



THE BEST OF TI 99/4A™ CARTRIDGES

THOMAS BLACKADAR



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BERKELEY • PARIS • DÜSSELDORF



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Library of Congress Card Number: 83-50716
ISBN 0-89588-137-3
Printed in the United States of America
10 9 8 7 6 5 4 3 2 1

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ACKNOWLEDGEMENTS

This book owes its existence to the inspiration and support of the entire Sybex staff. From the beginning, Rudolph Langer provided the ideas and inspiration that made it what it is. Paul Panish kept it moving and gave it direction when it needed it. Carole Alden risked destruction at the hands of alien invaders to give a detailed, sympathetic editing, and many others worked to turn a manuscript into a book. To all of these, I owe my thanks.

I would like to thank all those at Texas Instruments who helped make this book possible. Bill Barniea provided generous support throughout the project and allowed me an advanced review of cartridges his division was developing in Lubbock, Texas. David Leonnig and the press relations department helped with information and photographs. And in San Francisco, Sioux Thompson, Dawn Noland, and the others at the Texas Instruments Learning Center kindly gave me their help and the use of their facilities.

I would also like to thank Amy Davis of Scott-Foresman and Company and Barbara Gemme of Milton Bradley for their assistance. And finally, I want to acknowledge my debt to the staff of Adventure International. Without their help on the Pirate Adventure game, I would never have made it past the crocodile.

INTRODUCTION

You have recently bought a Texas Instruments home computer and you want to know what it can do for you. Or perhaps you are still thinking of buying one and want to know more about it before you make the plunge.

The computer is a remarkable tool. It can do many complex thinking tasks, patiently following directions very quickly and accurately. It can keep a customized mailing list, explain arithmetic to your children, or play a video game. It can solve difficult financial problems and play a respectable game of chess. But it can't do this by itself: it needs to have a *program*, a recipe of electronic directions to tell it what to do. This *software*, as it is also called, is the key to the computer.

Some people write their own computer programs that tell their computer exactly what they want done. Since this takes time and trouble, most people find it easier to use programs others have written.

Texas Instruments sells hundreds of programs for its TI-99/4A home computer, to do anything from home budgeting to playing a video game. These programs are sold as small Solid State Software cartridges, which you simply plug in and start using immediately.

With all these programs, you may have trouble deciding what you want. It is very hard to know what to expect from a cartridge until you have bought it and tried it out.

This book can help you. As you read through these pages, you will find the best TI cartridges: the programs that are powerful yet easy to use, interesting yet instructive, general yet adapted to your specific needs. The book is a buyer's guide, a review of the cartridges to let you know what you are buying. It is, however, a user's guide as well, a book that will help you take your first steps with the program.

This book contains a manageable selection of cartridges, not a full catalog. Many excellent cartridges have been left out without apology, either because they were too specialized for a general survey or because they were too similar to others. This limited selection is a starting point for your explorations: here you can choose among a few fine programs without wading through the entire list. After you have looked at these, you can turn to more specialized cartridges if you wish.

You'll find the reviews impartial. Even the best programs have their

shortcomings and you'll see them mentioned without reservation. If a problem is serious, you will also find some suggestions on how to work around it.

HOW TO USE THIS BOOK

This book is intended to fill two needs. It is primarily a reference book, a review of 18 specific cartridges. If you already know which cartridges you want, you can skip to those that interest you, to find out what they do and how well they work. If games are your primary interest, for example, you might jump straight to Section 4.

The book is also an overview of the cartridges available for the TI-99/4A, a representative sample to show what you can use your machine for. If you have never used a computer before, you might want to read the entire book, with particular attention to the section introductions. By skimming through the 18 reviews in order, you will get a feel for the wide range of cartridges you can buy.

Each review begins with a box to explain what special equipment is needed and to give some general evaluations of the program's overall quality, clarity, interest level, and graphic displays. Beneath the box is an overview of the cartridge—what it does, what you would use it for, and how it compares to other programs. Whatever your purpose, you will want to read this thumbnail sketch of the program.

Many programs are easy to use once you know them, but hard to approach the first time. The second section of each discussion can help you get past this first step, by giving you specific details on getting started and hints on how best to use the cartridge. For games, you will find some elementary tips on strategy, which will help you learn the game without becoming discouraged. This is not intended to replace the instruction manual that comes with the cartridge, but merely to supplement it with something you can easily read and understand.

The final section of each entry summarizes the good and bad points of the cartridge. If you read nothing else before you buy, you should read this. It will tell you what you can expect and what you need to watch out for.

The cartridge reviews that follow are divided into four general categories: Home Management, Education, Games, and Programming Utilities. Each of these four sections begins with an introduction that gives an overview of the territory and then some guidelines for using that kind of program. Once you have read the section introduction, you can skip straight through to the specific cartridge reviews that interest you.

Home Management is the first of the four sections, including programs for home finance, budget, record-keeping, and word processing. There are many things a home computer can do to help you organize your home financial calculations and routine paperwork, and several useful programs are available. Watch out, though. Home management ranks among the more complicated tasks for the computer, and it will take you some time before you feel comfortable with these programs.

The Education section covers a variety of programs, ranging from the preschool to the adult level. Many parents want to have their children use the computer, both to expand their education and to acquaint themselves with the machine. This section will help you choose from the bewildering array of math, reading, and computer-introduction packages that are available. It also covers two programs that you may want to use yourself: a Touch Typing Tutor and an introduction to Spanish.

Games may be your primary interest, so you shouldn't feel shy to skip straight to Section 3. This chapter starts with the popular video-arcade games which you can run directly on your TI-99/4A, but also includes lesser-known games which the computer can play equally well. If you have never used a computer before, games are the best possible way to overcome any fears you may have of your machine.

The final section of this book will help you if you want to know more about your TI-99/4A. By writing your own programs, for example, you can tell the computer exactly what you want it to do, rather than being locked into someone else's ideas. By using other, more specialized equipment, you can dip into the options of speech synthesis or electronic communication.

COMPUTERS AND CARTRIDGES

A computer is a machine, nothing more. You talk to it by pressing keys on the keyboard, and it talks back with words or pictures on your television screen. Between the two lies the computer's "brain," a small chip no larger than a thumbtack that will follow exact instructions. For the TI-99/4A, these instructions come packed in the small Solid State Software cartridges.

A cartridge is a black box which cannot be opened. Inside it are a number of complex electronic chips, which store the program that tells the computer what to do. This program is a long list of step-by-step instructions, which let the computer ask you for information and make decisions based on what you tell it. Because of this, you can control the computer without having to tell it every step to take.

You can buy preprogrammed software in forms other than cartridges. Cassette tapes are one common form. With these, the program is encoded electronically as variations in a high-pitched whistle. When the computer listens through a special cable, it can understand these codes and store them in its memory. These can then run the computer in the same way as a cartridge program.

Another form is the *diskette* or *floppy disk*, a 5 $\frac{1}{4}$ -inch plate covered with a magnetic recording surface. The computer can read these disks like a phonograph record, and can write information back on them as well. These diskettes are very useful because they let the computer store a great deal of information quickly and conveniently.

In many ways, diskettes are ideal, but they require some expensive equipment. The *disk drive* alone costs several hundred dollars, and you must also buy a *disk controller card* and the *TI Peripheral Expansion System* to use it. Since few TI owners are willing to put this kind of investment into their machine, only the more specialized and advanced programs are sold in this way.

Normally, cartridges do not require any special equipment, since they plug directly into the computer. They have several other advantages as well. They are ready to use as soon as you plug them in, whereas cassettes take several minutes to read in. They are sturdy and virtually indestructible with normal care. Their greatest advantage is that they store the program in their own memory, rather than in the computer's. This means that a cartridge program can be made more sophisticated than it could if it had to be read in from a cassette or diskette.

All of the programs described in this book are sold as plug-in cartridges. With only a few exceptions, all can be used with your TI-99/4A console alone, with no additional equipment. In a few cases, you may need to store data on tape from one of the programs, but you can use a regular cassette recorder for this. Some of the programs also have a computerized speech option for which you would need the Solid State Speech synthesizer; these cartridges, however, will also work without the speech.

There are several important cartridges that do require additional equipment, such as a disk drive, a memory expansion, or a printer. Since the cost of these expansions puts them beyond the range of most TI-99/4A owners, the following programs are mentioned only briefly in this book: the TI Writer word processor, the Multiplan electronic worksheet, the LOGO and Pascal programming languages, and the PLATO educational series. To use any of these programs, you must buy the required equipment and the TI Peripheral Expansion Box. Some of this equipment is shown in Figure I.1.

One way around this high cost might come with Texas Instruments' new



Figure I.1: The TI-99/4A computer with peripherals attached

HEXBUS series of small, battery-powered peripherals. These are relatively inexpensive, and do not require the TI Peripheral Expansion Box. So far, the series includes an RS-232 interface, a small printer/plotter, and a Wafertape high-speed tape-storage system, but other products will soon follow. To use these peripherals on your TI-99/4A, you will need to buy a relatively inexpensive HEXBUS interface. One can only hope that this series will make these more advanced programs affordable.

THE CARTRIDGE MARKET

The TI-99/4A is unique among the home computers in that virtually all of

the cartridges available for it are sold by TI. While other computer manufacturers have encouraged "third-party" designers to sell their own cartridges, Texas Instruments has tried to keep close tabs on its software. Because the TI-99/4A has an unorthodox, patented design, other companies are reluctant to adapt their programs. This is one of the reasons why you cannot buy well-known arcade games for the TI.

This situation may change. With the recent success of the TI-99/4A, many of the large software and game designers are hungry to get into this big market. Already one company has begun to sell TI-99/4A-compatible cartridges, and others will soon join in this challenge. It remains to be seen whether these companies will succeed in breaking into the market.

Conscious of the challenge, Texas Instruments is actively trying to buy rights to programs independent companies are developing in order to round out its line with more popular programs and video-arcade games. TI already sells many cartridges designed by other companies, and will certainly add to this list in the future. It has recently announced new cooperative projects with Scott-Foresman and Milton Bradley, and has purchased rights to a vast series of PLATO educational programs, owned by Control Data Corporation.

Whether the new products come from TI or other companies, the coming explosion in the TI-99/4A software market will certainly help you. Soon you should be able to choose not from hundreds, but from thousands of programs, including well-known video-arcade games and financial programs.

Choosing among the field of cartridges will become an even greater problem as the market expands. This book will get you started on a number of cartridges, but at some point you may want to explore others. You can, of course, simply buy the cartridge and see how it works. However, cartridges can be expensive, especially the good ones.

One useful resource is the *99er* magazine, a monthly periodical devoted to the TI-99/4A. If you read it regularly, you will find reviews of cartridges and announcements of new TI products. You will also find advertisements from a variety of manufacturers and distributors that offer useful products at reasonable prices. For information and subscriptions, contact the Emerald Valley Publishing Company, 1500 Valley River Drive, Suite 250, Eugene OR 97401.

Sometimes you can test out a popular cartridge for yourself right in the store. Most TI-99/4A store displays have ten or fifteen cartridges on wires just for this purpose. If you live near certain big cities, you can also visit a Texas Instruments Learning Center. They have a full selection of cartridges and will let you test them on their computers for a small fee. If you cannot do this, you can still borrow cartridges from other TI-99/4A owners.

Even after you've decided on a cartridge, you may still have trouble buying it. Department stores carry the more popular titles, but specialized programs may be hard to find. You should try one of the new software specialty stores. They carry many cartridges and can order those which they don't stock. Cartridges are also sold by the large mail-order houses that advertise in the *99er* magazine. If all else fails, Texas Instruments will tell you where to find the cartridge, on their toll-free hotline, 800-858-1802.

HOW TO USE CARTRIDGES

If you have just bought your TI-99/4A home computer, you will need first to connect it to your television or monitor. TI tells you how to do this clearly in the pamphlet that came with your computer.

If you want to get the most out of your cartridge programs, you will want to use a color television, since color graphics are one of the main attractions of the TI-99/4A. In most cases you can still use a black and white TV, though you should realize that you will be missing a lot.

Many people are afraid of computers because they think they might destroy something by pressing the wrong key. There is almost nothing you can do that will hurt your machine, short of hitting it with a hammer. If you press the wrong key, the worst thing that can possibly happen is that you might wipe out what you have been doing. Even if you do this, you can always turn the machine off and back on, and it will be back as good as new, ready to restart the cartridge.

You must be careful about one thing, however. The electronic circuitry of the cartridges can be damaged by static electricity if you touch the metal contacts that slide into the slot on the computer. Texas Instruments has minimized this danger by covering these contacts with a black plastic door on the thin end of the cartridges. If you simply slide them into the computer, you will never have trouble. Just make sure that you (and your children) don't put your fingers inside this door on the cartridge.

Texas Instruments has gone to great lengths to make their cartridge programs easy to use. When you turn on your computer, it will show a colored test pattern. By pressing any key, you will get to a screen similar to Figure I.2. TI BASIC, the first choice, is the built-in programming language of the TI-99/4A, which allows you to write your own programs and run them. For the moment, however, you probably want to use the cartridge, so you should press the number 2 on the keyboard. The program begins immediately, and you often need to do nothing more.

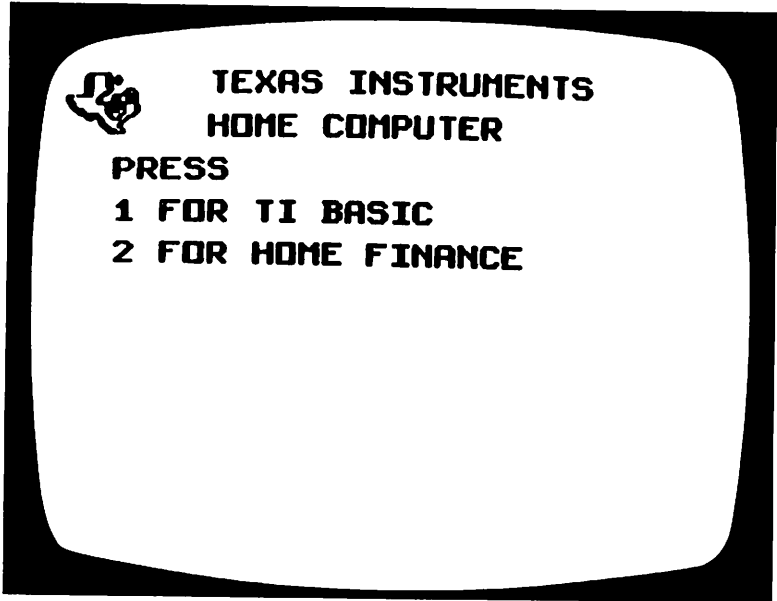


Figure 1.2: Selecting the cartridge

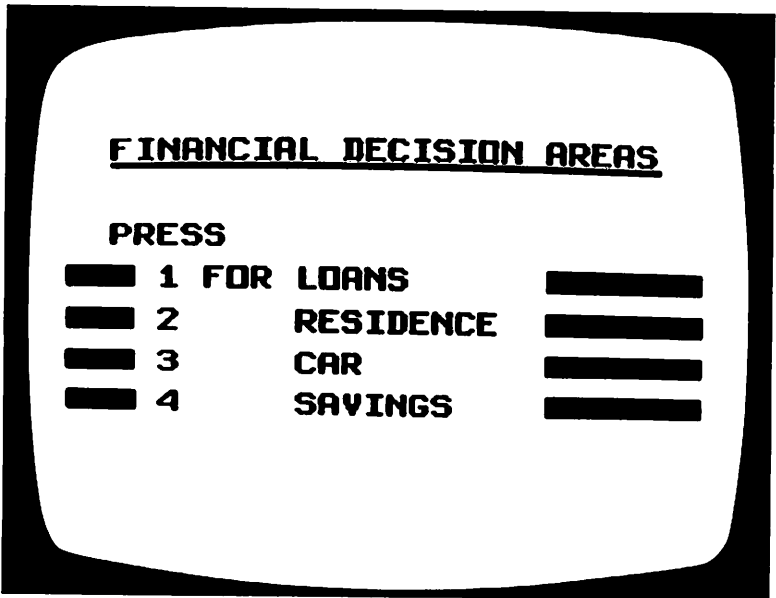


Figure 1.3: Cartridges often let you choose from a menu of options

TI cartridge programs give you most of the necessary instructions and explanations right on your television screen. Often there is a line or two at the bottom of the screen to tell you which keys to press to do various things. If you need to choose between a more extended set of options, the program will give you an index or *menu* of your choices, such as the one in Figure 1.3. With this multiple-choice approach, you do not need to think up commands: you simply press the number for the option you want.

The more complicated programs are arranged with their options in a tree. The first screen you see is the “master index,” which lets you choose among the major options of the program. Once you have chosen, you may need to choose again, naming more specific options. After that, if the program needs still more information, it might ask additional questions. Don’t let this intimidate you: these screens explain themselves as you get to them, and actually explain what the computer is doing.

THE KEYBOARD

The TI-99/4A looks very much like a normal typewriter. The letters are all in the same places on the keyboard, and only a few symbols have been moved. In most cases, you can simply type as if you were using an electric typewriter, and watch the letters appear on your television screen. A flashing square (called the *cursor*) shows where your next letter will appear on the screen.

You will quickly learn to use the ENTER key. When you are typing, you will press ENTER to complete each line, just as you press the carriage return on a typewriter. When you do this, the computer will accept the line of text and let you begin the next.

With cartridge programs, you will frequently need to press ENTER. Most of these programs are designed to ask you questions and act according to the responses you give. If your response is just a single key (such as the option number from an index), the computer will usually act as soon as you press it. If, however, you need to give a more extended response (such as a name or a dollar amount), the computer will wait until you press ENTER before it goes on. The instruction manuals try to mention this whenever it happens, but often neglect it. If you do not press this, you may be puzzled because the computer is not doing anything. It is waiting for you to finish your response.

On each side of the space bar you will find other new keys: ALPHA LOCK, CTRL (control), and FCTN (function). These three keys, when pressed down, alter the way the computer reads the keyboard, thereby giving special meanings to certain keys.

The ALPHA LOCK is the simplest of the three. Like the SHIFT LOCK on a normal typewriter, it changes all of the letters to upper-case capitals. Unlike a typewriter, however, the computer's ALPHA LOCK does not change all of the keys to upper-case, but only the letters. If you want to type one of the symbols above a number key, you will still need to press the SHIFT key.

With cartridge programs, you should never use the ALPHA LOCK. Some cartridges will not work correctly with the ALPHA LOCK down. This problem can take many forms, from no response to erratic operation. Video games, for example, will not respond to the joystick if you have the ALPHA LOCK pressed down. So, keep away from this key whenever you are using cartridges, and check to be sure it is up if your computer ever starts behaving strangely.

You will be using the computer's keyboard to type more than just words. The keyboard is also your way of telling the computer what to do, and for this you will need to use *function keys*. These are combinations of one of the keys on the keyboard and one of the two special keys, FCTN and CTRL. These combinations give the computer a specific command, anything from "erase the last letter typed" to "clear the entire memory." Of the two keys, FCTN is the one you will normally need to use. CTRL only works with very specialized programs.

The FCTN key is primarily used with the number keys on the top row of the computer. These *function commands* are described on a plastic strip that came with your computer, with names like BEGIN, REDO, and QUIT. To keep track of these, slide this strip into the slot right above the number keys.

Some of the letter keys also have special meanings if pressed with the FCTN key. These meanings, shown in gray on the front of each key, range from the four direction arrows to special symbols like the square brackets and the quotation marks. The left arrow (on the S key) is one of the most important, since it lets you back up and correct a typing mistake. In games, you will also use the direction arrows for movement.

To use one of these function keys, you must hold down the FCTN button while you press the key. For example, BEGIN is directly above the 5 key. To use it, you must press and hold the FCTN key, then press 5. The computer will then interpret 5 as a FCTN-BEGIN command.

While the precise meanings of these functions will vary from program to program, they will generally stay close to their names. FCTN-BEGIN will usually move you back from wherever you are to the program's master index, so that you can select another option. FCTN-REDO will let you start your current task over or reenter a screen of numbers if you have discovered a mistake. FCTN-BACK is similar, but moves you one step further up

the tree, letting you change some options. FCTN-PROC'D and FCTN-AID are also used, but their meanings vary.

The most important is FCTN-QUIT. Before you pull the cartridge out of the computer, you should always press this key. This tells the computer to reset itself and be ready to start a new program. If you don't do this, the computer may think it is still running the old program, and may behave strangely or stop working when you plug in another cartridge. Don't panic if this happens. You haven't ruined anything. Just turn the power of the computer off, using the main on-off switch, then turn it back on after a few seconds. The computer should be back to normal.

Be very careful about using FCTN-QUIT, because it clears everything from the computer's memory, just as if you had turned the machine off. You may have spent several hours entering numbers into one of the financial programs, only to see them disappear at the touch of a button. With many cartridges, you can save your numbers permanently on a cassette tape so that you can turn the computer off without losing your work.

INSTRUCTION MANUALS

Every TI cartridge comes with a detailed instruction book describing how to use its options. You should read the manual from cover to cover when you buy the cartridge, since it contains very useful information. After you have started to use the cartridge, however, you should need it only occasionally, since the programs themselves will tell you most of the things you need to know.

Like most people, you will probably have trouble reading these manuals. Although they avoid technical computer jargon, they are hardly as clear as they ought to be. They usually take great pains to describe all the minor details of the programs, but often neglect what you most want to know: how to use the program. Though Texas Instruments' manuals are better than most manufacturers', they are still confusing.

Don't give up! You can understand the manuals if you have patience. You may have to reread certain sections, but if you keep at it, you will understand them. All the information is there, and you can figure it out if you keep your head.

Make sure you look inside the front cover of the instruction book. There you will find a quick-reference guide to most of the important commands for using the program. You will find this list very useful, both when you are trying to get your bearings with the program, and afterwards, when you are

using the program and need to recall a specific command.

You should be aware that the TI-99/4A pictured in Figure I.1 is an improved model of the original machine, the TI-99/4. Be sure to check the model you have. You can use all of the cartridges for both, except for the Touch Typing Tutor and the Parsec game which work only on the TI-99/4A.

The difference between the two machines is that the TI-99/4A has a FCTN key to simplify commands for which the TI-99/4 used the SHIFT key. Most of the instruction manuals have not been updated to reflect this change. If you are puzzled by a reference to a SHIFT key combination in the manual, just remember that you will need to use the FCTN key instead. Look at the quick-reference guide inside the front cover of the instruction book: it has been updated to show the commands for the newer version.

Above all, don't be scared of the machine. If this is your first time using a computer, you might feel a little intimidated by all the unfamiliar words and ideas. This is perfectly normal, and not something to worry about. You are exploring new territory, and you shouldn't feel bad if you can't get your bearings immediately. As you use your computer, you will gradually start to understand how it works and become more comfortable with it.

Enjoy your explorations, wherever they may lead.

SECTION ONE

HOME MANAGEMENT

INTRODUCTION

Complex financial calculations haunt many homeowners. Buying a house, taking out a loan, making a budget, and keeping records are just a few of the problems that come up in the course of your life. You may have tried to face these tasks and given up, with ink on your fingers, sweat on your brow, and confusion in your soul.

In the business world, financial work has long been done on the computer. Large quantities of information can be stored electronically and retrieved whenever necessary. With a computer, a business can produce inventory lists, quarterly reports, and routine payrolls without tedious manual calculations. With a word processor, it can send out personalized form letters or revise a document without retyping it.

You can do this on your home computer as well. With preprogrammed cartridges, you can get big help from a small machine: it can calculate your finances, maintain your budget, and keep your records. You may be amazed to see how easy it becomes to solve your problems.

The most accessible financial package for the TI-99/4A is Home Financial Decisions. This is a clear, well-designed cartridge, which performs many of the routine calculations that homeowners face: compound interest, loan financing, and home buying. You can learn how much a new car might cost over a period of years, and whether it will save you money over your present car. You can calculate what payments you will need to make on a loan, and how much you must regularly deposit to reach a savings goal.

Another common problem is the monthly budget. With Household Budget Management, you can divide your monthly expenditures into clear categories, then set monthly limits to what you spend. As the months go by,

you can compare your actual expenditures to your targets and see where you are spending too much.

Personal Record Keeping is a general-purpose program for maintaining a file of information. Instead of keeping your records in a notebook or on index cards, you store them in the computer. Then, when you need to look something up, you have the machine sort through and find it for you. You may find this useful if you need help with tasks like keeping a mailing list or a teacher's grade book.

The TI-99/4A cannot do all of this by itself. Its memory is limited, and every time you turn it off, it forgets the numbers that you have stored. To keep permanent records on all of these cartridges except Home Financial Decisions, you must have some way of recording data. For Household Budget Management and Personal Record Keeping you can use cassette tapes, although they are slow and limited.

To get around this problem, more advanced TI cartridges use a disk drive to store their records. Since this requires a TI Peripheral Expansion Box, a disk controller card, and a disk drive, it is beyond the means of most TI-99/4A owners. Nevertheless, three of these advanced programs are interesting enough to be included at the end of this chapter, in case you are considering these expansions or already have them. Tax/Investment Record Keeping maintains a file of all the transactions you make during a year, and totals them up when you do your taxes. Multiplan, a popular *spreadsheet* program for the TI-99/4A, allows you to create, rearrange, and automatically calculate financial tables of any sort. The third program is TI Writer, an elementary word processor. While word processing is of great interest to many people, it requires a high-quality printer in addition to the disk drive.

For more specialized applications, other programs are available which do not require additional equipment. If you follow the stock market, you might be able to use the detailed calculations of Securities Analysis, though it is really a program for experts. Another cartridge, Personal Real Estate, will be valuable to those who regularly invest in real estate. While it is too specialized for most one-time home buyers, it provides the detailed calculations frequent investors need.

More than any other type of program, financial cartridges can open up a whole new world for your TI-99/4A. If this interests you, try out one of the cartridges, particularly Home Financial Decisions. As you learn what your computer can do and what you want from it, you can progress to other programs requiring additional equipment and more specialized knowledge.

HOME FINANCIAL DECISIONS

Overall Quality	Excellent
Flexibility	Good
Graphics	None
Time needed to learn	30 minutes
Ease of everyday use	Easy
Clarity of instruction book	Excellent
Clarity of screen instructions	Excellent
Data storage	None
Color television needed?	No
Extra equipment required	None

The Home Financial Decisions cartridge will help you with the calculations you encounter in your daily finances. If you are taking out a loan, buying a new car, or refinancing a house, the detailed, understandable computations of this module may be a godsend. Anyone who has ever waded through compound-interest tables or compared the costs of two homes will appreciate the clear approach of this program.

The cartridge is divided into four general areas: Loans, Residence, Car, and Savings. The Loans and Savings sections handle routine compound-interest problems. They can, for instance, tell you the number and size of payments you will need on a loan or the deposits to reach a savings goal. The Loans section can also calculate down payments and the interest cost of early payoff.

The Residence and Car sections also deal with loan costs, but from a different perspective. If you are buying a house or car, you must consider costs such as insurance, taxes, and utilities, as well as the mortgage payments. On the other hand, your investment will also save you money through tax deductions and appreciation in value.

The TI Home Financial Decisions package organizes this in a very

reasonable way. It computes the cost as expenses minus savings. With this method, you will be viewing your potential investments, not in terms of their immediate costs, but of their overall net value. The program makes all these calculations in terms of the “present value” of your money. This means that it adjusts the figures to reflect the interest you would be earning if you invested the money in a bank account rather than spending it.

Even if you don’t care about these subtleties, you will find it easy to use this cartridge. It comes with an excellent instruction book, which includes worked examples and a clear glossary of financial terms.

