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NEW PRODUCTS

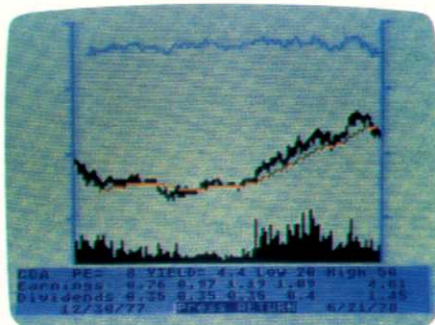
PERSONAL FINANCE AND RECORD KEEPING

MAKING SOUND INVESTMENTS

ATARI introduces the new INVESTMENT ANALYSIS SERIES to help you make decisions about your investments. Easy to use, these four separate programs can eliminate the need for hours of tedious calculations to get the same results.

Stock Analysis* consists of three separate programs on one diskette. *Portfolio Analysis* evaluates investment portfolios by calculating various statistics. *Stock Rate of Return* enables you to calculate the annually compounded rates of return for your various investments over a period of years. With *Stock Dividend Analysis*, you can assess the value of your stocks today based on projected future dividend payments. You can also compute the expected holding period and necessary price/earnings ratio for the market value to equal this present value. (Requires an ATARI 810™ Disk Drive and a minimum of 24K RAM.)

Bond Analysis* consists of two separate programs on one diskette: *Bond Price And Interest* and *Bond Yield*. User instructions are part of the program and allow for both beginners and experienced users. (Requires an



ATARI 810 Disk Drive and a minimum of 24K RAM.)

Stock Charting* allows the user to study and track selected stocks and monitor their on-going performance. Once you establish a portfolio, historical trends can be developed by entering daily quotations. With the variety of charts, moving averages, oscillators, volume data and high-low-close figures, you can make predictions for individual stocks. (Requires an ATARI 810 Disk Drive and a minimum of 24K RAM.)

Mortgage & Loan Analysis* calculates and displays the monthly payments and the total interest payments for a loan. With this program cassette, the user can easily compare different mortgage and loan terms by entering various combinations of interest rates, mortgage lives and loan values. (Requires an ATARI 410™ Program Recorder and a minimum of 16K RAM.)

MAILING LIST

Maintaining a personal address file is no longer a problem when you use the ATARI MAILING LIST program. Now you can maintain a record of names and addresses for social functions, business associates, club members or Christmas cards.

Remember special occasions by storing birthdays and anniversaries with your name and address file. Each month, you can call up all the birthdays and anniversaries for the month.

Names, addresses or additional information can easily be added, deleted or updated at any time. You can easily arrange your file alphabetically. If you have an ATARI printer, you can print labels or lists whenever you need them. (Requires an ATARI 410 Program Recorder and a minimum of 24K RAM. Printer and Disk Drive optional.)

Included in the program is a

General List program with almost the same capabilities as the MAILING LIST program, but it can be used to create other useful lists for you. For example, you can record an inventory of your belongings with serial numbers, your credit cards, insurance policies or albums and tapes.

PERSONAL INTEREST AND DEVELOPMENT



AN INVITATION TO PROGRAMMING™

The first cassette of a three-part series is now available. Learn how easy computer programming in ATARI BASIC can be. A must for beginning programmers, both adults and children. Learn how to make your ATARI Personal Computer do things for you. You don't have to know a thing about computers to use this series. A recorded voice asks you questions, waits for your response and indicates whether your response is correct or not. Following each lesson, you can practice what you learned before you continue.

*A Control Data CYBERWARE™ personal computer product manufactured under license from Control Data Corporation.

NEW PRODUCTS

With AN INVITATION TO PROGRAMMING I (one cassette), you'll learn about the ATARI Personal Computer keyboard and learn how to write simple programs and perform math calculations. The last lesson shows examples of the color graphics and sound capabilities of your ATARI Personal Computer. (Requires an ATARI 410™ Program Recorder and a minimum of 8K RAM.)

TOUCH TYPING

A good set of lessons for all. Whether you want to learn to type, increase your typing speed or your speed of entering programs on your ATARI Personal Computer, this program will benefit you. The ATARI computer keyboard closely resembles a typewriter, so transferring your new skills later to a typewriter is easy.

Learn at your own rate. These program cassettes provide step-by-step instructions to familiarize you with the typewriter keyboard and to increase your typing speed and accuracy. The program consists of drills on three difficulty levels: beginning, intermediate and advanced. You learn to type a variety of different materials while the computer calculates your speed and accuracy and determines your weak points. The built-in sentence generator provides drill and practice to strengthen your weak points. Each and every time you use this lesson, the sentences are different because they are randomly generated. (Requires an ATARI 410 Program Recorder and a minimum of 16K RAM.)

BIORHYTHM

Is today a good day for you physically, emotionally and intellectually? If you have the new BIORHYTHM program cassette, you can plot your

own personal biorhythm chart by giving the computer your birthdate. This program calculates your physical, emotional and intellectual high, low and critical days. To save your chart, you can print it on an optional printer. (Requires an ATARI 410 Program Recorder and a minimum of 8K RAM.)

LEARNING CAN BE FUN

Learning can be fun with four new education cassette programs for your ATARI Personal Computer System. (All require an ATARI 410 Program Recorder.)

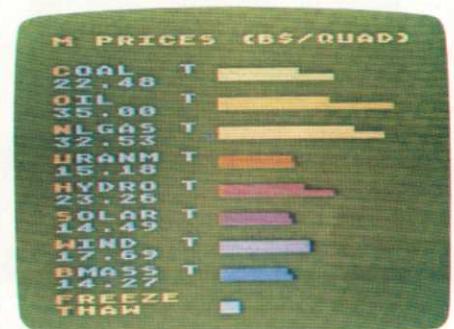
STATES & CAPITALS AND EUROPEAN COUNTRIES & CAPITALS

Learn the geography of the United States and Europe with these two new programs, (purchased separately) and have fun, too. The computer draws a map and quizzes you on the state or country name and capital. Be sure to spell the name correctly. The computer keeps score. Ages 10 to adult. (Requires a minimum of 16K RAM.)

ENERGY CZAR™

You are the government official responsible for the United States' energy policy. You must make decisions about such complex problems as which energy sources to use, and whether or not to subsidize or tax energy forms, tighten pollution controls, freeze prices, or ration gas. You must also monitor the country's entire energy usage system, including prices, taxes and environmental effects. The results of your decisions show up in the growth rate of the economy, the inflation rate, and whether or not the public thinks you're doing a good job.

ENERGY CZAR is an excellent tool for understanding the interaction of economic, technical, political and environmental factors and exemplifying the fundamental relationship among the economic concepts of price, supply and demand. Ages 12 to adult. (Requires a minimum of 16K RAM.)



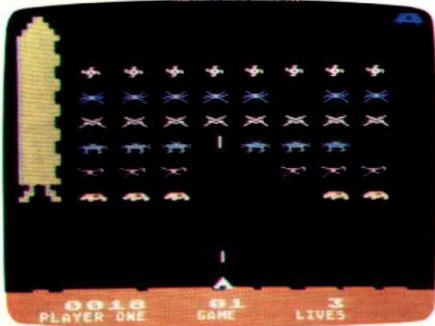
KINGDOM™

KINGDOM takes you back to the days of ancient civilizations, to a mythical country where you are King and must take care of your people. Your ATARI computer becomes a laboratory for testing your decision-making abilities. However, in this laboratory, if you make mistakes (which is a natural part of learning), you can always start over and profit from what you've learned!

In KINGDOM, the computer simulates an economy. Different factors influence this model — cost of land available, amount of grain planted and harvested, weather or natural hazards, etc. As King, you must try to produce enough food to feed your people, but not overproduce, lest the rats eat up your spare supply! Food production depends on how much land you have available, which, in turn, depends on how much money you can afford to spend. (Requires a minimum of 8K RAM.)

NEW PRODUCTS

LET US ENTERTAIN YOU SPACE INVADERS*



You just completed your lunar landing mission, but so did the deadly SPACE INVADERS. You must now protect the lunar surface and yourself from the enemy attack. As the SPACE INVADERS emerge from their spaceship, they progress towards the lunar surface. Equipped with a laser cannon, you try to destroy the enemy. Beware!! As you fire laser beams at the SPACE INVADERS, they also fire at you. This cassette program includes twelve different game variations. In some of these variations, the enemy even shoots diagonally. (Requires an ATARI 410™ Program Recorder and a minimum of 8K RAM.)

BLACKJACK

Based upon the popular game played throughout the world, BLACKJACK matches your skill (and luck) against the computer. While the game closely abides by Las Vegas rules, there are some variations, including a payoff for "5 Card Charlie". To get started, \$200 is placed in your bank (tally). Your maximum bet is \$2,000.

Be careful, because if you should exceed your credit limit, the house (computer) will politely request you to leave the table. However, you are invited back. BLACKJACK is a game avid gamblers can't resist playing. . . and playing . . . and playing. (Requires an ATARI 410 Program Recorder and a minimum of 8K RAM.)

