
Applying the same operation on both sides of the equal sign.....	204
Converting units with a special multiplication rule	207
Calculating Speed, Time, and Distance: Three Results from One Formula	208
Solving for speed.....	209
Solving for time	209
Solving for distance	210
Example: Cement Masonry – Pouring City Sidewalks	211
Example: Lunch Time — Buying Burgers and Fries	212

Chapter 14: Quick-and-Easy Geometry: The Compressed Version215

Looking at Geometry's Basic Parts	216
No snakes on this plane: Cartesian coordinates.....	217
What's the point?	218
What's your line?	219
What's your angle?: Acute, obtuse, and right angles	219
Examining Simple Geometric Shapes	221
The square and the rectangle	221
The triangle: Just because it isn't a right triangle doesn't mean it's wrong	222
The polygon.....	223
The circle	224
Learn It Once and Forget It: The Pythagorean Theorem.....	225
Example: Don't Fence Me In	227
Example: The Pen is Mightier Than the Paddock.....	228

Chapter 15: Calculating Areas, Perimeters, and Volumes231

Area: All That Space in the Middle	231
Calculating the area of rectangles and squares	232
Figuring the area of a parallelogram (a bent-over long rectangle).....	234
Determining the area of a trapezoid (a trapewhat?).....	235
Calculating the area of a triangle	237
Computing the area of a circle.....	238

Perimeters: Along the Edges	240
Understanding perimeters: What goes around comes around....	240
Calculating the perimeters of polygons	241
A perimeter by any other name: Finding a circle's circumference	242
Volume: The Third Dimension.....	242
Getting a handle on American volume units	243
Calculating the volume of cuboids (also known as boxes)	244
Finding the volumes of spheres and cylinders	245
Example: Bore and Stroke for the Auto Guy	246
Example: Yard Area, the Landscaper's Nightmare	247

Chapter 16: Trigonometry, the “Mystery Math” 249

Handling Triangles: More Angles than a Cornfield Maze	249
By Their Sines Shall Ye Know Them: Using Trigonometric Functions	251
Sine, cosine, and tangent: Three great relationships	252
Cosecant, secant, and cotangent: Three so-so relationships.....	253
The law of sines.....	253
Example: Surveying a River	254
Example: Locating a Wildfire.....	255

Part IV: Math for the Business of Your Work 259

Chapter 17: Graphs are Novel and Charts Are Off the Chart 261

Defining Charts and Graphs and Their Advantages	261
Paying Tables Their Proper Respect	262
Introducing the Three Most Important Types of Charts	263
Walking the line graph	264
Sidling up to the bar graph	264
Getting a piece of the pie chart	266
Reading Charts and Graphs (And Recognizing a Bad One)	267
For a start, the parts of a chart	268
The good, the bad, the ugly, and the inaccurate	269
Making Charts and Graphs	270
Creating line graphs	271
Building bar graphs	272
Putting together pie charts.....	272
Example: Tracking Weight and Height In a Pediatric Practice	273
Example: Cost of Materials In Residential Construction	275

Chapter 18: Hold on a Second: Time Math.279

Dividing Time into Hours, Minutes, and Seconds	279
There's a Time for Us, Somewhere a Time for Us:	
Time Notation Systems	281
12-hour notation.....	282
24-hour notation.....	282
Greenwich mean time (GMT)	283
UTC and Zulu time	284
Swahili time	285
Bible time	286
Converting Time	287
Going from minutes to seconds and back again	288
Changing hours to minutes and back again	289
Working with time as a fraction	289
Time Math: Calculating Time	290
Addition.....	291
Subtraction	292
Multiplication	292
Division	293
Example: The Timesheet for All Trades	294
Example: Microwave Magic.....	295

Chapter 19: Math for Computer Techs and Users.297

Try a Bit of This Byte: Understanding Basic Computer Terms	298
The Sum of the (Computer) Parts, and the Numbers Involved	300
Disk capacity	301
Flash memory	302
Rama lama ding dong: RAM memory	303
Speed out of the gate: Processor rate	303
The Internet is running on "slow" today: Network speed	304
Burn, baby, burn: DVD write speed.....	306
Example: Total Capacity of a Mass Storage System.....	307

***Part V: The Part of Tens*..... 309**

Chapter 20: Ten Tips for Solving Any Math Problem.311

Figure Out Exactly What the Problem Asks For	311
List the Facts	312
Convert Supplied Information into Needed Information.....	312
Determine What Information You're Missing	313
Eliminate Excess Information.....	313
Draw a Diagram.....	314
Find or Develop a Formula	314
Consult a Reference	315
Pay Attention to Units.....	315
Check Your Answer to See whether It's Reasonable	316

