



INTELLECTUAL SOFTWARE

PRACTICAL ALGEBRA



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PRACTICAL ALGEBRA SERIES

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PRACTICAL ALGEBRA

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PRACTICAL ALGEBRA

Program Purpose

The **Practical Algebra** series is designed to serve either as an introduction to or as a review of high school algebra. The programs in this series are suitable for use with students in high school, college, or adult education classes. The primary purpose of the series is to teach students step-by-step methods of solving various kinds of common algebra problems. After completing these programs, students will be familiar with the following topics:

- Signs of equality and inequality
- Sets and subsets
- Number lines
- Manipulating sets and number lines
- Four arithmetic operations
- Rational and irrational numbers
- Factors
- Equations with one unknown
- Equations with two unknowns
- Negative numbers
- A step-by-step process for solving algebra word problems
- Reducing
- Order of operations
- Powers
- Roots
- Algebraic expressions
- Equalities and inequalities
- Quadratic equations
- Coefficients
- Exponents
- Factoring

Program Contents

Practical Algebra consists of five interactive tutorial programs, each on a separate disk: *Symbols and Sets*, *Real Number System*, *Equations I*, *Equations II*, and *Algebra Word Problems*. Although the programs are most effective when used sequentially in the order listed here, each program can also be used independently by students who have mastered the prerequisite material.

Programs are organized into ten sequential lesson modules, each of which can be accessed separately from the disk's program menu. Because most lessons build on concepts and operations explained in earlier modules, it is recommended that students do the lessons in the order in which they are listed in the program menus.

SYMBOLS AND SETS

Prerequisites: Before using *Symbols and Sets*, students should have a good working knowledge of basic arithmetic: addition, subtraction, multiplication, and division of whole numbers, fractions, and decimals.

Symbols and Sets first introduces students to the symbols used in algebraic equations and then presents the concept of sets. Students practice working with factors, coefficients, and exponents; the order of operations; evaluation of expressions; and sets.

The third and sixth lesson modules listed below are practice lessons; the remaining modules are explanatory. In the explanatory modules, each wrong answer branches to an explanation. In the practice modules, the first wrong answer branches to a hint and a chance to try again. A second incorrect answer leads to a complete explanation. All questions not answered correctly on the first try are repeated at the end of the practice module. The final review can be used to test students' understanding of the material covered in the entire program.

| CODE | NAME |
|-------------|-----------------------------|
| L10 | INTRODUCTION |
| L15 | FACTOR/COEFFICIENT/EXPONENT |
| L20 | ORDER OF OPERATIONS |
| L25 | EVALUATING EXPRESSIONS |
| L30 | RULES OF EXPONENTS |
| L35 | EXPONENTIAL EXPRESSIONS |
| L40 | DEFINITIONS OF SETS |
| L45 | GRAPHS OF A SET AND SUBSET |
| L50 | UNION/INTERSECTION |
| L55 | REVIEW TEST |

REAL NUMBER SYSTEM

Prerequisites: Before using *Real Number System*, students should have a good working knowledge of basic arithmetic: addition, subtraction, multiplication, and division of whole numbers, fractions, and decimals.

This program provides practice with the real number system. Students practice working with addition, subtraction, multiplication, and division of positive and negative integers; the order of operations; rational and irrational numbers; square roots; and imaginary numbers.

All ten modules listed below are practice lessons in which students receive a hint and a second try after the first incorrect answer and a complete explanation after the second. Questions missed on the first try are reviewed at the end of the lesson.

| CODE | NAME |
|-------------|-----------------------------|
| L10 | INTEGER DEFINITIONS |
| L15 | ADDING/SUBTRACTING INTEGERS |
| L20 | MULTIPLY/DIVIDE INTEGERS |
| L25 | ORDER OF OPERATIONS |
| L30 | RATIONAL NUMBERS |
| L35 | RATIONAL/IRRATIONAL NUMBERS |
| L40 | APPROX. SQ. ROOTS |
| L45 | SIMPLIFYING SQ. ROOTS |
| L50 | WORK WITH SQ. ROOTS |
| L55 | IMAGINARY NUMBERS |

EQUATIONS I

Prerequisites: Before using *Equations I*, students should be familiar with the material covered in *Symbols and Sets* and *Real Number System*, especially with: the meaning of algebraic symbols; addition, subtraction multiplication, and division of positive and negative numbers; and the order of operations.

Equations I explains the process of solving simple algebraic equations and then provides practice, first with the concepts and then with actual problems. Students practice working with whole numbers, fractions, decimals, and signed numbers in the context of increasingly more complicated algebraic equations.

