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1,001 Algebra I Practice Problems FOR **DUMMIES®**

by Mary Jane Sterling



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Mary Jane Sterling is the author of six *For Dummies* titles: *Algebra I For Dummies*, *Algebra II For Dummies*, *Trigonometry For Dummies*, *Math Word Problems For Dummies*, *Business Math For Dummies*, and *Linear Algebra For Dummies*. She has also written many supplementary workbooks and study aids.

Mary Jane continues doing what she loves best: teaching mathematics. When not teaching or writing *For Dummies* books, she loves spending her time reading murder mysteries and fishing for her dinner.

Dedication

The author dedicates this book to her son, Sgt. James T. Sterling, USMC, and the other members of the 4th Air/Naval Gunfire Liaison Company, Det Juliet (part of Operation Enduring Freedom 2012). Jim and the others in his unit, as well as all military serving the U.S., have our utmost respect and appreciation.

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Contents at a Glance

Introduction	1
Part I: The Questions.....	5
Chapter 1: Signing on with Signed Numbers	7
Chapter 2: Recognizing Algebraic Properties and Notation	13
Chapter 3: Working with Fractions and Decimals	17
Chapter 4: Making Exponential Expressions and Operations More Compatible.....	23
Chapter 5: Raking in Radicals.....	29
Chapter 6: Creating More User-Friendly Algebraic Expressions	35
Chapter 7: Multiplying by One or More Terms	41
Chapter 8: Dividing Algebraic Expressions	47
Chapter 9: Factoring Basics.....	53
Chapter 10: Factoring Binomials.....	57
Chapter 11: Factoring Quadratic Trinomials.....	61
Chapter 12: Other Factoring Techniques	65
Chapter 13: Solving Linear Equations	69
Chapter 14: Taking on Quadratic Equations	73
Chapter 15: Solving Polynomials with Powers Three and Higher	79
Chapter 16: Reining in Radical and Absolute Value Equations.....	83
Chapter 17: Making Inequalities More Fair.....	87
Chapter 18: Using Established Formulas	93
Chapter 19: Using Formulas in Geometric Story Problems.....	99
Chapter 20: Tackling Traditional Story Problems	105
Chapter 21: Graphing Basics	111
Chapter 22: Using the Algebra of Lines	117
Chapter 23: Other Graphing Topics	121
Part II: The Answers	125
Chapter 24: Answers.....	127
Index	425

Table of Contents

***Introduction* 1**

What You'll Find	1
How This Workbook Is Organized	2
Part I: Questions	2
Part II: Answers	3
Beyond the Book	3
What you'll find online	3
How to register	4
Where to Go for Additional Help	4

***Part I: The Questions* 5**

Chapter 1: Signing on with Signed Numbers 7

The Problems You'll Work On	7
What to Watch Out For	7
Placing Real Numbers on the Number Line	8
Using the Absolute Value Operation	8
Adding Signed Numbers	9
Subtracting Signed Numbers	9
Multiplying and Dividing Signed Numbers	10

Chapter 2: Recognizing Algebraic Properties and Notation 13

The Problems You'll Work On	13
What to Watch Out For	13
Applying Traditional Grouping Symbols	14
Introducing Some Non-Traditional Grouping Symbols	14
Distributing Multiplication over Addition and Subtraction	15
Associating Terms Differently with the Associative Property	15
Rearranging with the Commutative Property	16
Applying More Than One Property to an Expression	16

Chapter 3: Working with Fractions and Decimals 17

The Problems You'll Work On	17
What to Watch Out For	17
Adding and Subtracting Fractions	18
Multiplying Fractions	18
Dividing Fractions	18
Simplifying Complex Fractions	19
Adding and Subtracting Decimals	19
Multiplying Decimals	19

Dividing Decimals	20
Changing Fractions to Decimals	20
Changing Decimals to Fractions	21

Chapter 4: Making Exponential Expressions and Operations More Compatible23

The Problems You'll Work On	23
What to Watch Out For	23
Multiplying and Dividing Exponentials with the Same Base	24
Raising a Power to a Power	24
Combining Different Operations on Exponentials	25
Changing the Base to Perform an Operation	26
Working with Scientific Notation	26