Chapter 21: Ten Formulas You'll Use Most Often. 317

Area of a Square, Rectangle, or Triangle	317
Area of a Circle.....	318
Feet to Meters and Inches to Centimeters	318
Miles to Kilometers and Kilometers to Miles.....	319
Pounds to Kilograms and Ounces to Grams	320
Gallons to Liters and Liters to Gallons	320
Temperature Conversions.....	321
Hours to Minutes and Minutes to Hours	321
Distance, Time, and Speed	322
Volts, Amps, and Watts.....	322

Chapter 22: Ten Ways to Avoid Everyday Math Stress 325

Get Help with Your Checkbook	325
Use Grocery Shopping to Build Confidence.....	326
Practice Reading Analog Clocks	327
Play Games	327
Memorize Math Signs, Symbols, and Formulas	328
Make the Multiplication Table a Mantra.....	328
Use Paper Maps and Practice Navigating.....	329
Try to Estimate Distances	329
Take Up Music.....	330
Integrate Math with Nonmath Skills.....	331

Glossary*** 333Index*.....** 345



Introduction

Technical careers require technical mathematics (technical math). That's why we wrote *Technical Math For Dummies*. Whether you're currently working in a technical trade or studying in school, you have probably made the discovery that most jobs require some math.

Most parts of technical math are simple. You may think some parts are hard, but look closer. After you read them, you'll hit your forehead with the heel of your palm and say, "Yes! Of course! I sorta knew that all along, but now I really get it!" We think we've filled a gap in the world of math guides, and we hope you enjoy the book.

About This Book

This book is a reference. It's also a repair manual that can help you fill voids you may have in your math background. It's different from other math books in three major ways:

- ✓ **It's all about practical math.** You won't find anything about symplectic geometry or sigma-algebra here. Our focus is on math for technical careers — it looks at problems you may deal with every day and the math skills you need to handle them. But we also include general principles when necessary.
- ✓ **It's comprehensive.** It covers all major math concepts; other math books are about individual concepts (for example, algebra, geometry or trigonometry).
- ✓ **It's not dull** (we hope) as other math books often are. One of us (Barry) is a long-time technical writer, and he's written far too many deadly dull user manuals. That nonsense stops here. Because it's a *For Dummies* book, you can be sure it's easy to read and has touches of humor.

Technical Math For Dummies applies basic math to basic tasks in many careers. You get practical examples, and most of them are based on real-life experiences. And in what other book can you work with math and also find out how to make 90 dozen pralines or figure the distance from a fire watch tower to a wildfire? You can also apply a lot of this math to your personal life as well as your work life.

At the risk of sounding like a late-night infomercial, we want to point out a couple of this book's unique features. We gar-on-tee you won't find them anywhere else.

Conventions Used in This Book

We designed this book to be user-friendly, maybe even user-affectionate. If it were any friendlier, it would drive itself to your house and bring coffee and doughnuts. To help you get the most out of your new friend, we use the following conventions:

- ✓ *Italic type* highlights new terms. We follow each term with a short and often informal definition. Occasionally, we give you clues about how to pronounce difficult words.
- ✓ Web addresses are in `monofont`. They're usually very short and shouldn't break across two lines of text. But if they do, we haven't added any extra characters (such as a hyphen) to indicate the break. Just type in what you see.
- ✓ Although our English teachers would cringe at our breaking the rules, we usually write numbers as numerals, not words. For example, the text may say "add 9 to 3 to get 12," not "add nine to three to get twelve." We think this setup makes the ideas clearer in a math book.

What You're Not to Read

We'd love for you to read every word in this book in the order it appears, but life is short. You don't have to read chapters that don't interest you. This reference book is designed to let you read only the parts you need.

You don't have to read anything with a Technical Stuff or Did You Know? icon. That text is there to give you overly technical or trivial info. *Sidebar*s (that's what they're called in publishing) are the shaded blocks of text you find every so often throughout the book. They're interesting (we think) but not critical to your understanding of the main text, so you can skip 'em if you want.

Foolish Assumptions

Although we know what happens when you assume, we went ahead and made a couple of presumptions about you anyway:

- ✓ We assume that you went to elementary and middle school, where you were exposed to math fundamentals. Why don't we include high school? Because high school is where many people get bored, dazed, or frustrated with mathematics. You may have been in class, but maybe your mind was somewhere else.
- ✓ We assume you have access to a computer and the Internet. It's not essential, but it's very handy. Use a good search engine to find out more about any topic in this book.

How This Book Is Organized

Technical Math For Dummies has five parts, moving from simpler topics (such as counting) to more complex topics (such as trigonometry). Here's how it's set up.