MORE POWERFUL PROGRAMS FOR THE PROFESSIONAL ATARI MAKES DATA ANALYSIS EASIER

If you are collecting data, whether it be weekly sales, food bills, test scores, jogging times or whatever, the ATARI GRAPH IT™ and STATISTICS I programs can help you visualize and interpret your data.

Now that you've collected all your data, you want to make some sense out of it. With the ATARI GRAPH IT program, you can turn your data into graphs and charts that show your information visually. GRAPH IT makes it easier to present data to others, since it is easier to see relationships with graphs than with tables full of numbers. You can even do 2 and 3-dimensional and polar plots with this program. Use your joystick controller to find values at specific



points on the 2 and 3-dimensional plots. GRAPH IT makes it easy to determine the intersection between two lines. (Requires an ATARI 410 Program Recorder and a minimum of 16K RAM.) Two cassettes.

Maybe you want a more detailed analysis of your data than can be provided by pie graphs or bar charts. The ATARI STATISTICS I program allows you to enter, edit or update data in a file and then calculate the following statistics for each data file: mean, median, mode, root mean square, variance, standard deviation, skewness, kurtosis. Easy to use, you don't have to be a statistician or a mathematician to get the information you need. (Requires an ATARI 410 Program Recorder and a minimum of 16K RAM. Adding additional memory allows you to analyze more data values. Printer and disk drive optional.)

MORE SPEED AND POWER FROM YOUR ATARI PERSONAL COMPUTER

The new ATARI ASSEMBLER EDITOR cartridge provides programmers with an additional dimension of programming power. Using the cartridge's three programs, the user can easily create programs in assembly language and then edit, assemble, test and debug them. These assembler routines then can be used as part of an ATARI BASIC program. (Requires a minimum of 8K RAM.)

You can now unleash the speed and power of your ATARI Personal Computer System by combining BASIC and assembly languages. Use the Assembler Editor:

To generate special sound effects.

*Trademark of Taito America Corporation.



NEW PRODUCTS

- To generate high-speed graphics and animation.
- To utilize the interrupt capabilities of the machine.
- To accomplish high-speed complex logical calculations and manipulations (from ten to one thousand times as fast as BASIC).

The ATARI ASSEMBLER EDITOR consists of the following three programs:

- EDIT (Editor program) — Helps you put programming statements in a form the Assembler (ASM) understands. Source statements can be input via the keyboard, diskette, or cassette, and listed on a printer.
- ASM (Assembler program) — Takes the program statements you create in the EDIT step and converts them to machine code, issuing diagnostics where applicable. You can then designate where to store the machine code and assembled listing.
- DEBUGGER — Helps you trace through the program steps. You can run the program a step at a time and simultaneously display the program contents, display and change memory contents, disassemble memory, assemble one instruction into memory and execute the entire program.

ATARI ANNOUNCES NEW ACCESSORIES FOR YOUR SYSTEM

As your needs grow, we are continuing to expand our line of accessories for your personal computer system. Visit your local dealer soon to see the following new accessories.

A NEW THERMAL PRINTER

Now available at your local dealer is the ATARI 822™ Thermal Printer.

This new printer connects directly to the ATARI Personal Computer to provide high quality dot-matrix print-out on thermal paper. This quiet, efficient printer prints a 40-character line at a rate of 37 characters per second. The full 96 characters available on your ATARI Personal Computer can be printed with this new printer. You can also plot points one line at a time through a simple assembly language routine.

THE LIGHT PEN IS HERE!

The CX70 Light Pen is now available and can be used in programs you write for menu selection, games, computer art . . . whatever you can dream up! Your Light Pen comes with complete instructions and a cassette containing demonstration programs to stimulate your imagination. Plugging into the controller jack on your ATARI Personal Com-

puter, the CX70 Light Pen is easy to use. It can be used with your program in all graphics modes in BASIC, PILOT, assembly language and other ATARI computer programming languages. Visit your local dealer now for a demonstration.

ADDED COMMUNICATION CAPABILITY

Although the ATARI 830™ Acoustic Modem isn't a brand new product, it opens up so many services to you that we thought we'd remind you that it's available. This modem allows you to set up communications over standard telephone lines. You can access news, weather, stock reports, electronic mail systems and other users of ATARI Personal Computer Systems. Your local dealer can demonstrate both the ATARI 830 Acoustic Modem and ATARI TeleLink™ I cartridge. One free hour of access to the CompuServe information service is available to all TeleLink I owners. You will also be able to read the ATARI Newsletter and TALK TO ATARI through CompuServe information service.



PERSONAL USE

COMPUTERS FOR PEOPLE™



Imagine merely touching a few keys on your ATARI 800™ Personal Computer and making all your travel arrangements yourself in just a few minutes at any hour of the day or night. Think of the joyful student who can access that government publication at home at 2 a.m. when the paper's due at 8 a.m. Can you envision pushing a few keys whenever you have dinner guests and calling an exciting new and different recipe from your favorite cookbook? Can you conceive of being able to access the latest news wires or stock reports before they're even in the newspaper or to read movie reviews or pro football statistics on your screen? Visualize the excitement of immediately announcing a new baby to your friends all over the country by typing a few words. Imagine how much fun Christmas shopping could be if you didn't have to fight the crowds in the stores but could view products on your television screen and just press a few keys to order them.

Imagine if you could do all these things and more! The time is now! A few lucky residents in Columbus, Ohio can now access all of these ser-

vices or will be able to in the near future. These individuals are participating in a test project jointly conducted by Atari, Inc., CompuServe, Inc. (a time-sharing computer information service company), and Qube* (a cable television subsidiary of Warner Amex Cable Communication).

One of the greatest wonders of this new system is that technical knowledge is totally unnecessary to operate the system. Instructions for using the system are presented in non-technical language via cable network, just like an educational television program. However, viewers can interact directly with the instructor by typing on their QUBE* console. To access the wealth of information available from CompuServe information services, the users merely call up an index of the information services and touch the designated key for the information they wish to see.

You, too, can access some of these services from CompuServe information services with your ATARI Personal Computer, although not via cable. All you need is an ATARI 830 Acoustic Modem, the TeleLink™ I

cartridge and a standard telephone. Then you can sign up for services from CompuServe or other computer service companies.

Why is the Columbus project so revolutionary? First of all, this is the first time cable communication has been linked with the capabilities of a personal computer system, resulting in a total home information and entertainment system. The possibilities are almost limitless. Cable transmission of information can provide fast and inexpensive transmission throughout the country. Two-way cable systems enable the user and information source to communicate back and forth with each other, opening opportunities for ordering, educational study, viewer participation in panels and shows, research and whatever else the imagination can develop.

Dare to dream and you may see the service tomorrow. **ATARI . . . COMPUTERS FOR PEOPLE.**



*Indicates trademark of Warner Amex Cable Communications.

PERSONAL USE

ELECTRIC BILLS ON THE RISE?

Are your electric bills getting you down? With the cost of energy today, everyone groans when the bill arrives, promising to turn off more lights, buy a more energy-efficient refrigerator or use cold water. The following program may help you to

estimate your monthly electric bills. The tables opposite show what inputs you should put into the program, according to your household. Energy usage is based on average levels developed by Pacific Gas and Electric in California and may vary with

your household. Using this program on a regular basis can help you monitor your use of electricity so you can reduce your bill. Remember, this program only includes electricity. You may want to expand it to include appliances that use natural gas.

```
10 PRINT "WHAT IS YOUR LOCAL RATE PER KILOWATT
    HOUR (KWH) OF ELECTRICITY";
20 INPUT RATE
30 PRINT "HOW MANY LIGHTBULBS DO YOU HAVE
    IN YOUR HOUSE";
40 INPUT LIGHT
50 FOR A=1 TO LIGHT
60 PRINT "LIGHTBULB: #";A;" WHAT WATT";
70 INPUT WATT
80 PRINT "HOW MANY HOURS IS IT ON";
90 INPUT HOURS
100 X=WATT*HOURS/1000
110 GOSUB 580
120 NEXT A
130 M1=T*30*RATE
140 PRINT "YOUR MONTHLY TOTAL IS $";M1
145 PRINT :PRINT
150 PRINT "WHAT TYPE OF HEAT/AIR CONDITIONING
    DO YOU HAVE";
160 INPUT HEAT
170 M2=HEAT*RATE
180 PRINT "YOUR MONTHLY TOTAL IS $";M2
185 PRINT :PRINT
190 PRINT "DO YOU HAVE A SWIMMING POOL ELECTRIC
    CIRCULATING PUMP & SWEEP (1=YES, 0=NO)";
195 INPUT POOL
200 IF POOL=0 THEN POOL=0
210 IF POOL=1 THEN POOL=465
220 M3=POOL*RATE
230 PRINT "YOUR MONTHLY TOTAL IS $";M3
235 PRINT :PRINT
240 PRINT "WHAT TYPE OF BED HEATER DO YOU HAVE";
250 INPUT BED
260 M4=BED*RATE
270 PRINT "YOUR MONTHLY TOTAL IS $";M4
275 PRINT :PRINT
280 PRINT "HOW MANY ELECTRIC LIGHTED CLOCKS
    DO YOU HAVE";
290 INPUT NIGHT
300 PRINT "HOW MANY ELECTRIC UNLIGHTED CLOCKS
    DO YOU HAVE";
310 INPUT CLOCKS
320 M5=(NIGHT*3+CLOCKS*2)*RATE
330 PRINT "YOUR MONTHLY TOTAL IS $";M5
335 PRINT :PRINT
340 PRINT "HOW MANY APPLIANCES DO YOU HAVE";
350 INPUT APPL
360 FOR X=1 TO APPL
370 PRINT "FOR APPLIANCE ";X;" WHAT IS YOUR
    USAGE RATE";
380 INPUT USAGE
390 PRINT "WHAT IS AVERAGE DAILY FREQUENCY OF USE
    OF THIS APPLIANCE";
400 INPUT FREQ
410 T=USAGE*FREQ
420 GOSUB 580
430 NEXT X
440 M6=T*30*RATE
450 PRINT "YOUR MONTHLY TOTAL IS $";M6
460 PRINT :PRINT :PRINT :PRINT :PRINT
465 FOR A=1 TO 200:NEXT A
470 PRINT "APPROX. TOTAL MONTHLY ELECTRIC BILL"
480 PRINT :PRINT
490 PRINT "LIGHTBULBS:      $";M1
500 PRINT "HEAT/AIR COND:   $";M2
510 PRINT "POOL PUMP:        $";M3
520 PRINT "BED HEATER:       $";M4
530 PRINT "CLOCKS:           $";M5
540 PRINT "APPLIANCES:      $";M6
550 PRINT :PRINT
560 PRINT "TOTAL ELECTRIC $";M1+M2+M3+M4+M5+M6
570 END
580 T=X+T
590 RETURN
```