You will rarely need to look at this book, though: the computer asks simple, self-explanatory questions and displays the results in clear, comprehensible tables. This is one of the rare computer programs that can actually help you understand the concepts as you work with it.

Using the cartridge

When you turn on the cartridge, the computer starts by describing its “Easy Three-step Use” as in Figure 1.1. The first step is to choose among the four main sections (Loans, Residence, Car, or Savings). Once you have done this, you can name the specific option you want and supply the numbers the computer asks for. The computer explains each of the options clearly at every step of the way, so you will not get lost. Once you have typed in all the necessary information, the computer automatically calculates the results.

For an example, let us say you are using the Loans section’s second option: SIZE OF PAYMENTS. The computer will ask how much you are borrowing, the number of monthly payments, and the interest rate. As soon as you push ENTER after this final number, the computer will calculate the amount of each payment you will make, including the total interest cost and the final payment (which may be a few cents different).

You may want to vary your figures, to see how differing interest rates or payment plans would affect your loan. Just press FCTN-REDO, and you can rerun the calculation to change anything you want. The computer will keep the previous numbers in its memory, so you can simply press ENTER on any line you want to leave unchanged.

You can also try other loan calculations. For example, you might want to see if you can reduce interest by making a down payment. To do this, press 1 FOR MORE ON LOANS and run the new option. Where possible, the computer will save your old figures and let you reuse them.

The home and car calculations are more complicated, but the structure is the same. You may need to enter as many as 22 different numbers in some of the options, but everything is clear. If you lack certain numbers, you can find

EASY 3 STEP USE

- 1 SELECT 1 OF THE 4
DECISION AREAS.**
- 2 SELECT THE SPECIFIC
QUESTION YOU WANT
ANSWERED.**
- 3 TYPE IN THE INFORMATION
ASKED FOR, THEN PRESS
ENTER.**

Figure 1.1: The directions for the Home Financial Decisions cartridge

THE COST OF BUYING:

DOWN PAYMENT	\$35000.00
CLOSING COSTS	+ 4000.00
MORTGAGE PMTS	+23994.55
INSURANCE PMTS	+ 2057.42
PROPERTY TAXES	+ 3166.03
UTILITIES	+ 5007.48
TAX SAVINGS	-10770.69
EQUITY	<u>-44256.80</u>
PRESS ENTER	\$18197.99

Figure 1.2: One of the result screens of the Home Financial Decisions program

them out from your realtor—and probably should before you buy the house! The results are easy to read. In the Buy a House or Rent option, for example, the computer tabulates the cost of the house as in Figure 1.2. The first six lines show the costs that will be involved in buying the house. The last two, with minus signs, are the tax savings and increased property value which offset these costs. The total expense is simply the cost minus the savings. When you press ENTER, the computer gives you a similar table for the cost of renting, then concludes by saying which is cheaper.

You should have a clear idea of what these numbers represent. To begin with, they are limited to the period of analysis you have selected. If you are comparing the cost of two houses over the next three years, the one may appear cheaper, but the other may save more in the long run. You should try the calculations several ways, using various time periods.

You should also remember that changing property tax, appreciation, and interest rates may greatly affect your results. The program itself warns you not to project beyond three to five years, and even that may be too long. Use these numbers as your guide, but think about other factors as well.

The economy has changed considerably since Texas Instruments first introduced this cartridge five years ago. Although you will still find it useful, you should remember that some of the underlying assumptions have changed. This is especially true of home mortgages, which have shifted away from fixed rates to the new “balloon” and variable-rate loans. You will need to take these variations into account, and not bank too heavily on property values that may be unpredictable for years to come.

Of course, the program can tell you nothing beyond the simple investment value of the house or car. It will not tell whether you can afford the financing or whether you really want to live in that house.

General Evaluation

Overall, the Home Financial Decisions is the best and most useful of the Texas Instruments home finance packages. It is a rare household that would never need the program's loan, mortgage, and savings calculations. The instruction book explains things clearly, but the program is designed so well that you should rarely need it.

Of course, you still have to use your head. Buying a house or a car is a difficult decision, which can never be reduced to a simple calculation of dollars and cents. But the costs are important, and the Home Financial Decisions cartridge is one of the best tools you can find to understand them.

HOUSEHOLD BUDGET MANAGEMENT

Overall Quality	Good
Flexibility	Good
Graphics	Very good
Time needed to learn	Several hours
Ease of everyday use	Fairly easy
Clarity of instruction book	Adequate
Clarity of screen instructions	Fair
Data storage	Very Reliable
Color television needed?	Yes
Extra equipment required	Cassette recorder

The TI-99/4A can help you keep track of your household expenses with the Household Budget Management module. It can arrange messy columns of figures into neat tables on the screen, automatically add them, draw graphs, and project your yearly expenses. It can help you break your expenditures down into small categories and tell you where you are spending your money.

It does, however, demand a certain commitment. You have to be willing to spend a few hours learning to use this relatively complicated program and setting up your budget the way you want it. You must also be conscientious about keeping your records up-to-date, if you want to reap the benefits of the program.

To use Household Budget Management, you must first set up *budget categories*, that break down your expenditures the way you want them. In each category, you must then set up a budget to represent your spending limits. As the months go by, you will be able to enter the amounts actually spent, and compare them to your original plan. The cartridge can automatically plot colorful graphs of this information and project how much money you have left for the year.

There is one important limitation, however. Household Budget Management will only keep track of your monthly *totals*, not your day-by-day expenditures. You will need to keep your daily records on paper, and add them up at the end of the month. Only then can you enter them into your budget.

Since you will want to save your data from one month to the next, you will need a cassette recorder or some other form of permanent data storage. A color TV is almost required, since the graphs are unreadable in black and white.

Using the Cartridge

Household Budget Management requires a bit of advanced planning. You can skip over most of this if you wish, but if you make the effort to do it correctly from the start, you will find your budget more useful later on.

You should first read the instruction manual and play with the demonstration data set. Spend some time experimenting: change numbers, change categories, explore the graphs and tables. Don't be afraid! This sample budget is provided so that you can learn without worrying about destroying your own data. If you get lost, you can always turn the computer off and get the sample data back the way they were.

In this beginning stage, you will look to the detailed instruction manual for help. You may be annoyed at having to read 52 pages of instructions, but you will find it a wealth of good advice and important information. The program gives most of the operating instructions on the screen, so once you have done your reading the first time, you should not need much help from the book.

As you begin to explore the demonstration data set, you will quickly come across the main index, shown in Figure 1.3. This index will be your closest friend while you use the module, since it points you directly to each of your options. If you ever feel lost, just press FCTN-BEGIN and you will be back here, ready to try again.

Option 2, ANALYZE DATA, is where you are headed, so you might as well go there now. As you try out the various options in this section, you will see that you can display the data in many different ways. You can, for instance, look at a cross section of the figures in each of the categories for a single month or for the entire year to date. Or, if you prefer, you can look at a single category spread across all 12 months of the year. Finally, you can get the largest picture with a table of your total income and expenditures month by month. In every case, you can press G for a beautifully-colored bar graph, or you can press P for a *projection*, an estimate of what you will spend in the

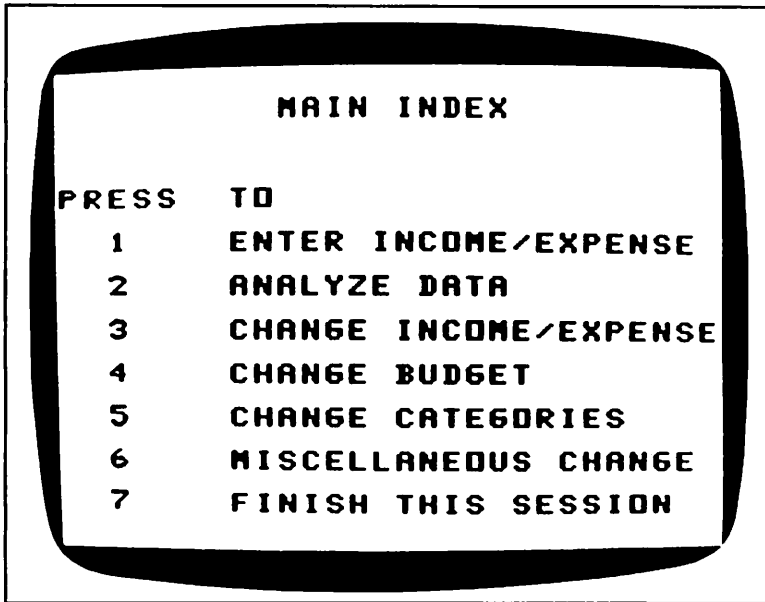


Figure 1.3: The Household Budget Management main index

entire year if you continue your present spending habits.

When you feel comfortable with the module and know more or less what you want, you can set up your own budget. You will need to do this in three steps. First, you must choose the 34 categories you want to break your budget into. Then, you set the limits on each category. Only then can you begin the ongoing process of entering your monthly figures.

Use FCTN-BEGIN to get back to the main menu, then type 7, FINISH THIS SESSION. This will return you to where you were when you first turned the computer on. You can now start the module up again, and choose option 2, SET UP FOR FIRST TIME. After a few preliminary questions, you will come to a screen labeled CATEGORY SELECTION.

This is where step one begins. To have a useful budget, you will want to divide your expenses into meaningful categories. The Household Budget Management program gives you 99 headings to choose from: everything from health care to liquor costs. Out of these 99, you can choose up to 34 for your budget. These become your *active categories*.

Texas Instruments has already set up 34 categories they think will be of interest to most people. Though they chose these well, you will probably have a few special needs they did not take into account. For instance, if you rent an apartment rather than owning a house, you might want to replace category number 39 (House Payments) with number 38 (Rent Expense).

Take a few minutes to look at the list of categories in the appendix of the instruction book. Write down the names and numbers of the categories you want, then go through and select them on the computer. When you've finished, keep your written list. It is easier to use a written category list than repeatedly to interrupt your work to look at them on the screen.

If you have only a few changes to make on TI's predefined list, you do not have to type all 34 categories in. When the computer asks you whether you want to use its preselected categories, answer Y for "yes," even though you intend to change them. When you press ENTER, the computer will shift to a new screen, but you can press FCTN-BACK to return to where you were. The advantage to this is that you now have the 34 preselected categories stored in the computer and can easily replace the ones you want to change. When the computer asks about preselected categories again, just answer N for "no" and make your changes.

Once you have set up your categories and typed F for FINISH SELECTION, you will come to a screen titled START YOUR BUDGET. This is the step where you must set your monthly spending targets. If you want to do this, type Y.

If you have never had a budget before, you might want to follow a suggestion in the instruction book. Skip this step for the moment and just use the cartridge to track your actual expenditures for the first few months. Once you have a better feel for the targets you want, go back and set them up.

When you do set up your budget, the computer will step you slowly through each of your active categories and ask how much you want to set aside for each month. When you name a figure, you will see a table of the numbers you have set up.

This is your chance to make adjustments for special circumstances. For instance, in the gifts category you might allot a small monthly amount in general, but set aside more for December and Santa Claus. Just enter the small amount at first, then answer Y. You can then make your adjustment for the single month.

Of course, none of this has to be cast in iron. The Household Budget Management module allows you to change your plan as often as you like, so you can name ballpark figures for your categories and change them later.

The final step is to enter your actual income and expense figures. You will need to go through this process every month. It will work best if you do this as a regular habit—at the end of each month, for example.

You enter these figures from the main index screen, which you will remember from your experiments with the demonstration data set. To do this, you will want to choose option 1, ENTER INCOME/EXPENSE. In this section of the program, the computer will repeatedly ask three questions:

"Which category?" "Which month?" and "What is the amount?" Each answer becomes an entry in one of your categories.

You may find it easier to use option 3, CHANGE INCOME/EXPENSE, especially if you want to enter figures for several months at once. Instead of asking the three questions, the computer puts a 12-month display of the category on the screen, showing the amounts you have entered. You are then free to change any of the entries, and can check to see if you got them right.

After this initial set-up, you can enjoy the program's benefits. With your numbers stored in the computer's memory, you can go to the ANALYZE DATA option to see how reality compares to your targets. Take advantage of the colored graphs: they will tell you things your number-weary eyes would never notice.

Remember to save your data on a cassette tape before you turn your computer off. If you don't, all of the numbers you have typed in will be lost when you turn off the power. The next time you want to use the program, you can read your figures back in and start where you left off.

To save your data, you should always use option 7 on the main index, FINISH THIS SESSION. Never use FCTN-QUIT or the on-off switch to stop the program. If you do, the computer will throw away all your data before you can say a word.

When you press the 7 key, the computer will lead you carefully through the steps of saving your data on cassette. The instructions are very clear and virtually foolproof. When the computer asks if it should check the tape you have recorded, type Y. This extra minute will bring a glow to your heart when you see the DATA OK flash on the screen. Rewind the cassette before you take it out of the recorder, to protect the tape surface.

The next time you want to work on your budget, you can reload the data with a similar procedure. When you have finished this second time, the computer has you store your data on a different tape, marked B. This way, if anything happens to one of the tapes, you will still have the previous version as a back-up. The computer even helps you label your tapes.

The cassette storage system is almost foolproof if you follow directions. Just to be safe, though, you should keep a file of your old papers and calculations, so that you can reconstruct your records if you have to.

General Evaluation

The Household Budget Management cartridge is a useful tool for month-by-month budget tracking and record keeping. It does, however, require a significant initial investment of time to get set up and running.

The instruction book is adequate, though you may have some trouble

reading it if you are new to computers. It is quite good in describing the steps to accomplish a specific goal, but lacks a clear general plan that would help you understand what you are doing. You may, in fact, wish the book were not as detailed as it is, since you will probably not want to wade through 52 pages before using the program. Be patient with it, and take advantage of the index if you are looking for something specific.

There are no major drawbacks to the module's design. You may find some of the procedures a little cumbersome when you have large amounts of data to enter, but they are at least clear.

The tape storage procedures are simple and reliable, provided you follow them to the letter. You might wish to have some protection against accidentally destroying your work with FCTN-QUIT, but this should not be a problem if you are careful.

Household Budget Management has its limitations. It cannot add up your daily bills and keep detailed records. It requires some time to get used to, and remains slightly cumbersome even in daily operation.

Even so, this program is a useful tool for managing your home finances. It will help you keep track of where your money goes and where you want it to go, and will provide a clean, easy means of recording information. With the graphs, tables, and projections, you can organize your money, and might even save some of it.

PERSONAL RECORD KEEPING

Overall Quality	Fair
Flexibility	Limited
Graphics	None
Time needed to learn	Several hours
Ease of everyday use	Fairly easy
Clarity of instruction book	Fair
Clarity of screen instructions	Good
Data storage	Reliable
Color television needed?	No
Extra equipment required	Cassette recorder

Many people maintain a file of information, such as a mailing list, a grade book, or a financial record. Keeping these files in a notebook or on index cards can be a great struggle, and it is often difficult to find something or to change information.

If you have a cassette tape recorder, the Personal Record Keeping cartridge will let you store these files on your computer. The advantage is that you can let the computer take care of the routine work of organizing and sorting through the tables. You can then review the file in any way you want, to change entries or search for information.

This type of program will only work for a certain type of data file. To use it, you must be able to lay down a template for your file entries, to say what exact pieces of information you will be keeping for each table entry. For a mailing list, for example, you might want to set aside places for each person's name, street address, city, state, and zip code. Each of the entries will then have this precise form, and you cannot vary it.

Though this structure may seem confining, it actually helps you organize your file in a useful way. Because you enter your information in a precise format, the program can check to make sure you are including everything.

Also, with structured records, the computer can easily find a specific entry, since you can tell it exactly what you are looking for.

The other restriction to Personal Record Keeping is space. The TI-99/4A can store only a limited amount of information before it runs out of memory. While it will hold enough data for most individuals, it will not be large enough for a small business. You are limited to what you might fit on a stack of about 200 index cards.

To store your records permanently, you will need a cassette recorder. If you have a printer and an RS-232 interface, you can also print out copies of the screens and tables. While this is not necessary, it does make the program more useful by allowing you to keep permanent written records and see your entire file.

Using the Program

Personal Record Keeping is organized like the other Texas Instruments financial cartridges, with a main index of major options, leading to screens of more specific selections.

Before you can get the main index, however, you must set up a file structure, laying out the template for your electronic file cards. You need to do this only once, but you must do it correctly, since it is *impossible* to change this later. You must therefore decide exactly what information you want in your entries and go carefully through the introductory procedures.

After a few preliminaries, you are asked to set up your *file structure* (the template). If you have never used a computerized filing system, you may be confused by this set-up procedure. Work through the example of the mailing list which you will find on pages 9 through 17 of the instruction book. That will help you understand what you need to do.

To set up your file structure, you must name each of the pieces of information you will want for each entry, then tell the computer whether to expect words or numbers. For words, or words mixed with numbers, you will use the "character" type. For numbers involving math, you can choose between integers (whole numbers), decimals (such as dollar figures), and scientific notation (a number with an exponent). You must also name the length of the *field*—the maximum number of letters or digits you will be entering.

You might think you would want to make all your items character type, but it is better to use numerical types when you can. They use less memory, and that will be important if you have a large file. Also, if you define the exact type of information you will be storing, you can have the computer let you know if you enter something wrong. For example, if you make the zip code field a five-digit integer, the computer will beep if you type a letter or an extra

number. This is a good way to keep wrong information out of your table.

When you have finished naming the items that will be in each entry, you might want to add a few extras, so that if you think of something you want to add later, you will have space to do it. You are allowed up to 15 items on your template, though each one uses up memory.

When you push FCTN-BACK, the computer will display the file structure, as in Figure 1.4. Check this very carefully, because once you type Y, the structure is fixed forever. If you do want to make a change, make sure you type N before typing the item number you want to change. This is important, because for some reason the computer also reads the 1 key as a "yes." If you forget to type N and try to change an item number beginning with a 1, you will be locked out of the change option, never to return. So, be very, very careful at this stage.

Fortunately, this set-up is the hardest part. You are now ready to use the ADD PAGES option to enter your data. When you do this, the computer will give you a form on the screen, leaving spaces for you to fill in the correct items. You will go down the chart, typing in a line at a time. When you are done, your entry will look something like Figure 1.5. Don't worry if you make a mistake or leave something blank: you can change or add to the entries later.

FILE STRUCTURE			
ITEM	TYPE	WIDTH	DEC
1 COMPANY	CHAR	15	0
2 ADDRESS	CHAR	15	0
3 CITY	CHAR	10	0
4 STATE	CHAR	2	0
5 ZIP	INT	5	0
6 PRODUCT	CHAR	15	0

PAGES AVAILABLE: 188

CORRECT (Y OR N)?

Figure 1.4: The file structure for a mailing list

DISPLAY PAGE

PAGE #? 1

1	COMPANY	BITS AND BYTES
2	ADDRESS	3401 FIRST ST
3	CITY	BERKELEY
4	STATE	CA
5	ZIP	94710
6	PRODUCT	COMPUTERS

PRESS AID TO SEARCH
 PRESS PROC'D TO REVIEW PAGES
 PRESS PROC'D TO PRINT SCREEN
 PRESS BACK WHEN FINISHED

Figure 1.5: An entry in a mailing list

DISPLAY PAGE

PAGE #? 1

1	STUDENT	JOHN DOE
2	QUIZ #1	79
3	QUIZ #2	84
4	QUIZ #3	80
5	AVERAGE	81.0

PRESS AID TO SEARCH
 PRESS PROC'D TO REVIEW PAGES
 PRESS PROC'D TO PRINT SCREEN
 PRESS BACK WHEN FINISHED

Figure 1.6: The computer calculated the average from the quiz scores in this table

Once you have stored the information in the computer, you can analyze it in any way you wish. You will probably want to look back through the data one page at a time. At times, however, you may also want to search for a specific item or pull out a group of pages that satisfy a certain condition. You can, for example, ask the computer to show you only the addresses in your mailing list where the city is Berkeley and the state is CA. You can also ask the program to sort the pages in alphabetical or numerical order.

You are able to do more advanced manipulations as well. One handy feature is the *math transformation*. This allows you to combine some of the numerical items on each page to make up a new item, such as a total or average. This is especially handy for a task like the teacher's grade book in Figure 1.6. You might have a page for each student in the class, with items for quiz and test scores. At the bottom of the page, you can leave an item blank for the total grade, then define a math transformation at the end of the course to average all the quizzes. This is complex to set up, but can save you a lot of time.

STATISTICS is another option for you. If you have all of the students' grades stored, for example, the computer can automatically calculate the class average. It can also name the lowest and highest scores, and the standard deviation, a measure of the scores' dispersion.

There are a variety of common applications for the Personal Record Keeping program beyond simple mailing lists and grade books. Be sure you read pages 39 to 44 of the instruction book, which suggest a few of these, including Small Library Management, Household Inventory, Stock Account Tracking, Payroll Worksheet, and Bowling League Scores. Many others are possible.

When you have finished, you will need to store your data on cassette tape, with option 7. Use a different tape each time or alternate between two tapes, so that you always have an old copy should something happen. If the data are irreplaceable, you should also keep a record on paper. If you have a printer, you can have the computer print this for you.

Be careful about option 8, EXIT, since it means you want to quit without saving the data. The computer does stop to ask, "Are you sure?" If you type y, your data will be erased.

General Evaluation

Personal Record Keeping is a very useful program if you want to keep a structured file of information on the computer. You can sort for any information you wish, and determine averages, totals or other functions of the data items. And best of all, you can do all this with no special equipment except a cassette recorder.

Unfortunately, the program is limited. You can only use it for a clearly structured file, and you must know your format before you set it up. The program works best for very specific applications where you might need to perform math transformations, as in a teacher's grade book, or sort for specific cases, as in a mailing list.

Also, sad to say, Personal Record Keeping was not designed as well as the other Texas Instruments programs. It is slow, hard to use, and has some annoying problems. The concept of a computerized database is not obvious to a first-time computer user, and the program's complex organization is far from clear.

A good instruction manual would have helped a lot. The Personal Record Keeping manual is hard to use and lacks a clear description of the program's general purpose. It does include several worked examples that help to explain the program, but even here it leaves you to draw your own conclusions rather than really describing the program. If you have used one of the other Texas Instruments financial cartridges, you will have little trouble with this, but you may still need to read it several times before you understand it.

If you have a disk drive, there are other programs, such as the Multiplan electronic worksheet, which might be better suited to your needs. If you know BASIC, you may also find it is easier to design a record-keeping system from scratch. And, old-fashioned as it may sound, a traditional deck of index cards might suit your needs best unless you are constantly sorting or searching for specific information.

Even so, Personal Record Keeping is a very good program when used for the right problem. This program could save you hours of time if you need to organize data that fit into a clear pattern.

OTHER HOME MANAGEMENT CARTRIDGES

	TAX/ INVESTMENT	MULTIPLAN	TI WRITER
Overall Quality	Very good	Excellent	Very Good
Flexibility	Fair	Excellent	Very Good
Time needed to learn	1-2 hours	2-4 hours	2-4 hours
Ease of everyday use	Easy	Easy	Fair
Clarity of instructions	Fair	Excellent	Very Good
Extra equipment required	Disk drive	Disk drive	Disk drive, printer, RS-232

Texas Instruments has developed a number of powerful programs for the TI-99/4A that take advantage of the greater flexibility of diskette storage. To use these, you will need the TI Peripheral Expansion Box, a disk drive, and a disk controller card. If you want to attach a telephone modem or a printer (to do word processing, for example), you will also need an RS-232 interface.

Since this requires a major investment, you should carefully consider your needs before you buy. Remember that even with the peripheral expansions, these programs will still be limited by the speed and design of the TI-99/4A. If you do extensive work or use the computer for your business, you may do better buying a different machine.

If you do have the equipment, however, these are excellent programs. Here are three of the best.

Tax/Investment Record Keeping

Do you find yourself rooting through piles of receipts every year at tax time? With Tax/Investment Record Keeping and a disk drive, you can store your records electronically and let the computer total them up when the time comes.

The cartridge stores your records on a diskette, in a rigid form based on double-entry bookkeeping. It divides your records into nine general categories, each of which contains a number of subcategories. Every time you enter a transaction, you ask the computer to file it into the appropriate area. Then, when you review your records, you will have them organized the way you want.

As with Household Budget Management, you will need some time at the beginning to get used to the cartridge and define your file structure. Once you have, however, the program is fast and useful.

Multiplan

This is a version of Microsoft Corporation's popular spreadsheet program, a wonderful tool for virtually any type of financial planning. Originally, this program was written for much larger computers, but it has been beautifully scaled down to the TI-99 without sacrificing any of its major features.

The idea is simple, as shown in Figure 1.7. The program maintains a large table of "cells" arranged in rows and columns. You see through a "window" into a small part of the table, but can move to see or change any cell in the table. Cells can contain either descriptive words or numbers, representing anything you wish: dollars, interest rates, time periods, or sales totals. You can design the table as you wish, and alter it to add rows, change numbers, or delete unnecessary information.

The most useful feature of this program is the *formula*. You do not have to type in explicit numbers for every cell in your table. If there is a figure that depends on other cells for its value, you can define it as a mathematical function of those cells. In Figure 1.7, for example, the Boardwalk Lumber company used this for all the figures below the first dashed line. The TOTAL line is simply a sum of the sales for the three departments for that month. Below that is the 10% commission, which is then subtracted to make the final NET figure for the month. By defining a formula to describe each of these lines in terms of the other numbers in the table, the company could let the computer do all the calculations.

Besides saving you work, this gives you another important advantage. If you have built your table up with formulas, you do not have to go back and recalculate everything if you found one number has changed. You can merely change the number in the cell where it appears and ask the computer to make any adjustments needed in the table. You will be amazed at how much time and effort you save by letting the computer automatically recalculate the columns in your table. You can also try out different assumptions (such as a 12% commission) to see how they would affect the entire plan.

	1	2	3	4
BOARDWALK LUMBER				
SALES				
	APRIL	MAY	JUNE	
LUMBER	12300	13400	14100	
HARDWARE	3400	3900	4100	
ELECTRIC	4500	4000	4900	
TOTAL	20200	21300	23100	
-COMM.	2020	2130	2310	
NET	18180	19170	20790	

COMMANDS: Alpha Blank Copy Del Edit For
 Go Help Ins Lock Move Name Off Print
 Quit Sort Trans Value Window Xterm
 Select option or type command letter
 95% TEMP

Figure 1.7: The Multiplan spreadsheet program

Since it is a very powerful program, Multiplan can take some time to learn. The diskette includes clear "help" displays to explain things if you get lost.

TI Writer Word Processor

One of the most common questions is "Will the TI-99/4A do word processing?" The answer is yes, but at a high price.

A word processor is like an electric typewriter, except that instead of typing your text on paper, you type it into the computer's memory. You are then free to insert, delete, or rearrange words, by reviewing your text on the television screen. Only after you have it exactly the way you want it do you press the print command. If you later see something you want to change, you can always go back, revise it, and print it again. You should never have to type anything more than once.

The TI Writer program, shown in Figure 1.8, applies this idea to the home computer. Like many larger word processors, you can type your text without carriage returns, insert and delete words, and move sections of text around. The computer can then "reformat" your text to rearrange it into neat paragraphs. Compared with more expensive word processors, some of TI Writer's manipulations can be difficult, but it can do the basics well.

