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# GAMES APPLES PLAY

By Mark James Capella and Michael D. Weinstock

Learn programming the fun enjoyable way...by gaming! Included is a vast selection of classic games for your Apple written in Applesoft BASIC. Why make programming hard work?

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by

## Mark James Capella

and

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## ACKNOWLEDGMENTS

To my wife, Genie, for all those times she turned her head to see me sneaking up the stairs to the computer room.

Mark James Capella

To Diana and Aaron. Diana for her patience, understanding and the cold dinners she ate while waiting for me to finish just a little bit more. Aaron for the thrill of understanding what is means having a four year old around when things just aren't working correctly.

To Brian Davis for his creative artistic talents that greatly assisted our effort.

To Scott Singer for his enlightening commentary on the programs.

To Dave Gordon because he is Dave Gordon, a trusted friend.

Michael D. Weinstock

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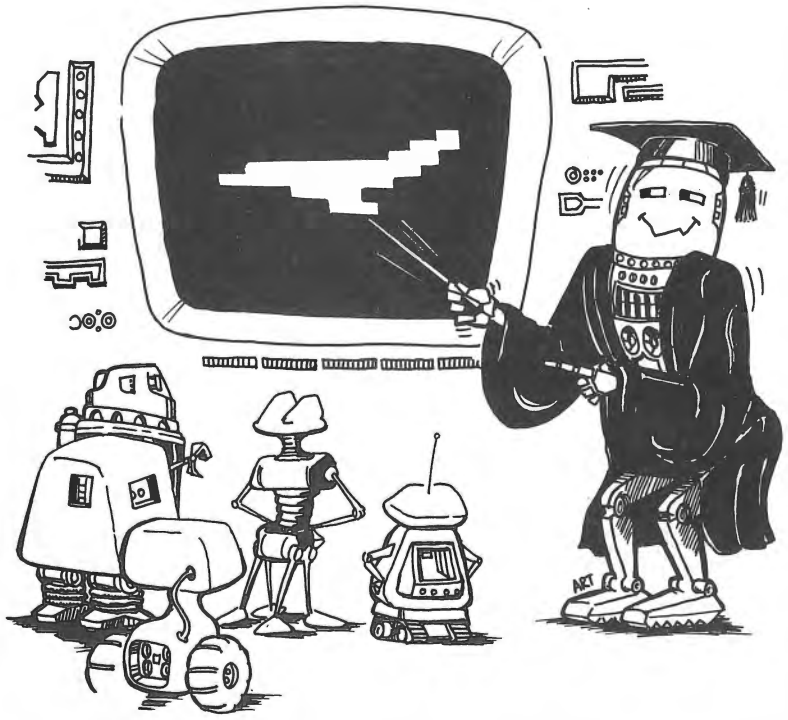
# INTRODUCTION
# Using games to learn BASIC

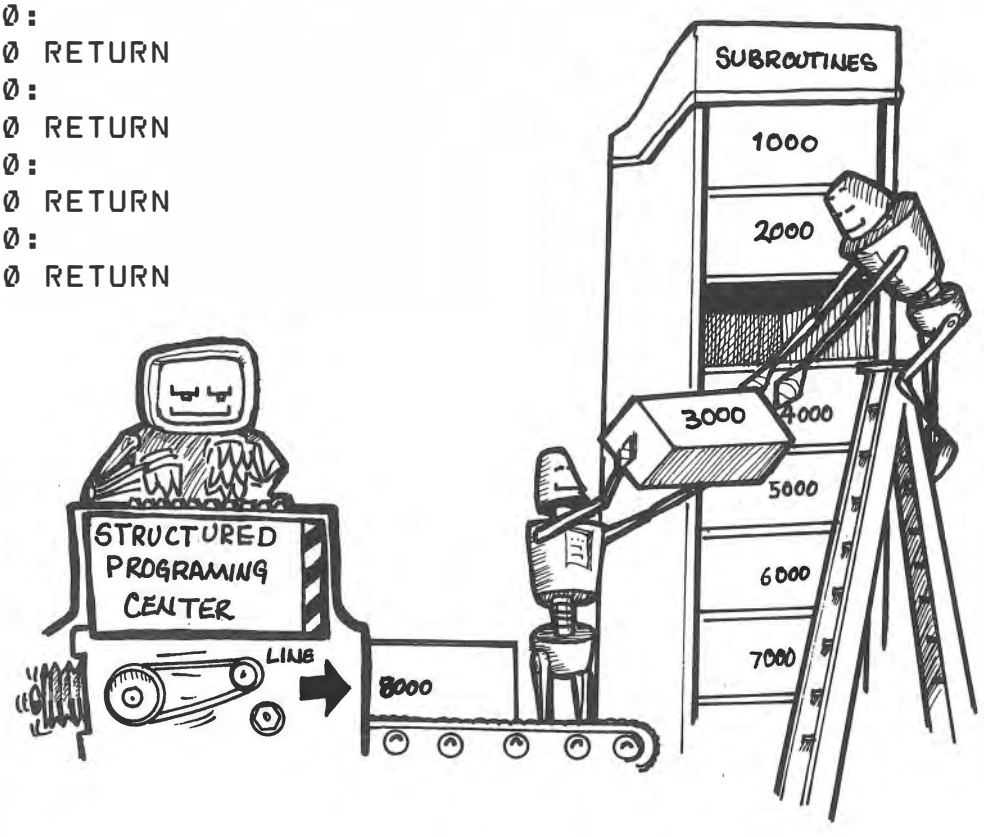
Commercially written games for the Apple computer are now being written in machine language with elaborate copy protection schemes. Techniques to increase speed and foil pirates also have the effect of making games both hard to understand and hard to learn from. Such was not always the case. In the good old days of 16K Apples and cassette tapes, the games were given away at user groups. Most of the games were in Integer BASIC. The listings were published in magazines and newsletters, and seldom exceeded two pages. Novice programmers didn't care that you could drink an entire soda pop before the ship got across the screen or that you could watch the bombs falling in slow motion, blip——blip——blip. Most of the people using those games wanted to learn about programming color graphics, and games were a good way to learn. Author Mike Weinstock has compiled a selection of the classic games such as AIR ATTACK and SAUCER DUELS that have been the precursor of many of the faster arcade games. Many types of games are not dependent on speed, such as adventure games like DRAGON'S LAIR, word games like HANG MAN and board games such as CONNECT-FIVE. These are all included along with many clever new games written by the author.



The games are written in Applesoft BASIC in a structured format. Structuring makes the programs more understandable and allows you to easily lift or adapt any routines that you like for inclusion in your own programs. The workings of each game are explained in a way that allows you to modify and customize the games to your heart's content. Two of the games, Mubble Chase and Sci Fi, are examined line by line. Sci-Fi introduces the principles of text formatting, word games, data statements, and input routines. Mubble Chase will help you understand how grids are constructed and graphic figures are moved and detected.