The first and sixth modules listed below are explanatory modules; the other eight modules are practice modules in which students are given a hint and a second try after the first incorrect answer and an explanation after the second. All questions missed on the first try in a practice lesson are repeated at the end of the lesson .

| CODE | NAME |
|-------------|--------------------------|
| L10 | INTRODUCTION |
| L15 | SUBTRACTION EQUATIONS |
| L20 | ADDITION EQUATIONS |
| L25 | DIVISION EQUATIONS |
| L30 | MULTIPLICATION EQUATIONS |
| L35 | INTRO. TO 2+ STEPS |

| | |
|-----|-------------------|
| L40 | TWO STEPS I |
| L45 | TWO STEPS II |
| L50 | MULTIPLE STEPS I |
| L55 | MULTIPLE STEPS II |

EQUATIONS II

Prerequisites: Before using *Equations II*, students should have completed *Equations I* or its equivalent: they should know how to solve simple algebraic equations.

Equations II introduces students to quadratic equations. The program teaches five step-by-step methods of solving various types of quadratic equations and quadratic equations systems: the factoring method; completing the square; inserting the equation into the quadratic formula; the addition-subtraction method; and substitution. Most lessons give students a hint after the first incorrect answer and an explanation after the second. The two review lessons can be used as cumulative tests of the material covered in the previous modules.

| CODE | NAME |
|------|-----------------------------|
| L10 | MULTIPLYING BINOMIALS |
| L15 | INTRODUCING QUADRATICS |
| L20 | FACTORING QUADRATICS |
| L25 | PRACTICE |
| L30 | COMPLETING THE SQUARE |
| L35 | QUADRATIC FORMULA |
| L40 | REVIEW |
| L45 | ADDITION-SUBTRACTION METHOD |
| L50 | SUBSTITUTION METHOD |
| L55 | FINAL REVIEW |

ALGEBRA WORD PROBLEMS

Prerequisites: Before using *Algebra Word Problems*, students should have mastered the material covered in *Equations I*: they should know how to solve simple algebraic equations with one and two unknowns.

This program teaches a step-by-step process for solving word problems algebraically. Students solve each problem using an approach which includes at least three steps: expressing the problem as an algebraic equation, simplifying the equation, and solving the equation. After completing this program, the student will know how to formulate algebraic

equations to express word problems and how to solve algebra word problems in multiple steps and with one or two unknowns. Problems become increasingly difficult as the program progresses.

All lessons in *Algebra Word Problems* are practice lessons which provide a hint and a second try after the first incorrect answer and a complete explanation after the second. All problems not solved on the first try are reviewed at the end of a lesson.

| CODE | NAME |
|------|--------------------|
| L10 | GETTING STARTED |
| L15 | TWO STEPS |
| L20 | MULTIPLE STEPS |
| L25 | L20 CONTINUED |
| L30 | MULTIPLE STEPS II |
| L35 | MULTIPLE STEPS III |
| L40 | L35 CONTINUED |
| L45 | TWO UNKNOWNNS |
| L50 | TWO UNKNOWNNS II |
| L55 | TWO UNKNOWNNS III |

Sample Screens

From *Symbols and Sets*, Introduction:

There are several signs of inequality, including the following:

$<$, $>$, \neq

| | |
|------------------------------|-------------------|
| $<$ means less than: | $123 < 124$ |
| $>$ means more than: | $56 > 56 - 1$ |
| \neq means does not equal: | $72 \neq 12 + 61$ |

Type the letter of the sign that should replace the question mark in the following sentences.

A. $<$ B. $>$

4. 1.1×4 ? $6 \overline{)24}$ Answer: _____

From *Real Number System*, Order of Operations, after a student has entered an incorrect answer for the first try. The hint is shown at the bottom of the screen.

When adding three or more integers together, group like signs together:

$-3 + 7 + 5$ There are two negatives, -3 and -5 . Add these together first. The sum is -8 . the problem is now $-8 + 7$, or -1 . Remember, if signs are opposite, subtract the absolute value and keep the sign of the larger value.

Add the following:

1. $-4 + 2 + 7 = 13$

Group $2 + 7$ together first. Try again. Hit any key first.

From *Equations I*, Multiple Steps I, before an answer has been entered:

Type in the correct answer, and hit return. You must enter left to right. Use paper and pencil whenever necessary. If asked to try again, hit any key first to proceed, then enter your new answer.

1. $\frac{7x - 8}{3} = 16, x = ?$

From *Equations II, Factoring Quadratics*, before the student has selected the letter of the correct answer:

If a quadratic is equal to zero, when factored, the products of the two factors will be equal to zero.