The main limitation comes from the TI-99/4A console itself. Though

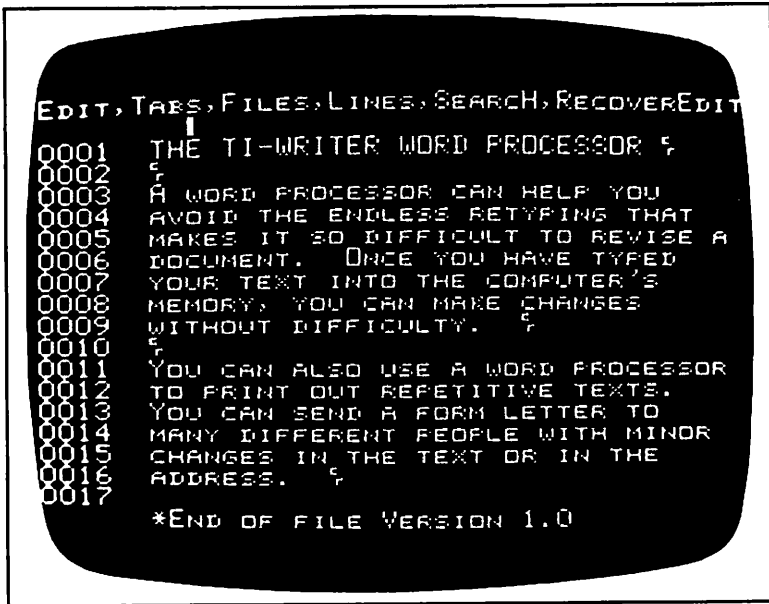


Figure 1.8: The TI Writer word processor

the computer's keyboard is modeled on the standard typewriter, it is a poor substitute. Response can be erratic at high speeds, and you must use the FCTN key to type quotation marks and other symbols, a clumsy operation if you are used to a typewriter. No secretary would want to type on this machine for long.

Another problem is the display: the longest line that will fit on a standard television is 40 characters, about half what you would want for a word processor. TI Writer gets around this limitation by using a movable window into the text. While this does make longer lines possible, it is difficult to use.

These limitations will not pose problems for an occasional letter or mailing list, but if you plan to do extensive work, you will probably want a different machine.

SECTION TWO

EDUCATION

INTRODUCTION

As the price of computers drops, many schools and parents are becoming interested in their uses in education. There are two good reasons for this. First, since a computer such as the TI-99/4A can give a child personalized attention and colorful, animated illustrations of concepts, it can often hold interest where other approaches might not. Second, many teachers feel that by playing with a computer at an early age, children become more comfortable with a machine that may play a large part in their future.

The computer is excellent for children's education. Interactiveness is the key to its success: it can check a child's work each step of the way. If he makes a mistake at any point, the computer can react immediately and help him correct it. Because of this, the computer gives individual attention to the child's specific problems, just like an individual tutor.

Texas Instruments has been a leader in bringing the computer into the classroom. From the beginning of its work on the TI-99/4A, the company has put a great deal of effort into its learning programs. It has cooperated with the leaders in the field of computer education, such as Scott-Foresman and Company, Addison-Wesley, and the Milliken Publishing companies. Compared with other computers in its price range, TI's educational software is spectacular.

Elementary Education Programs

If you are a teacher, you may already be familiar with the TI-99/4A programs that can help in the classroom. On the basic subjects of reading, spelling, and arithmetic, Texas Instruments has several extended series of cartridges at a variety of grade levels. You can probably find several within each series that would fit in with your course material.

If you are the parent of an elementary school child, you may be interested in using these cartridges at home to give your child some extra help, or to familiarize him with the machine. These are excellent uses for your home

computer, if you coordinate your efforts with what your child is learning in school.

Since most of the educational series contain many cartridges, you will want to choose carefully. If you are a parent buying only one cartridge for your child, you should avoid the programs that were designed to be used only a few times by a large number of children. Instead, you should concentrate on cartridges such as the Milliken Math and Scholastic Spelling series. Both of these cover a wide range of material and give extended use.

Arithmetic cartridges The structured problems of math can be taught very effectively with a computer. With its color graphics and music, it can give attractive illustrations of basic concepts and spice up the dreary tasks of drill and practice. Even apart from this strong visual appeal, the computer can easily monitor your child's progress. If he is having trouble with a certain problem, it can gently help him with the answer. If he seems to be struggling, it can suggest easier problems.

Math education programs divide themselves into two classes: tutorial and practice. The tutorials teach the basic concepts of arithmetic, such as the meaning of addition. On the other hand, practice programs merely repeat drills, assuming the child already knows the subject.

The only pure tutorial for the TI-99/4A is the Scott-Foresman math series, with titles including Addition/Subtraction 1 and 2, Multiplication 1, Division 1, and Numeration 1 and 2. These programs teach through animated illustrations of the basic concepts. Elementary schoolteachers, in particular, might find this a valuable tool for introducing arithmetic operations to their students.

However, the tutorials are not enough by themselves. The problem that most children face in arithmetic is not learning the theory. It is the application that is difficult. Other TI programs are designed to help with this.

The most interesting is the Milliken Math series. It aims at a slightly higher grade level than the Scott-Foresman Math, and assumes that the child already understands the operations and the arithmetic tables. It simply poses one problem after another, congratulates the child if he gets it right, and helps him work it if he does not. Since the program automatically adjusts the level of the problems to take account of the child's progress or difficulties, it is ideal for a child who wants to work alone, either to gain experience or to work on problems. This approach is certainly more enjoyable than working problems on paper.

Other programs make arithmetic practice more interesting by turning it into a game. Addison-Wesley, Inc. has recently developed a series of "Computer Math Games" for the TI-99/4A, and Scott-Foresman is publishing three

"Math Action Games." In these, the child must generally answer a math problem correctly to advance his counter or score points. In more advanced programs, there is also a time limit. Some of the games exercise the child's logical reasoning and other abstract skills.

One of the most interesting game approaches is the DLM Arcademic series. These six games, with titles such as Alien Addition and Alligator Mix, make the child play a video-arcade game with math problems: instead of pressing a fire button, he must type the correct answer to a problem. Though the idea is wonderful and the graphics excellent, the action is sluggish compared to the real arcade. Even so, most children will find this amusing, and might be sparked to learn math where they would otherwise lose interest.

Because of this variety of math series, it can be hard to choose which would be best for your children. You should think about the stage of your child's education. If he is in the earlier grades of elementary school, the tutorial approach of the Scott-Foresman series might be the best. If practice is more important, the Milliken series offers the most balanced program. If his problem is motivation you might prefer one of the math games.

Reading and Spelling Cartridges Texas Instruments sells various cartridges that teach reading and spelling skills. With one of these programs, a child can learn outlining, or play a spelling bee.

The best of these is the Scholastic Spelling series, described in detail later in this chapter. It consists of four cartridges that are designed for third through sixth graders. This series combines colorful games with a balanced, traditional approach to spelling. A well-designed workbook completes the program.

Scott-Foresman and Company has developed a series of reading cartridges, with titles such as Reading Fun and Reading Rally. At the lowest level, the programs use a speech synthesizer to read stories aloud for children who have not yet learned to read, stressing basic concepts of analysis and interpretation. Later cartridges concentrate on more advanced problems of outlining, summarizing, and map reading. In all cases, the cartridges illustrate the stories with colorful screen illustrations.

While the Scott-Foreman reading programs are very attractive, they have not been included in this book because of their short span of utility. Each cartridge contains only three or four basic stories or sections and although the child can choose among several variations of how he wants the story to continue, his options are limited. In the classroom, though, this limitation is not a problem, since many different children can use the same cartridge for a short period.

Another cartridge which could not be covered here is the popular Early Learning Fun, a single cartridge to help preschoolers familiarize themselves with the alphabet and the numbers from one to ten. Using an approach pioneered by the Sesame Street television program, it teaches counting through colorful, animated displays, and helps the child associate letters with words (A is for Apple). Since this is a single cartridge rather than an extended series, it might be of particular interest to parents who want to give their child a head start on the computer without making a major investment.

Other Resources If your main concern is to introduce your child to the computer, you might consider LOGO, a programming language specifically designed for children. Using simple commands, your child can learn the essential ideas behind all computer languages by writing programs to draw figures and animated pictures on the screen. The language is easy to learn and enjoyable to use, yet it demonstrates all the ideas underlying other computer languages.

It is unfortunate that LOGO requires the 32K memory expansion card and the TI Peripheral Expansion Box, since the high cost of this equipment puts it beyond the reach of many owners. It might, of course, still interest schools, and will certainly not disappoint the parents who are willing to spend the money. In this chapter, you'll find a short description of this important resource as well as a limited version which you can use without memory expansions.

If you have the TI Peripheral Expansion Box and a disk drive, you can use another educational series called PLATO, which was originally developed twenty years ago for use on large computers. Texas Instruments has bought rights to 450 programs in this series, and is now selling them for its home computer. Designed for kindergarten to high school, these programs are sold on diskettes bundled into 108 "program packages." To use this series, you will need to buy the PLATO interpreter cartridge and the diskette program packages you want to use. To help you decide which of these 108 packages your child could benefit from, the PLATO interpreter cartridge includes a set of diagnostic "survey lessons" and a parent questionnaire. While probably beyond the range of most families, the PLATO series should be of great interest to schools developing a computer-instruction library.

Programs for Adults

You can learn from your computer, too. Since you may have less time or patience for structured courses, you may stand to profit even more than your children from this type of self-paced learning program. Unfortunately, the current selection of adult-learning programs is limited.

The best is the Touch Typing Tutor, which, in a series of well-ordered lessons, leads you through all of the steps of learning to type. The program includes exercises and a diagnostic section so you can find out where you need help. There is also a game that can help you increase your typing speed.

Another four-cartridge series, called the Key to Spanish, is a self-paced introduction to spoken Spanish, intended primarily for businessmen and travelers who need the skills for everyday conversation. The four cartridges are linked with four cassette tapes, with oral drills and examples by native Latin American speakers.

This should be only the beginning. Other programs should soon appear to add to the self-instructional materials already available.

General Principles

Modern educators believe we learn better by being rewarded than by being punished. Encouragement helps children want to learn, while excessively negative reactions can lead them to become so afraid of failure that they lose interest.

The Texas Instruments educational packages are very positive. Most were carefully designed by trained educators and child psychologists to avoid techniques that might discourage a child. Correct answers are usually rewarded with congratulations and, sometimes, with a musical and visual display. Mistakes result in a simple "Try it again" or "Let me help you," with no stigma attached to the error.

The TI programs do, at times, go overboard on this: perceptive children may resent having their performance constantly rewarded with sugar cubes. Even if this happens, though, your child will probably regard it as simply funny rather than disturbing.

Although the Texas Instruments programs are based on sound educational principles, even the best will fail if you try to force them on your child. All of the educational series try to make learning attractive by making it enjoyable, with games, music, and graphics. But if your child uses them against his will, he will not benefit from them.

The computer is a tool, not a teacher. Its interactive, colorful programs can beautifully complement a standard educational program, but they can never replace the human teacher—the adult who must guide the child, help him with problems, and set an example for him to follow. The computer is like a textbook: when used well, it can make difficult subjects simpler and distasteful subjects more palatable, but it is always a mere tool for a larger purpose. Education remains a very human challenge, a responsibility that only a person can fulfill.

THE SCOTT-FORESMAN MATH SERIES

Overall Quality	Good
Length of use	Short
Graphics	Very good
Time needed to get started	10 minutes
Ease of everyday use	Very easy
Clarity of instruction book	Clear
Clarity of screen instructions	Very Clear
Educational philosophy	Encouragement only
Grade level	2 through 5
Color television needed?	Very helpful
Extra equipment required	Speech synthesizer very helpful

This is a very modern approach to teaching arithmetic on a computer. It is a self-paced introduction to the basic concepts, using animated color graphics and speech synthesis. Six cartridges are currently available in the series: Addition/Subtraction 1 and 2, Multiplication 1, Division 1, and Numeration 1 and 2.

This series is aimed at a relatively early stage in the teaching of arithmetic, where the child is just learning the concepts which underlie the operations. The addition and subtraction cartridges develop the idea of counting: two objects physically added to five objects make seven objects. The multiplication cartridge, then, develops repeated addition into multiplication ($5 + 5 + 5 + 5 = 4 \times 5 = 20$), and division splits a large number of objects into groups. The two numeration programs deal with the place value of the digits in a number. They teach, for example, why the 1 in 1000 means "one thousand."

This series stresses concepts rather than practical exercises. Each program

is organized into eight or nine lessons, each expanding slightly the scope of the one before. Each lesson begins with the tutorial segment, which explains the concept graphically. After the computer has worked this example, it moves on to a series of practice problems. If the child has trouble, it works the problem for him graphically, in the same way as it did in the tutorial.

The tutorials use a very modern educational approach: they stress intuitive understanding rather than rote memorization. The programs explain the concepts with colorful charts and visual displays, of the type many elementary schools now use. To teach multiplication, for example, the program might arrange 20 ducks in 5 rows of 4 columns, as in Figure 2.1. This shows that $4 \times 5 = 20$, and that $5 \times 4 = 20$. As it is doing this, the computer counts the numbers out loud, using the speech synthesizer.

You should remember that these visual presentations will rarely be enough to explain the concept by themselves. These programs work best as illustrations of abstract ideas, to supplement a verbal explanation, not to replace it. On their own, many children will not be able to understand what the computer is trying to say. Whether you are a teacher or a parent, you should always explain to the child what the computer is doing.

Also, you should remember that this series does not aim at drill and practice. The problems at the end of the lesson are designed only to make

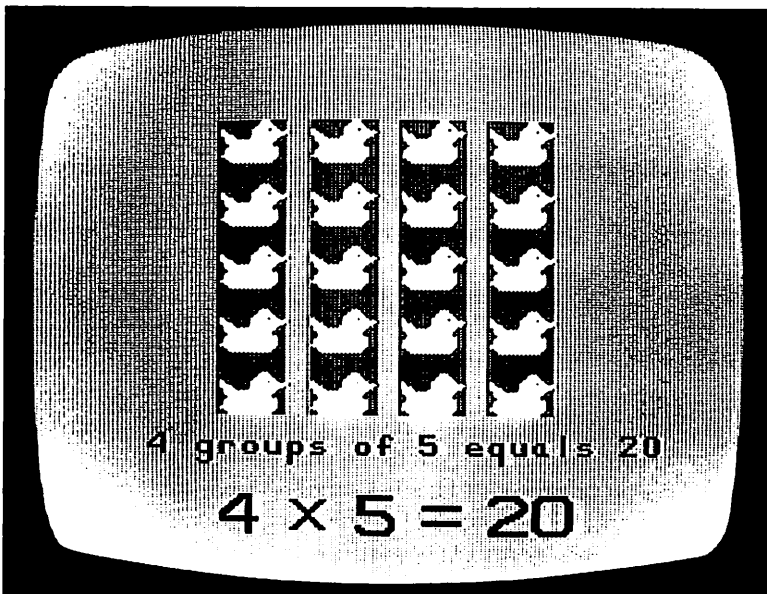


Figure 2.1: The Scott-Foresman Multiplication 1 program

sure the child is following the tutorials, and are not enough in themselves to teach arithmetic.

To make up for this lack, Scott-Foresman has developed another series of math cartridges, called the Math Action Games. These games, presently available only to schools, are designed to give direct practice on specific arithmetic problems. In Number Bowling, for example, your child must answer a problem correctly to score points. The faster he works, the more he will score. You might want to buy one of these games or one of the other Texas Instruments math cartridges if you feel the standard Scott-Foresman series is not enough.

Although the series does not absolutely require additional equipment, a speech synthesizer and a color television are strongly recommended. Without the synthesizer, the program cannot count the numbers out loud, thus making the tutorial segments harder to follow. The program relies heavily on color graphics, so it will be less appealing in black and white.

Using the Four Cartridges

The cartridges are essentially self-explanatory, with clear, on-screen instructions. Each is divided into eight or nine "activities," moving from a very basic level to concepts of greater complexity. The child can select an activity by typing its number, or push the period key to have the computer flash through lessons until he recognizes the one he wants. This scan-through option is a little hard to use since your child must wait through each tutorial until he gets to the correct one. Even so, it makes the program accessible even to a child who has not learned to read.

As soon as the child has chosen the lesson number, the computer begins the animated tutorial that explains the concept of the lesson. When it has run through this short example, it asks the child if he wants another. If the answer is no, the computer says YOUR TURN and gives 15 problems involving the concept. If the child makes it through the problems with better than 80 percent correct, the computer automatically advances him to the next lesson. If not, it tells him TRY A LITTLE HARDER and has him do it over. The idea is for the child to move on only when he is ready, but you cannot rely on this. Your child should go through each lesson several times, and you should always make sure he thoroughly understands the concept before he goes on.

The final lesson of each cartridge is a set of review problems that covers the entire cartridge. Here, the child has only one chance at solving the problem, but the computer stores all the mistakes for him to review at the end. If he does extremely well on this final lesson, the program will congratulate him and give ten "Extras for Experts" problems that go beyond the material it

has taught. If the child can do these problems, he is ready for a more advanced cartridge.

General Evaluation

The Scott-Foresman Math series is a well-reasoned look into the theory and principles of arithmetic, with nice, entertaining graphics and speech synthesis. It is a reasonable application of modern theories of elementary math education to the home computer, and is easy for a child to use, even at an early age.

Parents buying these programs for their children should consider the programs' limited period of usefulness. Although the problems do change each time the child uses the lesson, the general approach does not. Once the child has worked through each lesson a few times and mastered the concepts, he will have no further need for the cartridge.

Of course, this is not a problem for elementary schools, where the same program could be used over and over with many different students. In the classroom, the colorful, graphic approach of the Scott-Foresman math series would fit in well with many grade-school arithmetic courses. It provides a refreshing alternative to standard textbooks.

Some people may object to this series' educational approach, since it concentrates on abstract concepts, rather than the actual practice. This "new math" has come under a certain amount of justifiable heat in recent years for neglecting the more mundane routines of the actual calculations. In general, however, this modern approach is educationally sound, as long as it is carried on with more practical work on actual computations. When integrated into a larger program including practical exercises, the Scott-Foresman math cartridges would prove very valuable.

THE MILLIKEN MATH SERIES

Overall Quality	Excellent
Period of use	Extended
Graphics	Very good
Time needed to get started	10 minutes
Ease of everyday use	Easy
Clarity of instruction book	Clear
Clarity of screen instructions	Very clear
Educational philosophy	Encouragement only
Grade level	4 through 8
Color television needed?	Helpful
Extra equipment required	None

Milliken Math is an excellent series that applies the resources of the computer to the traditional way of teaching math with drill and practice. Eleven Milliken cartridges are currently available, covering all the basic skills: addition, subtraction, multiplication, division, integers, fractions, decimals, percents, laws of arithmetic, equations, and measurement formulas.

This traditional approach gives your child a graded series of problems to solve on the screen. He must work them just as he would on paper, except that the computer is there to make him try it again if he makes a mistake along the way. If he makes a second error, it finishes the problem and asks him to study it. If, on the other hand, he gets it correct, the computer rewards him with a colorful display, such as a boy throwing a ball or a peacock opening its tail.

Each cartridge moves through graded levels of difficulty. One cartridge can have as many as 64 levels, and will cover a wide range of material, from a beginning to an expert level. If the child is doing well, he will automatically move up to the next level, but he will also drop back if he is having too much

trouble. In this way, he will gradually find his own level and get practice where he needs it most.

The Milliken series does not intimidate the child by objecting to wrong answers. By giving him a chance to correct his mistake and helping him out if he still has trouble, it teaches without inspiring anxiety. Even when the computer sends him back to a lower level, it says nothing more than a humorous, **BAD NEWS!**

The Milliken Math series is not intended to teach basic arithmetic concepts but to give structured drills to fix the concepts in mind. This is what children need most, especially around the fifth or sixth grade. If you wish to have your child learn from the beginning, you should perhaps consider the more elementary Scott-Foresman cartridges.

When shopping for these cartridges, you may have to look carefully to tell the Milliken series packages from the Scott-Foresman. The Milliken cartridges are marked with titles like **MULTIPLICATION** with Milliken Educational Series in smaller letters. The Scott-Foresman titles are often similar, but they always contain a number, like **MULTIPLICATION 1**.

No special equipment is needed for the Milliken Math series, though a color television does help to make the programs more interesting.

Using the Cartridges

The Milliken Math programs are simple and self-explanatory for a child who has learned arithmetic in school. When your child selects the cartridge, the computer asks his name and the level he wants to start at. After this, it runs automatically. When your child wants to stop, he merely types E, and the computer says goodbye with a scorecard for the day.

The most important cartridges are the first four: Addition, Subtraction, Multiplication, and Division. These provide excellent practice on basic arithmetic skills, leading slowly from the basic one-digit calculations to complex, multidigit problems with regrouping and remainders.

The Addition cartridge is representative. The questions start very simply, with one-line problems such as " $2 + 3 = ?$ " As the child progresses, however, he will move into calculations with two-digit answers, then into sums of two-digit numbers. Problems are posed in both horizontal and vertical form, and the child must type the digits of the answer from right to left just as he would write them on paper. Figure 2.2 shows an addition problem.

After level 26, the problems include regrouping, or "carrying" a digit to the next column. This starts with a single carried digit, then becomes more

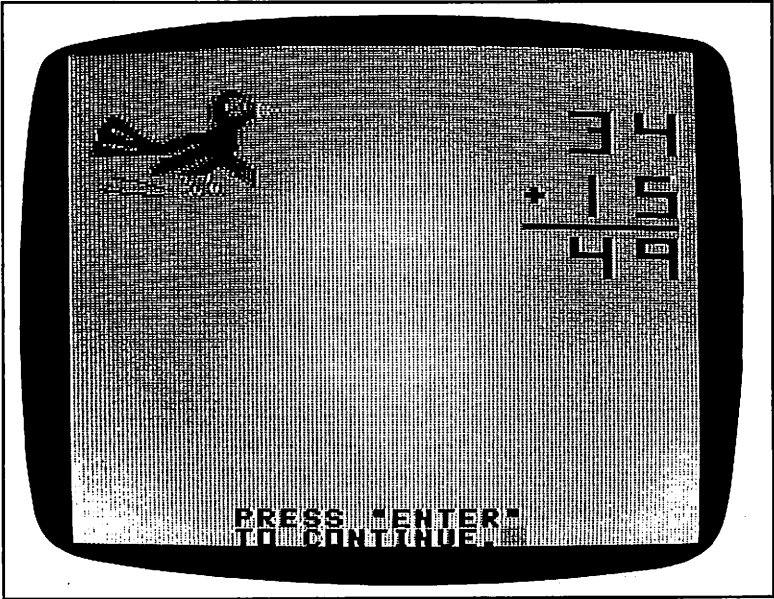


Figure 2.2: The Milliken Addition program

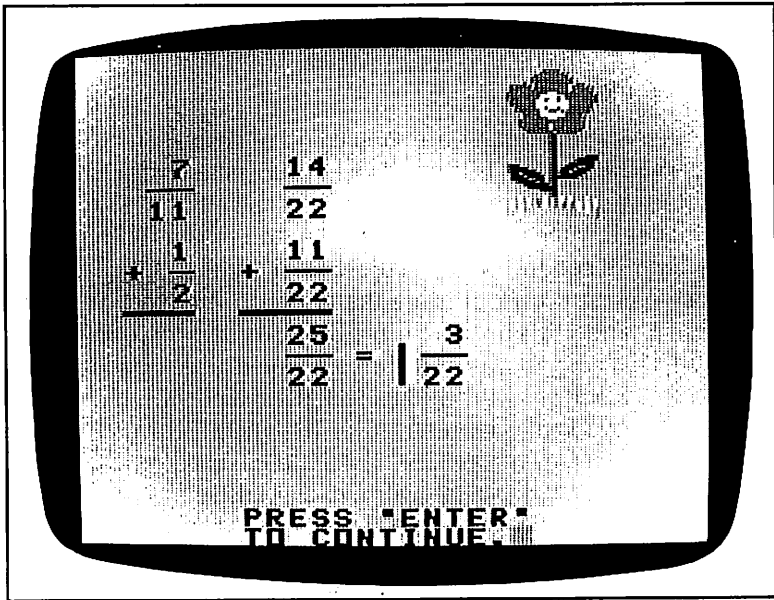


Figure 2.3: A Milliken Fractions problem showing the addition of unlike fractions

complicated. By level 60, the child is adding three four-digit numbers, regrouping in each column.

If the child wishes, he can have the computer help with the regrouping. If he presses the space bar, it will put a question mark where the carried digit should go—in the traditional place above the column it is to be carried to. Once the child has carried the proper digit, the computer moves the question mark back down for him to add up the new column.

The other operations are taught in the same way. Some complicated multiplication and division problems require partial sums and regrouping in the higher levels. The division cartridge gives the child a choice of long or short division, and lets him try out test digits and change them if they do not work. The computer takes nothing for granted. It even makes him choose the place where the quotient should begin.

The Integers cartridge teaches concepts of positive and negative whole numbers. There are 32 levels in this program, starting with the question of which of two negative numbers is greater (Is $-3 < -1$?), then moving into addition and multiplication of negative numbers.

The Fractions cartridge also follows a well-ordered sequence. The lowest levels start with exercises to teach the size of fractions (is $\frac{1}{2} > \frac{1}{3}$?), reducing to lowest terms ($\frac{2}{4} = ?$), and mixed numbers ($1\frac{1}{2}$). It then moves through addition of like fractions ($\frac{1}{5} + \frac{2}{5} = ?$), least common denominators, and adding unlike fractions. This last is not a simple concept, but Milliken's step-by-step approach works well, as shown in Figure 2.3.

To solve the problem posed in the left column on the screen, your child must first put the two fractions over the common denominator 22, in the column to the right. Then, he can add the like fractions to obtain $\frac{25}{22}$. This is the correct answer, but it must still be put into the form of a mixed number in lowest terms. Therefore the computer asks him whether the answer can be reduced ("No" in this case) and whether it can be written as a mixed number such as $1\frac{3}{22}$. Here your child must answer "Yes" and type the correct numbers. This is a complicated procedure, but every step is essential to learning. After the child has mastered this skill of adding fractions, the Fractions program leads him on to cover multiplication and division of fractions, and even a preview of decimals.

The next cartridge is Decimals, with 56 levels. The first 11 involve basic concepts, such as the decimal equivalents of fractions, the values of decimals (is $.63 > .47$?), and rounding. Addition, subtraction, multiplication, and division of decimals follow, with special exercises on new concepts where needed. The presentation is very clear and thorough, though the Milliken format might prove confusing to a child who has not used the first four basic arithmetic packages.

The Percents cartridge follows next. The fairly straightforward problems convert either from decimal numbers to percents or vice versa. The child might, for example, need to convert 6.7% to its decimal form 0.067, or the other way around.

The rest of the cartridges are less effective, since they deal with more specialized mathematical concepts. The Laws of Arithmetic package, for instance, covers the commutative, associative, and distributive laws, and the identity elements. While these ideas are usually quite important in modern math courses, they call for abstract thinking rather than the repetitive drills of the Milliken series.

In spite of this, the Equations and Measurement Formulas cartridges do have interest. The Equations program asks the child to find the value of an unknown letter in an equation. The problems start with simple addition equations such as " $N + 3 = 2$. WHAT IS N?" then move into multiplication and division. At the end, the child is solving equations in two steps, laying the foundations for high-school algebra.

The Measurement Formulas cartridge teaches the child to find the perimeter, area, and volume of two- and three-dimensional objects, such as squares, rectangles, and cubes. The computer helps by showing the formula and a picture of the object on the screen, leaving the child to plug in the correct numbers.

General Evaluation

Milliken Math is an excellent, engaging way to teach arithmetic. The computer makes the child work through each problem step by step and helps when he runs into trouble. By automatically shifting levels, the computer will gradually lead the child to the problems he most needs to work on. The short, animated sequences are enjoyable and entertaining.