Most of the programs in this book are structured in the same way, with a GOSUB, an empty target line and a RETURN line in exactly the same place. This allows you to start writing the 'action' parts of the program first and fill in the title screen, instructions, and ending routines later. This is a complete outline program that will RUN but doesn't do anything:

```
10 REM STRUCTURED PROGRAM
20 GOSUB 1000: REM INSTRUCTIONS
30 GOSUB 2000: REM SETUP
40 GOSUB 3000: REM PLAY
50 GOSUB 4000: REM END
60 END
1000:
1990 RETURN
2000:
2990 RETURN
3000:
3990 RETURN
4000:
4990 RETURN
```



You can use this program as an outline for your own original programs. It helps you to stay organized and reminds you of what parts need finishing. Give this progam a snappy title such as EMPTY and save it on a diskette. Load it into memory when you feel creative and start writing within the framework.

Techniques are given here that allow you to dissect basic programs and see what makes them tick. The games themselves are hours of fun. You will learn a lot about programming and de-bugging by typing in the games from the book and making them run correctly, or you may order the games diskette from DataMost, and use dissecting techniques described here to investigate their inner workings. Either way, you will not find a more enjoyable way to learn BASIC!

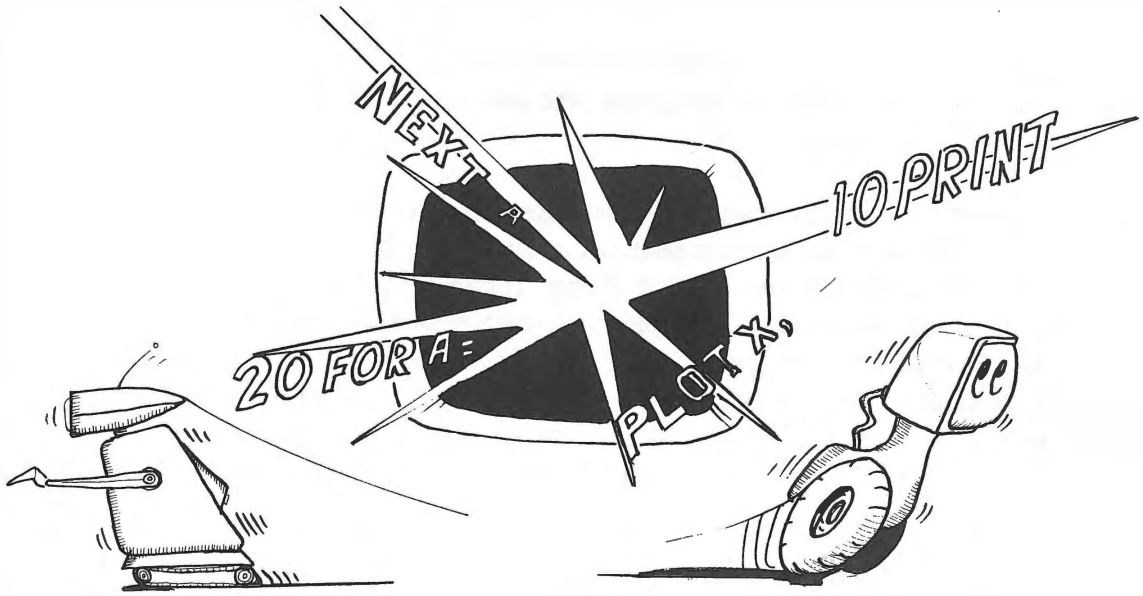
Do not be afraid of your computer! Remember, you are smart and the computer is dumb. The reason that programs have bugs in them is that the computer has to be told every little thing. It can't figure out a misspelled word the way you can. Fortunately Applesoft was written by some very clever humans who tried to program the computer to forgive as many errors as possible and to give very clear error messages for mistakes it does find. Relax and have fun. NOTHING you type in from the keyboard can hurt the workings of the computer, you will just get what is called GIGO—garbage in–garbage out.

Whatever is typed into the computer's memory or loaded in from a tape or disk drive exists in a temporary state. If you turn off the computer or the dog trips over the power cord the program is gone—vaporized. If the program came from a tape or diskette it is still there and can be re-loaded as if nothing happened. We emphasize this because we want you to play around with the programs, change the lines around, put in silly statements and eventually get it so messed up that you will want to throw it away and load in the original. This is the best way to learn. Try these techniques for investigating the inner workings of programs:

**Change lines**

As an example, if you see COLOR = X, change it to color = 8 (red). Run the program and you will see that some figure that is supposed to change color now just stays red; often figures are drawn in one color, redrawn in black, and drawn again in color one space over. This makes the figure appear to move. If the figure becomes a red streak on the screen you have discovered the line that moves the figure. You will also know when the line is used in the program and what is affected by the variation you introduced. Change variables (A B X Y etc.) to arbitrary numbers. Do things get stuck? Do you get overflow or 'illegal

quantity' errors? Variables are often the hardest things to understand. After a line containing a variable 'A' (or any variable) you can add a print statement :PRINT A . A number representing the value of 'A' will flash on the screen when the line gets executed and this number may give a clue to the function of variable 'A' (we don't guarantee it).




**Use TRACE**

Just type this magic word before you run the program and the line numbers that are being executed are displayed at the bottom of the screen. Watch for repeated series; this is the program loop where the action occurs. TRACE stays on until you enter NOTRACE or RESET.

**Use STOP**

Put in STOP in a separate line, giving it a number between two numbered lines in the program. The program will stop at that point and wait for you to type CONT(inue). By using STOP you can tell what parts of the program execute before STOP is reached.

**Detour**

If you want to know what the program will do without line 100, put a GOTO in front of it sending the program around line 100 without ever executing it.

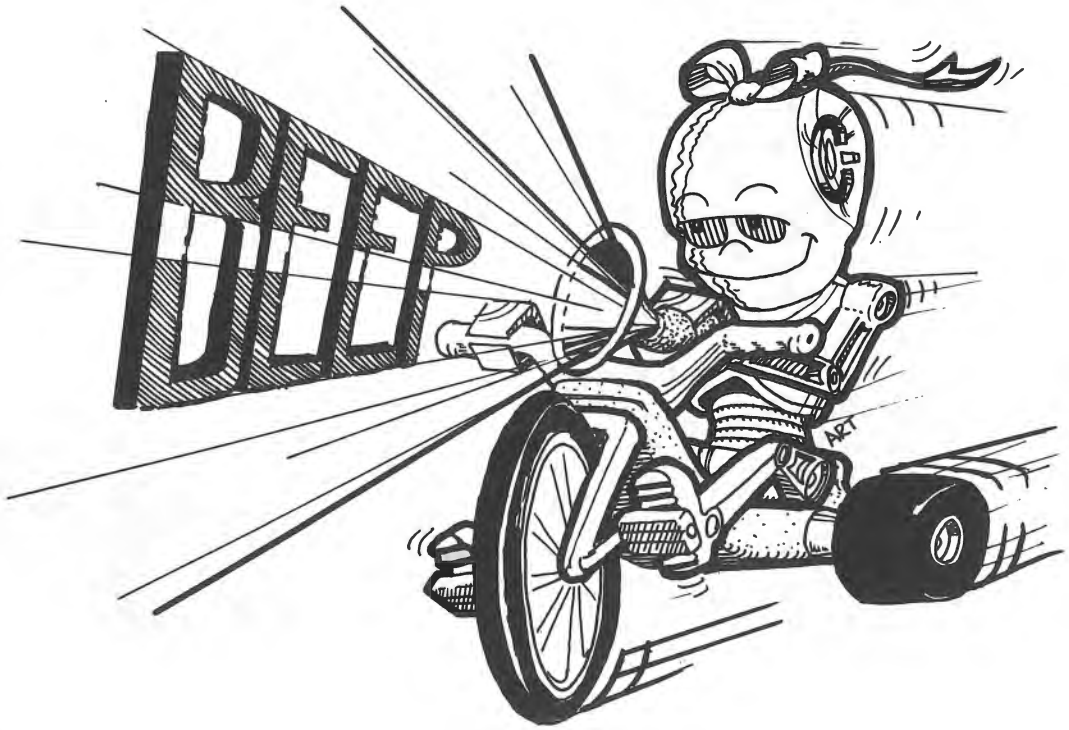
```
99 GOTO 110 (add this line)
100 E=MC*MC (mystery line)
110 PRINT "Hello"
```

Now you can see what the program does without line 100. Does it still run? What goes wrong? Restore the program by typing 99 with nothing after it. This deletes both the line and the line number that you added.