Example: Transpose $3x^2 + 5 = 16x$ to
 $3x^2 - 16x + 5 = 0$. Now factor:
 $(3x - 1)(x - 5) = 0$

Factor the following equations:

2. $x^2 + 4x + 3 = 0$ A. $(x + 3)(x + 1) = 0$
 B. $(x + 3)(x - 1) = 0$
 C. $(x - 3)(x + 1) = 0$
 D. $(x - 3)(x - 1) = 0$
 E. $(x + 3)(x + 4) = 0$

Answer: _____

From *Algebra Word Problems, Two Unknowns III*, before an answer has been selected:

One number exceeds another number by 4. If 4 times the smaller number is decreased by twice the larger number, the remainder is 6. Find the numbers.

1. First, let x = the smaller number, and
 y = the larger number. The first equation
is therefore:

- A. $x = y + 4$
B. $y = x + 4$
C. $x + y = 4$
D. $y = x - 4$ _____

APPLE

Operating Instructions

If you have the IBM version of this program, please refer to the accompanying *User's Guide* for loading and operating instructions.

NOTE: The software you have purchased is sold for use on only one computer at a time. Use of this software on a network violates copyright law. In order to use this software on a network, you must contact your vendor or Queue, Inc. and obtain a contract signed by Queue. Pricing depends on the number of computers which will be on the network.

STARTING THE PROGRAM

1. Insert the disk into the disk drive and turn on the computer. If you are using an Apple IIe, IIc, or IIGS, make sure the CAPS LOCK key is down.
2. When the second of two title screens appears, press any key to continue as soon as the small square cursor appears.
3. When prompted, type in your name. If you make a mistake, back-space with the left arrow key and retype your name. Press RETURN to continue.
4. If your program has a management system, it will ask: "Is this the first time you have used this disk? (Y/N)." Press Y for Yes, and the program will automatically display the menu screen.
5. If you have used this disk before and have answered N for No to the previous question, the system may ask you again for your name. This happens because the name you entered cannot be found on the disk. The computer will say, "You must type your name exactly as when we first met." Press any key and enter your name again. Make sure the CAPS LOCK key is down.
6. The list of lesson modules available on this disk should now appear. Type in the number of the lesson you want and press RETURN to start the lesson.

RUNNING A LESSON

The computer will display a passage of text. Below each passage will be a question, followed by several choices, one of which correctly answers the question or completes the idea contained in it. You should type the **letter** (not the phrase itself) of the correct answer. You do not need to hit RETURN. The program will automatically accept your response. If your answer is correct, the word CORRECT will appear at the bottom of the screen. If your answer is incorrect, the program will offer a complete

explanation of the correct answer. You do not have the option of answering the question a second time. Press any key to proceed to the next question.

ENDING A LESSON

To exit from a lesson before completing it, press the ESCAPE key (ESC) instead of entering an answer. ESCAPE will not work if it is pressed when the small square prompt appears. When you exit or complete a lesson, you will see a summary of your scores for that lesson. Press any key to return to the title screen and main menu.

The program now asks you if you wish to start another lesson. If you answer Y for Yes, you will be prompted to type a lesson number, and the new lesson will start. If you answer N for No, you will exit the program.

For programs with the optional management system, your place in the lesson will be saved if you did not complete it. You may resume that lesson the next time you use the program, or you may choose to work on another lesson at the next sitting.

NOTE: If at any point in a module you do not receive feedback to an answer you have typed in, press the ESCAPE key. This will bring you back to the program's title screen. Then press any key. The message "Your name, please" will appear. Type **RESTORE** instead of typing your name. Then hit RETURN. At that point, **enter any module number other than the one in which you were previously working**. Press the ESCAPE key before you enter the first answer. Then press any key twice. You may now continue working in the module.

APPLE Management System Instructions

NOTE: Unless you specified with your order that you wanted the management system, your program will not include the management system described below. If you would like to add a management system to your disk, return it to Queue, Inc. The charge for adding management is \$10.00 per disk.

If you do have a management system, the program will ask: "Is this the first time you have used this disk?" after you enter your name. If you do not have a management system, this question will not appear.

In order for the management system to work properly, the disk must not be write-protected. Do not put a write-protect tab on the disk.

STUDENT USE

Students interact with the management system only when they enter names which do not appear on the file or when they restart the program after exiting from a lesson before completing it.