The first four cartridges cover the four arithmetic operations in their full complexity. Since Milliken Math follows the traditional way of solving a problem with a pencil and paper, it is a nice supplement to the standard elementary school. The problems appear the same way on the computer as they do on written homework, except that the computer will catch wrong numbers as they are entered.

The excellent Fractions and Decimals cartridges give a well-reasoned introduction to difficult concepts. Some of the others are less effective, since they address more abstract concepts, but all have merit.

If your child is learning arithmetic in school, you may find the Milliken Math series an invaluable aid to his education. And if he is struggling, this

may be the way to give him the extra practice he needs. Although these cartridges will not make him do anything he could not have done on paper, they will help structure the practice by making him work at the proper level and by immediately correcting his mistakes. Taking the tedium out of arithmetic is a hard assignment, but Milliken Math has succeeded.

THE DLM ARCADEMIC SERIES

(Alien Addition, Minus Mission, Alligator Mix, Meteor Multiplication, Demolition Division, and Dragon Mix)

Overall Quality	Very Good
Period of use	Long
Graphics	Very good
Time needed to get started	1½ hour
Ease of everyday use	Fairly easy
Clarity of instruction book	Very clear
Clarity of screen instructions	Very clear
Educational philosophy	Some punishment for mistakes
Grade level	3 to 5
Color television needed?	Very desirable
Extra equipment required	Joysticks, if desired

Do you cringe to see your children spend hours in the video arcade and avoid their homework? Do you ever wish they could practice their multiplication tables while they shoot down aliens? With the DLM Arcademic series, they can do just that. The idea is simple: instead of a fire button, the game provides an arithmetic problem. Get it right, and the laser scores a direct hit. Get it wrong and it misses. Since time is limited, accuracy and speed are essential. As your child becomes drawn into the game, he will work faster to destroy the enemies, only to discover hours later that he has been learning math all the time.

The potential benefits are very great. For a good student, the game should be quite easy, and much more enjoyable than working through math tables. This is exactly the kind of practice your child will need to turn $6 \times 7 = 42$

from a struggle into a reflex. It is especially valuable for a child who would be good at math if he could only motivate himself to do the required practice. By sweetening the chore with some fast-paced action and pleasing color graphics, the computer may spark an interest in a child who would not otherwise be motivated.

This is the ideal, but not all children will be intrigued. While these games can help on speed, they can not teach arithmetic. A child weak on the basic concepts may actually find them more frustrating than instructive. In this case, you might consider one of the other TI math series, such as the Scott-Foresman or Milliken Math.

Also, in spite of its attractive color graphics, the DLM Arcademic series can not match the video arcade. Because of the need to focus the player's energies on the math problem rather than the action, the Arcademic games have had to be simplified from what a child might expect from a video game. While they still have some of the arcade feel, the action and mechanics are clumsy compared with a real video game.

Six cartridges are currently available in the DLM Arcademic series. Alien Addition, Minus Mission, Meteor Multiplication, and Demolition Division each drill a single arithmetic operation, while the others combine two: addition and subtraction in Alligator Mix, multiplication and division in Dragon Mix.

In each game, you can control the level of difficulty by pressing FCTN-AID. The "skill level" affects the speed at which the enemies approach and therefore the time available. The "problem level" determines the difficulty of the math, naming the largest number that will be required as the answer. The program starts at a good level for a fairly adept child, but if your child is just starting or having a lot of trouble, you should change to an easier level. He should be able to play the game easily and enjoyably, without being frustrated by having his ship repeatedly destroyed.

No additional equipment is required for these games, though a color television makes the graphics more pleasing. A joystick can be used, but the keyboard is usually easier and more instructive.

Playing the Games

Demolition Division, shown in Figure 2.4, is fairly representative of the series. The screen is arranged in four rows, each of which has a green enemy tank at the left and your blue cannon at the right. As you play, the four tanks march slowly forward, firing shots at your cannon. You are protected for a while by a low brick wall, but you will be hit if you wait too long. If you are hit three times, the game is over.

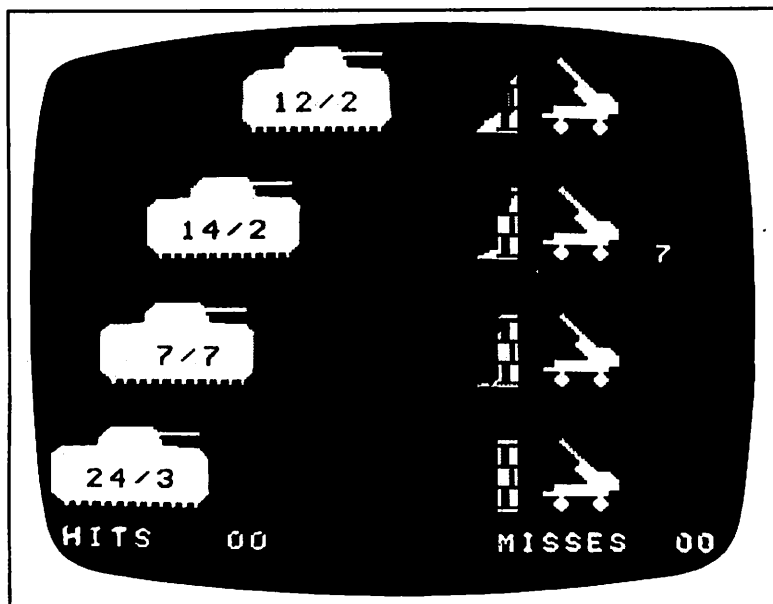


Figure 2.4: The Demolition Division game

To the right of your cannons is a number. You must position this next to the cannon you want to fire, type the correct answer, and hit the space bar. If you get it right, the tank explodes and you are free to move on to another row.

You can only shoot at one at a time, so you should concentrate on the tank that is nearest to the wall. The right and left arrows move the number from one row to another, and the number keys change it. You can also use the up and down arrow keys to increase or decrease the number, but will probably find it simpler to think of the answer and hit the appropriate key.

Use the fingers of one hand on the arrow keys to move the answer up and down, and your thumb on the space bar to fire. That way, you can use your other hand to tap the number keys and can get into the necessary rhythm of move-answer-fire.

The mechanics of the game can be cumbersome. At first you may be confused at having to move the answer up and down before firing, but will quickly get used to this. Even more awkward, however, is the need to hit the space bar after each answer to fire the cannon: it would have been much simpler if the number key could fire the shot directly. Still, the game is very enjoyable and most of the thinking goes into the math, where it belongs.

The game can also be played with a joystick, but the object is changed somewhat. Instead of thinking up the answer to a specific problem, you are

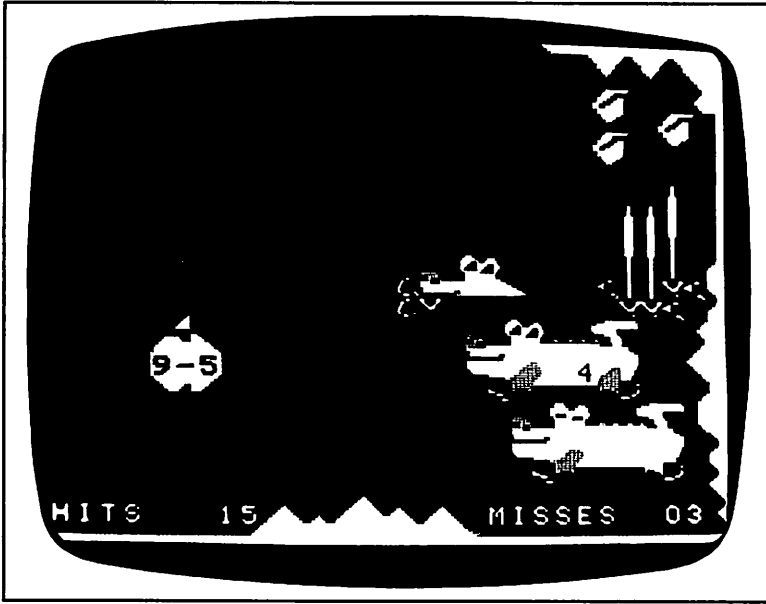


Figure 2.5: The Alligator Mix game

given an answer, which you must move to the correct row. This version of the game is enjoyable and somewhat less cumbersome. Unfortunately, the change makes it less suitable for learning, since you no longer need to calculate the answer. This multiple-choice approach may be an amusing alternative for children tired of the standard game, but the keyboard version is better practice.

Alien Addition, Minus Mission, and Meteor Multiplication are based on the same idea, except that your ship moves left and right, rather than up and down. Dragon Mix resembles the joystick version of Demolition Division: you are given an answer to one of three problems, and must shoot it by pressing the space bar when the dragon's tongue is pointed at the correct one. Since this is easier to do by trial and error than by calculation, Dragon Mix is the least instructive of the series.

The best is Alligator Mix, which combines addition and subtraction problems. Its idea is unique among the six, and is both simple and instructive. The graphics are very nice, and there are no clumsy mechanics to get in the way of the math practice.

The game, shown in Figure 2.5, starts with an alligator on the bottom right of the screen. An apple with an addition or a subtraction problem comes in from the left and hits the alligator's snout. If the answer on the alligator's back is correct, you must open its mouth before the apple hits. If it is wrong, you

must leave it closed. The alligator eats the apple and scores you a point if you have done this correctly. If you succeed in feeding it a certain number of apples, the alligator moves up to the next level, but if you fail, it will drop back down. You must answer faster as it moves to the higher rows, since it is closer to where the apples appear on the screen.

The idea sounds silly, but it works very well. Its great advantage is its simplicity, since it eliminates the three-step move-answer-fire of the other programs. All you have to do is think of the answer and press the space bar if it matches the number shown. This is a simple process, but it is the essence of arithmetic practice. Because of its exciting action, some children may have to be torn away from it!

Another advantage to this particular game is that it does not frustrate the child if he cannot come up with the answer. In *Demolition Division* and the other DLM games, the child has a limited time to answer a problem, and if he fails, his ship or cannon is destroyed. A child who is not ready for the math or who has trouble with the mechanics of the game might be upset by frequent failures of this sort. *Alligator Mix*, on the other hand, challenges the child to answer the problem quickly, yet merely refuses the apple if he cannot.

General Evaluation

The DLM Academic series is an excellent idea, which is well implemented for the most part. The graphics are very colorful, and the action is as exciting as could be expected without sacrificing the fast-moving arithmetic practice. *Alligator Mix* is the best, but all are worthwhile.

In some of the games, the arithmetic becomes obscured by the complex movements of the game, but with a little practice, the child can master the manipulations well enough to play.

Frustration can be a problem. Especially at the beginning, your child may frequently lose his ship because he could not think of an answer or because he got stuck on the game manipulations. If he takes this loss too seriously, the game could actually create the math block it was supposed to dissolve. If you feel your child is having troubles, you should make sure he is playing slow enough to be able to win without feeling excessive pressure or else stick with games such as *Alligator Mix* that do not force him to answer every problem.

You can ensure success if you remember what this series was designed for. It is an excellent drill and practice tool for a child who already knows the arithmetic tables but still needs to master them for speed. It is also an excellent remedial tool for a child who would be good at math if only he could enjoy it. It is not, however, for a child who needs to learn math from the beginning, and will not help overcome serious learning problems.

Above all, it is inappropriate for a child who doesn't enjoy it. The whole idea is to make math accessible by making it amusing; if the game is a chore, there is no point in pursuing it. If you think this might do your child good, try one of the packages. If he enjoys it, keep at it, but don't push it if he doesn't.

THE SCHOLASTIC SPELLING SERIES

Overall Quality	Excellent
Length of use	Very long
Graphics	Good
Time needed to get started	10 minutes
Ease of everyday use	Easy
Clarity of instruction book	Excellent
Clarity of screen instructions	Excellent
Educational philosophy	Encouragement only
Grade level	3 through 6
Color television needed?	Very helpful
Extra equipment required	Speech Synthesizer very helpful

This is a series of four cartridges that teach spelling without pain. Each cartridge contains 36 lessons of 16 or 20 words each, and drills the child with games. The cartridge comes with an excellent workbook, which includes a list of the words in each unit and additional written exercises. The approach is enjoyable and educationally sound, so this series deserves the highest marks.

Each cartridge is designed for a certain age group: level 3 is for grade 3, level 4 for grade 4, and so forth. While this will vary depending on your child's educational background, you can use this as a guide.

The designers of this series have taken great pains to avoid discouraging reactions to incorrect answers. The computer rewards each correct answer with a colored animation sequence and merely spells the word correctly rather than objecting when the child makes a mistake. Even illegal commands get nothing more than a TRY AGAIN.

The series is designed to be used with the speech synthesizer. Although this is not absolutely necessary, the games lose a lot without it. With the

synthesizer, the computer can read the words aloud as each unit begins and can speak the questions in the Spelling Bee. Without it, the games must be played from letter clues, and the third game cannot be played.

A color television makes these games more enjoyable.

Playing the Games

Before starting each unit, your child should study the list of words in the workbook. Alongside this list, the page for each lesson also contains a short written exercise or game, which will help your child fix the words in mind before turning on the computer.

The program starts by displaying and speaking each of the 16 or 20 words in the unit. It then asks your child which of the games he wants to play: Spelling Bee, That Did It, or Space Race.

The three games all follow the same general form. The computer asks the child to spell the words one by one, until he has covered all of the words in the lesson. Each time the child spells one of the words correctly, the computer plays a short musical piece and gives a colorful graphic display.

After your child has worked through all of the words in the list, the computer displays the words that he spelled correctly and the words that need more work. He can then go back and play the game again with these problem words until he knows them all.

Spelling Bee The first of the three games is a traditional spelling bee, which simply asks your child to spell a word when he hears it. If you have a synthesizer, your child can play this game in its best form, by spelling the words with "no clues" beyond what he hears from the synthesizer.

If you do not have a synthesizer, your child will have to depend on the "letter clues" the computer gives. He can choose between "vowel clues" and "consonant clues" and with these, the computer shows him where the vowels or the consonants are in a word. From there, he should be able to figure out the word and supply the missing letters. Since these letter clues often give away the spelling of the word, this game is much more effective when played with a synthesizer.

The synthesizer's voice can, at times, be hard to understand, especially because units tend to group words with similar vowel sounds. In the first unit

of level 3, for example, the words “black,” “thank,” and “laugh” sound very similar. With practice your child should be able to adjust to this, and you can always ask the computer to repeat a word by typing FCTN-REDO.

That Did It This is based on Milton Bradley’s Hangman game. The play starts with a set of blanks where the letters of a chosen word belong. Your child must then guess letters of the alphabet. If the letter belongs in the word, the computer puts it in the proper place, but if it is wrong it is thrown away. If your child can guess the word and fill it in before missing seven letters, he wins the round.

Your child may have trouble with this game if he does not begin correctly. Your child should start by guessing the most common letters, such as e and t. This way, he should be able to get a few letters in their places, so that he can guess at the others more intelligently. He can also take advantage of the organization of the lessons around a particular sound or letter. By choosing that letter, he can often get a free clue to the word.

This game can also be played by two players, taking turns choosing letters. Not having a synthesizer is no handicap in this game, since it has no speech. Your child should probably play this game after the other two, once he knows the list of words fairly well.

Space Race This game, shown in Figure 2.6, is similar to the Spelling Bee, but with different graphics. Since there are no letter clues in this game, the speech synthesizer must be used to read the words aloud. The reward for a correct answer is a very nice display of a spaceship docking—the best graphics of the three games.

Since this is essentially the same game as the Spelling Bee, your child can switch back and forth between them. If he tires of the one, he should try the other for some fresh graphics and music.

General Evaluation

This solid, traditional approach to spelling uses the resources of the computer well. The complete workbook/instruction manual provides a firm written base to work from. The computer makes a good partner for drill and practice, and the games are enjoyable. One possible objection is that the graphics and music are repetitive. These sequences are always the same and do become tiresome after a while.

All in all, the games are fun, and very good practice.

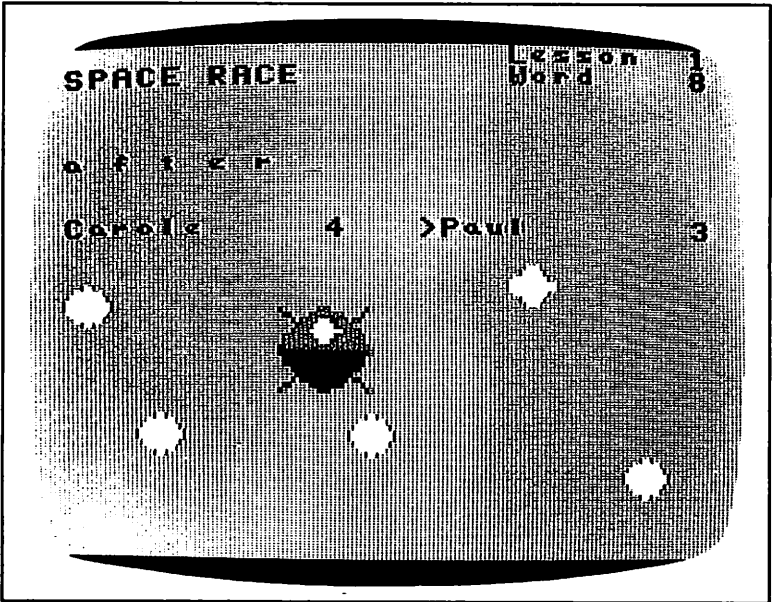


Figure 2.6: The Space Race game

LOGO

	TI LOGO and TI LOGO II	Early Learning LOGO Fun
Overall Quality	Excellent	Good
Length of use	Very long	Short
Graphics	Excellent	Very Good
Time needed to get started	1/2 hour to start	1/2 hour
Ease of everyday use	Easy	Easy
Clarity of instruction book	Very clear	Very clear
Clarity of screen instructions	Excellent	Fair
Educational philosophy	Encouragement	Encouragement
Grade level	K to adult	K to 2
Color television needed?	Yes	Yes
Extra equipment required	32K Memory	No

Texas Instruments has three versions of this famous programming language for children. TI LOGO and its expanded version, TI LOGO II, are real programming languages with powerful graphics plotting and display commands. In spite of this power, these languages remain simple enough for children to learn. Since they allow children to draw animated pictures easily, the LOGO languages will naturally hold interest.

Unfortunately, these two programs require the 32K memory expansion card, and therefore the TI Peripheral Expansion System. Since few TI-99/4A owners have this equipment, Texas Instruments has developed a simplified version called Early Learning LOGO Fun, which can be used without additional equipment. Although this makes some features of LOGO available at a

reasonable cost, it is an extremely limited version, stripped of LOGO's real programming features.

TI LOGO and LOGO II are both wonderful cartridges, introducing children pleasurably to the basic concepts of computer programming. By playing with the two options of Sprite Graphics and Turtle Graphics, a child can learn to give powerful commands in a simple way. The clear and visual concepts teach the fundamental ideas that lie behind computer programming at all levels.

Turtle Graphics is a good introduction to computer graphics. In this mode, the computer places a triangle-shaped "turtle" on the screen and your child orders it around: FORWARD 50 (steps), (turn) RIGHT 60 (degrees), and so forth. As the turtle moves, he leaves a trail on the screen, so that with some practice your child can draw line figures. This is an enjoyable introduction to computer graphics.

Sprite Graphics is more complicated, and therefore more interesting. In computer jargon, a sprite is a small figure which can move about the screen independently from the rest of the picture: the aliens and ships in video games are examples of this. In LOGO, a child can choose a predefined figure, such as a truck or house, give it a color, heading, and speed, then sit back to watch it move around the screen. Since TI LOGO allows up to 32 sprites, a child can combine them to make complicated, animated pictures.

Both Turtle Graphics and Sprite Graphics allow programs—sequences of operations to be done as a group. In Turtle Mode, for example, a child could set up a program to draw a box on the screen. Then, every time he wants a box, he could simply type BOX, instead of giving all the commands. In this way, LOGO presents the basis of all computer programming enjoyably and understandably.

Perhaps the best part of LOGO is its lack of error messages. When you enter a command wrong in most programming languages, the computer will say something threatening like SYNTAX ERROR. LOGO says nothing more than TELL ME HOW TO . . . or TELL ME MORE. With LOGO, programming feels like talking to a friend: if you say something wrong, the computer simply asks what you meant.

The differences between TI LOGO and TI LOGO II are fairly minor. The new version has added music commands, so that your child can compose melodies to accompany the pictures. It has added a MAGNIFY command to allow larger sprites, and has made more memory space available for programs and the Turtle Graphics. Since these changes are mostly simple clean-ups and slight improvements, there is little need to buy the new version if you already have the older one.

Unfortunately, both TI LOGO and TI LOGO II require the 32K memory

expansion card, and therefore the TI Peripheral Expansion Box, a major investment for the casual home computer owner. One way to reduce the cost is to buy one of the stand-alone memory expansions advertised in the *99er* magazine. Although these eliminate the expensive TI Peripheral Expansion Box, they can still cost several hundred dollars.

Early Learning LOGO Fun was designed to bridge this gap somewhat, with a LOGO-like program that runs without the expansion. Unfortunately, to make it run without the additional memory, much of the original program had to be cut out. Early Learning LOGO Fun is limited to the five basic exercises that were warm-ups for preschoolers in the full cartridge. No programming is possible, and the pictures are extremely limited.

Four of the five exercises in Early Learning LOGO Fun involve the basic concept of the sprite. With PARK, for example, the child can put a garage on the screen by pressing a key, color it, then move it around with the arrow keys. He can then put a car up, give it a different color, and move it around until he has parked it in the garage.

DRAW is an elementary form of Turtle Graphics which allows a child to move the turtle around the screen step by step with the arrow keys. While this allows some feel for the general capabilities of the full Turtle Graphics, it is very limited: you can only turn at 45-degree angles, for example. Even so, it is an enjoyable taste of computer graphics.

Besides the severe restrictions of the simplified version, there is another significant change. In TI LOGO, the child enters full commands such as FORWARD 50 and SETCOLOR: GREEN. While these take a little time to get used to, they are very powerful and flexible. More importantly, these sentence-like commands can be strung together into programs, just as in any other programming language.

In Early Learning LOGO Fun, all commands are reduced to a single letter. You move the object around the screen with the arrow keys, and change colors with the first letter or the word. While this is perhaps easier for a young child to learn, it makes complex commands and programming impossible. Since the whole idea of LOGO is to introduce children to a computer programming language resembling standard computer languages, there is relatively little point to Early Learning LOGO Fun.

In general, you should consider Early Learning LOGO Fun primarily as a first step, an inexpensive trial to see if your child likes the idea before you spend a lot of money on the real thing. It does teach a number of the basic concepts of computer use, and is simple enough even for preschoolers. But once your child has gotten his feet wet with this program, he will quickly want to move on to other things.

The full TI LOGO is wonderful, if you can afford it. There is no better

learning tool for teaching the essence of computer programming. In many ways, it is just as powerful as other programming languages; its sprite graphics, in fact, are superior to Extended BASIC's. It is a cartridge that can grow with a child and continually challenge his imagination. But watch out: you may find yourself even more interested than your child!

TOUCH TYPING TUTOR

Overall Quality	Excellent
Period of use	Fairly long
Graphics	None (good in game)
Time needed to get started	20 minutes
Ease of everyday use	Easy
Clarity of instruction book	Very clear
Clarity of screen instructions	Clear
Grade level	Grade 6 to adult
Color television needed?	No
Extra equipment required	No

With the advent of the computer, typing has become an increasingly important skill. Whether you are writing a BASIC program or using a cartridge, you must constantly talk to the computer using the keyboard. If you have to "hunt and peck," you will find yourself losing a lot of time.

If you want to learn to type or to improve your skill, you may be interested in this Touch Typing Tutor cartridge, one of the best educational programs around. If you are a beginner, you should work straight through the well-organized lessons. Each one tells you which fingers to use and gives exercises to drill the movements. If you already know how to type but wish to improve, you can use the program's diagnostic section to test your speed and accuracy, then practice the lessons on letters you have trouble with. No matter what your level, you can use the game option to push your typing speed beyond its present limits.

Touch typing is something the home computer is perfectly suited to teach. Since typing requires a great deal of individual practice, it is not easily learned in a large classroom. In a typing class, you can judge your progress only when the teacher corrects your exams. The Touch Typing Tutor, on the other hand, can catch your mistakes the moment you make them, and can

give you personalized practice until you get it right. Most important of all, you can use the Touch Typing Tutor at your convenience without the rigid confinement of a course schedule. Typing is best learned in short stints of a half an hour every day.

Texas Instruments' Touch Typing Tutor follows the traditional method of typing instruction. At the beginning of each lesson, the computer explains which key you should use for each of the new letters, then gives a series of drills to fix the finger movements in your mind. The lessons begin with the "home keys" (a, s, d, f, j, k, l, and ;), where the fingers of your two hands should always rest while you are typing. After that, the lessons move on to the "reach keys," where one of your fingers must move away from its home key. To type an e, for example, your left middle finger reaches from its normal position on d up to the e and back. The drills give combinations such as DED LED and FED JED to fix down this reach-and-return motion, which is the basis of touch typing. Figure 2.7 shows one of these initial exercises.

After this traditional routine, the lessons move on to other exercises. The first is a "single keystroke drill," in which you must rapidly type letters which the computer flashes on the screen. After that, the initial sequence is repeated, followed by sets of words. By the end, you have learned the basic keystrokes and begun to combine them into words.

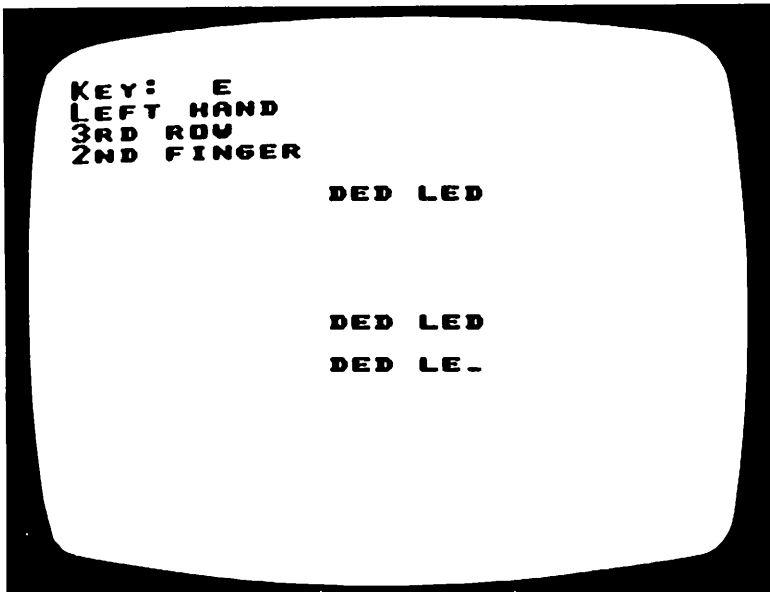


Figure 2.7: An exercise to teach the letter e

Since touch typing requires a full typewriter keyboard, you can use this program only if you have the more recent TI-99/4A.

Using the Program

The Touch Typing Tutor cartridge is fairly easy to use. Once you have started it up and begun using the lessons, FCTN-PROC'D will take you to the next lesson, FCTN-REDO will start the current lesson over, and FCTN-BACK will return you to the selection index.

If you are just learning to type, you should read the instruction book from cover to cover, and pay particular attention to the "typing pointers" on pages 8 and 9. You should follow these directions to the letter, even if they seem unnatural. As you gradually become accustomed to this new style of typing, you will soon work quicker and more reliably.

Touch typing means learning to type letters and numbers without looking at a keyboard. It may seem impossible at first, but if you train yourself to hold your fingers above the "home keys" on the second row, you can gradually learn where to find each of the letters. With practice, you will not even have to think about it: when you see the letter e, your left middle finger will move up and tap the key, as if by reflex. Once you have developed this "muscle memory" and mastered the coordination, you will be able to type quickly and accurately.