**Delete lines**

A quicker technique than the detour. Just type the line number and RETURN to eliminate the line from the program. Use this method when the line numbers are too close together for detouring or have lots of GOTO and RETURN. Just reload the program from diskette to undo all your surgical mishaps.

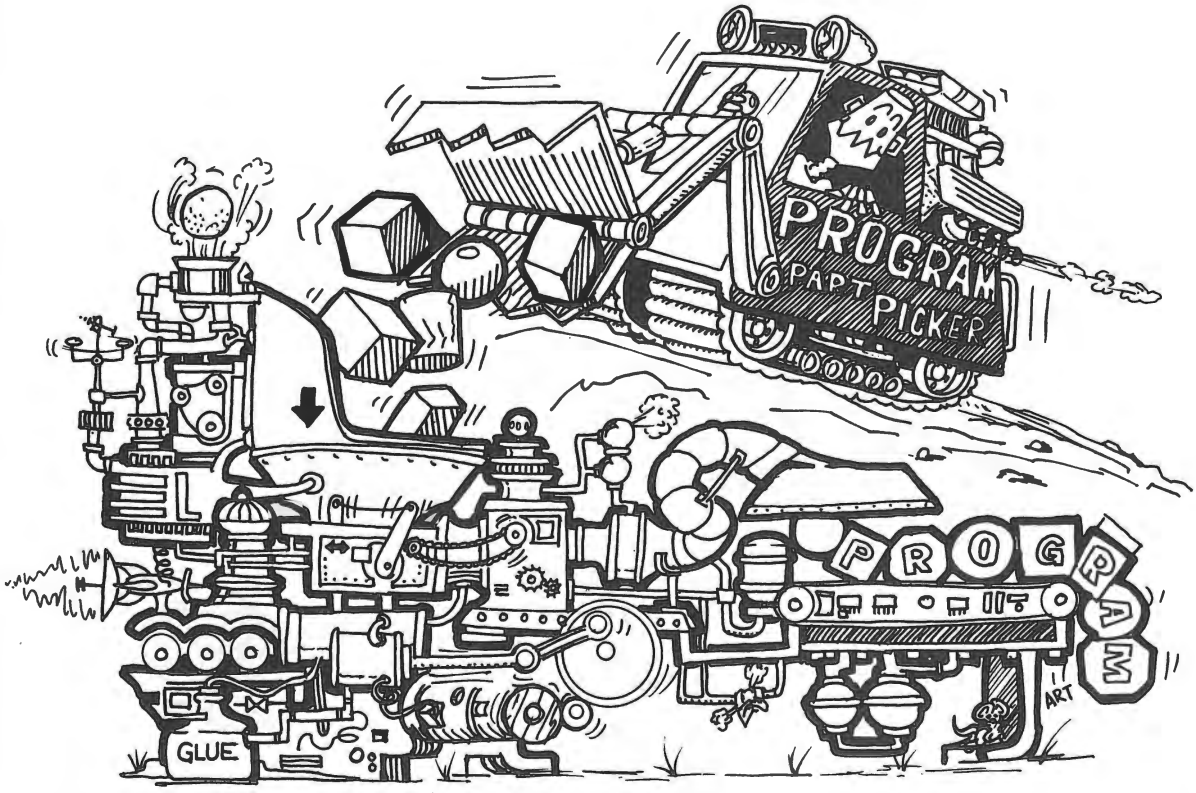
**Add a 'beep'**



If you want to know when a line is executed add a line PRINT CHR$(7) immediately after it. Be sure the line above doesn't send the program somewhere else with a GOTO or RETURN. If it does, rewrite the line with PRINT CHR$(7): at the beginning of the mystery line. The computer will obligingly beep when the line is executed.

**Isolate parts of programs**

Take away all but a few lines of the program by use of DEL(ete) 100,1200 or whatever line numbers are appropriate. Get the portion that is left to work by adding a few lines of your own. Mix parts of programs together using the Renumber program that is part of the DOS master diskette that comes with the Apple. Renumber has a MERGE utility that lets you put one program on hold, load another program, and merge the two together. You may get crazy results, but a lot can be learned in the process. You can name and save a part of a program even if it doesn't run. Leave yourself little notes (REMs) to remind you where the pieces came from.



**Add paddle or keyboard input**

If you want to see the action of variable 'X' you can add a line

```
NNN (line number) X = PDL(Ø)
```

You have to experiment around to find the right place for this line in the program loop. You will be able to control some action of the program that was previously automatic. Whatever value the program assigned to X up this point will be replaced by the X you insert. The paddle returns a value from 0 to 255. If this number is too large and makes the program crash, the value of paddle (0) can be divided to yield just the right range of values:

```
X = INT (PDL (Ø) / 6.5)
```

This command will give you INTegers (whole numbers with no decimals) from 0 to 39 to use with the lo-res graphics screen that is 40 characters wide. Of course additional variables can be controlled with paddle (1) and keyboard inputs until the entire program loop is under your control.

**Save the programs you have changed around**

When you get something that works, save it as an intermediate version even if you want to continue making changes. Often we make some useful changes and then mess the program up with later additions. You can delete extra versions later on if you run short of disk space. The only way to lose a program on diskette is to save another program with the same name on the same diskette. SO USE A DIFFERENT NAME!

Don't forget that you must turn on the computer with a DOS diskette in drive number one in order to be able to save programs to diskette. This is called BOOTING DOS. You can check to see if DOS is there by typing CATALOG. Always keep a few initialized empty diskettes handy, because the diskette must be initialized before it can be used. Here is a handy little HELLO program that will display the catalog of the diskette every time it is booted:

Turn on the Apple with the DOS Master diskette in drive one. When the ] prompt appears type NEW

```
10 TEXT:HOME
20 D$= CHR$(4):REM THIS IS CONTROL D
30 PRINT "JOHN DOE'S GAME DISKETTE"
40 PRINT "TODAY'S DATE"
50 PRINT D$;"CATALOG"
```

Run the program to test it out, and then place a new diskette in drive one. Be sure the diskette is empty because initializing a diskette erases everything that was on it. Add this line to the HELLO program:

```
60 NEW
```

Don't run the program after you have added this line, because line 60 erases the HELLO program from memory and leaves the computer 'empty' for your program to be entered.

Type INIT HELLO <RETURN>

Apple will create an initialized diskette that will display its catalog when booted and then clear the decks for your programs. This diskette will load DOS and allow you to save programs. You will not have to use the DOS MASTER diskette first.