Chapter 5: Raking in Radicals29

The Problems You'll Work On	29
What to Watch Out For	29
Simplifying Radical Expressions	30
Rationalizing Denominators	30
Using Fractional Exponents for Radicals	31
Evaluating Expressions with Fractional Exponents	32
Operating on Radicals	32
Operating on Factors with Fractional Exponents	33
Estimating Values of Radicals	33

Chapter 6: Creating More User-Friendly Algebraic Expressions35

The Problems You'll Work On	35
What to Watch Out For	35
Adding and Subtracting Like Terms	36
Multiplying and Dividing Factors	36
Simplifying Expressions Using Order of Operations	37
Evaluating Expressions Using Order of Operations	38
Operating with Factorials	39
Focusing on Function Notation	39

Chapter 7: Multiplying by One or More Terms41

The Problems You'll Work On	41
What to Watch Out For	41
Distributing One Term Over Sums and Differences	42
Distributing Using Division	42
Multiplying Binomials Using Distributing	42
Multiplying Binomials Using FOIL	43
Distributing Binomials Over Trinomials	43
Squaring Binomials	44

Raising Binomials to the Third Power	44
Using Pascal's Triangle	44
Finding Special Products of Binomials and Trinomials	45
Chapter 8: Dividing Algebraic Expressions.	47
The Problems You'll Work On	47
What to Watch Out For	47
Dividing with Monomial Divisors	48
Monomial Divisors and Remainders	48
Using Long Division to Divide with Binomials	49
Dividing with Binomials Using Synthetic Division	50
Dividing with Higher Power Divisors	50
Chapter 9: Factoring Basics	53
The Problems You'll Work On	53
What to Watch Out For	53
Finding Divisors Using Rules of Divisibility.....	54
Writing Prime Factorizations	54
Factoring Out a GCF	55
Reducing Fractions with a Common GCF	56
Chapter 10: Factoring Binomials	57
The Problems You'll Work On	57
What to Watch Out For	57
Factoring the Difference of Perfect Squares	58
Factoring the Sum or Difference of Two Perfect Cubes.....	58
Factoring More Than Once.....	59
Chapter 11: Factoring Quadratic Trinomials	61
The Problems You'll Work On	61
What to Watch Out For	61
Factoring Out the GCF of a Trinomial.....	62
Factoring Trinomials into the Products of Binomials.....	62
Factoring Quadratic-Like Expressions	63
Factoring Completely Using More Than One Technique	63
Chapter 12: Other Factoring Techniques	65
The Problems You'll Work On	65
What to Watch Out For	65
Factoring by Grouping	66
Combining Other Factoring Techniques with Grouping	66
Using Multiple Factoring Methods	66
Chapter 13: Solving Linear Equations.	69
The Problems You'll Work On	69

What to Watch Out For	69
Solving Linear Equations Using Basic Operations	70
Dealing with Fractions in Linear Equations	71
Chapter 14: Taking on Quadratic Equations	73
The Problems You'll Work On	73
What to Watch Out For	73
Applying the Square Root Rule to Quadratic Equations	74
Solving Quadratic Equations Using Factoring	74
Applying the Quadratic Formula to Quadratic Equations.....	75
Completing the Square to Solve Quadratic Equations	76
Writing Complex Numbers in the Standard $a + bi$ Form.....	76
Finding Complex Solutions Using the Quadratic Formula	77
Chapter 15: Solving Polynomials with Powers Three and Higher.	79
The Problems You'll Work On	79
What to Watch Out For	79
Applying Descartes's Rule of Signs to Count Real Roots	80
Applying the Rational Root Theorem to List Roots	80
Determining Whether Numbers Are Roots	80
Solving for the Roots of Polynomials	81
Chapter 16: Reining in Radical and Absolute Value Equations.	83
The Problems You'll Work On	83
What to Watch Out For	83
Solving Basic Radical Equations.....	84
Checking for Extraneous Roots	84
Squaring Both Sides of Equations Twice.....	84
Solving Radicals with Roots Other Than Square Roots.....	85
Solving Absolute Value Equations.....	85
Handling Absolute Value Equations with No Solution.....	86
Chapter 17: Making Inequalities More Fair.	87
The Problems You'll Work On	87
What to Watch Out For	87
Performing Operations on Inequalities.....	88
Writing Inequalities Using Interval Notation.....	88
Changing Interval Notation to Inequality Notation	88
Solving Linear Inequalities	89
Taking on Compound Inequalities.....	89
Solving Quadratic Inequalities.....	89
Finding Solutions of Nonlinear Inequalities	90
Rewriting and Solving Absolute Value Inequalities.....	90
Delving into Complex Inequalities.....	91
Chapter 18: Using Established Formulas	93
The Problems You'll Work On	93
What to Watch Out For	93
Getting Interested in Interest Problems	94
Heating It Up with Temperature Problems	94
Adding up Natural Numbers	94