To train your fingers to respond by reflex to letters you read, The Touch Typing Tutor flashes letter combinations on the screen for you to retype. Don't let your eyes wander from these as they appear on the screen. If your fingers are in the right place, they should be able to find the letter all by themselves. Don't even let your eyes move down to the bottom of the screen to check the letters you are typing: the computer will tell you whether you made a mistake when you press ENTER. Just stare at the letters and concentrate on moving the right fingers.

For most of the lesson exercises, you will need to type the word or letter combination exactly as it appears. Any mistake, including barely hitting the wrong key, sets you back to retype the entire line. This can be a headache, but don't let yourself get frustrated. Just try to hit every key squarely and bear with the program if it seems unfair.

Take your time on the lessons. Typing is a skill which cannot be learned overnight, so you should plan on spending many hours. You will probably need to repeat each lesson many times before you feel confident. The program will tell you when you have reached your target typing speed.

The instruction book wisely counsels you never to spend more than an hour working on the typing tutor at one time. Because typing requires a

great deal of concentration, you cannot learn it when you are tired. As soon as you start to become frustrated at your mistakes, you should stop: sometimes an hour may be too long.

Once you have finished the lesson, you may want to play the game, an entertaining option that will help improve your speed. As shown in Figure 2.8, an airplane flies across the screen, while a cloud moves in the opposite direction. As the plane flies, it leaves words for you to type. If you make a mistake in a word, you can try again, but if you have not typed it correctly by the time the airplane has returned, it will score an "error point" against you. Since you must cover six different words, you cannot afford too much time on any one. The game ends if the airplane returns to three words in a row which you haven't typed.

You may find this game difficult until your accuracy improves enough for you to type most of the words correctly. It will help if you try to keep up with the plane as it lays the words on the screen: you will tend to panic if you get behind, which will hurt your typing accuracy. It is better to omit one of the words if you get behind than to miss three in a row and lose the game.

Don't worry that you can't hold out indefinitely against the plane. The game is designed to increase gradually in difficulty, with the plane speeding up to the point where you could not possibly follow. Though this may be

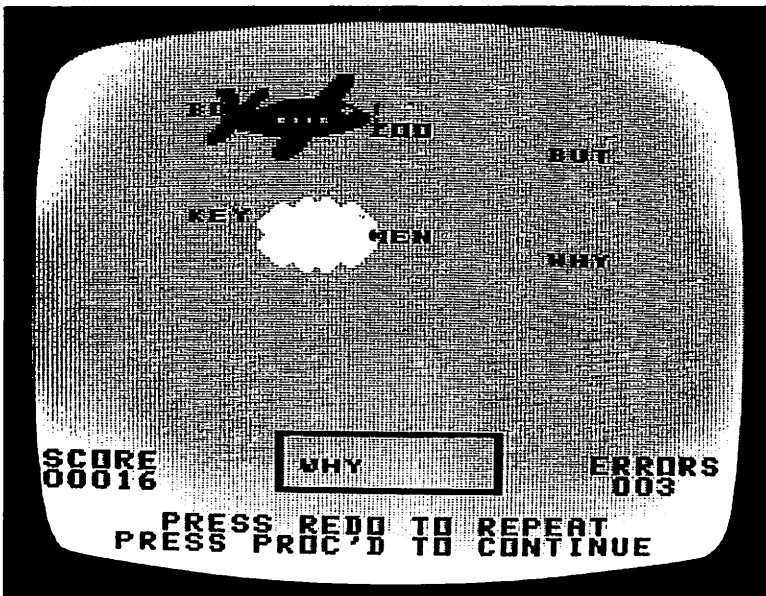


Figure 2.8: The Touch Typing Tutor game

frustrating, you should be comforted by the thought that it helps your typing to be pushed beyond your limits.

If you already know how to type, you can still use the Touch Typing Tutor to gauge your abilities and improve your skill. You might, for example, want to work on the numbers and symbols, if they are a problem. Or, you may want to practice your keystroke accuracy by practicing lessons on letters you have troubles with.

You should take advantage of the program's excellent diagnostic section. To start off, you can test your speed with the wpm (words per minute) timing option. This test times you as you type four nonsense sentences of two or three lines. If you make more than one mistake, you must type the whole sentence over, but you are not penalized for the time lost. When you have typed four sentences correctly, the computer tells you your average speed, then sets a target for you of two words per minute faster.

If you are interested in your overall typing speed, you will find this figure fairly accurate. On longer passages, such as those used on secretarial typing exams, you will find your speed will be somewhat lower. Also, this program does not reduce the timing figure for the mistakes you might make; in actual typing, these may slow you down considerably. Still, you can use this speed test as a gauge of your progress.

You may also want to try the ANALYSIS option. The computer will ask you to type short letter combinations and will evaluate your accuracy and speed as you type. At the end, it displays a screen showing all of the letters that you need to work on, and the lessons that will help you with them. This computer benefit is quite an improvement over the classroom. You can save valuable hours by knowing your problem areas and drilling them.

You may find that the diagnostic section gives different results each time, or says you need work on many of the letters. If this happens, take the test again at a lower target wpm. If the results still seem meaningless, don't worry about it: just go straight to the lessons where you feel you need work.

Some people have trouble using the TI-99/4A keyboard. While it does have full push-button keys, it does not have the feel of a full, moulded typewriter keyboard. The feel is only a minor problem compared to the keyboard layout: while the letters, numbers, and symbols above the numbers are in the same places as on an electric typewriter, many of the symbols on the right have been changed and can only be typed with the awkward FCTN key.

If you eventually wish to use a typewriter as well as your home computer, you might ignore lessons 4, 7B, and 8, which involve symbols moved to fit on the TI-99. The most serious of these changes are the question mark and the single and double quotation marks. Unless you plan to type a lot of BASIC

programs on your TI, you should simply ignore these lessons, since you will find them confusing.

General Evaluation

The Touch Typing Tutor cartridge is a fine example of what the computer can do. It packs a well-organized series of useful exercises into a self-paced tutorial. It uses the computer to continually examine your individual performance, while following the traditional approach of typing instruction. Since you can use it when and how you wish, the Touch Typing Tutor is more rewarding than any typing course, no matter how well taught.

Of course there are a few problems. Although they are excellent ideas, the diagnostic and game options are somewhat erratic, and could have been designed better. The game starts off at a very slow speed, then suddenly speeds up to the point where it becomes impossible to follow. If it could have sped up more slowly, it would have forced the player gradually to the limits of his abilities rather than abruptly pushing him beyond it.

The lessons tend to be dry. Except for the colorful game, there are no graphics in the program, and very little to maintain interest. Your reward is in the long-term goal of learning to type.

The main drawback is the TI-99/4A keyboard, which has changed the position of certain important symbols. While you can use the Touch Typing Tutor perfectly well to learn the letters, numbers, and selected symbols, you will not be able to use it for the keys which have been moved. Of course, if you plan to type only on your TI-99/4A, this will not be a problem.

These problems are not major, though. The diagnostic and game options seem uneven only because they are excellent ideas that fall slightly short of the mark: they are still fine learning tools. While graphics might have made the program more attractive, they are hardly necessary for the educational goal. Even the keyboard is not a major problem. While you may need to make some allowances, you can easily learn the changed keys when you move to your typewriter.

If you've ever wanted to type quickly and accurately, but have shied away from formal typing courses, buy the Touch Typing Tutor and teach yourself. In addition to the skills you will learn, you will have the added privilege of using one of the best programs around.

KEY TO SPANISH

Overall Quality	Excellent
Period of usefulness	Extended
Graphics	Very good
Time needed to get started	1/2 hour
Ease of everyday use	Fairly easy
Clarity of instruction book	Clear
Clarity of screen instructions	Clear
Grade level	Adult
Color television needed?	Strongly recommended
Extra equipment required	Cassette recorder

This is an excellent new idea for the TI-99/4A home computer. Texas Instruments has joined its computer resources with Westinghouse Learning Corporation to produce a Berlitz-style language package. It is aimed at adults who want to learn Spanish for basic travel and business conversations. The Key to Spanish series combines the computer's interactive visual displays with the advantages of a spoken cassette tape. It concentrates on spoken conversation with a basic vocabulary of 500 words. You buy this package as a unit containing four cartridges and four audio cassette tapes.

The series consists of an introduction, six standard lessons, and a pair of word games for vocabulary practice. The first of the four cartridges contains the introductory lesson and the word games, while the other three contain two lessons each. Each lesson is made up of a number of sections, typically starting with "Say it in Spanish" for pronunciation, followed by a "More About . . ." section to expand the basic dialogue into other situations and teach basic grammar. Each lesson ends with "The Pablo Tapes," an extended conversation which you must listen to and answer questions about.

Each of the cassette tapes works hand in hand with one of the four cartridges. Through most of the lesson, you will leave the cassette recorder

connected directly to your computer, just as if you were reading data. After you have started it up, the computer controls the recorder. You turn the tape on when you start the lesson and switch it on and off as it needs the spoken examples. The spoken voice will automatically play through the computer and come out on your television monitor. The result is a computer program that speaks in Spanish.

The only exception to this automatic control is the Pablo Tapes, which are more extended selections. Since you may well want to replay these conversations several times to grasp their meaning, the program asks you to disconnect the recorder and to control it manually. This is easy to do, and allows you greater flexibility.

The Key to Spanish program comes with a 150-page book of operating instructions, supplementary material, notes on language and Latin American culture, and an English-Spanish/Spanish-English glossary of the series' vocabulary. This well-written book gives a clear view of the language as well as useful tips on the culture and travel.

Key to Spanish requires a cassette recorder and cable (*not* a disk drive). Since the phrases are being spoken directly by the tape recorder and not by the computer, this series does not use the Speech Synthesizer. This means that the taped phrases are accurate representations of native Spanish speech.

Using the Series

You set up your computer for the Key to Spanish series just as you would if you were using your cassette recorder to record a program or an adventure game. It is especially important that you connect the computer to the remote control jack with the black wire of the cassette cable, since the program must turn the recorder on and off as it needs it.

You will normally want to start with the Introductory Lesson, on the first tape and cartridge. This covers basic expressions such as "buenas dias" (hello) and useful phrases such as, "I'd like to reserve a table." The phrases are not hard, and the lesson will help you learn what to expect from the series.

When you feel you are ready to go on, you can start working your way through lessons one through six, found on the other three cartridges and cassettes. The structure of each lesson is essentially the same as the introduction.

You learn a foreign language with your ears. Modern language programs rely heavily on taped conversations between native speakers. By listening carefully to these sentences and repeating them as accurately as you can, you will slowly learn the sounds and structure of the language, so that you can begin to make up your own sentences.

Once the computer has led you through this basic listening and repetition drill, you can pass on to the "More About" sections. These expand on basic concepts of the opening listening section, introduce more vocabulary, and lead into more specific details about sentence structure and grammar. In the introductory lesson, for example, the computer gives variations on the sample sentences. Having taught you to say "I want to reserve a table," it might ask you to say "I want to find a museum" or "I'd like to rent a car." The more advanced lessons will have more complicated exercises in this place.

The real test comes with "The Pablo Tapes." This is an extended conversation involving a person named Pablo. Unlike the earlier sections, the sentences are not written on the screen, and you do not need to repeat them. You must listen very carefully, though, since the computer will ask you questions at the end of the conversation. You are free to rewind the tape and play it as many times as you wish.

This is excellent training in following spoken conversations. At first, it may seem impossible to catch the drift, even if you have studied the unit carefully. The dialogue moves very quickly, and sometimes includes words you have never been taught. But don't give up if you're having trouble. If you listen to it often enough, you will begin to catch words, then sentences, then entire ideas. This is the best training you can get for the time when you will actually need to understand a sentence in real life.

When you have finished the Pablo Tapes, you may want to try one of the word games on the first cartridge. They will let you work on vocabulary from any combination of this and past units. Both of the games help you to practice the vocabulary of the units by forcing you to guess the letters of words. Wordchase, a Spanish version of the Hangman game, is the easier and more useful of the two.

You will probably want to repeat each unit until you feel at home with all the phrases and can speak them clearly and effortlessly. Texas Instruments feels its Spanish program should take about sixty to eighty hours to work through.

The Key to Spanish series is generally easy to use, as long as you go straight through the lessons. Problems can arise if you try to skip around, since the cartridges are designed to work hand in hand with the cassette recorder. If you want to start with the "More About" section, for example, you must either find the place on the tape manually, or let the computer silently search for about ten minutes. Even then, you can only start the section at the beginning, not in the middle.

If you skip around, the tape can get out of synch with the cartridge program. If this happens, you should try to find the correct selection manually. If you can't, go back and restart the lesson from the beginning.

General Evaluation

Key to Spanish is an excellent idea, well implemented on the TI-99/4A. It uses a traditional, proven approach to language teaching, in which the student imitates native speakers. The well-written reference book gives insight into the language and culture.

The only problem is the beginning-to-end structure the cassette tapes impose on the lessons. Though possible, it is difficult to start in the middle of a lesson. Fortunately, the lessons are not so long that this becomes a major problem.

Of course you must also weigh the cost of the package: with four cartridges and four cassettes, the Spanish series is considerably more expensive than the standard TI line. But you do get a lot for your money—a well-balanced, sound approach to the language with full pronunciation drills. If you study the series carefully, you will learn the basic conversation skills you would need for travel in Latin America.

SECTION THREE

GAMES

INTRODUCTION

Many people start exploring their computer with a game. Entertainment is one of the strongest selling points of the TI-99/4A and one of its most rewarding uses. If you have never used a computer before, there is nothing better than a good game for breaking down the fears you might have.

A very wide range of games is available for the TI-99/4A. Video-arcade games are only the beginning; your home computer also plays a respectable game of chess, and can challenge you with a fantasy adventure game.

For all games, the TI-99/4A's color graphics are a strong drawing card. Arcade games depend on fast, colorful action, but even in other types, the attractive displays help greatly in making the game enjoyable.

One advantage of computer games is that they can be played alone. How often have you wanted to play a game, but lacked a partner? The computer is always there, willing to play, and it won't get angry if it loses!

This tendency toward solitaire is also a drawback. Many games are as much social as intellectual, and human interaction is lost in a battle against a machine. While a computer poker game presents an intellectual challenge, it can never be what it is in real life—an intricate social ritual involving human idiosyncrasies, skillful bluffing, and joyful conversation. While some computer games can be played with more than one person, this is usually awkward.

With all of the excellent games available for the TI-99/4A, it is impossible to do justice to them all here. This book restricts itself to the best ones, yet still gives an idea of the range available. While you cannot go wrong buying the cartridges in this book, you should continue to look for games you want.

Video-Arcade Games

Video games are one of the outgrowths of the computer age. The

machines in a video arcade are very sophisticated computers designed specifically for their task. Now, with computers such as the TI-99/4A, this kind of action can be brought into the home.

Your home computer handles multiple tasks while you are playing a video game. It continuously calculates the position of all the objects on the screen, moves them if necessary, fires lasers, and destroys ships when they are hit. At the same time, it controls the colorful screen, and tells the television exactly what to display at every moment. When necessary, it complements this with realistic sounds and explosions.

Video games can be split into two groups. The first, known as the "space shoot-'em-up," pits you against waves of hostile alien ships. While this can take many forms, the idea remains the same: you must shoot down all of the enemy ships before they can shoot or collide with you. The time limits force you to rely on your reflexes to dodge obstacles and get out of danger. On the TI-99/4A, this class is represented both by *TI Invaders*, a descendent of the classic *Space Invaders* arcade game, and by *Parsec*, an original game with beautiful graphics and varied action.

The other group is the maze game, such as TI's *Munch Man*, a descendent of the *Pac-Man* arcade game. Gone are the hostile aliens, replaced by lovable monsters who chase you around a maze. Your object is not to destroy, but to outrun them, covering the entire maze before they can corner you. While these games require split-second coordination, careful planning is also important.

You never win a video game: you just keep playing until you lose your last ship. When you start out to destroy a wave of alien invaders or to cover a *Munch Man* maze, you have a very definite goal to complete. If you are successful in getting through this "board," you are rewarded with—yes—another board. In most TI video games, the boards become progressively more difficult, until eventually the game becomes too difficult for you to survive.

As hard as it may sound, you must be cool and methodical as you play, even when you have ten aliens converging on your ship. Panic and tension will quickly ruin your aim and prevent you from enjoying yourself. The best players approach a video game with the detached attitude of a scientist: it is a problem to be solved, not an enemy to be killed. A ship lost gives only a little more experience.

Video games require careful strategy. While you can score points with a random attack, you will never be an expert unless you develop a method. You will learn by experience which patterns work best and which places are safest.

This book describes some basic strategies for each of the games. These

should start you off on the right track, but in time you will develop your own. Take note of your enemies' vulnerabilities, and of the tricks that help you play. As you learn the game, you will also be training your reflexes, so that you can consistently dodge bombs and move quickly around corners.

One variation on this is called the *action game*. These are games, usually modeled after a popular sport such as football or soccer, which you play against a friend. In some of these, such as Texas Instruments' Indoor Soccer cartridge, you maneuver your players individually around the playing field and take shots when you are in position. In others, such as the Football cartridge, you merely decide on a strategy (what type of play to run) and watch as the computer acts out the results on the screen.

While some people enjoy these games, many are disappointed. They can never compete with a real game of football, and are usually less exciting than a game designed from the beginning for the computer. For this reason, they have not been covered in this book.

Most video games are controlled by a "joystick," or "wired remote controller," as Texas Instruments calls it. This is a small handle which you can move in any direction, that tells your ship which direction to move. A small button fires your ship's laser.

If you are used to the responsiveness of the joysticks on video-arcade machines, you may be disappointed with the TI controllers, because they are small and unnecessarily stiff. The fire button is hard to use, since you must press it with the hand that is holding the box. If you are the nervous type, you may find yourself developing hand cramps after only a few minutes.

One way around this is to buy or make a board that can clamp the joystick firmly to a table, so that you can move the handle without having to hold it. Another solution is to buy a different joystick. TI joysticks are unfortunately not compatible with those made for other machines, so you should be careful what you buy. Perhaps the best solution, at least for the moment, is to buy a standard Atari-style joystick and an adapter to convert it to the TI. WICO Corporation sells an adapter that will work with any of its models or with any other Atari-compatible joystick.

Before you spend a lot of money on a new joystick, however, you should be aware that another, larger problem will remain. As you play certain video games, including Munch Man and Parsec, you will notice at times that your ship will seem to freeze and not respond when you tug. This hesitation lasts only a fraction of a second, but that is often enough to miss a turn or fall prey to a laser shot. While you can learn to live with this, it is very frustrating to lose a game because of the computer's refusal to do something you asked it to do.

The problem is not, as you might think, with the joystick. It lies with the

computer program itself, which occasionally neglects to sense the joystick, with all of the other things it is doing. There is, unfortunately, nothing you can do about it: even the best joystick cannot control a game if the computer does not listen to it. You will simply have to live with this.

There is one alternative. All TI video games were designed to be played using the arrow keys on the keyboard, and these do register immediately. You will certainly find it harder to keep track of four keys than one joystick, but you will have better response if you do. You can play *Parsec* in this way. *TI Invaders* actually seems easier using the keys. The keyboard is less practical with *Munch Man*, since it is hard to keep track of directions without a joystick. Even here, though, some people have accumulated very high scores using the keys.

What does the future hold? Certainly more games. Texas Instruments is quite conscious that its customers are hungry for arcade-style games, and is actively working on new ones. The next year will certainly bring many new games for the TI-99/4, perhaps including well-known names from the video arcade. See the section on late breaking developments on page 125 for details.

Another exciting new product has been announced for the fall of 1983. The Milton Bradley Company, in cooperation with Texas Instruments, is developing a new game control called the MBX system, which will combine an improved joystick, a keypad, and a speech recognition device for a fairly reasonable price. Using this box with one of the new arcade games under development, it will be possible to control the action not with a joystick and fire button, but with spoken commands.

The video-game revolution has only begun. In the future, home computer games will expand beyond mere imitations of arcade games into new territory. In the video arcade, games are made difficult so that you will spend many quarters to learn, whereas at home, you should be able to relax. Future games might combine quick reflexes with thought and adventure to become more exciting and rewarding than ever.

Thinking Games

Because of its ability to make decisions based on its program, the computer can also play strategy games. Although at first you may feel humiliated at being outsmarted by a machine, you will enjoy having a worthy opponent to play at any time.

Of course, the computer is not actually thinking when it plays one of these games. It has been carefully programmed to follow a clear strategy no matter what happens. In blackjack, for example, the dealer might take a card if

he has less than seventeen points and hold if he has more, unless one of his opponents clearly has a better hand, based on the cards showing.

In chess, the computer has great potential. Though the computer lacks intuitive insight, it can use its great speed and storage capacities to consider more alternatives than any human player. While computer chess programs have not yet beaten the best chess masters, the day is perhaps not far away.

Video Chess is the best intellectual game cartridge available for the TI-99/4A, because of its educational value. While an accomplished chess player would not have trouble beating the computer in this game, a beginner would find it a very worthy opponent. It can play games on a variety of skill levels, including a losing game if you wish. Video Chess will make a wonderful partner for someone wanting to learn chess.

Because of space limitations, this book has not been able to include other thinking games which the TI can play. One of these is the A-MAZE-ING cartridge, a challenging cat-and-mouse game. With your joystick, you maneuver a mouse through a maze trying to avoid cats and other obstacles. A large choice of options allows you to play in virtually any way you want: with a simple or complex maze, obstacles or mouseholes, and many types of cats (fast, slow, smart, dumb, or pouncing). This is a good game if you like mazes.

The Othello cartridge is also interesting. This popular board game is a race to cover the board with counters of your color. Whenever you surround an opponent's piece with yours on each side, it changes to your color. Since a single move can switch the colors of eight or ten pieces, the game's strategy is very interesting. Various skill levels are available, and the computer plays quite well.

Another game called Hunt the Wumpus is a valuable learning tool to teach logical reasoning to children. You blindly explore a maze of rooms and try to locate the Wumpus without coming into the same room. You must reason this out from a single clue: every room within two steps of the Wumpus is marked by blood. After exploring as much of the maze as is safe, you must guess the monster's location from the clues you have gathered. You then have one chance to fire an arrow into this room and win the game if you figured correctly. The game is enjoyable, and does hone reasoning skills.

Adventure Games

The adventure games are in a class by themselves. These computer descendants of the famous Dungeons and Dragons game place you in a complicated fantasy universe. You play by exploring this world, trying to

gather treasures without being "killed" by a monster. The computer acts as the universe, telling you what happens with every step you take. Since you know nothing about this world until you have explored it, you must play as if you were yourself trapped in a dungeon, trying to imagine what to do.

The Scott Adams Adventure series is the most popular of these games. It places you in an imaginary situation ("You are in a flat in London . . ."), and you must figure out everything else. At the beginning of the game, you do not even know what commands to use to move your character around: you must experiment until you find words that work. As you move from room to room, the computer tells you what you see and what happens when you do something.

As the game goes on, the riddles become more difficult. At times you will need to think your way around an obstacle such as a locked chest, a hungry crocodile, or an unknown magic word. You must use your creativity to think of the solution and move one step further into the game's universe. The game ends when you find the treasures and succeed in bringing them back to the starting point.

If you do not like to scratch your head over riddles, you might prefer the Tunnels of Doom series. Instead of overcoming mental obstacles with the force of your imagination, you must battle monsters, relying on your weapons and experience to gain the edge. While you must still explore the dungeon blindly, at least you know what commands to use, and how the game works. With some luck, you can also find maps to floors of the dungeon, which will help you organize your search. Once again, the object is to find a number of treasures buried deep in the dungeon and bring them back to the surface without being killed.

One additional advantage of Tunnels of Doom is its fine color graphics. In Adventure your only contact with the fantasy universe is the verbal description the computer types on the screen. Because there are no graphics, you are left to imagine the entire scene. In Tunnels of Doom, on the other hand, you walk through the dungeon visually, and see a three-dimensional view of the halls in front of you.

To use these programs on your TI-99/4A, you must buy a game cartridge and one or more cassette tapes. The cartridge acts as a general bookkeeper for the game, while the tape stores the specific information about the fantasy universe. In this way, when you have fully explored one universe, you can move on to others by reading in a new tape. One cassette tape comes packed with the game cartridge.

Not everyone likes the adventure games. You must enjoy the challenge of figuring ways around obstacles, and be imaginative enough to lose yourself in the illusion. Both games take many hours to play, and may be frustrating at

On each floor, you must first explore without a map. As you move through the halls and rooms, you will learn your way around until you find a full map hidden in one of the rooms. This shows you the layout of the floor and, more importantly, gives you the right to descend to the next level.

The game is quite complex, as it should be. Each of your fighters can carry two different weapons, wear various types of armor, and use magic scrolls and potions. By fighting, they gain experience, luck, and "hit points," which help them in their battles against the monsters. When they are hit by the monsters, however, they also get "damage points," and can be "disabled" if they get too many. If your entire party is disabled, you lose the game.

The main attraction of the game is its marvelous graphics. While you are in the halls of the dungeon, you can see about four steps in front of you in a colorful, three-dimensional view, shown in Figure 3.9. As you move with the arrow keys, you see the perspective change just as if you were walking through the maze.

To obtain treasures, you must go into a room and fight monsters. These battles are waged on a two-dimensional "combat screen," like the one in Figure 3.10. You can move your players around the room or shoot from where you stand. You will need to hit most monsters several times to kill them, and some of your blows will miss because of their protection. Your chances are better if you have gained more experience and better weapons.

Although the game involves maneuvering a "party" of up to four warriors through the dungeon, it is designed to be played by a single person.

Because of the various difficulty levels and dungeon sizes, *Tunnels of Doom* is appropriate for a wide range of age groups. The most interesting game is with a large dungeon, since the deeper, more difficult monsters present more strategic challenges. A large dungeon, however, can take a very long time to explore—up to ten or twelve hours of playing time.

Since you will not want to do this all at once, *Tunnels of Doom* allows you to save your games on a cassette tape or disk. This is especially useful in a long game, since by recording the game at strategic points, you can avoid going back to the beginning if you are destroyed.

Tunnels of Doom, like *Adventure*, is a generalized cartridge that reads in a specific game off cassette. At this time, only the *Quest for the King* tape is available (supplied with the *Tunnels of Doom* cartridge), but others should appear in the future.

The game requires a cassette recorder or disk drive. A color television is necessary to enjoy the wonderful color graphics.

Playing the Game

Since *Tunnels of Doom* is complicated, it takes some time to learn. Read

TUNNELS OF DOOM

Overall Quality	Good
Graphics	Very good
Time needed to learn game	Several hours
Length of game	2 to 10 hours
Clarity of instruction book	Fair
Clarity of screen instructions	Good
Ability to sustain interest	Good
Action	Strategic
Age level	12-adult
Color television needed?	Very helpful
Extra equipment required	Cassette recorder

Tunnels of Doom is a treasure hunt. Somewhere in a large, many-leveled dungeon are hidden two objects which you must find in a limited time. To do this, you must explore many rooms and open treasure chests and vaults wherever you find them. Unlike the Adventure series, you do not need to guess magic words or tricky answers, but you do have to fight battles of uncertain outcome. Since the monsters you must fight often have greater strength and protection than your own characters, you must choose your combat strategy carefully.

As you work through the dungeon, your fighters will gain experience and find powerful weapons. The monsters, however, become more deadly as you move deeper, so be more careful as the game goes on. Your strategy becomes very important, because in the deepest levels you can easily be killed in a single battle.