Before the individual programs are explained, copy and run the following program.

```
10 GR
20 FOR I = 0 TO 15
30 COLOR= I
40 VLIN 0,34 AT 2*I+3
50 NEXT
60 PRINT "  *  *  *  *  *  *  *  *  *  *  1  1  1  1  1  1"
70 PRINT "  0  1  2  3  4  5  6  7  8  9  0  1  2  3  4  5"
```

You will note that above the zero (0) there is, apparently, a blank space. Actually, the color zero is black (the background color), so what you see (or don't see) is a black line drawn on a black background.

Fill up your program diskette and have fun.

A note about BUGS! It is not inconceivable that a few mistakes have crept into the following listings. Trust your intuition and tinker with the program even if you have to change what is in the book. Please drop us a card if you find a real boo-boo.


This program is not a game, rather, it is an entertaining collection of short stories which you make as personal as you want. You are given the chance to enter your own data. As with MUBBLE CHASE, this program will be described line by line.

10 REM stands for REMark. Any comments, numbers, symbols, expletives, or anything else may follow REM. In this case, the remark is used to highlight the program name. The computer, in effect, ignores the material which follows REM. In this case, the

REMark ********** is made.

11-16 completes the title with REM statements including two blank lines for readability.

20 The entire program is controlled by lines 20 through 50. There are actually two parts to line 20. First, GOSUB 1000 instructs the computer to go to line 1000, and to continue from there until the command RETURN is encountered. The second instruction, REM, is allowed on the same line for only one reason. The colon (:) allows the programmer to clump many, not necessarily related, instructions onto the same command line. This is usually done to show that certain pieces of a program are so closely related, that to isolate them on separate lines would belie their common purpose or association. The REMark: INSTRUCTIONS is the programmer's way of telling the reader that the subroutine beginning at line 1000 (GOSUB 1000) is where you can find the INSTRUCTIONS. In this case, the remark serves to explain the purpose of the subroutine rather than serving the equally important, but more eccentric, role of lines 10 through 16.

30 When the subroutine, begun by line 20, is completed by the RETURN statement, the program, having completed line 20, drops down to the next

sequential instruction, which in this case is line 30. Like line 20, this line first initiates a subroutine (GOSUB 2000), and then informs the reader as to the main emphasis of the subroutine, which is the program SET-UP.

40 This line is identical, in function, to line 30.

50 END returns control to the machine. Control WAS with the program.

1000 This line is the 'target' of the GOSUB in line 20.

1001 Here, the REMark: *** INSTS is again made to inform the reader of the function of the subroutine.

1010 This line contains three, distinct instructions. TEXT instructs the computer to change to (if not already in) the text mode. In this mode, all forty lines are reserved for text. The use of color is reserved for the graphics mode. Next, the instruction NORMAL is encountered. This command instructs the computer to display the text using white letters on a black background. HOME clears the screen of all text. Instructions such as this are called 'housekeeping', and should be included in all your programs.

1020 VTAB is the programmer's way of telling the computer to Vertically TAB down three spaces. The reason that VTAB instructs the computer to tab DOWN, is that in terms of X and Y, 0,0 is in the UPPER left-hand corner. After the computer Vertically TABs down three (3) lines from the top of the screen, it is told to Horizontally TAB thirteen (13) spaces to the right. The next instruction, PRINT, tells the computer to prepare to output whatever follows. If the material is written between a set of quotes, then whatever is enclosed by the quotes is printed verbatim. If there are no quotes, then the numeric value of the variable will be printed. To illustrate, if a program reads: 10 X = 5
20 PRINT "X+3" the output will read 'X+3'. On the other hand, if a program reads: 10 X = 5  20 PRINT X+3 the output will be '8'. Line 1020 causes the message *** SCI-FI *** to be printed. It will begin at a position three lines from the top (VTAB 3) and thirteen columns from the left margin (HTAB 13).

1030 After Vertically Tabbing down seven (7) lines, the message that appears between the quotes will be printed. This time, the message will begin at the left-hand margin.

1040 The empty PRINT statement serves a very useful purpose. What this statement does is to PRINT a blank line. Notice that some of the words of text in the listings are split in the middle and continue on the next line, but when printed on the screen by the program the text is neatly formatted. In the listing

there is no space between HOPESOF but it prints correctly when run. HOPE is at the end of the line, so OF would be indented one space when printed by the program if a space occurred in the listing. Good looking screen formats are a matter of trial and error. If you try to edit print statements using the arrow key you might have noticed that seven blank spaces are inserted in the text whenever the cursor wraps around a line. There is a cure for this problem that allows quick editing of basic listings: type POKE 33,33 <RETURN> before typing LIST. The text will not be indented and can be easily copied over and parts changed. RESET gets things back to normal.

1050 Notice that the instructions asks you to type RETURN. Nothing gets entered in ANS$ and in fact it becomes an 'empty' string. The function of ANS$ in this program is just to hold up the works until you have read the screen and want to continue. Many programs ask for your name in a similar situation and then use the input in an appropriate response.

Try this:

```
1050 VTAB 23: INPUT "HI, WHAT'S YOUR NAME";NA$
1060 PRINT"WELL HELLO ";NA$;", LETS PLAY SCI-FI"
1070 FOR I= 1 TO 2000:NEXT I
```

Since the program would dash off after it received NA$ we add a delay loop in 1070 to wait just long enough for us to read line 1060. You can use any letters for variables as long as they are not basic commands (reserved words). For clarity variables should suggest what they perform. Programmers generally use ANS for answer and NA for names but are not required to. The ON—GOTO command can provide excellent flexibilty in your programs. In Sci-Fi a random number sends the program off to different sections, but this command also works well for branching from a menu:

```
10 PRINT "PRESS 1 FOR SALAD, 2 FOR ENTREE, OR 3 FOR
DESSERT"
20 GET X
30 ON X GOTO 100,200,300
```

Starting at line 100 you would put the salad choices, etc. If you succeed in actually teaching the computer to make a salad let me know.

1990 RETURN ends the subroutine initiated by line 20 and begun at line 1000. At this point, program flow is RETURNed to line 20, and then line 30.

2000 As stated before, a blank colon (:) is a legitimate means of writing a virtually blank line within the program itself.