lighting

heating or air conditioning

pool heater

waterbed heater

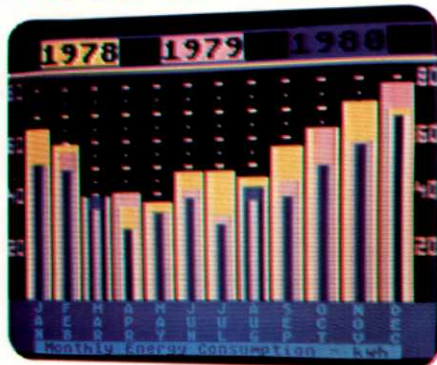
electric clock

appliances

total monthly electricity bill estimate

PERSONAL USE

NUMBERS TO BE ENTERED IN ELECTRICITY USAGE PROGRAM



You can increase the accuracy of the estimates of your electric bill by entering the amount of electricity your appliances actually use rather than average figures. You can also include other appliances not listed in these charts if you want.

To determine the usage rate, multiply the number of watts the appliance uses by .001. For the frequency input, enter 1 for each hour (or .017 for each minute) you use the appliance each day.

REFRIGERATOR TYPES

| | Usage Rate | Frequency Input |
|---|------------|-----------------|
| 10 cu.ft.—manual defrost | 2.03 | 1 |
| 12 cu.ft.—partially automatic defrost | 3.01 | 1 |
| 15 cu.ft.—manual defrost | 3.03 | 1 |
| 15 cu.ft.—manual defrost, 1979/80 model | 2.03 | 1 |
| 15 cu.ft.—frostfree | 5.07 | 1 |
| 16 cu.ft.—frostfree | 5.03 | 1 |
| 16 cu.ft.—frostfree, 1979/80 model | 3.43 | 1 |
| 20 cu.ft.—frostfree | 6.10 | 1 |
| 20 cu.ft.—frostfree, 1979/80 model | 4.57 | 1 |

OTHER APPLIANCES

| | Usage Rate | Frequency Input |
|--|--------------|---------------------|
| Electric dishwasher—normal cycle | 1 | 1 per load |
| Electric dishwasher—hot water | 3 | 1 per load |
| Electric range/oven | 1 | 1 per meal |
| Electric oven—self-cleaning | 6 | 0.003 per cleaning |
| Microwave oven | 0.1 | 1 per 5 minutes |
| Toaster oven (portable) | 0.5 | 1 per hour |
| Coffee maker | 0.25 | 1 per brew |
| Electric skillet | 0.33 | 1 per hour |
| Electric deep fryer | 1 | 1 per hour |
| Dehydrator | 0.25 | 1 per hour |
| Waffle iron | 0.33 | 1 per 4 servings |
| Hair dryer | no. of watts | 0.000017 per minute |
| Steam iron | 0.33 | 1 per hour |
| Washing machine—cold water (50 gal.) | 0.25 | 1 per load |
| Vacuum cleaner | 0.5 | 1 per hour |
| Radio | 0.1 | 1 per hour |
| Stereo | 0.1 | 1 per hour |
| TV — black & white | 0.08 | 1 per hour |
| TV — color | 0.1 | 1 per hour |
| ATARI Personal Computer with either an ATARI Disk Drive or an ATARI 410 Program Recorder | 0.04 | 1 per hour |

HEATING AND AIR CONDITIONING TYPES

| Characteristics | Type (Average Monthly Usage) |
|--|---------------------------------|
| Single family electric space heating | 1217 |
| Multiple family electric space heating | 456 |
| Single family electric heat pump | 739 |
| Single family electric air conditioner | 667 |
| Multiple family electric air conditioner | 152 |
| Electric heat pump air conditioner | 298 |
| Evaporative cooler air conditioner | 43 |
| No heating or air conditioning in use | 0 |

BED HEATER TYPES

| Characteristics | Type (Average Monthly Usage) |
|----------------------------------|---------------------------------|
| Water bed heater | 106 |
| Electric blanket—twin | 15 |
| Electric blanket—double or queen | 23 |
| Electric blanket—king | 30 |
| None or not in use | 0 |

ENTERTAINMENT PLAYER- MISSILE GRAPHICS

As you probably already discovered, particularly if you have the Star Raiders™ cartridge, your ATARI Personal Computer has significantly greater graphics capabilities than any other personal computer.

Have you been wondering if you can make your ATARI Personal Computer do the spectacular things that Star Raiders does? We have exciting news for you! You can learn to write graphics and animation programs just as good as, and possibly better than, Star Raiders. Writing these programs, however, is more difficult than using BASIC. Mastering the complexity of your ATARI Personal Computer takes a lot of work. In this article, we will explain just one aspect of the graphics capabilities of your ATARI Personal Computer — the basics of player-missile graphics.

ATARI's basic system has very powerful graphics with four *players* you can use. Thus, you can have four different objects moving around the screen. All four players are independent of each other and therefore can move independently from

one another and from the background or the playfield.

Each player also has its own *color register*, so you can make each player a different color from other players and from the background. You can put up to nine different colors on the screen, depending on the graphics mode you use to write your program.

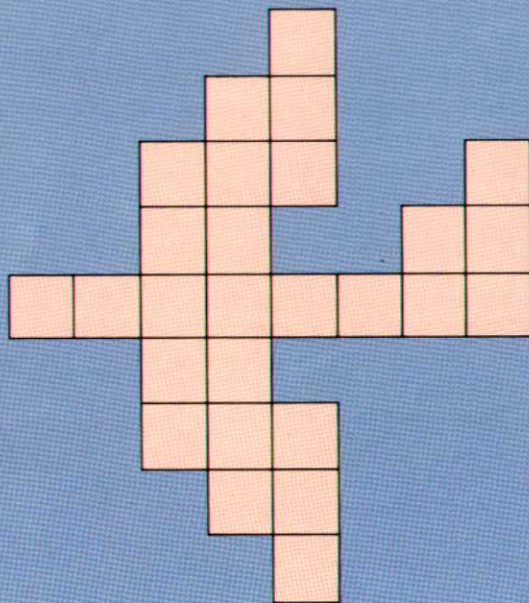
Your ATARI computer also allows you to make your players fatter or skinnier by making them either double or quadruple width. You also have the option of making your players either single or double line *resolution*. Single line resolution enables you to design your player's shape with greater detail, but the program uses more space in memory and runs more slowly. With double line resolution, you sacrifice some detailing, but your program uses less memory space and runs more quickly.

Since both the player and the background will be presented on the screen in the same location, you must decide which should have priority. If you give the player priority,

the player and not the background will be displayed on the screen in the particular position. Conversely, if you give the background priority, the player will seem to disappear behind the playfield. You can also prioritize the different players to define which player will show if two players collide at the same location.

Finally, each player has one tiny player, a *missile*, associated with it. The missile takes on the same color as the player, but can move independently of the player. Therefore, if you want, you can have airplanes drop bombs or some other small item. If you would rather have a fifth player than separate missiles, you can group the four missiles together to form a fifth player. This player can be a separate color from the other four players.