You can select from three levels of difficulty and a dungeon of any size from one to ten floors. Each floor contains twenty rooms, most of which are defended by monsters.

It is, however, a very difficult game, which requires a lot of imagination and careful reasoning. It is designed for those who enjoy mental challenges, so it may be too much for some people. If puzzles are not your strength, you might consider *Tunnels of Doom* instead, a related game with nice graphics and less abstract thinking.

If you do take on the *Adventure* series, you should face the challenge squarely. It takes time, independent thought, and persistence. If you have the hint book, you should be able to finish the game, but you should use it only as a last resort, not as a way to avoid thinking. If you do take the trouble to work through the game, you can look back on it with genuine satisfaction.

make a magic word work, for example. If you are about to try something dangerous, save the game on tape so you won't lose everything if you are killed.

Make maps of where you've been. Note down everything you know about each room: the exits, the contents, the commands that work, and the significant details that might be useful later on. If you keep a map, you can easily go back and review when you need to think of new things to do.

No matter how clever you are, you will almost surely get stuck at some point. You will go to every place you know how to get to, try everything you know how to do, and nothing will help. You probably know exactly what you need to do, but can think of no way to do it. You've even tried typing HELP and the computer gives you only a cryptic clue. You are about to cry.

Save the game and go to sleep. You need creativity to get around a brick wall, and no one is creative when they are on the verge of tears. When you wake up, you can think back on the game and see if there was something you had missed. Don't rule anything out, even the impossible. You may need to go back to a place you have been, or reuse an object you have thrown away. If there's an object in some room that you haven't used, see if there's a way it might help you out.

Think in multiple steps. Think of what you want to accomplish, then of the steps that would take you toward that goal. Then think about how you might make those preliminary steps work: you may need to go back to your starting point and get some other object. Brainstorm with a friend and think of words and techniques you have used in other adventures. If you've tried everything and are still stuck, let it sit for a week or so and see if you can come up with something.

If you are still stuck, you can get help. Most Adventure players get stuck at some point or other, so the company that made up the game has compiled a book of hints for the entire series. You can order this pamphlet-sided answer key for \$7.95 plus postage and handling from Adventure International, Incorporated, P.O. Box 3435, Longwood FL 32750. Don't overuse it, though, once you have it: it will take the pleasure out of the series if you rely on it as a crutch. The hints are written in code so that you will look only at the one you need.

General Evaluation

The Adventure series is an excellent game for those who like to scratch their heads. The idea is very clever, and the fantasy worlds are intriguing and amusing. You may break into laughter at the ingenuity of some of the small touches of the game.

is clearly where you must head, so you know you must build a ship. Most of the materials are available right on the island, but some are inaccessible. The lumber, for example, is in a very tight spot, and cannot be removed until you do some other things. There's a hungry crocodile in the story, but I want to leave you with some surprises.

Once you've succeeded in building the ship, you can sail to Treasure Island. After this, the rest is fairly easy, though you do have to kill some deadly snakes. You win the game if you find the two buried treasures and bring them back to London.

To work your way through all of these obstacles, you will need a system of logical reasoning and experiment. While you must develop this for yourself, you can follow some general principles.

Everything is significant. If you find a shovel somewhere, chances are you will need it to dig something up. If the parrot says something, you will probably need to remember it later on. If the computer says, "I can't do that yet" when you try to do something, you should write this down so you can come back when you have the necessary tools. You will find these notes invaluable.

If your command doesn't work, try rewording it. Or try looking around for something that might help: you may need to be holding something to

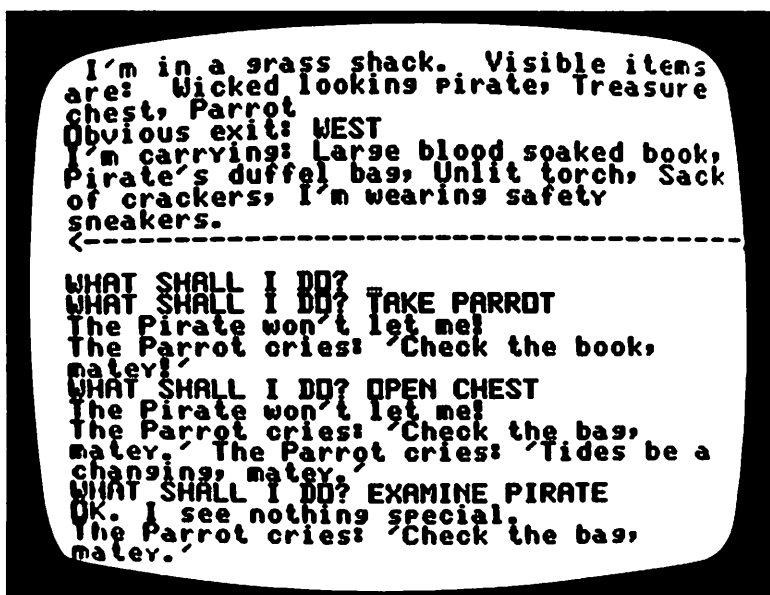


Figure 3.8: How do you get at the chest?

Playing the Game

When you fire up the game, the computer will ask you, "Where is the database?" To use the cassette recorder, you should answer CS1, then follow the computer's directions to read in the tape. This takes about three minutes, but you need to do this only once at the beginning of each day.

After you have read the tape in, the computer will ask: "Want to restore previously saved game?" If you are just starting a game, you will answer "No" here. The program must ask you this, because it has an option that lets you save a game in midstream. If you do want to continue a game you have already been playing, you will answer "Yes" here and read in the tape you had stored your game on.

I really shouldn't tell you anything else. To play an Adventure in its purest form, you should know nothing about the game before you start. You should just sit at your computer and type two-word commands until something works. If you want to have the thrill of pure discovery, you should close this book right here and start playing.

Unfortunately, the Adventure games are so difficult that even the cleverest will need some help. Therefore, you should not feel ashamed to continue reading if you want an idea of what you will encounter and how you can move forward.

The first step is to read the instruction book carefully. It is intentionally kept very short, since part of the adventure is to figure out the rules. If you read it carefully, though, it will give you a clear introduction, and will get you started in the right direction. Pay particular attention to pages 5 and 6, which describe how you must phrase your two-word commands to the computer.

You will quickly discover most of the essential commands. GO and CLIMB are essential, since they get you from one room to the next. Each adventure consists of about twenty-five locations, from apartment rooms to secret passages to beaches on desert islands. In each location, you will find a number of objects. You can LOOK at any of these and TAKE them if you want. You can, however, carry only a limited number of objects, so at times you may need to DROP some as well. Other commands become necessary as you go along: you may, for example, need to SAY a magic word at some point.

You will probably want to start by playing the Pirate Adventure, since it comes with the Adventure cartridge. The game begins in a flat in London, but soon moves to a desert island. This is where most of the game occurs, and where the most difficult problems arise. In one place, shown in Figure 3.8, you find a wicked-looking pirate guarding a treasure chest. To get what is inside, you need to make him run away and find a key.

When you climb a hill, you can see Treasure Island off in the distance. This

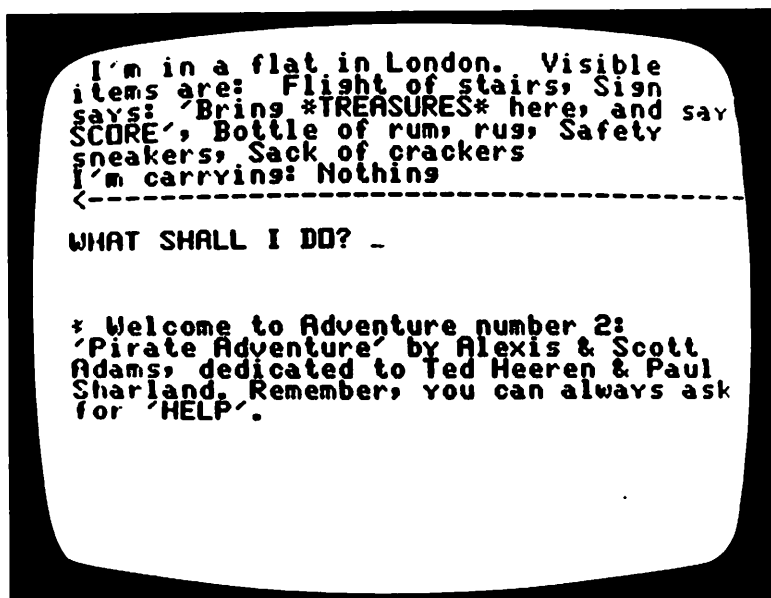


Figure 3.7: The opening situation of the *Pirate Adventure* game

Adventure games have a vocabulary of about 100 command words, and if you do not use words it knows, it will answer, "I don't know how." Also, although your command might be legal, it might not work in your present situation. You might need to go somewhere else first, or carry a special object to make your command work. By inspired guesswork, you will gradually learn what you can do in various situations, and how to get around.

When you buy the Adventure game, you will receive a plug-in cartridge and a cassette tape (or diskette if you prefer). The cartridge controls the computer, but the cassette really contains the game. This tape stores all of the information about the fantasy universe, describes the exact characteristics of each room, and tells what will happen in response to anything you might do. This database is the real game in Adventure.

You'll spend many hours exploring the Pirate Adventure game that comes with the cartridge. You can only play the game once, however: there is no reason to explore a mystery you have already solved. For this reason, you can buy a variety of other cassette tapes in the Adventure series, each with a completely new universe to explore.

A cassette recorder is needed to load and save the Adventure games. Since Adventure is completely non-graphic, it does not suffer on a black and white television.

THE SCOTT ADAMS ADVENTURE SERIES

Overall Quality	Very Good
Graphics	None
Time needed to learn game	One hour to start
Length of game	Several hours
Clarity of instruction book	Intentionally vague
Clarity of screen instructions	Very clear
Ability to sustain interest	Very good
Action	Imaginative
Age level	12-adult
Color television needed?	No
Extra equipment required	Cassette recorder

This may be the hardest game you ever play. It takes imagination, creativity, and a lot of determination. If you are the kind of person who likes to guess your way into a magical fantasy world, you may enjoy the challenge of the Adventure series. But be warned: you will have to do a lot of original thinking.

At the beginning of the game, you are placed in a situation, as in Figure 3.7. You know nothing about the universe around you, and must find out everything by experiment. You don't even know the commands or the rules of the game: the instruction book intentionally tells you only a few key words to start you off. You must move about, examine objects, and try to do things until you can find some that works.

There are no graphics in this game: the computer gives only written descriptions of what you see. You talk to it in two-word commands such as LOOK SIGN, TAKE SNEAKERS, or CLIMB STAIRS. The computer then describes the results.

At first, the computer probably won't understand your commands. The

The Video Chess program has a number of useful options that set it apart from other computer chess packages. By pressing FCTN-REDO, for instance, you can have the computer replay the entire game while you watch, so that you can review what you have done or take notes on the game. You can also save the game on tape, if you wish, for future replays or continuation. Other options, allowing simultaneous games, problem-solving, and use of the screen as a chessboard, are nice to have, even if you don't use them often.

One problem is the difficulty in using the function keys to choose options. The key functions seemed to have been chosen arbitrarily, and are very hard to remember. This problem is compounded by the fact that the descriptions in the instruction manual refer to the old TI-99/4 console, which used different SHIFT key commands. Be sure to refer to the guide on the inside front cover of the instruction book.

On the standard option of play against the computer, the function key commands work fairly well. On some of the other options, however, certain commands are missing: in simultaneous play and problem-solving, for example, the only way to get back to the main part of the program is to press FCTN-QUIT and start all over. Many of the nicer points, such as the timer and the ability to store programs, are missing from these options. The mechanics can therefore seem rough when using these options, but since you will probably want to use them only rarely, it should not be a problem.

All this aside, the Video Chess cartridge is a very fine program, which plays a difficult game well. If you already play chess, you may or may not enjoy pitting your skill against the computer's. If you are just learning, however, there is nothing better than this program: you can play the computer on any level you wish and even tell it what style to play. If you are stuck on a move, you can ask the computer for advice, and can replay the game at the end to see what you did wrong. If you have been waiting only for a patient partner to help you learn the game, the Video Chess program may be your answer.

advice of a good player if you want to play well. You can also read books that explain the finer points of chess strategy.

General Evaluation

The Video Chess cartridge, while it will not win any chess tournaments, does play a good game. If you are a beginner, the computer plays as well as you want, and sets a good example for basic play.

As you become better, the program's weaknesses will grow more apparent. While the computer's game does improve somewhat if you give it more time to think, its basic weaknesses remain. Even at its most advanced level, the computer might still make a fairly serious mistake, as shown in Figure 3.6. Also, at the higher levels, the computer's long thinking time becomes a problem: while you might gladly wait several minutes for a good opponent to consider a difficult move, you will become impatient with a machine.

The mechanics of moving the pieces can be a slight problem. It would have been nicer if TI had followed the example of other chess programs that let you move the pieces graphically with the joystick. Even so, the algebraic notation is clear and unambiguous, once you get used to it.

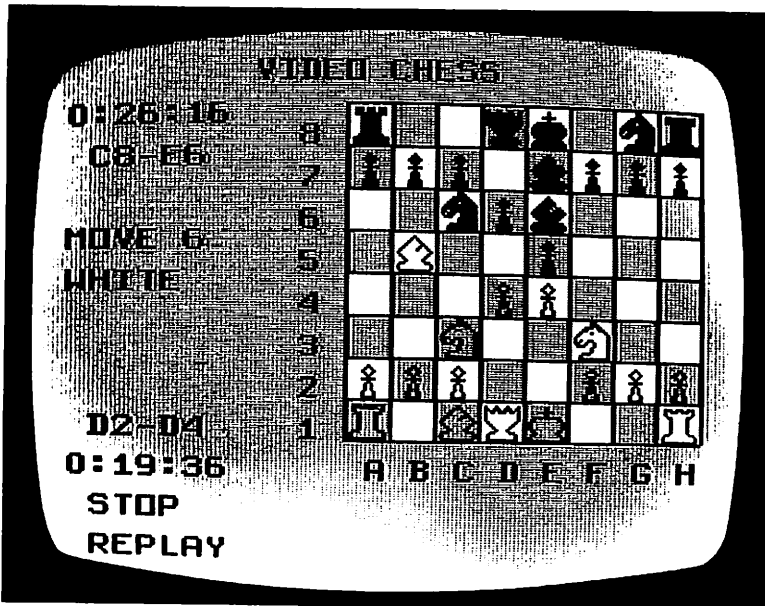


Figure 3.6: The Video Chess program has just moved its bishop to E6. This mistake allows white to win the bishop or knight by moving its pawn to D5.

Video Chess does have a very nice "back-up" option. Until you have played enough chess to be able to see all the consequences of your moves, you will occasionally make careless mistakes, which you regret after your opponent makes his move. The Video Chess module lets you take back one or even several moves by pressing FCTN-I. This option is also handy if you make a mistake typing in a move.

Be sure, incidentally, that the ALPHA LOCK key is in the up position when you play. On some versions of the TI-99/4A, the computer will act erratically if you use the Video Chess program with the ALPHA LOCK down.

You may be interested in knowing how the computer approaches chess, so that you can both capitalize on its weaknesses and learn from its strengths. The computer plays by systematically examining all the possible moves available. For each potential move, it considers all of your possible responses, then all the responses it can make to all of your responses, and so forth. Since this can rapidly lead to thousands of alternatives, the computer must also weed out the least likely lines. As it looks ahead, the computer will gradually settle on the one move that will best advance its position, while not leaving it vulnerable.

This is, in fact, an imitation of the way a human player will think about a move. Most players will look at the consequences of their actions at least two or three moves down the line and take into account the responses their opponents can make. Chess masters often plan twenty or thirty moves ahead, foreseeing with lightning precision the remote consequences of their move.

Because of its great speed, a computer can afford to consider more alternatives than a human player. This means that it has a fairly good grasp of what can happen two or three moves down the line and cannot be tricked by something obvious. It may, of course, still be caught in more clever traps.

The computer's real weakness is strategy. Because we rely on our intuition, we human players imagine the long-term consequences of moves even if we cannot systematically consider everything that can happen. While the computer can be programmed to grasp chess strategy, it cannot hope to equal our creative imagination. Each of the computer's individual moves may be sound in themselves, but you will eventually gain the upper hand if you attack with a well-organized plan.

Of course, if you are just learning to play the game, your long-range planning will be limited. The computer really makes an excellent opponent at this stage, because it plays a sound basic game. Since it avoids the careless mistakes that plague most beginning players, it sets a good example, and its strategy is varied enough to give you experience with many different positions. You should, of course, play against friends, too, and work with the

general principles of chess strategy, then closes with ten good pointers on playing the game.

The computer can advise you of the best move in your position. You can also ask it to play an aggressive, defensive, or even a losing game, if your ego needs a boost.

The computer lets you choose three levels: beginner, novice, or intermediate. At the beginner level, the computer takes only a few seconds for each move. At the novice and intermediate levels, you can give the computer more time to think—up to three minutes for a move if you allow it. This lets it play better, so you can have your opponent improve as you learn. Even at the beginner's level, however, the computer rarely makes obvious mistakes.

The program does not claim to go beyond the intermediate level. If you are an experienced chess player, you may be able to beat the Video Chess program easily, though you may still find some interest in the game. The program is not particularly strong on long-term strategy, and does make blunders because it lacks foresight. Although challenging, a cartridge game can never match the power of a good player's intuition and creativity.

A number of special options allow you to use the Video Chess cartridge for other purposes. If you don't have a chessboard, for example, you can play a game against a friend using the computer as a chessboard. Another option lets up to nine different people play simultaneous games against the computer. You can also set up a chess problem on the screen and ask the computer to solve it for you. While this can take a half an hour, it will give you the answer to a problem you might never solve by yourself.

No special equipment is required for Video Chess, though a cassette recorder does allow you to save games for future reference. You don't even need a chessboard, since the computer displays the game directly on your television screen. A black and white television is no handicap.

Playing the Game

When you start the game, you must tell the computer what level you want it to play at, what style of game you want it to play, and whether you want black or white. The computer will then set up the board on the screen and ask you for your first move.

Entering the moves is complicated at first. Video Chess uses an "algebraic notation" to specify the squares of the chessboard, with the letters a through h naming the columns and the numbers 1 through 8 the rows. To specify your move, you must type the position of the piece, followed by the place you want to move it to. This is confusing if you are used to the standard chess notation, but it should not take long to readjust.

VIDEO CHESS

Overall Quality	Very Good
Graphics	Good
Time needed to learn game	Several hours to start
Length of game	15 to 60 minutes
Clarity of instruction book	Clear
Clarity of screen instructions	Clear
Ability to sustain interest	Good
Action	Thinking only
Age level	10-adult
Color television needed?	No
Extra equipment required	No

Chess is one of the oldest thinking games, yet it remains one of the best. The rules and board are extremely simple, yet the strategy is so complex that even the best players can surprise each other with new ideas.

It is not a new idea to have a computer play chess, for although the game's strategy is complex, it lends itself well to the kind of fast, repetitive calculations the computer does best. Years of work have resulted in sophisticated programs which can compete with the best players in the world.

You cannot expect a small computer like the TI-99/4A to play at this level, since it lacks the large memory and lightning speed which are required. But the TI-99/4A can play chess, and quite a respectable game at that. While it will not be a match for a good player, TI's Video Chess is an excellent sparring partner for someone just learning.

For those who have not played chess before, the cartridge's instruction manual describes the rules: how each piece moves, special situations, and the object of the game. As it introduces the pieces, the manual also describes

be able to get through. You may lose a ship, but the asteroid belt is of limited duration.

Higher Levels After negotiating the asteroids, you find yourself back where you started, up against the swoopers. This time, however, you have to hit each ship twice to destroy it. This is actually not as forbidding as it sounds, since you can usually line yourself up with a ship and hit it repeatedly with your machine-gun laser. This is easy with the smaller ships, since they fly horizontally after their initial approach. The Urbites, Dramites, and Bynites are large enough that you will usually hit them twice anyway. On these higher levels, the Bynites turn invisible after the first hit.

After the fourth level, an additional type of obstacle appears beyond the asteroid belt: the Killer Satellites. If you can get this far, you won't need my help!

General Evaluation

Parsec is the best video game made for the TI-99/4A, and one of the best anywhere. It has excellent color graphics, realistic sounds, speech-synthesized warnings and comments, and wonderful action. The varied missions, refueling tunnels, and asteroid belts will keep you constantly on your toes.

The only problem with the game is the glitch in the joystick control that can leave your ship momentarily frozen in place. This might cause a certain amount of frustration, but you can adjust to it. You may even choose to think of it as a challenging part of the game—a "paralyzer" the ship can use on you if you aren't careful.

Other than that, Parsec is marvelous, a must for anyone who likes the fast action of the video arcade.

The Saucers Although these resemble the Swoopers and LTFs, the Saucers come onto the screen from the left—from behind. You have to dodge them as they fly past, then shoot as they turn to come back. They are at their most vulnerable as they slow down and change direction; once they start back, however, your time is very limited. Fire off one or two shots, then get out of the way.

The approach from the left is not a problem if you have lost one or more ships, since the attack pattern is predictable. If you can pick the first off at the top of the screen, you can wait there safely for the rest.

If there are still four ships left, however, their attack pattern is random, and you must be ready to dodge as they zoom on the screen. You can give yourself a little more time to react by moving your ship forward to the center of the screen. Although this gives you less time to shoot, it also lets you aim more accurately.

Don't aim too low at the saucers. They have a plume of fire coming from under the ship, which your laser will pass right through. A nice trick is to fire off some shots just as the saucer is turning. If your first shot passes just above the saucer's head, you know that your next will be on target. If it does not, you can adjust your position before you are in danger.

Don't get discouraged if you cannot handle the saucers from time to time. They are the hardest of the six, because of their approach from the left and the difficulty of hitting them on the wing.

Refueling Tunnels Whenever you keep a ship alive long enough to deplete its fuel tank, you must stop to fly through a refueling tunnel. The tunnel requires precision maneuvering, so you will need lift 1. Even at this slowest speed, you may find you tend to move too soon. Just sit back and relax.

The tunnel seems to be more forgiving about flying low than high. Since the space is so tight that you almost have to do one or the other, you should try to skirt the ground. But not too much!

Although three refueling tunnels come on the screen, you should stick to the first unless you are an expert. The other two are worth more, but are also more difficult. When you get through, be ready to shoot aliens immediately. And don't forget to change your lift number!

Asteroid Belt If you get past all six series of alien, you will be faced with an asteroid belt, a barrage of boulders that moves across the screen. Unlike the rocks in the Asteroids arcade game, these all move horizontally, and need to be hit only once to be destroyed. Even so, there are a lot of them, and they speed up as time goes on.

A good strategy is to switch into Lift 2 and move to the top of the screen. If you just move up and down blasting the top three or four rows, you should

of the bout, once all five have appeared. After their first fly-by, these ships move almost horizontally, so they aren't hard to hit, even when moving quite fast.

Another technique is to ignore the ship altogether the first time it crosses the screen, then line yourself up to hit it squarely on its second, horizontal pass. This is quite easy, and probably best for the higher levels.

The slower lift 2 seems to work well for these ships, since it assures you of a hit if you sweep across the alien with your laser blasting. This also makes it easier to hit low-flying ships without crashing into the ground.

Urbites, Dramites, and Bynites The second, fourth, and sixth rounds present a different problem. In each case, a large ship appears at the right of the screen, tracking your movements up and down. When it reaches your level, it fires one or two photon missiles at you. The three vary in maneuverability and missile type, but all present the same problem.

You have to be on your toes, since the photon missiles are extremely fast. This is especially important if the ship first appears at the same level as yours, since it can destroy you before you have a chance to react. The Bynites, in particular, always come on the screen firing.

The only defense against this is to position yourself near the bottom of the screen with your hand on the joystick, ready to move up as soon as the ship flashes on the screen. If you do this, you will survive the initial ambush and can then fire back at the ship where you can see it. With the Urbites and Bynites, you should move straight to the top of the screen, then back and forth across their noses with your hand on the fire button. The faster Dramites are more difficult, but the same general strategy should work. Lift 3 is imperative for these ships.

Don't waste your concentration firing shots at the beginning, because these ships are indestructible for the first two seconds they are on the screen. Wait until they change color, then keep your laser firing until you hit them. There is little chance of your gun overheating unless you go overboard.

Unfortunately, there is a frustrating glitch in the program if you are using a joystick. During a battle against these three types of ships, the computer will sometimes neglect to react to the joystick for a moment, leaving your ship frozen in place no matter how hard you tug. This is bad, because it often happens just when the alien is firing at you. Even after scoring a hit, you can get stuck and fall prey to a ship you have already destroyed. If you keep moving and stay away from the top of the screen, you can learn to avoid this. If it becomes a real problem, you can always use the up and down arrow keys on the keyboard: they are immune from this defect.

As you learn to combat each of the six types of alien, you will develop your own techniques. As with any video game, you will want a strategy that allows you to destroy the aliens methodically and with minimal danger. In particular, you should decide on a starting position for your ship and on a direction to move it during the attack. You will find some suggestions in Figure 3.5.

Name of ship	Number of ships	Recomm. Lift	Starting Altitude	Ending Altitude	Point Value
1. SWOOPERS	5	2	Middle	Bottom	100
2. URBITES	4	3	Bottom	Middle	200
3. LTF'S	5	2	Bottom	Top	200
4. DRAMITES	4	3	Bottom	Middle	200
5. SAUCERS	7	3	Middle	Top	300
6. BYNITES	4	3	Bottom	Middle	300
ASTEROIDS	Many	2	Top	Top	1000
REFUELING	—	1	Bottom	Bottom	1000
7. KILLER SATELLITES	Varies	3	Middle	Middle	400

Figure 3.5: Strategy Hints for Parsec

Swoopers and LTF's The first and third types of alien are quite similar, and must be combatted in the same way. Both are small ships that dive from the upper-right corner of the screen, then continue to sweep across from right to left until they are hit. Since they move faster the longer they stay on the screen, you should try to destroy them on their first sweep. Don't panic if you miss one or two, though. You can always go back and get them later.

Try to hit each new alien as it swoops down. If you just sit in the middle of the screen and fire as it moves across, you should be able to hit all but one or two. You can then pick off the ones you miss either immediately or at the end

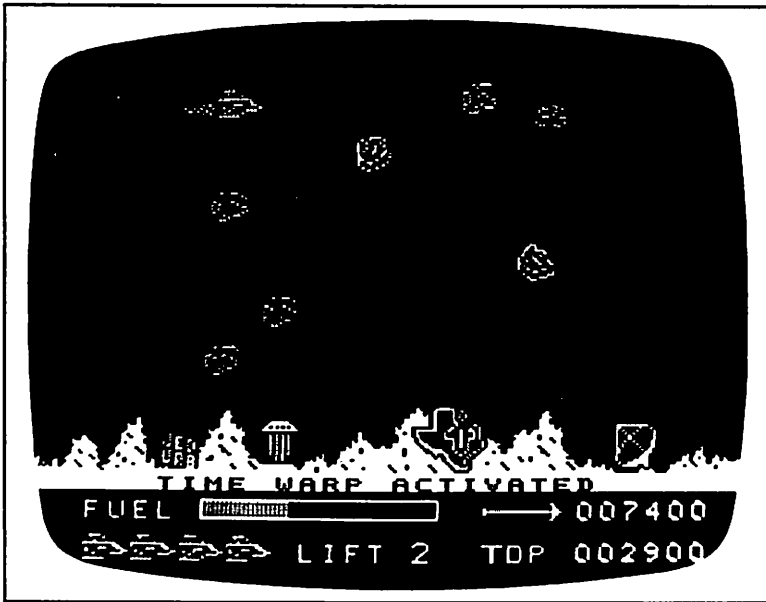


Figure 3.4: The asteroid belt in Parsec

Playing the Game

You must maneuver your ship to dodge aliens and to aim your laser. You are free to move in any direction, but since the enemy ships fly and shoot horizontally, you will normally need only to change your altitude.