2001 On this line, the main function of the subroutine is detailed by a REM statement.

2002 This command line serves to separate line 2001 from the body of the text.

2005 This line appears to be a nebulous conglomeration of variables. Not so! This line serves a very specific purpose. DEF stands for DEFine. The next question is, what is to be defined? The answer is, a FuNction (FN). The FuNction being DEFined is R(X). 'R' is the given name of the function. 'X' is a variable name which is equal to the FIRST INT ( RND (1) * X) + 1. Each time the FuNction 'R (any variable or digit)' is used, the variable inside the parentheses assumes the value of 'INT ( RND (1) * (the new variable or digit)) + 1. Following will be a list which, hopefully, will help you to understand the 'DEF FN' statement.

| FUNCTION | VALUE OF VARIABLE OR DIGIT | VALUE OF FUNCTION |
|---|---|---|
| A(X)=4*X+5 | 'X', IF NOT STATED, =0 | A(X)=5 (4*0+5) |
| A(13) | 13=13 | A(13)=57 (4*13+5) |
| A(Y) | LET US SAY THAT Y=6 | A(Y)=29 (4*6+5) |
| BS(X)=X*X-22 | X=0 | BS(X)=-22 (0*0-22) |
| BS(17) | 17 = 17 | BS(17)=267 (17*17-22) |
| BS(FN A(Y)) | FN A(Y)=29 | BS(FN A(Y)=819 |
| A(FN BS(17) | FN BS(17)=267 | A(FN BS(17)=1073 (267*4+5) |

Here is a program to further illuminate the function of line 2005.

| THE PROGRAM | THE OUTPUT |
|---|---|
| 10 A = 17 : C = 2.65 | — |
| 20 DEF FN PRY(C) = -A * C | — |
| 30 PRINT C; : PRINT FN PRY(C) | 2.65 -45.05 |
| 40 PRINT A; : PRINT FN PRY(A) | 17 -289 |
| 50 PRINT FN PRY(FN PRY(C)) | 765.85 |

Line 20 identifies the variable as being 'C'. Therefore, whenever the FuNction 'PRY' is executed, the variable (or digit) within the parentheses is substituted for C. In line 2005, 'X' is the variable. If the number five (5) is substituted for X, then the result is, R(5) = INT ( RND (1) * 5 + 1. The reason the DEF FN instruction is used in this program is so that whenever a random number between 1 and any other number is needed, all the programmer need write is R(any other number), and the random result will be generated.

2010 This line sets aside sixteen memory locations for SO$. The instruction, DIM, instructs the computer to DIMension memory so as to allow for sixteen separate values of SO$. Also, the value of SO is set to zero. The number in parentheses is the number of the array variable. Apple starts counting from (0).

2011 This line sets up a one-dimensional table in memory. This table can accomodate up to sixteen separate values of PL$. Also, PL is set to 0.

2012 and 2013 are both duplicates of lines 2010 and 2011.

2015 The READ statement is an interesting animal. What is does is to find the first available DATA statement and read from it. In this program, the first DATA statement is at line 2020. What happens is, the first piece of data before a comma (Alexander Haig) is read into (stored at) SO$. Then a test is done to see if SO$ is equal to END. If so, the program falls through to line 2016. If not, SO is incremented, SO$(0) is assigned the value of the contents of SO$ (Alexander Haig), and then the process is repeated (GOTO 2015). The program will next READ the second piece of DATA (Ronald Reagan) and store it in SO$. The test will again prove negative, SO will be incremented, RONALD REAGAN will be stored at SO$(1), and the process will be repeated. After the seven pieces of DATA on line 2020 are read, the DATA statement on 2021 is read next. This time the test on line 2015 (SO$ < > "END") will prove to be affirmative, so the program will fall through to line 2016. When you understand that SO, SO$ and SO$(0) are all different variables you get a gold star.

2016 Once a DATA statement has been read, it is no longer "available". Therefore, the first available data is on line 2025. It seems likely that PL stands for PLace. Actually, all of the variables are representative of their meaning.

2017 and 2018 Both of these lines are identical in function to line 2015.

2020 If the data in a DATA statement is to be read into a character-string location (a variable ended with a dollar sign), then it must be enclosed in quotes (" "). Each item is kept separate from other items by using a comma.

2021 through 2036 These are all DATA statements. All of the data could have been combined into one long DATA statement. The reason for dividing the lines was to add clarity.

2100 (six instructions) HOME clears the screen of text. The VTAB and HTAB instructions pinpoint where the beginning print location will be. The message, *** SCI=FI ***, is outputed. The computer is next instructed to TAB down to line 22. At this point a message is printed.

2110 The messages printed at line 2100 still appear on the screen. Previously, the printing had been done on line 22 (VTAB) 22). The first instruction brings the computer back up to line 7 (VTAB 7). The message between the quotes is printed, starting at line seven at the left-hand margin. The empty PRINT statement follows the above message with a blank line.

2114 This line sets the counter (CO) to zero.

2115 Line 2110 revealed the nature of the input, now you have a place to put those names. Just input whatever you'd like. When you've entered five pieces of data, or when you enter nothing, the program will fall through to line 2117. The data that you input is stored in SO$ (temporarily). Then the input is tested to see if "nothing" (RETURN) was entered. If so, the program falls through. If not, the line continues; CO is incremented; SO$ is moved to a permanent location (SO$(SO)); the counter is incremented and tested; if the counter is not yet five, then the line is begun again.

2117 This line clears the screen (HOME), and then prints the message beginning at line three (VTAB 3) column thirteen (HTAB 13).Then the computer is instructed to tab down to line seven (VTAB 7).

2120-2145 continues the INPUT sequences for Places that will be Attacked, Names of Monsters, etc.

2150 RETURN ends the subroutine initiated by line 30 and started at line 2000. Program control is returned to line 30.

2900 This line sets the value of PT to one (1) each time the subroutine (lines 2900-2990) is begun.

2905 MID$ states that the computer will look at the MIDdle of a given word. Which word? All of the remaining pertinent information is in the parentheses. The word or words that are to be checked by MID$ are contained in WRD$. Beginning at the left-hand side of WRD$, the computer will begin the scrutiny at that character plus PT. If WRD$ contained the phrase "I Love You", and PT equals six, then MID$ (WRD$,PT) would instruct the computer to begin looking at 'I Love You' six characters over from the left most character (the 'e' in 'Love' is the SIXth character). If not specified, the computer will begin the

search at the designated location, and continue through to the end of the word/s. If you want a certain number of characters looked at, just specify that number after you tell the computer where to start. The following program should help.

| PROGRAM | OUTPUT |
|---|---|
| 10 A$ = "SEND MONEY" | -- |
| 20 PRINT MID$ (A$,4,5) | D MON |
| 30 PRINT MID$ (A$,1,6) | SEND M |

In line 20, the computer is told to search the MIDdle of A$, to begin 4 characters from the left and to PRINT the next 5 characters. Likewise, line 30 tells the computer to PRINT the contents of A$ beginning with character 1,and to continue for a total of 6 characters. You will admit that at the end of most words you will find a blank space. The test (IF MID$ (WRD$,PT,1) = " ") checks to see if the character at position PT is a blank space ( ) and it checks to see if its line position is greater than 30. PEEK (36) surveys the screen and checks to see if the cursor is beyond column 30 (there are 40 columns to a row (0-39)). If the cursor is beyond column 30, and MID$ (WRD$,PT,1) = " ", then the next word to be written is in danger of overflowing the right-hand margin. To prevent this from happening, an affirmative test result will force the computer to skip to the next line before continuing to print.


2910 There are two steps to this line. First, PT is incremented (PT = PT +1). Second, the size of PT is compared to the character LENgth of WRD$. For example, if WRD$ contained the phrase EARTH WAS ATTACKED, then the LENgth of WRD$ would equal the number of characters in that phrase (18). To prevent lines 2905 and 2910 from looping indefinitely, there must be some

contingency factor, some restraint which stops the loop. This is the function of the second half of line 2910. When PT is larger than the length of WRD$, the program will fall through to line 2990.

2990 This line completes the subroutine begun at line 2900.

3000 This is the 'target' of the GOSUB in line 40

3001 The REMark *** PLAY is used to inform the reader of the main function of the subroutine starting at line 3000.

3010 through 3070 instruct the computer to perform various subroutines. These subroutines determine which format the story will reflect.