Going the Distance with the Distance Formula	95
Getting the Inside Scoop with Sums of Interior Angles	96
Averaging Out the Numbers	96
Summing the Squares of Numbers	96
Finding the Terms of a Sequence	97
Adding the Terms in an Arithmetic Sequence	97
Using the Formula for the Sum of Cubes	97
Compounding the Problems Involving Compound Interest	98
Chapter 19: Using Formulas in Geometric Story Problems.	99
The Problems You'll Work On	99
What to Watch Out For	99
Working around the Perimeter of Rectangles	100
Using the Area Formula for a Trapezoid	100
Tackling Area and Perimeter of a Square	100
Solving Problems Using the Perimeter of a Triangle	101
Working with the Area and Perimeter of a Rectangle	101
Using the Formula for the Area of a Hexagon	101
Getting Pythagoras Involved in the Area of a Triangle	101
Making Use of the Volume of a Box	102
Working with the Volume of a Cylinder	102
Changing Radians to Degrees and Degrees to Radians	102
Determining the Height of an Object	103
Working with Heron's Formula for the Area of a Triangle	103
Chapter 20: Tackling Traditional Story Problems	105
The Problems You'll Work On	105
What to Watch Out For	105
Tackling Age Problems	106
Working with Consecutive Integers	106
Getting the Job Done on Work Problems	107
Counting on Quality and Quantity Problems	108
Solving Money Problems	109
Chapter 21: Graphing Basics	111
The Problems You'll Work On	111
What to Watch Out For	111
Plotting Points on the Coordinate System	112
Determining the Quadrant of a Point	113
Finding the Intercepts of a Line	114
Calculating the slope of a line from two points	114
Determining a Line's Slope from Its Equation	115
Sketching the Graph of a Line from Its Equation	115
Sketching Lines Using Two Points	116
Chapter 22: Using the Algebra of Lines	117
The Problems You'll Work On	117
What to Watch Out For	117
Writing Equations of Lines Using the Slope and a Point	118
Writing the Equation of a Line Using Two Points	118
Dealing with Slopes of Parallel and Perpendicular Lines	119

Finding Equations of Lines Parallel or Perpendicular to One Given	119
Computing the Distance Between Points	119
Determining the Midpoint	120
Chapter 23: Other Graphing Topics	121
The Problems You'll Work On	121
What to Watch Out For	121
Graphing to Find the Intersection of Two Lines	122
Sketching the Graph of a Circle	122
Creating the Graph of a Parabola	123
Transforming the Graph of a Figure.....	123
 <i>Part II: The Answers</i>	 125
Chapter 24: Answers	127
 <i>Index</i>	 425

Introduction

One-thousand-one algebra problems: That's a *lot* of algebra problems.

It will take you seven days to do all of them, if you do 143 each day. Whew! It will take you 91 days to do all of them, if you manage to do 11 each day. And, of course, it will take you 1,001 days to do all the problems if you do just one each day. Whatever your game plan, this is still a lot of problems. You may want to start at the beginning and do each problem in turn, or you may want to jump around and do the problems in an order that suits you best. Either plan is doable. Either plan is fine. Just watch out for topics that build on one another — you may need the information from one skill to succeed in another.