Your laser will repeatedly fire rapid shots if you hold the button down. You can do this only for a limited time, however, before your ship explodes from overheating. In practice, this is not much of a problem, since you can get off about 20 quick shots before this happens. You should never need that many unless you are shooting blindly.

You can control the vertical mobility of your ship by selecting one of the three *lifts*. (This is done by pressing the appropriate number key). Lift 3, at which the game begins, is the fastest, while lift 1 is extremely slow. While you will normally prefer the highest lift in this fast-paced game, you will also find lift 2 useful, since it allows you to aim more accurately. Use lift 1 for the tricky refueling tunnel.

Texas Instruments has included a very nice pause option. By pressing the P key, you can put the game into a "time warp," freezing the action indefinitely. You will find you will enjoy the game more if you use this P key frequently, to get ready for the next wave or merely to unwind. If you use the 1, 2, or 3 key to restart the game, you can also change the lift in the pause.

named the Swoopers, Urbites, LTF's, Dramites, Saucers, and Bynites. Each presents a different problem. The Swoopers and LTF's dive down from the right of the screen and continue to sweep across with increasing speed until you shoot them. The Urbites, Dramites, and Bynites are larger ships, which chase you up and down and fire photon missiles. The Saucers are in a class by themselves: they move in from the left, then turn around to fly back at you.

If you make it through all six waves of aliens, you must face an asteroid belt: a twenty-second barrage of boulders from the right of the screen. If you survive this as well, you go back to the beginning to face the six waves again, but with added complications and difficulty. At the higher levels, you must hit the ships two or three times to destroy them and face an unpredictable barrage of "Killer Satellites." There are no less than 16 levels, so there is no reason anyone should tire of *Parsec*.

There is one other complication to the action: a narrow refueling tunnel you must fly through when your fuel gauge runs low. This is quite a challenging sidelight.

If you have a speech synthesizer, the cartridge will give realistic warnings of approaching dangers. Although this adds to the game, it is hardly necessary, since the dangers are also announced by warning tones. The game can be played with either a joystick or with the arrow keys on the TI-99/4A keyboard.

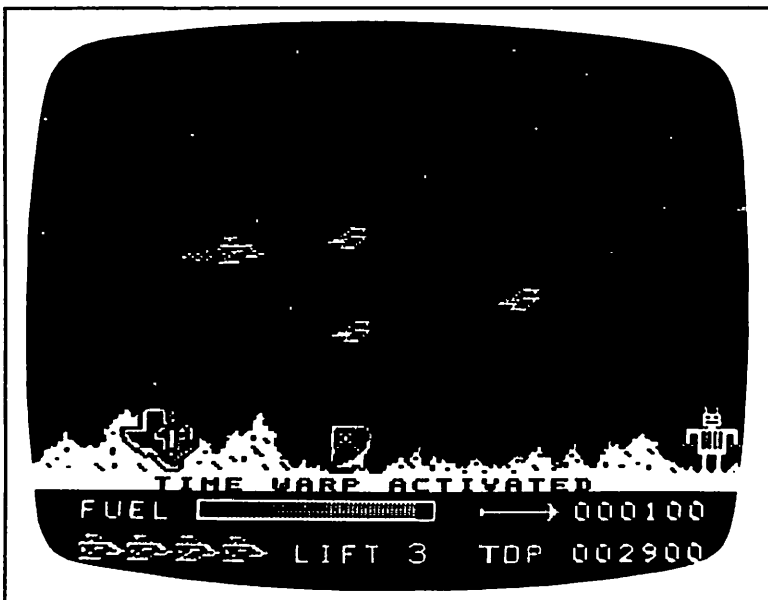


Figure 3.3: The Swooper wave in *Parsec*

PARSEC

Overall Quality	Excellent
Graphics	Excellent
Time need to learn game	One hour to start
Length of game	5 to 30 minutes
Clarity of instruction book	Very clear
Clarity of screen instructions	Very clear
Ability to sustain interest	Excellent
Action	Intense
Age level	12-adult
Joystick response	Slightly erratic
Color television needed?	Very desirable
Extra equipment required	Speech synthesizer and joystick recommended

Note: Does not work with the original TI-99/4 version.

Parsec is by far the best video game currently available for the TI-99/4A. With fast, varied action, beautiful color graphics, voice warnings on the speech synthesizer, and constantly increasing difficulty, Parsec has everything an arcade fanatic could desire.

The closest analog in the video arcade is Williams' Defender game, but even that has only a superficial resemblance. In Parsec, you command a ship flying at the left of the screen, above the surface of a turning planet. You can move the ship up or down and fire repeated laser shots horizontally to the right. The object is to shoot down waves of alien ships before they have a chance to shoot you or collide with you.

As you play, you will face six different waves of alien ships, affectionately

excellent way to get a jump on the more dangerous parts of the maze before having to risk your neck.

Above all, don't panic. High blood pressure will not help your maneuvering: Munch Man is a game which requires calm, systematic planning. Take it easy, and if you get cornered, you can always do better the next time.

General Evaluation

Munch Man is an enjoyable game, with challenging action. Although it has minimal sound effects and mediocre graphics, the game itself is worth the price. Since it requires long-range strategy more than simple reflex action, it is a good alternative for those who might enjoy video games, but do not care for shooting down aliens.

You should not buy Munch Man hoping to play Pac-Man. Its strategy is considerably altered by the different maze layout, the changes in the monsters' attack habits, and the absence of a set search pattern. If you are playing the game for the first time, this is no problem: the game is, if anything, more challenging. But if you are a Pac-Man devotee, you should remember that Munch Man is a different game.

The most serious problem is the sluggish joystick. Absolute, split-second control is essential to a game like Munch Man, and an unresponsive joystick is hard to forgive. You will never get the full feel of the arcade game, but with practice, you can reduce your frustration by taking new strategies.

Munch Man is still enjoyable, especially if you have not been spoiled by the original arcade game. But watch out: it isn't easy!

three or four boards, for scores of about 20,000. Beyond that, the game becomes increasingly difficult, because the Hoonos are more clever and the energy dots do not last as long.

On Munch Man, you cannot use the patterns that experts use to score in the millions on the original Pac-Man game. On that game, the monsters always searched a given board in the same way, so experienced players could discover routes that would safely cover the entire maze. In TI's Munch Man cartridge, the monsters do not follow a predictable pattern, but make random turns.

You can, however, use a version of this technique in your play. Since you are given a few seconds to move before the monsters come out, you can develop a good starting pattern which will allow you to cover some large parts of the maze before the monsters get there. One such game opening is shown in Figure 3.2. Leave the central box to the right, move up and across to the left. By the time you reach the intersection above the top left Hoono's shelter, the monsters will be coming out. Turn upwards and move to the straight passage at the top of the screen. In most cases, you will be able to cover the whole upper row without being chased, and even if you are, you can eat an energizer and obtain your safety. This is obviously not the only possible opening: you can develop your own with practice. This is an

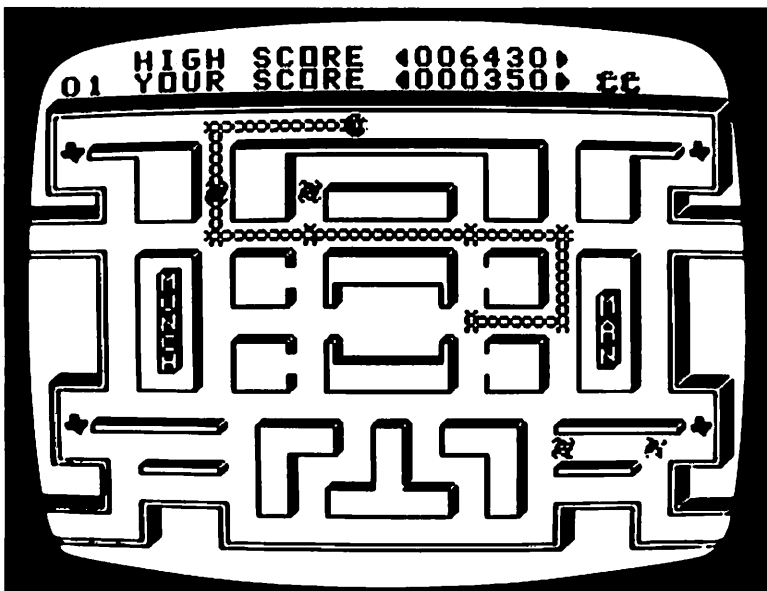


Figure 3.2: The Munch Man Game

After you have eaten an energizer, you can use your safety in several ways. One idea is simply to chase the Hoonos down, racking up as many points as possible. You can usually do this easily, especially on the first few levels, where the energizers last a long time.

At times, you will also want to use the energizers in another way. Certain parts of the board are dangerous, particularly the box around the central cell and the dead-end loop just above it. After eating one of the energizers, you can use your temporary immunity to lay a chain through these danger spots, so that you can spend your vulnerable periods working on the corners, close to the safety of the uneaten energizers.

You will probably want to use both of these strategies. In the earlier boards, you will probably have time to do some full-scale Hoono-hunting, but later on you may prefer to devote all your energies to covering the maze.

Until they get quite close to you, the Hoonos do not know where you are. This means that if you stay out of the way, they will keep to their standard random searches, leaving you free to cover the section as you wish. If you watch carefully, you will notice they tend to neglect certain parts of the maze, particularly the corners near the upper energy dots. You can often use these safe spots as bases from which to go out into more hazardous regions.

If a Hoono gets near you, he will chase you. Since Hoonos are normally slower than you, they can not catch you from behind, but they can trap you if you make a wrong turn. If you keep running, the Hoono will eventually give up the chase, but it is safest to head for the nearest energy dot.

The major problem with Munch Man is the joystick. Although it is technically possible to play the game with your fingers on the arrow keys, the human brain cannot keep track of so many things at once. You must therefore depend on the joystick in this game, and that can create some troubles.

The problem arises when you come to a crossing in the maze and want to turn a corner. You would like to hold the joystick in the proper direction and have your man turn the corner as soon as he arrives. This does work most of the time, but it sometimes happens that the computer doesn't respond and leaves your man to run straight through the intersection. This is normally just an annoyance, but can be fatal in a hot chase.

This problem is most severe after you have eaten an energizer. At this higher speed, the computer is far more likely to miss your joystick command. Since you are immune from attack, this is not dangerous, but it is more difficult to get where you want to go. The best solution is to stick to the straightaways, moving back and forth to snap up Hoonos as they come out of side passages. It is handy to cover these long passages anyway, since they are often the most dangerous parts of the maze.

With these strategies and some practice, you should be able to get through

maneuver your man through the entire maze, including the two passages that connect the edges of the screen. As you move, your man lays down a chain, and the game continues until every stretch of the maze is covered. You must be systematic about this, since a single link left out in a passage leaves the chain unfinished. If you succeed in covering the entire maze, you advance to a new level, with a slightly more difficult maze. There are 60 levels in the game, though you will probably never see most of them.

You are chased by four roving monsters, called "Hoonos." While the Hoonos are not particularly intelligent, they can often trap you in a corner or catch you if you make a wrong turn. Fortunately, you can turn the tables by eating one of the four flashing "energizers," which allow your man to move at a higher speed and eat any Hoonos he can catch.

If you are an enthusiast of the Pac-Man games in the video arcade, you may be disappointed with some of the changes. Munch Man lacks the original game's delightful musical interludes and personable monsters. Much of the appeal of the original game comes from these excellent touches. The changes in the maze layout also make it more difficult to run away from monsters, so the game tends to be a more mechanical task of avoiding monsters than a strategic cat-and-mouse chase.

Apart from the joysticks, no special equipment is needed to play Munch Man. A color television is very helpful, since it allows you to see the colored flash that warns you when the energizer tablet is about to run out.

Playing the Game

You start up Munch Man like the other TI cartridges. When MUNCH MAN comes on the screen, you press any key to get to the game screen. The game will then wait patiently for you to begin by moving your man out of the center, either left or right. This is a nice feature, since it allows you to take time out between games. You can also stop the game at any time by pressing P for "pause."

There are many strategies for the Munch Man game. Perhaps the best way to start off is to divide the screen mentally into four quarters, each containing one of the Texas-shaped "energizers." These dots mean safety, since by eating them you obtain the power to outrun and eat the monsters rather than being eaten. However, there are only four of these, so you should try not to waste them. You should cover as much of the corner as you can before eating the energizer. If you can, lure two or three of the Hoonos after you when you head for the energizer, so that you can turn around and catch them right after you have eaten it. Of course, if you get in trouble, you may eat an energizer to save yourself, but make sure you leave at least one for the end.

MUNCH MAN

Overall Quality	Good
Graphics	Fair
Time needed to learn game	One hour to start
Length of game	5 to 30 minutes
Clarity of instruction book	Very clear
Clarity of screen instructions	Very clear
Ability to sustain interest	Good
Action	Intense
Age level	12-adult
Joystick response	Poor
Color television needed?	Quite helpful
Extra equipment required	Joystick

The Space Invaders game may have started the video-arcade revolution, but the Pac-Man machine made it popular. People who never liked blasting aliens found that they enjoyed maneuvering a little man through a maze, eating dots, fruit, and little blue ghosts. While still requiring quick reflexes and intense concentration, this game introduced an additional problem of general strategy and long-range planning.

For copyright reasons, Texas Instruments is not free to sell the Pac-Man game directly for its machine. Instead, it has put together a slightly-altered version called Munch Man, with different graphics and action. The screen is white instead of black, the maze is laid out differently, and the monsters have different shapes and personalities. These changes alter the game considerably, but the basic idea remains the same.

The Munch Man game, shown in Figure 3.2 on page 89, presents you with a maze of passages surrounding a central cell. The object of the game is to

turn off the sound on your TV. You will be able to concentrate much better.

When you do learn to shoot at the mystery vehicle, you can gain up to 300 points if you hit it in the center. Unlike the original Space Invaders game, TI Invaders does not calculate the saucer's point value from the number of shots fired, but merely from the place where it was hit. In doing this, TI perhaps has taken away the challenge of counting 23 shots before shooting the saucer, but has given an added challenge of hitting it squarely.

Texas Instruments has added a nice touch: a saucer that moves back and forth across the screen once the board has been cleared. Each time you hit this saucer, it reverses direction and heads for the other side of the screen. It becomes increasingly difficult to hit, since it becomes smaller and higher with each shot. When you finally miss, it slips off the edge. With a little practice, you should be able to hit it four or five times, thereby obtaining a welcome breather from the constant stress of shooting down the boards of aliens.

Unlike Space Invaders, the original arcade game, TI Invaders does not become much more difficult with each additional board. The rows of aliens are slowly replaced by more valuable types, each slightly harder to hit, but you always have enough time, since the array always starts from the same height. With a few hours of practice, you should be able to get through several boards, for a score in the thousands. Video games experts will do much better, and might be more satisfied playing at the DOWNRIGHT NASTY level of difficulty, where the aliens aim their bombs at you rather than firing randomly.

General Evaluation

The only major drawback to the game is the inadequacy of the Texas Instruments joystick. To use it effectively, you will need to hold it in your hand, and press the "fire" button with your thumb. Your hand becomes tired quickly from the split-second reactions you must make. Moreover, you may sometimes be hit by a bomb because the joystick did not respond to your last-second pull.

To remedy this, you can also play using buttons on the TI-99/4A keyboard. In fact, you may even find this easier. You use the S and D keys to move the laser back and forth, and the Y to fire. This is an excellent replacement for the joystick (it was, in fact, how the original arcade game was designed).

Except for this plus the annoying buzz of the mystery vehicle, TI's cartridge is a very satisfying game. For those who want to play a fast-action video game on their home computer, TI Invaders is one of the best.

TI INVADERS, you will choose your level of difficulty. If you are playing for the first time, you will probably want MERELY AGGRESSIVE, saving the DOWNRIGHT NASTY level for the experts. Be ready to go once you've made your choice: the invaders don't wait.

The object of the game is to clear the board of aliens without being hit by falling bombs. You need to aim accurately, yet stay ready to dodge a bomb if one should appear. Most players slip in beneath an alien, shoot, and move back to safety—with practice, you can make this into a single motion.

One key to the game is to shoot down vertical columns near the edge of the pack. If, like the player in Figure 3.1, you can knock out all the aliens from the first three columns on the left edge of the screen, you can buy a lot of time. This is because the pack drops down a step only when the leftmost column reaches the edge of the screen. If you clear out the edge columns, the pack will have further to walk.

Another key is to stay in the empty space in front of the pack, in the direction it is moving. You are safe as long as you are not directly under a line of aliens. If you shoot the first vertical column, you always have a safe direction to run. You can also work on the last column and move in from behind, but since the aliens' bombs fall slightly behind them as they move, this is not as safe.

If you do this, the invaders will eventually trap you at the edge. As you move across the pack to the other side of the screen, you can take the opportunity to shoot some of the aliens off the bottom row. While you should spend most of your time destroying whole vertical columns, you will also find it useful to knock some out of this lowest row before they become dangerously close.

This strategy works until only a few aliens are left. By this time, they move so fast that you can aim only in their general direction. Position yourself in the center, away from the decaying shelter of the houses. Then shoot at the speeding aliens as they pass by, concentrating more on dodging the bombs than on aiming. The last one is always the hardest to hit, but you can learn to do it if you practice and stay calm. One reassuring fact is that the last invader actually becomes easier to hit as it draws closer, and is almost impossible to miss at point-blank range. Don't be ashamed if you can't hit it the first time you play: it takes practice.

If you are a beginner, you should ignore the space ship that crosses the top of the screen from time to time. Until you are experienced enough to shoot down the pack calmly with time to spare, the added distraction of aiming at this moving target will cost you valuable time and frustrating mistakes. Unfortunately, the flying saucer is accompanied by an obnoxious buzz, which will surely disrupt your concentration. If you find this annoying, just

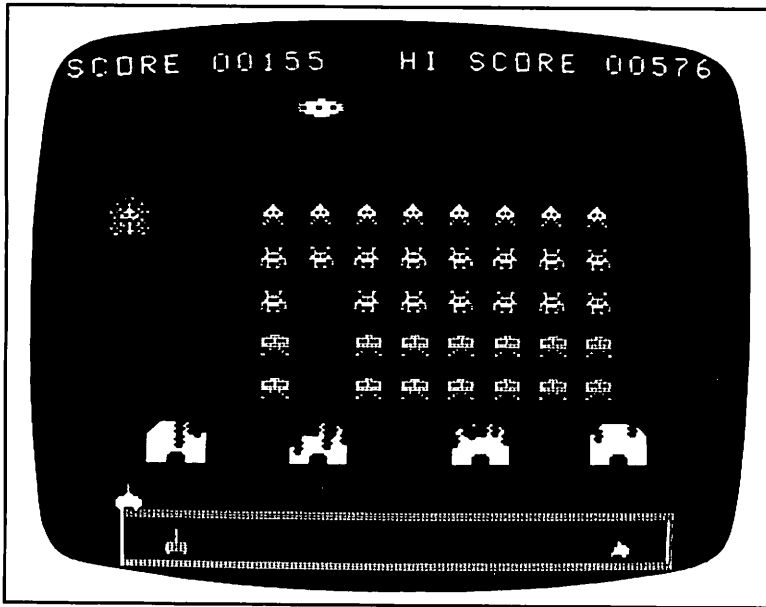


Figure 3.1: The TI Invaders game

time to react to the bombs as they come lower, you must work quickly to destroy the array. The pressure also increases as you destroy the aliens, because they move and shoot faster as they become fewer. An increasingly rapid heartbeat sound adds to this tension. As if this were not enough, a flying saucer occasionally crosses at the top of the screen, offering a variable bonus to those who can hit it.

If you do succeed in destroying all of the invaders, you are rewarded with a chance to shoot at a moving saucer for bonus points. You keep shooting until you miss, and are then relentlessly faced with another wave of aliens.

Those familiar with the Space Invaders arcade game will be satisfied with TI Invaders. The two versions have their differences, but the overall feel is the same. The TI Invaders graphics are excellent, and while the sounds and timing are somewhat different, it is not hard to adjust.

The game can be played on two levels of difficulty. It is designed to be played with a joystick, but does not require one. In fact, it is easier to play it using the keyboard.

Playing the Game

The TI Invaders cartridge is easy to start up. Simply plug in the module and follow the directions the computer puts on the screen. After pressing 2 FOR

TI INVADERS

Overall Quality	Very good
Graphics	Very good
Time needed to learn game	One hour to start
Length of game	5 to 30 minutes
Clarity of instruction book	Adequate
Clarity of screen instructions	Adequate
Ability to sustain interest	Good
Action	Intense
Age level	12 years to adult
Joystick response	Marginal
Color television needed?	Desirable
Extra equipment required	Joystick, if desired

This is Texas Instruments' adaptation of the Space Invaders game that started the video-arcade explosion in 1978. Other games have followed it in popularity, but the Invaders game remains one of classics of the video arcade. Requiring fast action and split-second coordination, TI Invaders is a captivating and exciting game for video-games enthusiasts of all ages. It does, however, require great coordination and concentration, and is not for those who are easily frustrated.

As shown in Figure 3.1, the game begins with an array of "invaders," arranged in columns at the top of the screen. You must fire at these aliens while you dodge the bombs they drop. You can move your gun left or right and hide it behind the house-shaped barriers; as the game goes on, however, the barriers become riddled with holes and offer less and less protection. The line of aliens marches slowly across the screen, reversing direction and dropping one step down each time it gets to the edge. Since you have less

times. If you enjoy testing your wits in a difficult puzzle, though, there is nothing better than an adventure.

Whatever you choose—video game, thinking game, or adventure—you will not be disappointed. Computer games are both amusing and rewarding. Enjoy yourself!

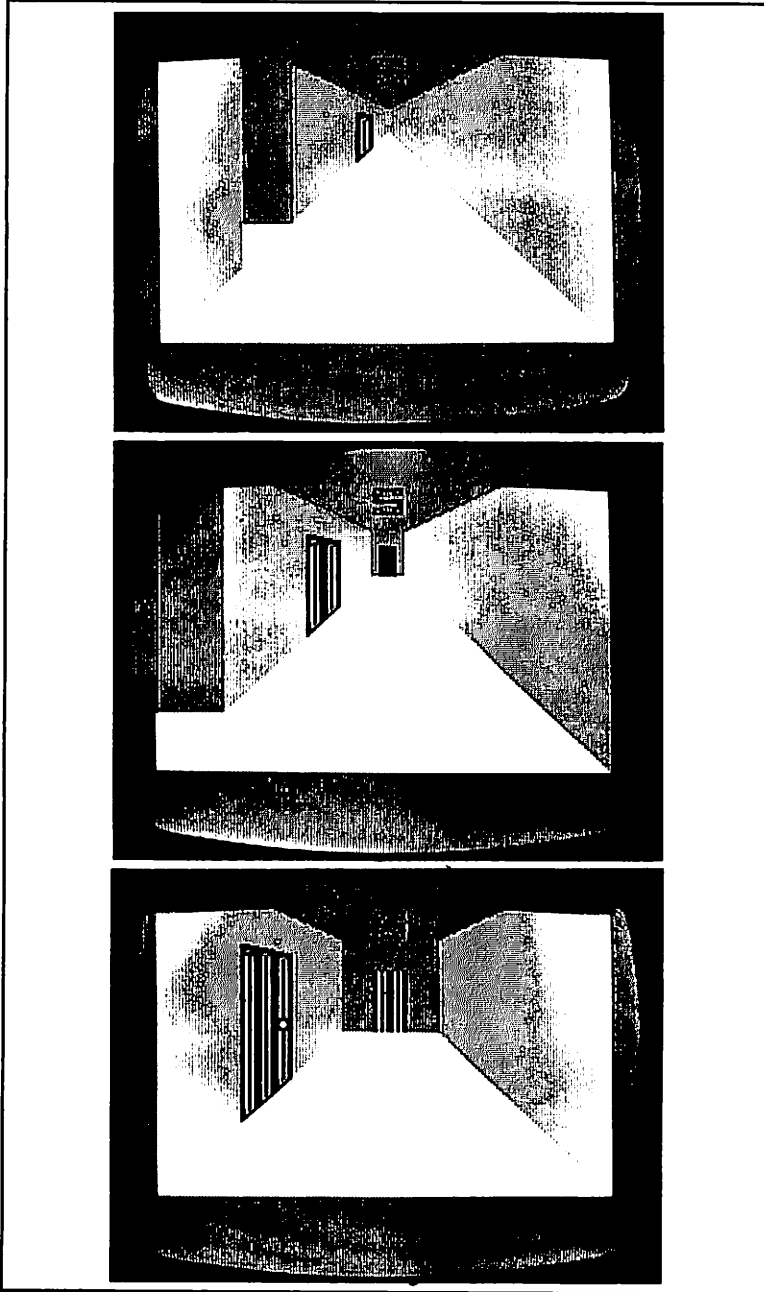


Figure 3.9: Three steps down a hall in a Tunnels of Doom game

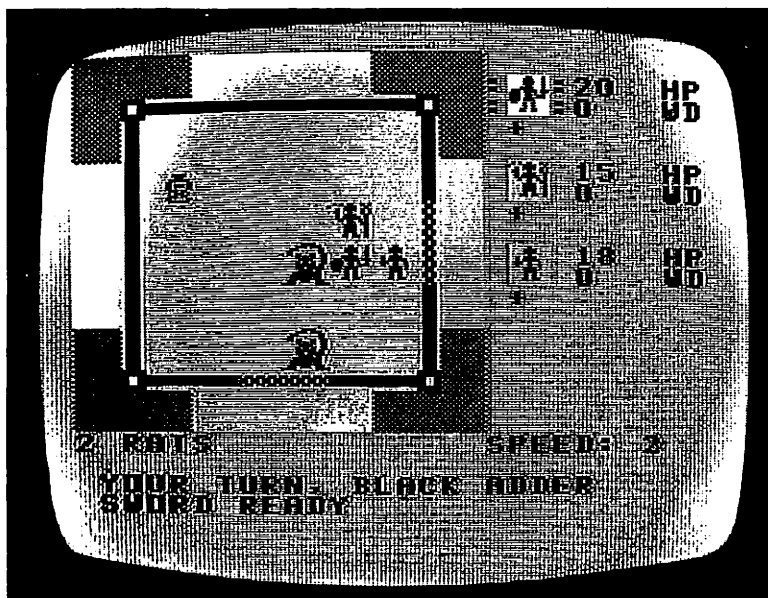


Figure 3.10: Combat in a room of a *Tunnels of Doom* game

the instruction manual. There are many important features to the game, and you cannot expect to understand what's going on until you've read about it. Pay particular attention to pages 6 and 7, a quick-reference chart of all the commands you will need.

The first thing you should do is play the sample games described on pages 12 to 18 of the instruction book. These will show you the major features of the full game and give you an idea of what you are up against. Without doing this, you cannot hope to understand the game.

The cassette tape that came with the *Tunnels of Doom* cartridge has two different games stored on it: Pennies and Prizes and Quest of the King. Before playing Quest of the King, you'll want to try the simplified Pennies and Prizes to get a feel for moving about the maze. To load either of these games, you will press 1 for CASSETTE, then follow the instructions to read in the tape. This takes about four minutes.

Pages 9 and 10 of the instruction book describe how to load the tapes, but are very unclear. The Pennies and Prizes game is at the beginning of the first side of the tape (the side with the red label). If you want to play Quest of the King, turn the tape over to the side with no label and rewind it. There is also a copy of this game on the first side of the tape, but it is difficult to use since it is not at the beginning.