How do you use all of these fantastic capabilities of your ATARI Personal Computer? You might think it's very difficult to put all of this together into a program, but it's really very simple. The program below will put a player on the screen, an airplane.



| | |
|---|---|
| 10 SETCOLOR 2,0,0 | Sets the background or playfield color. |
| 20 X=130 | Sets the horizontal position of the player. X must be a number between 48 and 207 (48 = far left, 127 or 128 = center, 207 = far right). |
| 30 Y=70 | Sets the vertical position (Y) of the player. For double line resolution, Y must be a number between 4 and 123 (4 = top, 63 or 64 = center, 123 = bottom). For single line resolution, Y must be a number between 8 and 247 (8 = top, 127 or 128 = center, 247 = bottom). |
| 40 A=PEEK(106)-8:POKE 54279,A:PMBASE=256*A | Sets up location in memory for player-missile graphics. |
| 50 POKE 559,46 | Enables double line resolution (46 = double line resolution, 62 = single line resolution). |
| 60 POKE 53277,3 | A 3 enables player-missile graphics. |
| 70 POKE 53248,X | Sets the horizontal position (X) for player 0. |
| 80 FOR J=PMBASE+512 TO PMBASE+640:POKE J,0:NEXT J | Clears player out first. |
| 90 POKE 704,88 | Sets color of player 0 to pink. To change the player color, consult color chart below. |
| 100 FOR J=PMBASE+512+Y TO PMBASE+520+Y:READ A:POKE J,A:NEXT J | Tells computer to draw a player to be an airplane. |
| 110 DATA 8,24,49,51,255,48,48,24,8 | Data that defines the shape of the player. |

Now that you have a player on the screen, the following additional lines will allow you to move your player around with a joystick.

| | |
|---|--|
| 120 A=STICK(0) | Tells the computer to read joystick 1. |
| 130 IF A=15 THEN GOTO 120 | Checks to see if joystick is straight up and down; if yes, keeps reading the joystick position until it changes. |
| 140 IF A=11 THEN X=X-1:POKE 53248,X | Checks to see if the joystick is pressed to the left for player 0; if yes, moves player left. |
| 150 IF A=7 THEN X=X+1:POKE 53248,X | Checks to see if the joystick is pressed to the right for player 0; if yes, moves the player right. |
| 160 IF A=13 THEN FOR J=10 TO 0 STEP -1:POKE PMBASE+512+Y+J, PEEK(PMBASE+511+Y+J):NEXT J:Y=Y+1 | Checks to see if the joystick is pressed to the top for player 0; if yes, moves player up. |
| 170 IF A=14 THEN FOR J=0 TO 10:POKE PMBASE+511+Y+J, PEEK(PMBASE+512+Y+J):NEXT J:Y=Y-1 | Checks to see if the joystick is pressed to the bottom for player 0; if yes, moves player down. |
| 180 GOTO 120 | Keeps the program continuing to read the subroutine for determining which direction the joystick is pressed. |

To stop the program, press SYSTEM RESET.

ENTERTAINMENT

This program was written to help you understand the principals of player-missile graphics and thus, you can improve upon it in a variety of ways. All you need to do is add additional lines to your program.

You might add more players. To do this, copy lines 20 through 180 with new numbers and substitute the following numbers in the appropriate lines.

| | Line Numbers | | | |
|----------|--------------|-----|---------|---------|
| | 70, 140, 150 | 90 | 160 | 170 |
| player 0 | 53248 | 704 | 512,511 | 511,512 |
| player 1 | 53249 | 705 | 640,639 | 639,640 |
| player 2 | 53250 | 706 | 768,767 | 767,768 |
| player 3 | 53251 | 707 | 996,995 | 995,996 |

You might want to have each player controlled by a different joystick, which can be done by adding a new line like line 120 but with a different line number and the following change.

| | |
|-------------|----------------|
| Joystick 1: | 120 A=STICK(0) |
| Joystick 2: | 120 A=STICK(1) |
| Joystick 3: | 120 A=STICK(2) |
| Joystick 4: | 120 A=STICK(3) |

You can also change the color of your players. To do this, change the number 88 in line 90. To determine the new number, multiply the number of the color you want (from the chart below) times 16 and add the luminosity you want (a whole number between 0 and 15). Put this new value in the line.

Color

| | | | |
|---------------------|---|--------------|----|
| Gray | 0 | Medium Blue | 8 |
| Light Orange (Gold) | 1 | Light Blue | 9 |
| Orange | 2 | Turquoise | 10 |
| Red-Orange | 3 | Green-Blue | 11 |
| Pink | 4 | Green | 12 |
| Lavender | 5 | Yellow-Green | 13 |
| Blue-Purple | 6 | Orange-Green | 14 |
| Purple-Blue | 7 | Light Orange | 15 |

The possibilities are almost limitless. Watch in future issues of THE ATARI CONNECTION™ for additional steps in writing games.

COMPUTERESE DICTIONARY

Color Register—The specific location in the computer's memory that stores the color you tell it to.

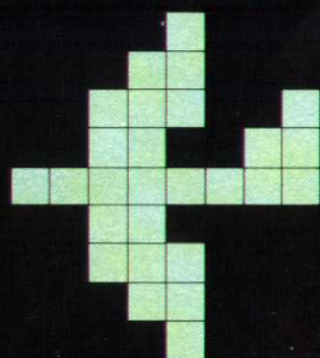
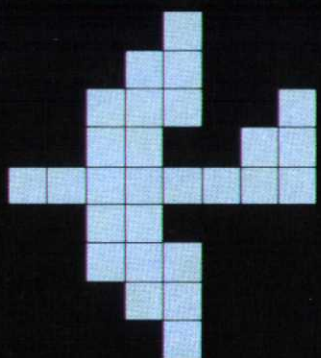
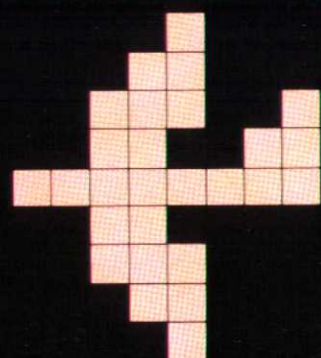
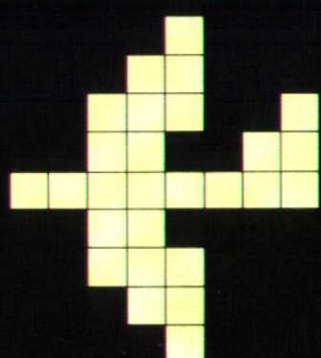
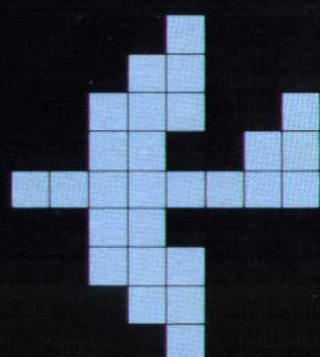
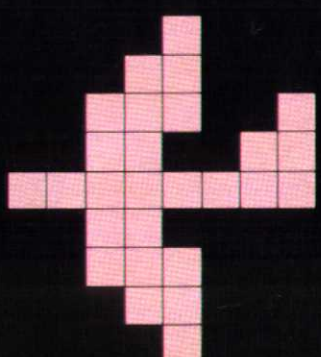
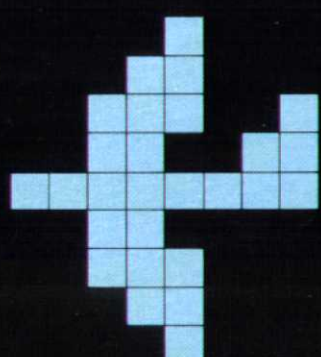
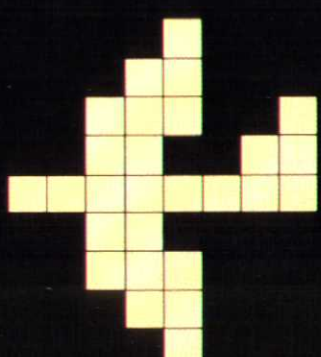
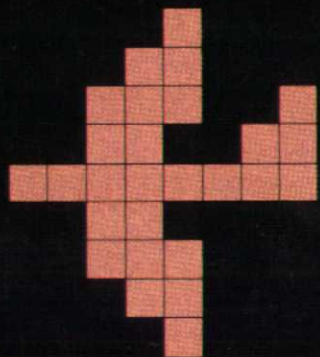
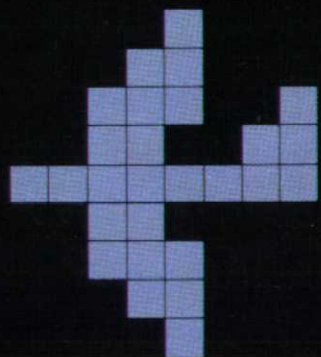
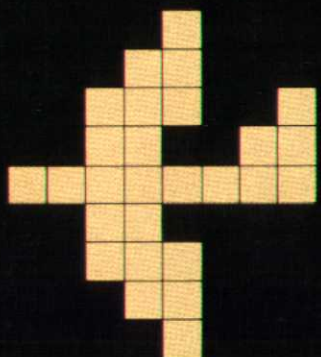
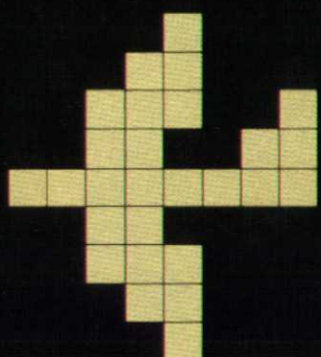
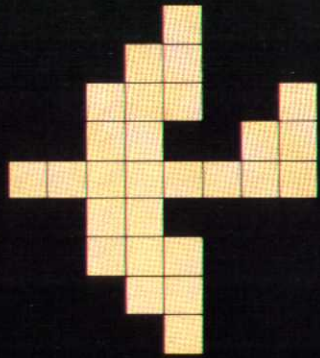
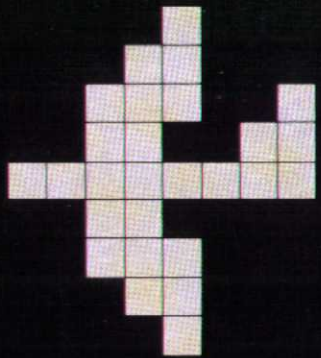
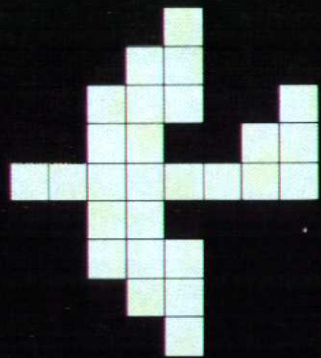
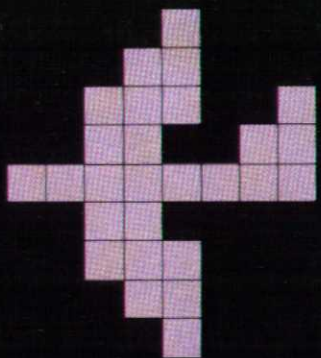
Missile—An object (2 bits wide) that can be moved around the screen. (See *Player*.)