Practice makes perfect. Unlike other subjects where you can just read or listen and absorb the information sufficiently, mathematics takes practice. The only way to figure out how the different algebraic rules work and interact with one another is to get into the problems — get your hands dirty, so to speak. Many problems appear to be the same, on the surface, but different aspects and challenges have been inserted to make the different problems unique. The concepts become more set in your mind when you work with the problems and have the properties confirmed with your solutions.

Yes, one-thousand-one algebra problems are a lot of problems. But you may find that this just whets your appetite for more. Enjoy!

What You'll Find

This book has 1,001 algebra problems divided up among 23 chapters. Each chapter has many different sets of questions. The sets of questions are sometimes in a logical, sequential order, going from one part of a topic to the next and then to the next. Other times the sets of questions represent the different ways a topic can be presented. In any case, you're given instructions on doing the problems. And sometimes you're given a particular formula or format to use.

Instead of just having answers to each of the problems, you find a worked-out solution for each and every one. Flip to the back of the book for the step-by-step process needed to solve the problems. The solutions include verbal explanations inserted in the work where necessary. Sometimes an alternate procedure may be offered. Not everyone does algebra exactly the same way, but this book tries to provide the most understandable and success-promoting process to use when solving the algebra problems presented.

How This Workbook Is Organized

This workbook is divided into two main parts: questions and answers. But you probably figured that out already.

Part I: Questions

The questions chapters cover many different topics:

- ✓ **Basic operations:** The first six chapters cover the types of numbers and the types of operations on those numbers that are essential to working in algebra. The natural numbers and whole numbers are fine for elementary arithmetic, but you need to broaden your horizons with signed numbers and decimals and fractions and exponential expressions. All these types of numbers are added, subtracted, multiplied, and divided. The rules for the different types of numbers have similarities and differences. The problems can help you come to grips with these situations and recognize what's the same and what's different.

Also important in algebra are the operations involving radicals, absolute value, and factorial. And, tying together all the numbers and operations are the rules on how to deal with them: the order in which you perform the operations, and then the effect of grouping symbols on the whole process.

- ✓ **Algebraic expressions:** An algebraic expression can consist of one or more terms — separated by addition and subtraction — or it can be in factored form. The factored form has everything connected by multiplication and division. Each of these forms is useful in some process or another, so it's important to be able to change from one form to another and back again. Multiply out the factors if you want a listing of terms from highest exponent to lowest. Or, factor many terms to make them all just one if you want to solve for a root or reduce some fraction.

You'll find techniques for multiplying by one term or two — or more. There are some helpful tricks for raising binomials to higher powers. And then you find the factoring techniques — from rules of divisibility to factoring by grouping. One of the challenges of factoring expressions is deciding which technique to use. You find lots of practice to help you make those decisions.

- ✓ **Solving equations:** What is the point of learning all those algebra basics and then going through the factoring process? One of the favorite and most common goals for all that practice is to use the techniques to solve an equation. Solving an equation means identifying the number or numbers you can replace the variable with to make a true statement.

You'll find factoring and the multiplication property of zero to be your first approach, and then you'll also have the quadratic formula to use on some of the more challenging second-degree equations. Polynomials can be solved using synthetic division to help with the factoring. And then you have radical and absolute value equations — with their particular challenges. Finish the section off with inequalities, and you'll have run the gamut of solving for what variables can represent.

- ✓ **Applications:** Mention the words *story problem*, and you'll see either a shudder or a brightening smile. People either love them or they don't. But story problems (practical applications) are a main goal of learning to use algebra effectively.

The practical applications found in this section of the workbook are broken into many different types. You find some that are based on an established formula: area, perimeter,

simple interest, and so on. Other applications have to do with relationships between numbers or sizes of objects. The trick to doing those applications is understanding the wording, which is why you come armed with all the basics under your belt. Get to work on the work problems before you age too much with the age problems. Just write yourself a simple algebraic equation, and you're almost finished.

✓ **Graphing:** Most of us are very visual — we understand things better when a picture is drawn. I usually draw pictures when working on word problems; it helps me focus on what type of equation to write. But the pictures in this section are a bit more structured. The pictures here involve the *Cartesian coordinate* system, which involves placing points, segments, and lines in their proper positions. Graphing lines is often used when solving systems of equations. And graphing is found in pretty much all the mathematics that follows algebra. This is where you can get a good start on the topic.