Part I: Basic Math, Basic Tools

In this part, you get math basics (and we do mean basics). Chapter 1 gives you an overview of broad technical math concepts. Chapter 2 dispels myths about math and provides some history about technical careers. Technical professions are very old and go back (at least) to making arrowheads and spear points. And with all due respect to art history and library science majors, stonemasons built the pyramids. You also learn about the tools of the trades in this chapter.

The remaining chapters in this part are a complete review of basics — numbers, addition, subtraction, multiplication, division, measurement, and conversion. You see how to do these operations faster and better. We also tackle something that everybody says fills them with fear and loathing — the notorious word or story problem. Story problems can be filled with tricks and traps, but in this chapter you see how easily you can deal with them all.

Part II: Making Non-Basic Math Simple and Easy

In Part II, you review the workhorses of technical math, the processes that are a simple step above arithmetic. Most careers can't function without them.

Part III: Basic Algebra, Geometry, and Trigonometry

You may think some topics (algebra, geometry, and trigonometry) are tough, but in this part you find out that they aren't. The basic techniques are easy to understand, and those are the techniques you need. Now that's a happy coincidence!

This part removes the mystery from formulas and shows you how to make your own custom formulas. It's also filled with practical applications for areas, perimeters, and volume, as well as a little theory.

Part IV: Math for the Business of Your Work

In Part IV, we point out the obvious: "Life math" is different from "classroom math." Although the previous parts have direct application to your technical work, this part brings some math concepts to the business side of your job.

In this part, you see how to use graphs and charts to your advantage for both problem solving and presenting information to management and clients. We also present a chapter on time math, which we hope clears up a few mysteries about the basic questions "What time is it?" and "How long will it take?"

The last chapter deals with computer math, and it's a simple mini-education in what's going on with your computer and your Internet connection. This chapter may help make you a smarter shopper when you're buying computers, smartphones, MP3 players, and digital instruments for your business or your home.

Part V: The Part of Tens

For Dummies books always have a Part of Tens, and this book is no exception. The world loves lists of ten things, and in these chapters you find a large amount of information in a small space.

Chapter 20 has ten principles for solving any common math problem. Its partner is Chapter 21, which contains the ten most commonly used formulas. It also has some formula variations and some estimating shortcuts. Finally, Chapter 22 shows you ten easy ways to get good at math while doing everyday tasks. Finally, we also include a glossary of terms that you may or may not see in the text but that may pop up in your work.

Icons Used in This Book

We use several *icons* (the little drawings in the margins of the book) to call out special kinds of information and enhance your reading experience — that's just the kind of people we are. Here's a breakdown:



A Tip is a suggestion or a recommendation that usually points out a quick and easy way to get things done.



This icon represents a key idea that's worth remembering — the information may come in handy later.



Technical Stuff contains information that's interesting but overly technical and not vital to your understanding the topic.



Text with this icon contains odd facts (such as a legislature trying to regulate the value of pi), pieces of pop culture, strange bits of history, or bizarre terms.



The text with this icon describes a situation where a math principle is used in real-world work.



This icon alerts you to conditions that can spoil your work or result in wrong answers. For example, dividing by zero is never allowed in math. Don't try it or your hair may catch fire!

Where to Go from Here

You can go to any chapter of the book from here. First, check the table of contents, where you see the names of the parts and the chapters. Then, pick a chapter you're interested in.

The book isn't linear, so you can start anywhere. If you're comfortable with some math concepts, take a glance at the early chapters of this book. This strategy will confirm how much you already know (and you may pick up a couple of interesting new words, too). Then go on.

If you're uncomfortable with some math concepts (and some of them have truly bizarre and intimidating names), take a look at those chapters. Inside every "complicated" math concept is a simple concept trying to get out.

If you get stuck, you'll probably find another chapter that can help you out. If you haven't made a choice, we recommend beginning with Chapter 1, which introduces the broad concepts. If you have a particular problem, find a chapter in the table of contents that deals with it and go straight to it, or simply look up that topic in the index.

Part I

Basic Math, Basic Tools

The 5th Wave

By Rich Tennant



"Ed's in charge of calculating your height and weight ratio so you get the right length Bungee cord. He's too stupid to do anything else."

In this part . . .

Part I starts with the basics. In Chapter 1, you find the broad scope of what technical math involves. Chapter 2 identifies the myths of math and the trades that make the world as you know it possible from earliest to latest. It also gives you a survey of tools (especially new digital tools) that make your work (particularly measuring) in the trades easier and more fun.

The other chapters in this part offer a complete review of numbers and arithmetic. But they're more than just a good review — they also give you new insights and may even speed up your work. Chapter 6 is about measurement and conversion. Sorry to say it, but the world speaks measurement in different units, and the modern technician needs to know unit conversions. Chapter 7 is about word problems. After you read this chapter, you'll never run from a story problem again.