Peek—A BASIC command that tells the computer to look into a specific location in the computer's memory and see what is stored there.

Player—A player is an object (8 bits wide) which can be moved around the screen. While they are often used for games, many other applications are possible. The system supports 4 players and 4 missiles.

Poke—A BASIC command that tells the computer to put a new number into a specific location in the computer's memory.

Resolution—The number of points ("pixels") you can put on a television screen vertically and horizontally.



EDUCATION

EDUCATION LABORATORIES FOR THINKING

Ted M. Kahn

The word "laboratory" usually conjures up the image of a mad scientist, hidden away from the rest of the world in some cold, damp room full of bubbling potions and foreboding cobwebs. But think of this — each of us has his or her own laboratory, even if we're not all scientists. A typewriter, a dictating machine, paper and a pencil and an artist's or music composer's studio with canvas and music paper are just as much laboratories for composing ideas as a scientist's laboratory is. Children today can use computers as a laboratory for thinking.

ATARI Personal Computers can become laboratories when they are used as *simulators*. Computer-based simulations are exercises in asking the question "What if ...", trying out different strategies and solutions, examining the results and learning the fundamentals of a model or theory. Simulations allow us to work in laboratories that may not exist or would be too costly to be practical. All of us, however, make complex decisions throughout our lives, decisions which require careful consideration of the facts, evaluation of different possible courses of action and prediction of future consequences. We must prepare students to make complex decisions which are ever increasing in their lives. We must teach students how to think and solve "real" problems. Personal computers can play a major role in this teaching, and the time for this education is now. Simulations and games have become an important part of education during the past two decades. Thus, ATARI has developed several simulation programs.

Kingdom™ and **Energy Czar™** are both programs (described in New Products) that simulate the economy, but vary in the factors influencing the model. **Kingdom** simulates

resource management in an ancient agricultural economy, whereas

Energy Czar simulates the social, economic and political aspects of energy policy making.

Video Easel™ is another simulation, although at first glance, the program may seem to be a random assortment of flashy colors and patterns. Part of this program is based on the game "Life", developed by English mathematician John Conway. Life simulates a very powerful mathematical model of population growth and decline. The entire screen is divided into cells. Living organisms continue to thrive, grow and give birth to new organisms if surrounded by just the right number of "neighbors" to provide a supportive environment. Organisms die if surrounded by either too many or too few neighbors, presumably because of "overcrowding" or "isolation", respectively.

ATARI will continue to develop educational simulation programs and further the use of computers as a powerful educational tool. The greatest promise, however, lies in students and teachers learning to develop and write their *own* computer simulations. This process is an example of creative thinking at its best. This process requires time, planning and cooperation from many different people, but the end result is worth it! In future issues of THE ATARI CONNECTION™ we will publish case histories of what others have done in this area. Let us hear how you are using your ATARI Personal Computer for your own educational laboratories for thinking.

As Albert Einstein once said: "To raise new questions, new possibilities, to regard old problems from a new angle requires creative imagination and marks real advance in science."



EDUCATION

THE RENAISSANCE KID



Brenda Laurel

"It was the best of times, it was the worst of times...." Dickens knew when he wrote those words that he was describing more than the climate of pre-revolutionary France; he was identifying a critical moment in the process of change.

For children today, it seems to be a worst of times. If we believe our popular reality, the world is surely headed for disaster, and there are no new answers. We are approaching the limits of our resources and our ecosystem, our economy is quivering, and our schools are crippled by shortages of funds and teachers. Scientific knowledge doubled in the last seven years, but the achievement scores of American students continued to decline. Information may not be hard for our civilization to collect, but it is exceedingly difficult to sort through, harder still to disseminate and impossible to interpret or absorb. The jewel of our age — our high technology — is buried in the services of creditors, the defense department and a distant technological elite. The wonders of microprocessors are locked away in microwave ovens and Cadillac dashboards.

There was a time, a worst of times, when the wonders of books were

locked away in monasteries, or perhaps in the dusty library of an obscure feudal lord. Even if one could obtain such a rare item as a book, for most folks, the writing on the page was as indecipherable as a line of programming code.

Then came the printing press and with it, books. Telescopes, clocks and other budding inventions followed and with them came a rebirth of the desire to know new things and to find new ways of knowing. This era was the Renaissance. Those who glimpsed the new possibilities struggled against believers in the status quo — institutions and fellow humans. Gradually, average people began to say, "I wonder" again, and they learned to read. Art, literature, scientific invention and philosophical inquiry flourished.

Thinking again of today's worst of times, something hopeful is speaking to us and for us from contemporary science and imagination: the hopeful fables of George Lucas, the hopeful vision of the space program. The hope is that our sense of wonder can be reborn. We are gearing up for a "Renaissance".

The printing press of our age has

been invented. Today's children have access to computer technology, can learn its languages and can grow up with the most elegant and powerful tool of our civilization. Today's children can sit down at terminals and access works from the London Library or the Library of Congress. They can share the exhilaration of the first images transmitted from distant planets. They can access instruction and information on nearly any topic with computers — nuclear reactors, music theory, why dandelions turn into puffs. Today's children can control the pace, the order and the level of difficulty of the instruction they receive. A child can interact with a computer before she or he even knows how to read. Like the insatiable minds of the Renaissance, our children can access or invent ways to find out about practically anything they want to know. Our children sit on the edge of possibilities we have seen only dimly. Even in their infancy, these tools are astonishingly powerful. Personal computers, in homes and in schools, are opening doors for all of us to take advantage of the limitless possibilities of our technology.

Tomorrow, our children may be mining asteroids and moving heavy industry into space. They may perfect fusion reactors and complete a unified field theory. They may create three-dimensional computer art forms and compose symphonies with the movements of the stars.

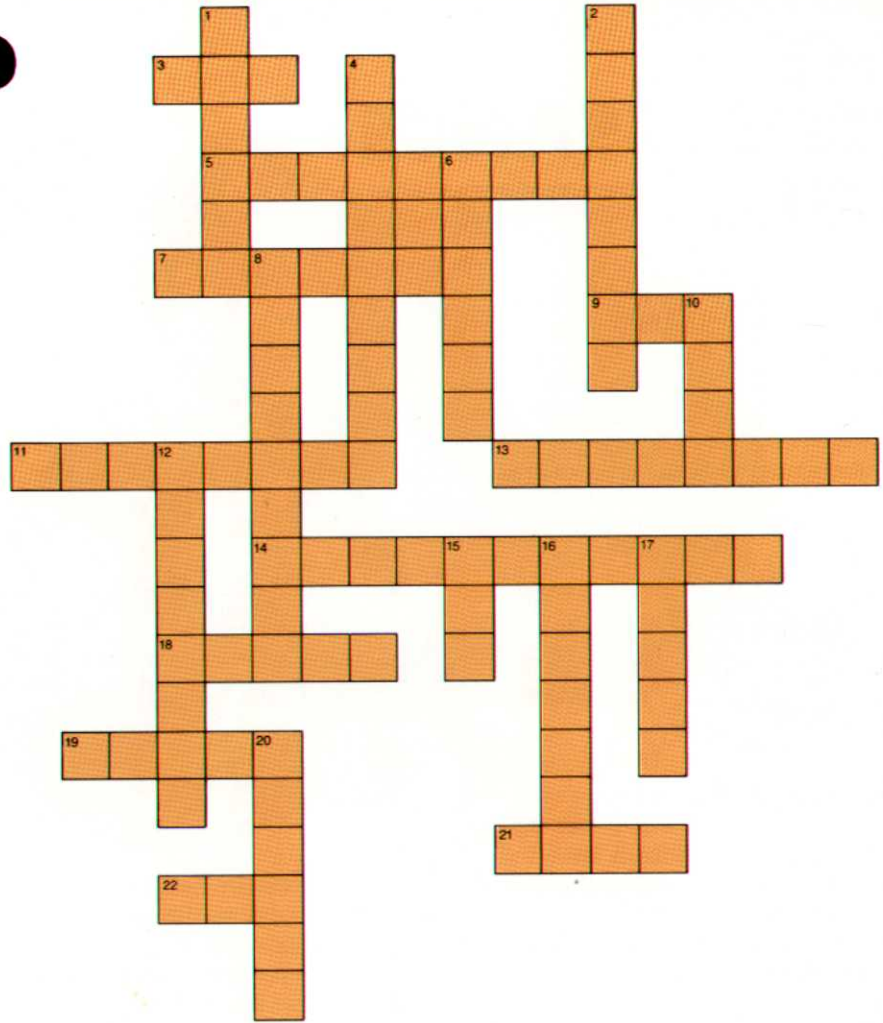
For the Renaissance kid . . . today is the best of times