- Remind students to enter their names exactly the same way each time they use the program. If a student enters her name as KATE one day and as KATHERINE the next, the management system will list her as two different people.
- When a student resumes the program after using ESCAPE to exit from a lesson, the unfinished lesson module will be highlighted on the menu. The program will suggest that the student work on that lesson. If the student selects the highlighted module, the lesson will resume where the student left off.
- Another module may be selected instead, but the system will not continue to hold the student's place in the unfinished module. The student will have to restart that module when he or she returns to it.

TEACHER USE

Teachers must load the management system in order to see the students' records. To load the management system, follow the directions below.

At any point before or after a lesson module:

Apple II and II+ Users: While holding down the CONTROL key, press down both the SHIFT and the M keys. Release the keys when the message LOADING MANAGEMENT SYSTEM appears on the screen.

Apple IIe, IIc, and IIGS Users: While holding down the CONTROL key, press down the right bracket (]) key. Release the key when the message LOADING MANAGEMENT SYSTEM appears on the screen.

When the red disk drive light goes off, the following management system menu will be displayed:

MICROTUTOR II MANAGEMENT SYSTEM

— STUDENT RECORDS—

YOU MAY CHANGE DISKS NOW

- (1) ALL STUDENT RECORDS TO SCREEN
(SHIFT - 1 FOR HARD COPY)
- (2) INDIVIDUAL RECORDS TO SCREEN
(SHIFT - 2 FOR HARD COPY)
This function is not currently operable.
- (3) ERASE ALL STUDENT RECORDS
- (4) ERASE INDIVIDUAL RECORD
- (5) CUSTOMIZE SYSTEM
- (6) RETURN TO TUTOR

Type the number of the desired option:

(1) ALL STUDENT RECORDS TO SCREEN
(SHIFT-1 FOR HARD COPY)

This option allows you to see the score tables for all the students in the file. Proceed from one screen to the next by pressing RETURN when prompted. Individual score tables are displayed in the order in which the students entered their names in the system. To print out all the records, press the (1) key while holding down the SHIFT key. The program will ask: "Is the printer on and connected properly? (Y/N):" Make sure that the printer is on before pressing Y. Press N to return to the management system menu.

(2) INDIVIDUAL RECORDS TO SCREEN

This function is not currently operable.

(3) ERASE ALL STUDENT RECORDS

This option clears all names and scores from the management system. The management system can hold only ten students' records. If an eleventh student tries to enter his or her name, a DISK FULL message will appear. You must then record or print out the current records, if desired, and then erase them from the disk to clear the management system. Typing 3 will display CONFIRM ERASE ALL STUDENT RECORDS? (Y/N). Type N for No to change your mind and select a different option. Type Y to erase all records.

(4) ERASE INDIVIDUAL RECORD

This option clears an individual student's name and score from the management system. Typing 4 will display CONFIRM ERASE INDIVIDUAL RECORD? (Y/N). Type N for No to change your mind and select a different option. Type Y to erase a record.

(5) CUSTOMIZE SYSTEM

Queue does not offer technical support for disk customization.

(6) RETURN TO TUTOR

This option loads the tutorial program.

SCORING TABLE DESCRIPTION

The table that displays a student's scores looks like this:

1. TED BROWN

PERCENT CORRECT BY TOPIC

| MODULE: # ITEMS | -1- | -2- | -3- | -4- | -5- | -6- | -7- | -8- |
|--------------------|-----|-----|-----|-----|-----|-----|-----|-----|
| L45: 19 | | | | 53 | | | | |
| L15: 17 | 65 | | | | | | | |
| L35: 14 | | | 29 | | | | | |
| L55: 5 | | | | | 80 | | | |
| L55: 10 | | | | 100 | | | | |

TOPICS NEEDING

INSTRUCTION: * * * * *

PRESS RETURN KEY TO PROCEED

Ted is the first student who used this disk. The code numbers of the modules Ted worked on, in the order in which he selected them, are listed vertically below the MODULE: # ITEMS title. Next to the module number is the number of questions Ted completed in that module. L55 is listed twice because Ted exited that module after completing 5 questions; he then went back to do 10 more questions. The score for each attempt is listed separately.

Ted's percentage scores for the modules he attempted are listed under the columns (1-8) that correspond to the first digits in the module codes. For instance, when Ted worked on either L10 or L15, his score would be under Column 1 of the PERCENT CORRECT BY TOPIC heading. His scores for modules L30 and L35 would be under Column 3.

TOPICS NEEDING INSTRUCTION indicates the numerical range of module codes on the disk. Most programs using this management system use the following module codes: L10, L15, L20, L25, L30, L35, L40, L45, L50, and L55. Therefore, there will usually be asterisks under columns 1 through 5. This allows you to see whether or not a student has worked in all modules without consulting the module codes in the main menu. If a percentage score appears above an asterisk, the student has worked in that section of the program.