If you read the description of the sample game carefully, you should be

able to learn the complexities of starting up and playing the game. Most of this is clear, though you will need to flip to page 35 of the instruction book to understand how to open a vault you find in one of the rooms.

You might be confused about how to move your party around the dungeon with the four arrow keys. Read the first three paragraphs on page 24 of the instructions and play around with the keys until you have a feel for what they do.

These arrows work in three different ways. In a room, the four arrow keys represent directions north, south, east, and west. To move out the door to the right, you will use the D key (right arrow). In a hall, however, the keys have a different meaning. The up arrow means "move a step forward," in the direction you are facing, while the other three turn your party 90 or 180 degrees without moving. The third use of these arrow keys is for moving up or down stairs, from one level of the dungeon to another. To use this third type of movement, you must use the FCTN key with the up or down arrow.

Once you have played the sample games, you will want to go on to your own dungeon. While you are learning, use the "Easiest" level and a fairly small dungeon of one or two floors.

You will first need to name your players and buy supplies for them. Probably the most interesting is to choose a party of one of each of the three types of warrior: a fighter, a rogue, and a wizard. Each has its own attributes, but the fighters are generally the best, since they can use all weapons and armor.

The game starts in the general store on Level 0. At the beginning, you have a very limited amount of gold to spend on supplies, so you should concentrate on weapons and rations. Weapons come in two types—ranged and standard—and you will want to give your warriors both if you can. Standard weapons tend to be more effective, but can be used only on a monster standing right next to your player. Ranged weapons (such as slings and crossbows) can hit a monster anywhere, but their use is limited by your supply of arrows. It is therefore good to have one of each, so that you can start off with the ranged weapon, then change to the other when you get close.

Don't worry, though, if you don't have enough gold to fully arm your party. You will find weapons and armor along the way, and can always go back to buy more when you have accumulated more money. If you are playing in a deep dungeon, you will also find general stores on levels 4 and 8. These are worth finding, since by this time you will certainly need more supplies. The deeper stores also stock more powerful weapons (such as a Battle Ax and a Warball and Chain). The prices, however, are four or eight times higher in these stores than they were at the surface. Certain weapons, such as the wizard blade, can only be found in rooms, and represent an important means of arming your party without spending money.

Hallways are safe, except for an occasional wandering monster in your

path. Rooms are where you find treasures, however, so you should begin trying them as soon as you come across a door.

Rooms can contain any number of useful objects, shown graphically on the screen. A pot of gold is one possibility, and while it is useful, it is not worth getting killed over. More interesting are the treasure chests and vaults, which can contain anything from magic scrolls and powerful weapons to the quest objects themselves. Finally, you might find a map in the room, which is the key to moving down into the dungeon.

The treasures you find in the rooms aren't free, however. Almost all rooms, including those with no treasure at all, are guarded by monsters, which you must kill before you obtain or see the treasure.

In a battle, your fighters take turns at the monsters. In each turn, your warrior can move a space or change weapons, then try a weapon cut. Generally, you will want to start with your ranged weapons, and move a step closer each time before you fire. Then, when you are right next to the monster, you can change weapons and make more effective cuts with your standard weapons. You will usually need to hit monsters several times before you can kill them, though with better weapons and more experienced fighters you can inflict more damage. Sometimes your blow will miss, especially against well-protected monsters.

After each of your fighters has taken his turn, the monsters attack back, moving toward you and possibly inflicting damage. Armor and shields can protect you to some extent, but you will usually suffer some damage points. Since many monsters only inflict damage when they are right next to you, it is sometimes best to keep your distance and fire at them with your ranged weapons.

Your fighters can survive a certain amount of damage, but with too much, they become disabled and disappear from the screen. If you have bought "rations" or "healing" for your party, the damage will be repaired with time and your players will reappear, but if your whole party is disabled, the game is over. You can also reduce your damage by drinking from magic fountains, though this can also backfire and increase your damage.

Therefore, combat is risky. You should carefully weigh the value of the treasure in the room against the power of the monsters you will have to combat. Generally, maps, vaults, and treasure chests are worth the trouble, but if the screen shows no treasure or only a pot of gold, you would do better to escape.

You can do this in two ways. If you want to get through the room to another exit, you can negotiate with the monsters, by paying them gold if they will accept it. Since this is costly and uncertain, it is usually better to back out the door you came in. You are then free to continue your explora-

tions, with the added benefit of knowing you should avoid that room. This important second option of escaping from rooms is *not covered in the instruction book*.

Make sure you don't forget the point of the game as you get involved in fighting battles. The basic problem is finding the quest objects and building up enough powers and experience to be able to defeat the more difficult monsters. The game will become dull quickly if you are spending all your time in battle.

In general, your strategy should be to explore each floor only long enough to find the map that will let you descend to the next level. At floors four and eight, you will also want to find the general store to buy arrows, rations, and healing for your party.

Make your own map of each floor as you go. Even after you obtain the full map, you will find this very useful, since you can record the rooms you have visited. Keep track of what was in each room, and note carefully the ones you have cleared of monsters, so that you can know which rooms it is safe to go back through. If you decide you are not ready to fight in some well-defended room, you can also note this on your map so that you can go back when you are ready.

Use your cassette recorder to save the game at convenient points, preferably when you are in good shape. There is no reason why you can't save the game, do some dangerous exploring, then go back and use the knowledge you have gained. If you are killed, press FCTN-BEGIN to load the game back in from your tape.

The quest objects are normally hidden at the deepest levels of the dungeon. When you get there, you should concentrate your energies on either a treasure chest or a vault, since these are where the quest objects are hidden. One of them will surely be guarded by a very difficult set of monsters, so you should save the game before going into your final combat. If your players are badly damaged, you might want to have them drink at a fountain to restore their powers.

After you have found the two quest objects, you must still climb out of the dungeon. Although you now have maps, this can still be difficult, since the program now throws many more wandering monsters in your way. You should chart the quickest route back through each floor, because you may have to face a battle every two or three steps. Try to make it through the final battle with some damage points to spare, and save some gold for the climb back out, so that you can negotiate when you cannot fight.

General Evaluation

Tunnels of Doom is a very good game with excellent graphics. It is varied

enough to hold interest, and difficult enough to present a real strategic challenge, especially in a deep dungeon.

It does require considerable time to learn and to play, however. Even the simplest one-level dungeon takes an hour to explore, and a full dungeon might take several days.

One drawback is the complicated instruction manual. Since the organization is unclear for the first-time player, it can be very difficult to look up one of the program's features. An index would have helped.

The other problem is that the battles tend to be mechanical. Escape and negotiate in rooms you really don't care about, and spend your time in the corridors exploring. If the game begins to seem dull, move to a higher difficulty and a deeper dungeon. One- and two-level dungeons quickly become routine, but more complicated games remain challenging.

Even if the action does occasionally become repetitive, *Tunnels of Doom* is an enjoyable game. While the hard-core explorer will probably prefer the Scott Adams Adventure series for its challenging riddles, everyone will enjoy the fine graphics and interesting strategy of *Tunnels of Doom*.

SECTION FOUR

BEYOND CARTRIDGES

INTRODUCTION

Throughout this book, you have been using programs written by other people. That is easy and convenient: you just plug in the cartridge and let the machine run the show. Sometimes, however, you may want to do something your own way, or to do a unique task. Then you need to go beyond cartridges.

If you want to do something for which you can't buy a cartridge program, you can write your own, using a *programming language*. Several of these are available for the TI-99/4A, including BASIC, LOGO, and Pascal.

The uses of customized programming are as varied as your imagination. You might, for instance, want to write a program to simplify calculations you frequently need around your home, such as balancing your checkbook. Even if you could buy a cartridge to do this, it might not serve your personal needs. By writing your own program, you can have the computer do exactly what you want.

Your interests may go beyond simple programming into some of the other equipment you can attach to your TI-99/4A. You might have already used a speech synthesizer with some of the educational programs or with games such as Parsec. If you wish, you can also create your own sentences and have the synthesizer speak them back to you.

With more advanced equipment and the TI Peripheral Expansion Box, you can use your TI-99/4A for electronic communication. You will be able to send programs over the telephone to friends, or use communication services such as The Source.

This chapter has a dual purpose. It is both a narrative that describes what you can do to expand the horizons of your computer, and a guide to three

special cartridges that help to expand your computer beyond simple plug-in programs. The first of these is the Extended BASIC programming language, an improved version of the language that comes built into your home computer. The other two, the Speech Editor and the Terminal Emulator II cartridges, help you control the speech synthesizer. The Terminal Emulator II cartridge also serves as a key to the telecommunications interface, which allows you to send and receive data.

If you want to get an idea of what your computer can do beyond using plug-in cartridges, you can read straight through this chapter, skimming sections such as the Extended BASIC cartridge review, which deal with specific details. On the other hand, if you are interested in a particular cartridge or option, you can skip straight to the section where it is described in detail.

PROGRAMMING LANGUAGES

You might think that a computer should be able to understand a simple English command, like "Add up my taxes." You could just tell it what you want it to do and sit back while it does the dirty work.

Unfortunately, it's not that easy. A computer has to be told exactly how to do a task or it will not be able to understand. English sentences, no matter how carefully worded, are always full of ambiguity. We can understand them because we can read between the lines to understand what the speaker intended to say. A computer is too literal to do this: it must have very specific directions.

Rather than trying to teach the computer all the nuances of the English language, computer designers have invented "programming languages," which are easy to learn yet specific enough for the computer to understand. Most of these try to build a bridge between us and the computer: they are close enough to English that we can learn them without trouble, yet specific enough that the computer can understand them precisely.

BASIC has become more or less the standard language for small computers, like the TI-99/4A. While it is easy to learn and simple enough to run on even the smallest home computer, it is still powerful enough to solve complex problems efficiently.

The TI-99/4A comes with a version of this language called TI BASIC. You do not need to buy a cartridge to use this: it is built right into the machine. All you do is press 1 FOR TI BASIC when you are firing up the computer, and it will immediately respond, TI BASIC READY. You can now immediately start typing commands and program lines.

This book is not intended as an introduction to BASIC. There are literally hundreds of books available that can help you with this, including TI's own *Beginner's BASIC*. For a more elementary introduction to the fundamentals of BASIC programming, you might try *Your First BASIC Program*, by Rodnay Zaks, or its TI-99 version, *Your First TI-99/4A Program* (Sybex, Inc., 1983).

When choosing one of these resources, you should make sure it is a real introduction, and not simply a reference manual that lists the commands. A reference manual (such as the *User's Reference Guide* that came with your computer) is valuable for refreshing your memory once you know how to program, but it will not be well organized for learning the art for the first time.

You may find TI BASIC useful even if you do not want to write programs yourself. Many magazines and books contain programs written in BASIC, both for the TI and other machines. You can often just type these programs in as they are printed, although you may need to make some minor changes if the program was not originally written for the TI-99/4A. If you have a cassette recorder or disk drive, you can also buy BASIC programs that you can simply read in and run as they are. Watch out for games written in BASIC, though. They are usually too slow to have good action.

You can buy other languages besides BASIC for your TI-99/4A. LOGO, a graphics programming language for children, has already been mentioned in the education chapter of this book. Besides being an entertaining learning tool, this is a very powerful language for animated graphics. You can also buy Pascal, a high-level "structured" programming language often used by scientists and engineers. Both LOGO and Pascal require the 32K Memory expansion card and the TI Peripheral Expansion Box.

Most of the cartridge programs you have been using were written in "machine language," which is very difficult and cumbersome to use. Professional programmers use it because it allows very fast programs and direct control of graphics. Since machine language requires a knowledge of how the computer itself works, it is far too technical for most people.

TI EXTENDED BASIC

Overall Quality	Very Good
Flexibility	Excellent
Graphics	Very good
Time needed to get started	One hour
Ease of everyday use	Fairly easy
Clarity of instruction book	Clear
Color television needed?	No
Extra equipment required	No

Unless you are a very accomplished programmer, the built-in TI BASIC should be all you will need. It has all of the major features of any BASIC language.

If you are writing very complicated programs in TI BASIC, you may be bothered by some of its limitations. While TI BASIC is nice for beginning programming, it lacks a few of the more sophisticated operations found in other versions of the language. To satisfy those who expect a little more, TI has developed another version of the language, called TI Extended BASIC.

Unless you are very experienced with TI BASIC and know you need something more, you should skip straight to the next section in this book, on page 123. What follows is quite technical, since it is directed at readers who want to know specifically how Extended BASIC differs from TI BASIC.

If you do move up to Extended BASIC, you won't need to throw away your old programs and programming skills. Your TI BASIC programs will run perfectly well in the extended version, though they won't take advantage of the added features. Of course, if you do use the special features of Extended BASIC, you cannot run them in the standard version.

Some mathematical functions, such as MAX, MIN, and PI, have been added. You can tell the computer to do something other than stop if it finds an error in your program. You can type multiple statements per line, and assign a value to more than one variable. You can have as many as seven subscripts on an array, rather than three. Subprograms can contain their

own variables, rather than being tied to those found in the main program.

A more important change involves the IF-THEN-ELSE statement. In normal TI BASIC, you can use this only to jump to another statement line, as if with a GOTO statement. In Extended BASIC, you can give a statement to be executed if the condition is true, as well as the usual line number. This is a very handy feature, which is often used by programs you might find in a book or magazine.

Sprites are another important addition. A sprite is a small figure which can move about the screen in any direction and speed you want. Unlike normal TI graphics, sprites move smoothly, and can be used to make animated pictures on the screen. The ships and monsters which move about in video games are examples of sprites.

With Extended BASIC, you can set up as many as twenty-eight of these figures, giving each its own color and heading. By alternating between two or more pictures, you can actually make them appear to walk. Extended BASIC can tell you where each of your sprites is on the screen, and whether any two are crossing. You might have one sprite be a ship and the other a small laser burst: if the two collide, you can have the ship explode.

This all sounds very nice, but it is quite complicated in practice. The hardest problem is to design the sprite in the first place: you must sit down with a pencil and graph paper and design the figure, then translate the picture into coded numbers. Only then can you start to program the graphics.

If you want to use sprites easily, you might consider LOGO. While it was conceived as a children's language, LOGO is a very powerful graphics language, which is both enjoyable and easy to use. Its sprite graphics are every bit as powerful as Extended BASIC's and much easier to use.

Most of the other features of Extended BASIC are of interest only if you have the TI Peripheral Expansion Box. If you have the 32K memory expansion, you will need Extended BASIC to run longer BASIC programs: the standard TI BASIC can only use the memory built into the TI-99/4A console. If you have a disk drive, you will appreciate some of the other new features. You can, for instance, have your program automatically load and run another program off the disk or execute a stored program when you turn the power on.

Computer fanatics will be happy to know that Extended BASIC makes it possible to run assembly language subprograms from BASIC programs, and that it has a PEEK option to directly retrieve numbers from the computer's memory. There is, however, no POKE statement which would let you store numbers directly back into the memory.

If you want to take advantage of the TI's sprites or get the most out of your memory expansion or disk drive, you will certainly want Extended BASIC.

Also, if you often use programs out of books or magazines, you may want Extended BASIC, since these programs often use advanced programming features. You may still have to change a few lines if the program was written for a machine other than the TI, but the changes should be fairly minor.

If you are only writing a few casual programs, though, you will not need Extended BASIC. You might, in fact, never notice the difference between it and the TI BASIC you already have, so you shouldn't buy Extended BASIC until you know you need it.

SPEECH SYNTHESIS

	SPEECH EDITOR	TERMINAL EMULATOR II
Overall Quality	Good	Very good
Flexibility	Limited	Excellent
Graphics	None	None
Time needed to get started	15 minutes	30 minutes
Ease of everyday use	Easy	Fairly easy
Clarity of instruction book	Clear	Adequate
Clarity of screen instructions	Clear	Clear
Color television needed?	No	No
Extra equipment required	Synthesizer	Synthesizer

If you have a Texas Instruments speech synthesizer, your computer can speak. You may already be familiar with this from one of the educational programs or video games that use the synthesizer's voice to read suggestions and important warnings. While the voice sounds somewhat canned, it is certainly understandable and is a useful addition to these programs.

You can make the speech synthesizer work for yourself as well. Two cartridges, the Speech Editor and the Terminal Emulator II, give you an option called *text-to-speech*: you type in a sentence and the computer speaks it back through the synthesizer.

The Speech Editor is the simpler of the two, but also the more limited. With this cartridge, you simply type in the words you want the computer to say. These words appear on the screen, so that you can make changes. When you are satisfied, you press ENTER and the computer will speak the sentence back.

The limitations of this become apparent when you try to type a complicated word. The Speech Editor will recognize only the 400 basic English words built into the Texas Instruments speech synthesizer. Other words are

thrown away with a grouchy beep. While you can do a lot with this vocabulary, at times you will certainly want to go beyond it.

This is where the Terminal Emulator II excels. It can recognize any word, even if it isn't in the synthesizer's vocabulary: if it doesn't know the pronunciation, it makes an educated guess. While not perfect, the program does remarkably well. Its pronunciation of "The rain in Spain falls mainly in the plain" was better than Liza Doolittle's. It only erred when the last word was changed to "plateau," a fairly excusable mistake.

Unfortunately, Terminal Emulator II is not quite as easy to use as the Speech Editor. To make it speak back the sentences you type, you must use a short TI BASIC program, found in the appendix to the instruction manual. Fire up the computer with the Terminal Emulator II cartridge plugged in, and choose 1 for TI BASIC, rather than 2 for the cartridge. Then type in the following program, exactly as it is printed on page 37 of the manual:

```
100 OPEN #1:"SPEECH",OUTPUT
110 INPUT "PHRASE→":A$
120 PRINT #1:A$
130 GOTO 110
```

You don't need to understand this to use it—just type it in and type RUN. When you press ENTER, the computer will put the word

PHRASE→

on the screen, telling you it's ready. You can now type sentences, just as with the Speech Editor, and the computer will read them back to you.

You can control the speech in many other ways with the Terminal Emulator II cartridge. You can specify the pitch and inflection of the voice to make the computer sound like a woman or a deep-voiced man. You can also tell the computer which syllables to accent, to make its voice more understandable.

Terminal Emulator II allows you to dig even deeper into the speech synthesizer, using the "allophone" level. There are about one hundred sounds that make up every word in the English language. The computer's speech synthesizer pronounces a word just as we do: it strings these phonetic building blocks together into full syllables and words. If you are willing to break the words down into the sounds that make them up, you can have the computer say absolutely anything, just the way you want.

This option is, unfortunately, quite difficult to use. You must first break down the words into the sounds that make them up, then look up codes in the back of the instruction manual. You must then string these codes

together and run them through the computer. For normal use, this is too much trouble.

You can use both the Speech Editor and the Terminal Emulator to give speech to your TI BASIC programs. This is extremely useful if, for example, you want to write games or programs that give verbal suggestions, such as the TRY AGAIN of the educational cartridges.

To use this in your programs, you simply run TI BASIC with the cartridge plugged in. Even though you haven't selected the cartridge, it has added the speech commands to the TI BASIC language, and you can use them automatically. Unfortunately, you cannot use this with Extended BASIC, since you would have to plug two cartridges into the TI-99 at once.

The BASIC option on the Speech Editor is very easy to use. The cartridge, when plugged in, adds a subprogram to the TI BASIC library, which you can call directly from your program. All you need is a line like this:

```
100 CALL SAY ("HELLO")
```

When the computer gets to this line, it will speak the word "Hello." Note that you must use regular parentheses in your statement, not the square brackets that are shown in the instruction manual.

With the Terminal Emulator, the process is a little more involved, but once again, you get greater flexibility for your trouble. As the first statement in any speech program, you must type the line

```
10 OPEN #1:"SPEECH",OUTPUT
```

Then, when you are ready to print out your text, you should use a statement such as this:

```
150 PRINT #1:"HELLO"
```

Unless you are concerned about ease of use, you should buy the Terminal Emulator instead of the Speech Editor. It can do everything that the Speech Editor can do, and much more, since it is not limited to the basic 400-word vocabulary of the speech synthesizer. While its TI BASIC statements are slightly more complicated than the Speech Editor's, they are ultimately more powerful. The slight confusion is worth the added features.

TELECOMMUNICATIONS

The Terminal Emulator II program gives you another important feature as well: telecommunications. If you have an RS-232 interface and a telephone modem, you can send and receive information over your telephone. You

can, for example send a program across the country to a friend, or use one of the new electronic communication networks, such as The Source.

This was, in fact, the primary purpose of the Terminal Emulator II cartridge: the speech options are merely an added feature, covered in the appendix of the instruction book. To send or receive data, you must have a program running in the computer that will listen to the message and accept it as it comes off the wire. This program will then store up the letters and display them on the screen.

Telecommunications is a rather technical business, involving many conventions for describing how the letters are transmitted. The computer industry has agreed on a standard code and a standard speed. As long as both computers are using the same conventions, you don't have to worry, but unfortunately, many of the more specific details vary from one machine to another.

It is therefore nice to be able to vary the options if you need to. Terminal Emulator II allows you to do this, offering every option you are likely to run across. You can, for example change the speed of transmission in case you are talking to a slower machine.

Unless you want to do something very tricky, you will want to stick to the standard conventions. You can choose these automatically when you turn on the computer by pressing 3 FOR DEFAULT OPTIONS instead of 2 FOR TERMINAL EMULATOR II. These standard options allow you to communicate with The Source or another TI-99/4A computer without worrying about any technical details.

You will have to decide if this is something you want to get into. It does require a fair amount of extra equipment: the TI Peripheral Expansion Box, the RS-232 interface card, and a telephone modem, the cradle that holds the telephone receiver for the computer to talk. Also, since the hourly subscription fees for the electronic communication services are quite high, you will probably not want to spend hours every day listening to the news on your computer. After a short time, you may find that you have little need for electronic communication, and regret that you invested in a high-priced gimmick.

On the other hand, telecommunication is a very useful tool for those who need it. If, for example, you want to exchange programs or data with another person, you will find telephone communication much easier than sending tapes or program listings through the mail. If you depend on minute-by-minute news reports (from the stock market, for example), you may need one of the electronic news services.

The computer industry has only begun to explore the possibilities of this type of electronic communication, and the systems will become far more

useful in the future. Within a few years, you might be able to use the computer to shop for furniture, read customized newspapers, or play games against a friend across the country.

AFTERWORD

As you have read this book, you have seen a few of the things you can do with your TI-99/4A. Cartridge programs help you learn about your machine and start it working for you immediately. You can have your computer take away your problems of routine financial calculations. You can have your children use one of the math education series, or teach yourself Spanish with its help. And, of course, you can play games—video games, traditional thinking games, or difficult fantasy adventures. With over a hundred cartridges to choose from, you should have no trouble finding a few that fit your interests.

In the course of this final section, you have seen a number of other things you can do with your computer. With no additional equipment at all, you can run programs in TI BASIC, either writing them yourself or typing them in from a book or magazine article. If you want more sophisticated functions, you can buy the Extended BASIC cartridge or one of the other programming languages.

The Speech Editor lets you have the computer speak words as you type them on the keyboard and let's you put spoken messages into your BASIC programs. For about the same price, the Terminal Emulator II program goes further and gives full control of the synthesizer's voice. More than that, though, the Terminal Emulator II cartridge allows you to connect your computer to the telephone, so that you can use your TI-99/4A to send or receive programs, data, or other electronic messages.

You will find your computer a wonderful tool, whether you choose to do your own programming, to buy advanced peripheral equipment to connect to your computer, or simply to use the basic machine with its growing family of useful cartridge programs. Enjoy it, and use it with confidence.

LATE BREAKING DEVELOPMENTS

Writing a book about the computer industry is like jumping on a horse at full gallop: by the time you reach the saddle, the animal has moved. In the few months that have separated the writing of this book from its appearance in the bookstores, much has happened to Texas Instruments and its line of products.

The summer of 1983 has not been kind to Texas Instruments. The price wars between the TI-99/4A and other home computers cut deeply into the company's profits, and have led to fears about its entire future. In effect, TI gambled and sold its home computer at a loss, hoping to make up the money on cartridge sales. So far, that hasn't happened, but there are signs that the situation will improve.

Texas Instruments will not abandon the TI-99/4A. Recently, TI has been strongly promoting the machine on television, and will stand by the TI-99 no matter what happens. And don't worry about cartridges: these are the breadwinners of the whole company, and will be available for many years to come. Every cartridge in this book is currently in the stores, and Bill Cosby is advertising many of them on national TV. There is no danger that TI will leave you without programs to run your computer.

In fact, Texas Instruments has been scrambling to prepare a variety of new programs for release before the end of 1983. As predicted in this book's introduction, TI has recently bought the rights to sell a number of the most popular video games. These are mostly games written and already proven on other computers by independent computer companies. TI has translated them for its own machine and will soon be selling them under its own name. If you have been waiting for good video games for your TI-99/4A, you will find them available soon.

One of the most exciting developments is a deal TI has made with Imagic, one of the leading video games companies. The two companies have already announced four titles, and expect to produce more in the future. Two of these will be available by Christmas, and two others are expected in early 1984. The first of these, *Demon Attack*, has long been a best-selling

cartridge for Atari and Commodore computers; the TI version is said to have spectacular graphics. Another interesting program is Microsurgeon, which lets you perform surgery on a simulated human face.

Another leading company to announce a cooperative effort is Brøderbund Software. TI is planning a version of this company's *Choplifter* game, which is a runaway best-seller for other computers. In this game, you pilot a helicopter into enemy territory on a mission to rescue hostages from prison. It is an exciting game based on a very original concept. Also announced is David's *Midnight Magic*, a video pinball game.

The third important company to join forces with TI is Sega Enterprises, a leading designer of video arcade machines. TI has announced three of these games, including the *Star Trek: Strategic Operations Simulator* game, which is well known in the video arcades. Other titles include *Congo Bongo* and *Buck Rogers: Planet of Zoom*.

The most exciting serious program is the new TI Miniwriter, which offers limited word processing without requiring the expensive Peripheral Expansion System. With nothing but a cassette recorder and the 4K Mini-Memory cartridge, you can obtain many of the features of the full TI writer program.

In the educational area, TI has announced a cooperative effort with Spinnaker Software, one of the leading designers of educational programs for Apple and Atari computers. *Facemaker*, one of these new programs, is an exciting product for young children, which lets them create a face by choosing which hair, eyebrows, nose, and mouth to put together. It also contains an intriguing memory game. *Story Machine*, the other Spinnaker cartridge, teaches reading skills.

These new product announcements signal the start of an exciting new era for TI-99 computer owners. Texas Instruments has too long neglected the excellent programs and video games sold by independent companies. These new announcements show that TI is now serious in providing the fine arcade-style games and educational programs that its owners expect. Many more should follow in coming years.

The other major development is still unofficial, but is considered definite. Sometime, probably before the end of the year, Texas Instruments will unveil a new machine that will sell alongside its TI-99/4A. While the exact nature of this machine is still a secret, it is known to be an expanded version of the TI-99/4A. It will have more memory, work faster, and provide expanded resources for TI owners wanting to move up to a more powerful machine. The larger machine will run all of the cartridges sold for the present TI-99/4A (except, perhaps, for a few early programs rarely sold anymore). You can therefore buy cartridges for your TI-99/4A and be assured you can use them if you move up to the new machine.

So, in spite of its recent setbacks, Texas Instruments is moving forward quickly, with both new programs and new machines. You can now buy many excellent video games for your TI-99/4A, and be sure that more will follow. And, if you ever tire of your machine's limitations, you can trade it in for a more powerful TI computer and still keep the cartridges you have bought and learned to use.

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