3075 and 3077 A legal filler and an empty line.

3080 The computer waits for you to indicate that you have finished reading the story by pressing RETURN. You could change this line to allow the reader to escape from further Sci-Fi literature.

```
3080 INPUT "HAD ENOUGH ";ANS$
3085 IF LEFT$(ANS$,1) = "Y" THEN END
```

Using the LEFT string function to find the first letter of "yes" is standard practice, and most computerists are used to answering 'Y' and expecting it to work. 'Yo', 'Yea', 'Yes', will all work. Any other response will end the program. Instead of END you could branch to a line at the end of the listings and add any farewell sequence you wished.

3100 This line first clears the screen of text (HOME). Then the function defined at line 2005 yields a RaNDom number between one and five. If the integer generated is one, then the program will branch to 3110. If FN R(5) generates the integer '2', then the program branches to 3120. If FN R(5) yields 3,4, or 5, then the program will branch to 3130,3140, or 3150 respectively.

3110 through 3150 These lines PRINT the five different attention-getting headlines.

3200 Line 2016 counted the total number of PLaces saved in PL$. FN R(PL) will yield a RaNDom integer ranging from one to PL. There is the name of a different place saved in PL$(1), PL$(2), PL$(3).....PL$(PL). What this line does is to randomly select one of the many PLaces and to copy it into the location WRD$. Then the subroutine beginning at line 2900 checks to make sure that the PLace is not PRINTed in such a manner that it breaches the right margin.

3300 Like line 3100, selects a RaNDomly generated integer ranging from one to five (FN R(5)), and depending on the integer, branches to line 3310, 3320, 3330, 3340, or 3350.

3310 through 3350 These lines serve as continuations of the currently unfolding drama. One of the five rather repugnant actions is stored in the location WRD$.

3400 Location WRD$ already contains one of the five actions outlined on lines 3310 to 3350. These lines add the name of one of the many (MO) monsters (MO$) to WRD$. Line 2217 counted the number of monsters and stored the name of each one in an MO$ location. This line RaNDomly selects one of the MOnsters and adds its name, plus a trailing blank space (" ") to WRD$. Each time the subroutine at 2900 is performed, the contents of WRD$ are PRINTed and cleared from WRD$. Each time WRD$ is emptied, the story grows.

3500 First, the word 'FROM' and a trailing space (" ") are stored in WRD$. This word is added to the developing story. At the subroutine beginning at line 2900, the contents of WRD$ (FROM ) are added to the rapidly developing story. Then, the HOme base of the MOnsters is added to WRD$, and a period (".") is also added. Once again WRD$ is emptied (in the 2900 subroutine) and the story sprouts another section.

3600 From the list of potential heroes, SOmeone will be RaNDomly selected (FN R(SO)). A space (" ") will follow SOmeone's name, and then this material will be added to the story.

3700 First, the words "TRIED TO" are added to the text. Next, one of the five 'defense methods' is randomly selected and added to WRD$ (at 3710, 3720, 3730, 3740, and 3750). Finally, the subroutine which begins at line 2900 adds the 'defense technique' to the story.

3710 through 3750 These lines contain the five 'defense techniques'.

3800 Two more words and a trailing space (BUT THEY) are added to the text. Next, one of five responses to SOmeone's 'defense technique' is RaNDomly chosen and the text is once again supplemented.

3810 through 3850 Each line contains one of the five responses to a 'defense technique'.

3900 There are five ways to announce the changing fortunes of battle. One of these five choices is randomly selected (FN R(5) GOTO....). The subroutine at

line 2900 again prevents right-hand margin overflow while adding the new material to the story.

3910 through 3950 These lines contain the five 'fortune-reversal lead-ins' mentioned at line 3900.

4000 You were given an explanation of the "ON" statement in line 1050, but it deserves reiteration. First, line 2005 DEFined the FuNction R(X) to be be equal to a RaNDon INTeger between 1 and X. The number 5 is substituted for 'X', making R(5) yield a random integer between one and five. The "ON" statement will cause the program to execute one of the five given subroutines, depending on the value of FN R(5). If the number generated is 3, then line 4000 reads, in effect, ON 3 GOSUB (the 3rd line-number) which is line... 4030. After one of the five subroutines is performed, the program executes the subroutine beginning at line 2900. Then RETURN completes the subroutine initiated at line 3060.

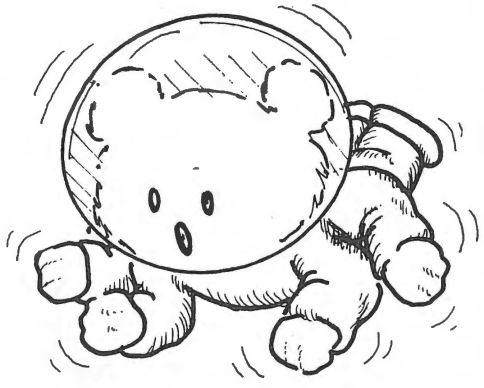
4010 through 4050 These five lines contain the different 'attack methods' that SOmeone might employ. The information is stored in WRD$ until it is PRINTed (by line 2900).

4100 A two word phrase, "SO THEY ", is stored in WRD$ for later addition to the story. Next, the subroutine beginning at line 2900 is executed. This subroutine not only PRINTs the contents of WRD$, but it prevents the contents of WRD$ from being printed so that they breach the right margin. After one of the five 'attack results' is added to WRD$, the subroutine which begins at line 2900 is executed. For all intents and purposes, the RETURN statement at line 4100 completes the program.

4110 through 4150 These lines contain the five 'results' of the 'attack method'.

Even as you read these words some of the illustrious characters whose names are stored in the data statements are slipping further into obscurity. Put in your own selection of names. This program is really an easy one to change and make your own. Change the data statements and print commands to your own fiendish specifications. You can save the new version under a new name and have both versions on diskette. Remember! What you change in the computer's memory does not change what is stored on the diskette unless you save the new version and give it the same name as the old version. It is sound practice to leave the original version unchanged on a different diskette and call your version Sci-Fi V1, Sci-Fi V2, etc. Have fun changing things around. It's the best way to learn.

```
10  REM  ********************
11  REM  ***                 ***
12  REM  ***    SCI-FI       ***
13  REM  ***                 ***
14  REM  ********************
15  REM
16  REM
20  GOSUB 1000: REM  INSTS
30  GOSUB 2000: REM  SETUP
40  GOSUB 3000: REM  PLAY!
50  END
1000 :
1001  REM  *** INSTS
1002 :
1010  TEXT : NORMAL : HOME
1020  VTAB 3: HTAB 13: PRINT "***
      SCI-FI ***"
1030  VTAB 7: PRINT "THIS PROGRAM
      WILL PRODUCE LOTS OF FUNNY
     LITTLE SCIENCE-FICTION STORI
     ES FOR YOUR READING PLEASURE
     ."
1040  PRINT : PRINT "YOU ARE GIVE
     N THE CHANCE TO ENTER SOME
     PERSONALLY RELEVANT INFORMAT
     ION IN HOPESOF MAKING THE ST
     ORIES MORE INDIVIDUAL."
1050  VTAB 23: INPUT "HIT RETURN
     WHEN READY TO CONTINUE : ";A
     NS$
1990  RETURN
2000 :
2001  REM  *** SETUP
2002 :
2005  DEF  FN R(X) =  INT ( RND (
     1) * X) + 1
2010  DIM SO$(15):SO = 0
2011  DIM PL$(15):PL = 0
2012  DIM MO$(15):MO = 0
2013  DIM HO$(15):HO = 0
2015  READ SO$: IF SO$ <  > "END"
      THEN SO = SO + 1:SO$(SO) =
     SO$: GOTO 2015
```