SPECIAL PROMOTIONS FOR EDUCATORS

ATARI is offering many special promotional programs for educational institutions and schools. Tell your school officials to visit their local ATARI Dealer to find out the details of these special programs.

KIDBITS CROSSWORD

Fill in this puzzle and test how many computer words you know. The answers are on the last page. Don't look until you have done the best you can. Try to remember the new words for later puzzles.



ACROSS

3. A mistake in your computer program.
5. An instruction to your personal computer.
7. A group of instructions that tell your personal computer what to do.
9. Where your personal computer saves both your programs and your information while you are using them.
11. Machines that make up your personal computer system.
13. What is used to talk with your personal computer. BASIC is a programming _____.
14. A computer that answers you quickly is _____.
18. How many bits of information are usually in a byte?
19. The name of the amount of information your computer needs to make a letter, number or special sign in the computer memory (plural).
21. When you make a change in a program you are writing, you _____ it.
22. Smallest amount of information your personal computer can work with.

DOWN

1. Little white box on your screen that shows where the next letter or number you type will be written on the screen.
2. Computer programs and information used with your personal computer.
4. Electronics used so two machines in your personal computer system can talk to each other.
6. Part of the personal computer that stores information.
8. Group of programs or instructions inside your personal computer that tell it what to do (two words).
10. A list of different things you can do in a program.
12. Small, flat, black square which you use to save your personal computer programs.
15. Programs you can use in your personal computer but cannot be changed are called _____.
16. An instruction to your personal computer.
20. Your personal computer and all your accessories (like a tape recorder or a printer) make up your personal computer _____.

KIDBITS

KIDBITS PROGRAMS

Type the **KIDBITS** programs into your computer. Make sure you have your BASIC cartridge installed in your computer before you start. Some **KIDBITS** programs are just fun to use and show you some of the things you can make your ATARI Personal Computer do for you. Others can help you learn. Make sure you type the programs in exactly as they are below or your program won't work. Computers have to be told exactly what to do. They can't think as well as you do, although they do things very quickly. After you type in your program, type "RUN" and the computer will show you your program.



MATH CAN BE FUN

Practicing your math facts can be fun with your ATARI Personal Computer. Type in this program and you can practice your addition facts.

```
10 PRINT "ADDITION FACTS"
20 X=INT(RND(0)*10)
30 Y=INT(RND(0)*10)
40 PRINT X;"+";Y;"=";
50 INPUT A
60 IF A=X+Y THEN 90
70 PRINT "WHOOOPS!!! TRY AGAIN."
80 GOTO 40
90 PRINT "GOOD!!! DO YOU WANT
  TO TRY ANOTHER?"
100 PRINT "(TYPE 1 FOR YES,
  TYPE 2 FOR NO)"
110 INPUT C
120 IF C=1 THEN 10
130 END
```

If you want to practice your subtraction or multiplication facts, you need to make the following changes.

For Subtraction:

```
10 PRINT "SUBTRACTION FACTS"
35 IF X<Y THEN 20
40 PRINT X;"-";Y;"=";
60 IF A=X-Y THEN 90
```

For Multiplication:

```
10 PRINT "MULTIPLICATION FACTS"
40 PRINT X;"*";Y;"=";
60 IF A=X*Y THEN 90
```

CIRCLE

This program will draw a circle for you on the screen. See if you can figure out how to change where the circle is printed on the screen.

```
10 GRAPHICS 7+16
20 COLOR C
30 C=C+1:IF C>3 THEN C=1
40 A=A+0.1
50 X=SIN(A)*40:Y=COS(A)*40
60 REM PLOT 80,45
70 PLOT X+80,Y+45
80 GOTO 20
```

BUSINESS/PROFESSIONAL

WE BELIEVE IN OUR PERSONAL COMPUTERS

ATARI believes in its products. ATARI **employees** believe in the personal computer system. We use it in our work. The following articles show you some of the ways we use our system to make our work easier while still making good business and professional decisions. Maybe you can use your ATARI Personal Computer the same way in your work. Let us know how you're using your computer in your work, so we can share your ideas with others through THE ATARI CONNECTION™. Just write to this magazine.

DO YOU REALLY KNOW HOW MANY WIDGETS YOU HAVE?



Frank Marrone, Distribution

Inventory control can sometimes be a headache for small business. In most small companies, manual inventory records are the norm and, unfortunately, so are record inaccuracies. Errors in inventory records can seriously damage your business by resulting in angry and lost customers. If your inventory records are too high, you may commit to ship something you think you have, but really don't. If your records are too low, you may miss out on an order you could have filled. In addition, you may commit to needless replenish-

ment when your resources could have been spent better elsewhere.

At ATARI, we use the ATARI 800™ Personal Computer for finished goods inventory for both the Computer and International Divisions. Our program includes a complete listing of all products stocked in the warehouse (approximately 120 items) along with their respective part numbers. This list can be updated easily and quickly as we add new products, discontinue obsolete products or change part numbers. In addition, inventory balances can be adjusted at any time based on cycle counts and quarterly physical counts. The beginning inventories, of course, had to be posted initially.

Sales orders can now be entered on the shipping log, which is displayed on the screen. The first entry is the date and sales order number. We then enter each item on the sales order one at a time. As we enter a part number, the corresponding available inventory is displayed on the right-hand side of the log. We then know whether or not we can ship the item complete. When the entire order is completely entered, the inventory files are automatically adjusted to reflect the transaction. Therefore, we maintain a perpetual available inventory balance.

When the order is physically shipped from the warehouse, the paperwork is returned to the Inventory Control Department. The sales order number is again entered into the ATARI 800. The computer searches through its data, locates the order and displays the original quantities ordered. We then enter the quantities shipped, and the computer matches these quantities to the quantities ordered. When a discrepancy exists, it is displayed on the screen for our review. If the order is entered with a discrepancy (i.e. 100 units ordered, but none shipped due to a cancelled order), the inventory bal-

ances are automatically adjusted to reflect the shipped quantity.

At any time of the day, by entering in the proper commands, a printed listing of inventory balances or pending orders is available.

Needless to say, record accuracy has improved since we began using the ATARI 800 Personal Computer.

CHOOSING AMONG FINANCIAL ALTERNATIVES



Richard Lauck, Property Accounting

So there you are, the person responsible for deciding how to finance the equipment your company uses. The phone rings and someone in Purchasing wants to know if it's better to buy a new and improved widget maker for \$100,000 now, or to lease it for five years at a rate of \$2904.44 a month with a final payment of \$45,000.

How do you decide which alternative is better? You have a choice. You could add up the monthly payments plus the final payment for leasing and compare this figure to the cost of buying the equipment now. Of course, the total cost of leasing will be higher, but putting off paying the entire amount now should be worth something to you . . . this has something to do with the cost of money over time.

PLANT



Instead of making this rough comparison, you could go through hours of tedious calculations and "guessing," trying to back out the present value of the different alternatives.

Another alternative would be to use the program listing below. With this program, you can determine quickly and easily the effective interest rate of buying now, financing by leasing or leasing with the option to buy. For the math-minded, this program is based on Newton's method of estimating roots (adapted for my use by Tom Pennello). To

check if you entered the program correctly, try the sample problem above. For this problem, the effective interest rate for leasing the widget maker would be 30% annually.

Without a comparison like this program provides, the differential costs of the financing alternatives are not so obvious. For example, someone in our company once wanted to lease a machine for nine months with an option to buy rather than purchase it, because we had not budgeted for it. The need for the equipment was justified. Upper management quickly

changed their tune and was very willing to buy the machine immediately when this program showed the effective interest rate for the leasing option to be over 42%.

In summary, the program below can save you time and, more importantly, money, as it can help you make sound financing decisions more quickly. While a discounted cash flow offers a more complete analysis of lease vs. buy options, this program quickly identifies which of your financing options are high-priced and which are reasonably-priced.