MACINTOSH

Operating Instructions

NOTE: The software you have purchased is sold for use on only one computer at a time. Use of this software on a network violates copyright law. In order to use this software on a network, you must contact your vendor or Queue, Inc. and obtain a contract signed by Queue. Pricing depends on the number of computers which will be on the network.

STARTING THE PROGRAM

1. To start the program, use the mouse to position the pointer on the startup icon. Then "double-click" the startup icon by quickly pressing and releasing the mouse button twice.
2. The Queue title screen will appear. Type in your name. If you make a mistake, use the backspace (or delete) key to erase. Press the RETURN key to enter your name.
3. Select a lesson module from the menu by clicking on the title. If you change your mind, select another module. Click OPEN to proceed.

RUNNING A LESSON

Answering Questions

- Multiple-choice questions can be answered by typing the letter of your answer choice and pressing RETURN. Correct typing errors with the backspace (or delete) key before you press RETURN. The program accepts both upper- and lower-case letters.
- Press RETURN (or any key) or click the mouse button to go on to the next question.

General Directions

- Commands and buttons are available only when they have not been dimmed.
- Select QUIT from the file menu to exit from a lesson before finishing it.
- When the score screen is displayed at the end of a lesson, click CONTINUE to return to the program menu or QUIT to return to the "desktop" screen.
- To eject a disk, QUIT to the desktop screen, pull down the File menu and select the Eject option.

THE MENU BAR

During a lesson, three menus are available from the menu bar at the top of the screen. To see a menu, click the mouse on the option you want. Then drag the mouse down and release the button to select one of the items from the menu.

1. **Apple Menu**

The options available under the **Apple Menu** vary with the model you are using. Consult your Macintosh manual for more information.

2. **File Menu**

Quit ends the program. If the student has not answered a question, the program goes immediately to the Desktop. If a question has been answered, a score screen is presented, and the student may choose to continue the program by clicking on the **CONTINUE** button. **CONTINUE** takes the student to the program menu.

3. **Help Menu**

This option lists the title of each available help screen. When the student has finished reading a help screen, clicking on the **CONTINUE** button will return the student to the program.

4. **Report**

Show Score shows the student the number of questions that have been answered in that module and how many of those questions were answered correctly on the first try.

Show Time shows how long the student has been working on the current module.

MACINTOSH Management System Instructions

The management system automatically saves all student scores to disk. To enter the management system, double-click on the icon labeled **Class Management System**.

SUGGESTION: You may want to copy the **CLASS MANAGEMENT SYSTEM (CMS)** to a separate disk to prevent students from accessing the management system. After you copy the management system, drag the **CMS** icon to the trash from your program disk. Remember that to access the student records, the student files must be on the same disk or

in the same folder as the CMS. Therefore, you will also have to copy the student files to the separate management disk you have created.

A menu is presented showing all of the files in that window that contain student scores. Choose one of the files to view. You will then see each module title that the student worked on, the number of questions in that module, the number of questions the student answered correctly on the first try, the percent score, and the total questions and scores for all of the modules the student worked on.

The PRINT button sends the information to the printer. Be certain that a printer is connected to the appropriate port (printer or serial) and that it is on. Also, be certain that the correct driver file (Imagewriter, Laserwriter, etc.) has been chosen from the CHOOSER on the Apple menu before you choose PRINT.

The ANOTHER button returns the user to the menu so that another student file can be chosen for display.

The QUIT button ends the management program and returns the user to the Desktop.

SUPPORT

If you have any questions or problems, call Queue, Inc. at 1-800-232-2224 (in Connecticut, Alaska and Canada call 203-335-0908). Defective disks will be replaced free of charge up to 180 days after invoice date. Disks damaged after 180 days may be replaced at \$10.00 for the first disk and \$5.00 for each additional disk in a program. Mail the damaged disk(s) and appropriate payment to Queue at 338 Commerce Drive, Fairfield, CT 06430, for a prompt replacement.

Backup disks are available at \$10.00 for the first disk and \$5.00 for each additional disk in a program. Customers are limited to one backup disk for each disk purchased. **Backup disks are for archival purposes only.**

Never expose any computer software to excessive heat or cold. Do not leave your software near a strong magnetic field such as might be produced by an electric appliance, stereo, or speaker magnet. Always place your software in its sleeve when you are not using it. This will protect it from dust and finger prints. Finally, never touch the exposed parts of the disk which are visible through the holes in the disk cover.