Part II: Answers

This part provides not only the answers to all the questions but explanations of the answers as well. So you get the solution, and you see how to arrive at that solution.

Beyond the Book

This book is chock-full of algebra goodness — I've given you enough problems to significantly improve your confidence with all things algebra. But maybe you want to track your progress as you tackle the problems, or maybe you're stuck on a few types of algebra problems and wish they were all presented in one place where you could methodically make your way through them. No problem! Your book purchase comes with a free one-year subscription to all 1,001 practice problems online. You get on-the-go access any way you want it — from your computer, smartphone, or tablet. Track your progress and view personalized reports that show where you need to study the most. And then do it. Study what, where, when, and how you want.

What you'll find online

The online practice that comes free with this book offers you the same 1,001 questions and answers that are available here, presented in a multiple-choice format. The beauty of the online problems is that you can customize your online practice to focus on the topic areas that give you the most trouble. So if you aren't yet a whiz at factoring polynomials and solving quadratic equations, then select these problem types and BAM! — just those types of problems appear for your solving pleasure. Or, if you're short on time but want to get a mixed bag of a limited number of problems, you can plug in the quantity of problems you want to practice and that many — or few — of a variety of algebra problems appears. Whether you practice a couple hundred problems in one sitting or a couple dozen, and whether you focus on a few types of problems or practice every type, the online program keeps track of the questions you get right and wrong so that you can monitor your progress and spend time studying exactly what you need.

You can access this online tool using a PIN code, as described in the next section. Keep in mind that you can create only one login with your PIN. Once the PIN is used, it's no longer valid and is nontransferable. So you can't share your PIN with other users after you've established your login credentials.

How to register

To gain access to additional tests and practice online, all you have to do is register. Just follow these simple steps:

1. **Register your book or ebook at Dummies.com to get your PIN. Go to www.dummies.com/go/getaccess.**
2. **Select your product from the dropdown list on that page.**
3. **Follow the prompts to validate your product, and then check your email for a confirmation message that includes your PIN and instructions for logging in.**

If you do not receive this email within two hours, please check your spam folder before contacting us through our Technical Support website at <http://support.wiley.com> or by phone at 877-762-2974.

Now you're ready to go! You can come back to the practice material as often as you want — simply log on with the username and password you created during your initial login. No need to enter the access code a second time.

Your registration is good for one year from the day you activate your PIN.

Where to Go for Additional Help

The written directions given with the individual problems are designed to tell you what you need to do to get the correct answer. Sometimes the directions may seem vague if you aren't familiar with the words or the context of the words. Go ahead and look at the solution to see if that helps you with the meaning. But if the vocabulary is still unrecognizable, you may want to refer to the glossary in an algebra book, such as *Algebra I For Dummies*, written by yours truly and published by the fine folks at Wiley.

The solution to each problem is given at the end of its respective chapter. But you may not be able to follow from one step to the next. Is something missing? This book is designed to provide you with enough practice to become very efficient in algebra, but it isn't intended to give the step-by-step explanation on how and why each step is necessary. You may need to refer to *Algebra I For Dummies* or *Algebra I Essentials For Dummies* (also written by me and published by Wiley) to get more background on a problem or to understand why a particular step is taken in the solution of the problem.

Part I

The Questions



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In this part . . .

One thousand and one algebra problems. That's a lot of work. But imagine how much work it was for me to write them. Don't get me started. Anyway, here are the general types of questions you'll be dealing with:

- ✓ Performing basic operations (Chapters 1 through 6)
- ✓ Changing the format of algebraic expressions (Chapters 7 through 12)
- ✓ Solving Equations (Chapters 13 through 17)
- ✓ Applying algebra by using formulas and solving word problems (Chapters 18 through 20)
- ✓ Graphing (Chapters 21 through 23)

Chapter 1

Signing on with Signed Numbers

Signed numbers include all real numbers, positive or negative, except 0. In other words, signed numbers are all numbers that have a positive or negative sign. You usually don't put a plus sign in front of a positive number, though, unless you're doing math problems. When you see the number 7, you just assume that it's +7. The number 0 is the only number that isn't either positive or negative and doesn't have a plus or minus sign in front of it; it's the dividing place between positive and negative numbers.