PROGRAM FOR COMPUTING THE EFFECTIVE INTEREST RATE IN ARREARS

Required input from user:

- Monthly leasing payment (\$2904.44)
- Lump sum leasing payment at end (\$45000)
- Current cost of equipment (\$100000)
- Number of monthly payments (60:12 payments x 5 years)

```
10 ? ">";? " ";? " ";? " "
20 ? "LUMP SUM PAYMENT=";;INPUT R
30 ? "MONTHLY PAYMENT=";;INPUT A
40 ? "COST IF BOUGHT NOW=";;INPUT C
50 ? "NUMBER OF MONTHLY PAYMENTS=";;INPUT N
60 Z=12:I=0.01:E=0.01:K=0:?
70 ? "      EFFECTIVE INTEREST WITH : "
80 ? " "
90 ? "A LUMP SUM PAYMENT OF $";R
100 ? "A MONTHLY PAYMENT OF $";A
110 ? "AND PAYMENTS NUMBERING- ";N
130 GOSUB 210
140 F=F+5.0E-03:F=100*F:F=INT(F):F=F/100
150 F1=F1+5.0E-03:F1=100*F1:F1=INT(F1):F1=F1/100
160 I=I1:K=K+1
170 IF ABS(F)-E>0 THEN 130
180 ? " "
190 X=Z*I:? "THE EFFECTIVE ANNUAL INTEREST RATE IS ";100*X;" %"
200 END
210 T=(1+I)^N
220 F=C-R/T-A*(1-1/T)/I
230 T2=T*(1+I)
240 F1=R*N/T2+A*(1-1/T-I*N/T2)/I/I
250 I1=I-F/F1
260 RETURN
```

QUESTIONS & ANSWERS

Q: After my computer has been sitting undisturbed for a period of time, why does my television begin cycling through a series of colors?

A: This cycling through a series of colors is called the "attract mode". This term is a hold-over from the coin-operated games where it was primarily used to attract customers. We incorporated this feature into your ATARI Personal Computer, not to attract, but rather to protect the television screen from being permanently "burned" by any bright stationary image. This burning of the screen will only happen after many hours of displaying an image. ATARI decided to insure your television screen would be protected by including this feature in the design of our personal computer. Thus, if you do not press a key for approximately nine minutes (even if you are using other inputs, for example joysticks), your system will automatically initiate the "attract mode" and your screen will begin cycling through a series of colors. This will not occur with ATARI programs that only utilize input from the joystick or paddle controllers. ATARI programs have been designed to go into the attract mode only if there is no joystick or paddle activity within the nine minutes.

Q: If I have designed my own game, how can I eliminate the annoyance of the attract mode when I am only inputting into the system via the joystick or paddle controllers?

A: All you need to do is periodically reset the attract mode calendar so that it never reaches the end of its nine-minute count. To do this, simply add a line with POKE 77,0 at various points in your programs.

Since this feature is an important one, you should not eliminate the attract mode entirely. Instead, you

should include a routine in your program like the following pair of lines to determine if a joystick has been used recently. These two lines should be included at various points in your program.

```
100 IF STICK(0)=15 THEN 100
110 POKE 77,0
```

The first line checks to see if the joystick is in the upright position (in other words, unmoved). If it is, the program will remain on this line and, after nine minutes, the attract mode will begin and thus, protect your television screen. If you have moved the joystick, the program will continue automatically to the next line. This line resets the counter so the attract mode will not begin for another nine minutes.

Q: How do I clean the heads of my disk drive?

A: The heads of your ATARI Disk Drive *can be damaged* by some head cleaning diskette kits. We advise owners of these disk drives *not* to use any head cleaning diskettes. Clean the heads much like you would clean the head of a tape deck. Gently wipe the head with a bit of cotton, soaked in denatured alcohol. Let it dry for thirty minutes before using the drive.

Q: Can I use my ATARI Personal Computer with a video monitor or only with a television set?

A: ATARI designed their personal computer to be compatible with a television so you wouldn't have to buy a special monitor. However, if you want to use a monitor, you can, but you need a different cable connection, either the CX82 Black & White Monitor Cable or the CX89 Color Monitor Cable. Your local ATARI Dealer either has these items in stock or can order them for you.

Q: Where can I get technical documentation for my ATARI Personal Computer System and listings of the ATARI 400/800 Operating System (OS) and the ATARI 400/800 Disk Operating System (DOS)?

A: All of these items are now available through ATARI Customer Support. Send a check for the amount shown below and a note indicating the name and number of the item wanted to Customer Support, ATARI, Inc., 1346 Bordeaux Drive, Sunnyvale, CA 94086, Attn: Barbara Burbridge. (California residents, include a 6½% sales tax.)

1. Technical User Notes — CO16555
Includes the OS, Hardware Manuals, Schematics and selected notes on the ATARI 400/800 computers technical features. This is a compilation of the material that will be used in the Technical Reference Guide available in 1981.

Cost: \$27.00 plus \$3.00 shipping and handling.

2. ATARI 400/800 Operating System (OS) listing with binder — CAO16557

This is a computer listing of the assembly language code that comprises the 10K ROM OS of the ATARI 400 and 800, excluding the floating point routines.

Cost: \$17.00 plus \$3.00 shipping and handling.

3. ATARI 400/800 Disk Operating System (DOS) listing without binder — CAO16558

This is a computer listing of the assembly language code that comprises the disk operating system of Master Diskette.

Cost: \$4.00 plus \$1.50 shipping and handling.

Both the OS and DOS listings can be purchased together for \$24.00. This includes shipping and handling.

COMPUTER TALK

THE CASE OF THE UNWANTED HEARTS

If you program in graphics mode 1 or 2 and use lower case characters, little hearts appear on the screen where spaces should be. The way the computer makes letters results in these hearts.

Your computer doesn't know what printed characters look like. It must interpret them using an internal table called a "character set". Graphics modes 1 and 2 have two different *character sets*, each with 64 different characters. One character set contains all the upper case characters (capital letters) and punctuation marks. The other set contains all the lower case letters and graphics characters.

Each key on the keyboard matches a position in the character set. The first position of all character sets represents the space bar. Thus, the computer looks in the first position of the character set whenever the space bar is pressed to see what to put on the screen.

The first position of the upper case character set contains a space, and the first position of the lower case character set contains a heart shape. Therefore, if you use upper case characters, you will see a space on the screen whenever you press the space bar, but if you use lower case characters, you will see a heart.

The computer clears the graphics screen by filling it with the internal character for the space bar. Thus, if you use the lower case character set, the screen will become filled with hearts instead of blank spaces.

Normally, you get the upper case characters, but you can use lower case if you use the command `POKE 756,226`. Two methods exist to avoid getting the unwanted hearts with this character set.

The first and easiest way is to set the hearts to the screen's background color by using the command `SET-COLOR 0,0,0`. This method, however, uses up one of your colors.

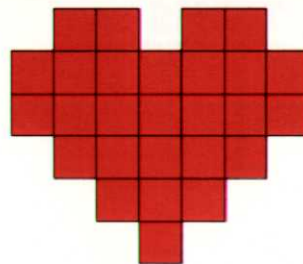
A better way, but it requires a little more work, is to change the character set so the first lower case character becomes a blank space rather than a heart. Before you try to change the character set, an understanding of its arrangement in the computer's memory would be helpful.

A character set is simply a picture of what the letters will look like when they are printed on the screen. If you look closely at the printing on your television screen, you will see that the letters actually consist of little dots. The computer represents each dot as a single *bit* of information in its memory. Each memory location can store eight bits (one *byte*) of information, or eight dots. A bit can either be 1 or 0. If a bit is set to 1, it represents a dot on the screen. If it is set to 0, it represents a place where no dot shows, or a blank space. The computer represents each character as an 8x8 arrangement of dots. Therefore, the computer uses eight locations in memory for each character. For example, the heart character looks like the following in your computer's memory:

```
00000000
00110110
01111111
01111111
00111110
00011100
00001000
00000000
```

See how the 1's and 0's form a heart?

Each row of 1's and 0's can also be read as a number. Page 55 of the BASIC Reference Manual displays the entire character set and corresponding numbers for your ATARI Personal Computer. Each box represents eight locations in the computer's memory and contains the image of one character. The heart is character 64 in the set. A space is character 0 in the set. The space



would be represented by a block of 0's in memory. (Do you remember why?)

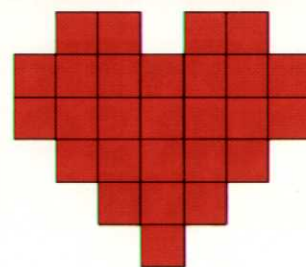
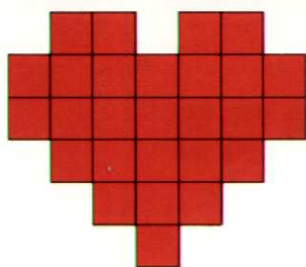
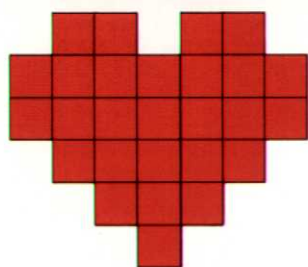
Your computer's character set is stored in read only memory (*ROM*), but as a result of the versatility of the *ANTIC chip*, we can move the character set into the read/write memory (*RAM*) and the characters will still be displayed correctly. Once we have the set in *RAM*, we can modify the characters to our heart's content.