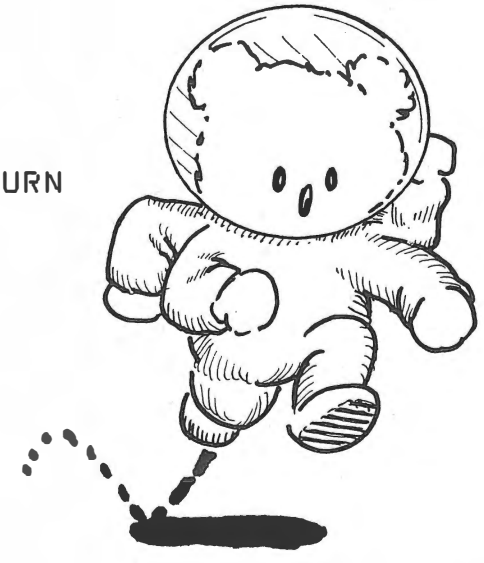


```
2016  READ PL$: IF PL$ <  > "END"
      THEN PL = PL + 1:PL$(PL) =
     PL$: GOTO 2016
2017  READ MO$: IF MO$ <  > "END"
      THEN MO = MO + 1:MO$(MO) =
     MO$: GOTO 2017
2018  READ HO$: IF HO$ <  > "END"
      THEN HO = HO + 1:HO$(HO) =
     HO$: GOTO 2018
2020  DATA  "ALEXANDER HAIG","RON
     ALD REAGAN","SUPER CHICKEN",
     "FATHER GUIDO SARDUCCI","A L
     ITTLE GIRL","AN INTERESTED O
     NLOOKER","SUPERMAN"
2021  DATA  "END"
2025  DATA "SYRACUSE","NEW YORK",
     "EARTH","THE UNITED STATES",
     "YOUR TOWN","LOS ANGELES","W
     ALLA-WALLA WASHINGTON","THE PR
     ESIDENT","THE EASTERN COAST"

2026  DATA  END
2030  DATA  "LITTLE GREEN MEN","A
      CROWD OF ANGRY PEASANTS BEA
     RING TORCHES","BOOGEY MEN","
     ALIENS","IN-LAWS","SPACE EGG
     S","FLYING GOOKIES","ZOMBIES
     ","RELIGIOUS FANATICS","ICKY
      THINGS"
2031  DATA  "END"
2035  DATA "VENUS","MARS","OUTER
     SPACE","OUT OF OUR GALAXY","
     THE MOON","THE FOURTH DIMENS
     ION","THE NEGATIVE ZONE","A
     TIME WARP","THE STARS","PLUT
     O"
2036  DATA  "END"
2100  HOME : VTAB 3: HTAB 13: PRINT
     "*** SCI-FI ***": VTAB 22: PRINT
     "PRESS RETURN AT ANY TIME."
2110  VTAB 7: PRINT "TYPE IN UP T
     O 5 NAMES OF PEOPLE THAT
     WILL SAVE THE DAY : ": PRINT
```

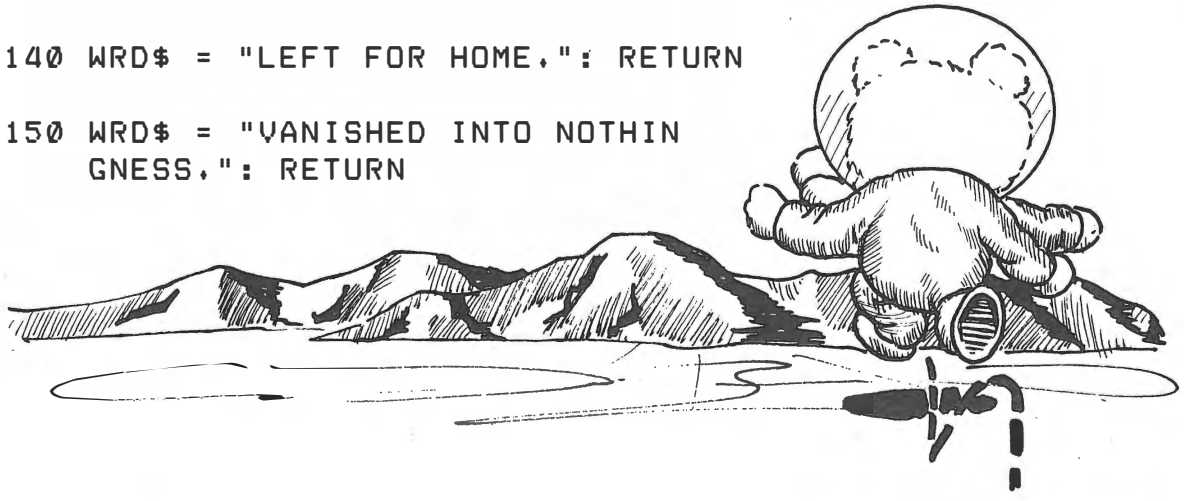
```
2114  LET CO = 0
2115  INPUT "===> ";SO$: IF SO$ <
      > "" THEN SO = SO + 1:SO$(S
     O) = SO$:CO = CO + 1: IF CO <
     5 THEN 2115
2117  HOME : VTAB 3: HTAB 13: PRINT
     "*** SCI-FI ***": VTAB 7
2120  PRINT "TYPE IN UP TO 5 NAME
     S OF PLACES THAT    WILL BE
     ATTACKED : ": PRINT
2124  LET CO = 0
2125  INPUT "===> ";PL$: IF PL$ <
      > "" THEN PL = PL + 1:PL$(P
     L) = PL$:CO = CO + 1: IF CO <
     5 THEN 2125
2127  HOME : VTAB 3: HTAB 13: PRINT
     "*** SCI-FI ***": VTAB 7
2130  PRINT "TYPE IN UP TO 5 NAME
     S OF MONSTERS THAT  WILL ATT
     ACK : ": PRINT
2134  LET CO = 0
2135  INPUT "===> ";MO$: IF MO$ <
      > "" THEN MO = MO + 1:MO$(M
     O) = MO$:CO = CO + 1: IF CO <
     5 THEN 2135
2137  HOME : VTAB 3: HTAB 13: PRINT
     "*** SCI-FI ***": VTAB 7
2140  PRINT "TYPE IN UP TO 5 NAME
     S OF PLACES THAT THEMONSTERS
      COME FROM : ": PRINT
2144  LET CO = 0
2145  INPUT "===> ";HO$: IF HO$ <
      > "" THEN HO = HO + 1:HO$(H
     O) = HO$:CO = CO + 1: IF CO <
     5 THEN 2145
2150  RETURN
2900  LET PT = 1
2905  PRINT  MID$ (WRD$,PT,1);: IF
      MID$ (WRD$,PT,1) = " " AND
      PEEK (36) > 30 THEN  PRINT

2910 PT = PT + 1: IF PT <  =  LEN
     (WRD$) THEN 2905
```

```
2990  RETURN
3000 :
3001  REM  *** PLAY
3002 :
3010  GOSUB 3100: REM  TITLE
3015  GOSUB 3200: REM  PLACE
3020  GOSUB 3300: REM  ACTION
3025  GOSUB 3400: REM  MONSTER
3030  GOSUB 3500: REM  PLACE
3035  GOSUB 3600: REM  SOMEONE
3040  GOSUB 3700: REM  DEFEND
3045  GOSUB 3800: REM  TOO TOUGH
3050  GOSUB 3900: REM  FINALLY
3055  GOSUB 3600: REM  SOMEONE
3060  GOSUB 4000: REM  DEFEND
3070  GOSUB 4100: REM  THEY DIED
3075 :
3077  PRINT
3080  VTAB 23: INPUT "HIT RETURN
     WHEN READY TO CONTINUE : ";A
     NS$
3085  GOTO 3010
3100  HOME : ON  FN R(5) GOTO 311
     0,3120,3130,3140,3150
3110  VTAB 3: PRINT "*** FLASH! F
     LASH! FLASH! ***": VTAB 7: RETURN

3120  VTAB 3: PRINT "*** BULLETIN
      !!! ***": VTAB 7: RETURN
3130  VTAB 3: PRINT "*** ALERT !!
     ! ***": VTAB 7: RETURN
3140  VTAB 3: PRINT "*** SPECIAL
     NEWS BULLETIN ***": VTAB 7: RETURN
3150  VTAB 3: PRINT "*** TO ALL C
     ITIZENS ***": VTAB 7: RETURN

3200 WRD$ = PL$( FN R(PL)) + " ":
      GOSUB 2900: RETURN
3300  ON  FN R(5) GOSUB 3310,3320
     ,3330,3340,3350: GOSUB 2900:
      RETURN
3310 WRD$ = "WAS ATTACKED BY ": RETURN
```