The Problems You'll Work On

As you work with signed numbers (and positive and negative values), here are the types of problems you'll do in this chapter:

- ✓ Placing numbers in their correct position on the number line — starting from smallest to largest as you move from left to right
- ✓ Performing the absolute value operation — determining the distance from the number to 0
- ✓ Adding signed numbers — finding the sum when the signs are the same, and finding the difference when the signs are different
- ✓ Subtracting signed numbers — changing the second number to its opposite and then using the rules for addition
- ✓ Multiplying and dividing signed numbers — counting the number of negative signs and assigning a positive sign to the answer when an even number of negatives exist and a negative sign to the answer when an odd number of negatives exist

What to Watch Out For

Pay careful attention to the following items when working on the signed number problems in this chapter:

- ✓ Keeping track of the order of numbers when dealing with negative numbers and fractions
- ✓ Working from left to right when adding and subtracting more than two terms
- ✓ Determining the sign when multiplying and dividing signed numbers, being careful not to include numbers without signs when counting how many negatives are present
- ✓ Reducing fractions correctly and dividing only by common factors

Placing Real Numbers on the Number Line

1–6 Determine the correct order of the numbers on the real number line.

- 1.** Determine the order of the numbers:

$-3, 4, -1, 0, -4$

- 2.** Determine the order of the numbers:

$-3, 3, -2, 0, 1$

- 3.** Determine the order of the numbers:

$-1, 2, -5, \frac{3}{7}, -\frac{7}{3}$

- 4.** Determine the order of the numbers:

$\frac{5}{6}, -\frac{6}{5}, -2, -4, 0$

- 5.** Determine the order of the numbers:

$\sqrt{3}, -\sqrt{2}, 0, 3, -4$

- 6.** Determine the order of the numbers:

$-3, \sqrt{3}, 0, 2, 4, -\frac{7}{2}$

Using the Absolute Value Operation

7–10 Evaluate each expression involving absolute value.

7. $|-4|$

8. $|-7.6|$

9. $-|-2|$

10. $-|-\frac{2}{3}|$

Adding Signed Numbers**11–20** Find the sum of the signed numbers.

11. $-4 + (-2) =$

12. $2 + (-4) =$

13. $-2 + 4 =$

14. $-5 + 3 =$

15. $-6 + 6 =$

16. $7 + (-2) =$

17. $5 + (-4) + (-2) =$

18. $-1 + 2 + (-3) + 4 =$

19. $-67 + 68 + (-69) + 70 =$

20. $-4 + (-5) + (-6) + (-7) + 7 + 4 =$

Subtracting Signed Numbers**21–30** Find the difference between the signed numbers.

21. $-4 - 6 =$

22. $7 - (-8) =$

23. $6 - 3 =$

24. $-9 - (-4) =$

25. $-7 - 7 =$

26. $-7 - (-7) =$

27. $3 - (-2) =$

28. $-[-2] - 3 =$

29. $-[-4] - (-4) =$

30. $0 - (-5) =$

Multiplying and Dividing Signed Numbers

31 – 50 Find the products and quotients involving signed numbers.

31. $2(-3) =$

32. $-4(-5) =$

33. $-5(6) =$

34. $3(-1) =$

35. $(-7)(-7) =$

36. $(-8)(8) =$

37. $-6\left(-\frac{5}{3}\right) =$

38. $20\left(-\frac{3}{4}\right) =$

39. $-2(0) =$

40. $(-1)(-1)(-1)(-1) =$

41. $\frac{-6}{2} =$

$$42. \frac{-8}{-4} =$$

$$43. \frac{12}{-3} =$$

$$44. \frac{-60}{-15} =$$

$$45. \frac{0}{-2} =$$

$$46. \frac{-5}{1} =$$

$$47. \frac{-16}{2(-4)} =$$

$$48. \frac{2(-6)(-1)}{4(-3)} =$$

$$49. \frac{-4(-3)(-2)(-1)}{6(-1)(-1)(-1)} =$$

$$50. \frac{2(2)(-3)(-3)}{(-2)(-2)(3)(3)} =$$