To avoid the unwanted hearts in lower case you need to move the character set into *RAM* and change the heart to a space, which the program listed below will do. From then on, a simple *POKE* statement will switch you from upper case to lower case characters.

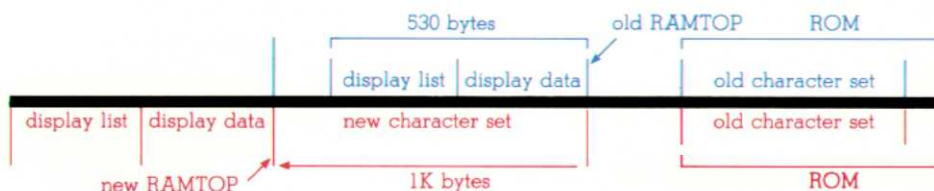
The first step required is to determine if adequate memory space exists for the program to change the heart to a space. This program requires about 4600 bytes of memory, so the first line in the program listing, *Line 10*, checks to see if 4600 bytes of memory are free.

If adequate *RAM* exists, you need to make room above *RAMTOP* for the character set. The character set occupies 1K of memory. The computer's Display List occupies a little less than 1/2K. Since information is accessed from memory in 256 Byte or 1/4K pages, you must move *RAMTOP* down 4 pages to allow 1K of space (1/4K per page x 4 pages = 1K). The current value of *RAMTOP* is stored in the *RAM* location 106. *Line 20* looks into the memory location for *RAMTOP* (106) and sees what its present value is. *Line 30* subtracts 4 pages, moving *RAMTOP* down the needed 1K.

Before you move your character set, you need to let the computer know you moved *RAMTOP* so it can save its Display List. You do that with a graphics command. *Line 40* sets up the computer to use graphics mode 1. If you move the character



BEFORE



AFTER

set before doing a graphics command, you might write over the Display List and ruin your display.

Now, you're ready to move the character set from ROM to the last 1K of RAM, just before the old RAMTOP. We'll call the beginning of the character set CHBAS. Since 1K equals 4 pages of memory ($\frac{1}{4}$ K per page \times 4 pages = 1K), *Line 50* tells the computer where CHBAS, your new character set, should be located in RAM. *Line 60* tells the computer where the CHBAS should begin. (Remember, one page equals 256 bytes.)

```

10 IF FRE(0)<4600 THEN PRINT "NOGO":END
20 RAMTOP=PEEK(106)
30 POKE 106,RAMTOP-4
40 GRAPHICS 1
50 CHBAS=RAMTOP-4
60 ADDR=CHBAS*256
70 FOR X=0 TO 1023
80 POKE ADDR+X,PEEK(57344+X)
90 NEXT X
110 CHAR=64
120 POS=ADDR+(CHAR*8)
130 DATA 0,0,0,0,0,0,0,0
140 FOR X=0 TO 7
150 READ A
160 POKE (POS+X),A
170 NEXT X
180 STOP
  
```

In ROM, the old character set began at location 57344. To move the character set so its RAM location begins at ADDR, the actual location of the character set, you need *Lines*

70, 80 and 90. *Line 80* looks into the ROM memory location and then moves the character set to its new location.

All you need to do now is change the heart to a space. Remember, the heart is character number 64, each character requires eight locations in memory, and the character set begins at ADDR. As a result, the beginning location of the heart character is $ADDR + 64 \times 8$. *Lines 110 and 120* read character 64 from memory and put it into the correct location.

To replace the hearts with spaces, recall that eight values are required to represent a character in memory. For the space, these values are easy to determine . . . all the values are 0! *Line 130* defines character 64 to be represented as all 0's or to be a space.

Once the character has been defined with the DATA command, another FOR-NEXT loop (*Lines 140#170*) will load it into the character set.

If you use this routine in a program, type in your other lines of code next. If not, end the program with a STOP command (*Line 180*). Otherwise, the computer will automatically close the graphics display area and prevent you from being able to print in the graphics area.

After you have entered this routine, if you want the upper case character set, use the command `POKE 756,CHBAS`. For the lower case character set, use the command `POKE 756,CHBAS + 2`. The hearts will be gone!

COMPUTERESE DICTIONARY

Antic Chip—A microprocessor that enables the computer to display graphic images on the television screen.

Bit—Smallest amount of information your personal computer can work with; must be either a 1 or a 0.

Byte—Amount of information your computer requires to represent a character (letter, number or symbol); one byte consists of eight bits.

Character Set—Table in the computer's memory which contains a picture of what the letters, numbers and symbols will look like when they are printed on the screen.

Display List—Machine language program for the ANTIC chip.

FRE—BASIC command which determines amount of memory available.

PEEK—A BASIC command that tells the computer to look into a specific location in the computer's memory and see what is stored there.

POKE—A BASIC command that tells the computer to put a new number into a specific location in the computer's memory.

RAM—Acronym for Random Access Memory; computer memory for temporary storage of information; the computer can both read information stored here and write new information to be stored here.

RAMTOP—Top of memory; the number put in this location is the number of 256-byte pages of memory space available for RAMTOP.

ROM—Acronym for Read Only Memory; computer memory for permanently stored information; the computer can read information stored here but cannot write new information to be stored here.

GETTING ACQUAINTED

ANSWERS TO YOUR SOFTWARE QUESTIONS

In September, 1980, the ATARI Customer Service Department began offering a new service to support you in all areas of software. If you have a software question, you can get in touch with a software support engineer simply by dialing our toll-free number (800-538-8547 outside California, 800-672-1430 inside California), and leaving your name and number. Normally, your call will be returned the same day. Every effort will be made to find the answers to your questions.

To insure your call is returned promptly, leave an alternative number where you can be reached, for example, your home phone number. Keep a list of your questions handy to insure we cover them all at once.

If you prefer, you can write to Customer Software Support with your questions. Send them to Customer Software Support, Atari, Inc., 1346 Bordeaux Drive, Sunnyvale, CA

94086. Include your name, address, and phone number.

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For more information, contact Earl Rice, Marketing Manager, Users' Group Support Program, Atari, Inc., 1196 Borregas Avenue, Sunnyvale, CA 94086, (408) 745-2000.

Let us know about users' groups in your area so we can tell others about them. Several users' groups have already contacted us. In future issues of THE ATARI CONNECTION™, we will provide you with information on users' groups in your area.

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If you're looking for information on your ATARI Personal Computer, the following magazines have regular columns on ATARI Personal Computers:

Compute — "ATARI Gazette"

Micro — "ATARI Notes"

Creative Computing — "Outpost ATARI"

Purser's Magazine is developing an issue dedicated solely to the critique of software available for your ATARI Personal Computer System, whether developed by ATARI or outside suppliers.

In addition, you may find the following recent articles on ways to use your ATARI Personal Computer Sys-

tem informative.

"Adding a Voice Track to ATARI Programs", John Victor, **Compute**, July/August 1980, pp. 59-61.

"An Introduction to Atari Graphics", Crawford & Winner, **BYTE**, Jan. 1981, pp. 18-32.

"The Basics of Using 'POKE' in ATARI Graphics", Charles G. Fortner, **Compute**, July/August 1980, pp. 62-63.

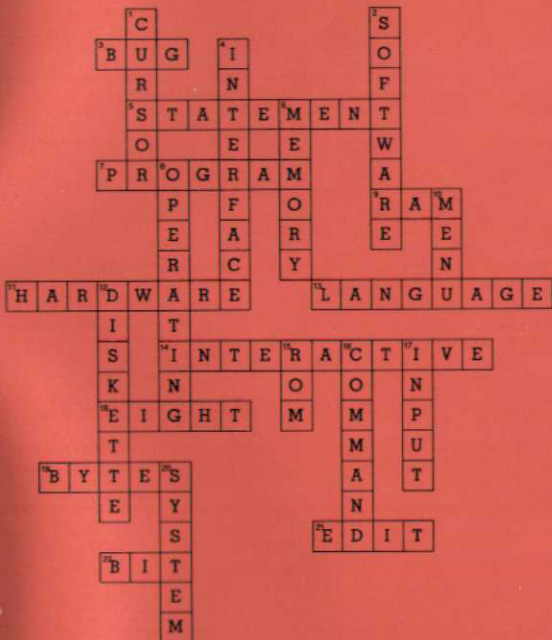
"Color Wheel for the ATARI", Neil Harris, **Compute**, July/August 1980, p. 64.

"Choose Your Joystick", Len Lindsay, **Compute**, July/August 1980, p. 64.

"Input/Output on the ATARI", Larry Isaacs, **Compute**, July/August 1980, pp. 65-68.

"Player-Missile Graphics with the Atari PCS", Crawford, **Compute**, Jan. 1981, pp. 66-71.

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