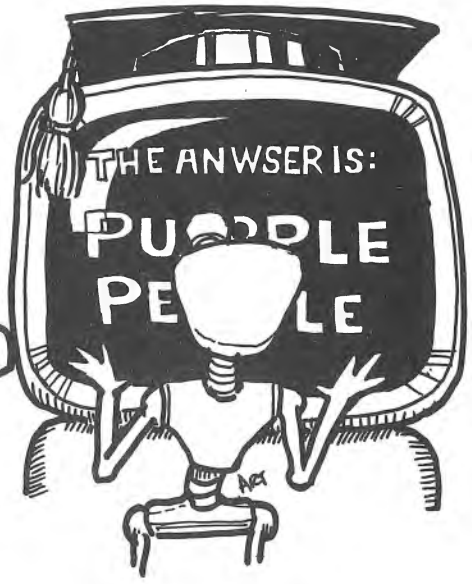
```
3320 WRD$ = "WAS EATEN BY ": RETURN

3330 WRD$ = "IS UNDER THE SPELL O
     F ": RETURN
3340 WRD$ = "IS BEING INVADED BY
     ": RETURN
3350 WRD$ = "IS OVER-RUN BY ": RETURN

3400 WRD$ = MO$( FN R(MO)) + " ":
      GOSUB 2900: RETURN
3500 WRD$ = "FROM ": GOSUB 2900:W
     RD$ = HO$( FN R(HO)) + ", ":
      GOSUB 2900: RETURN
3600 WRD$ = SO$( FN R(SO)) + " ":
      GOSUB 2900: RETURN
3700 WRD$ = "TRIED TO ": GOSUB 29
     00: ON  FN R(5) GOSUB 3710,3
     720,3730,3740,3750: GOSUB 29
     00: RETURN
3710 WRD$ = "KILL THEM ": RETURN

3720 WRD$ = "FIGHT THEM ": RETURN

3730 WRD$ = "HOLD UP A CROSS ": RETURN

3740 WRD$ = "ATTACK AT DAWN ": RETURN

3750 WRD$ = "SHOOT THEM ": RETURN

3800 WRD$ = "BUT THEY ": GOSUB 29
     00: ON  FN R(5) GOSUB 3810,3
     820,3830,3840,3850: GOSUB 29
     00: RETURN
3810 WRD$ = "WERE TOO TOUGH. ": RETURN

3820 WRD$ = "KEPT COMING. ": RETURN

3830 WRD$ = "YELLED AND LAUGHED.
     ": RETURN
3840 WRD$ = "SCREAMED FOR MORE. "
     : RETURN
3850 WRD$ = "SHOT BACK. ": RETURN
```



```
3900  ON  FN R(5) GOSUB 3910,3920
     ,3930,3940,3950: GOSUB 2900:
      RETURN
3910 WRD$ = "FINALLY, ": RETURN
3920 WRD$ = "LATER, ": RETURN
3930 WRD$ = "THEN ,.. ": RETURN
3940 WRD$ = "BUT THEN, ": RETURN

3950 WRD$ = "AFTER, ": RETURN
4000  ON  FN R(5) GOSUB 4010,4020
     ,4030,4040,4050: GOSUB 2900:
      RETURN
4010 WRD$ = "YELLED AT THEM, ": RETURN

4020 WRD$ = "DROPPED WATER ON THE
     M, ": RETURN
4030 WRD$ = "EXPOSED THEM TO MEAS
     LES ": RETURN
4040 WRD$ = "NUKED THEM, ": RETURN

4050 WRD$ = "SHOWED THEM RERUNS O
     F I LOVE LUCY, ": RETURN
4100 WRD$ = "SO THEY ": GOSUB 290
     0: ON  FN R(5) GOSUB 4110,41
     20,4130,4140,4150: GOSUB 290
     0: RETURN
4110 WRD$ = "DIED.": RETURN
4120 WRD$ = "TURNED INTO LITTLE B
     ROWN LUMPS.": RETURN
4130 WRD$ = "PASSED AWAY.": RETURN

4140 WRD$ = "LEFT FOR HOME.": RETURN

4150 WRD$ = "VANISHED INTO NOTHIN
     GNESS.": RETURN
```



# Apple Learner

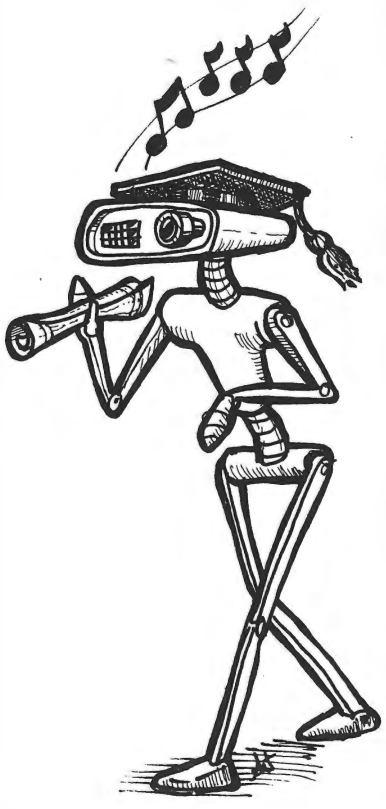


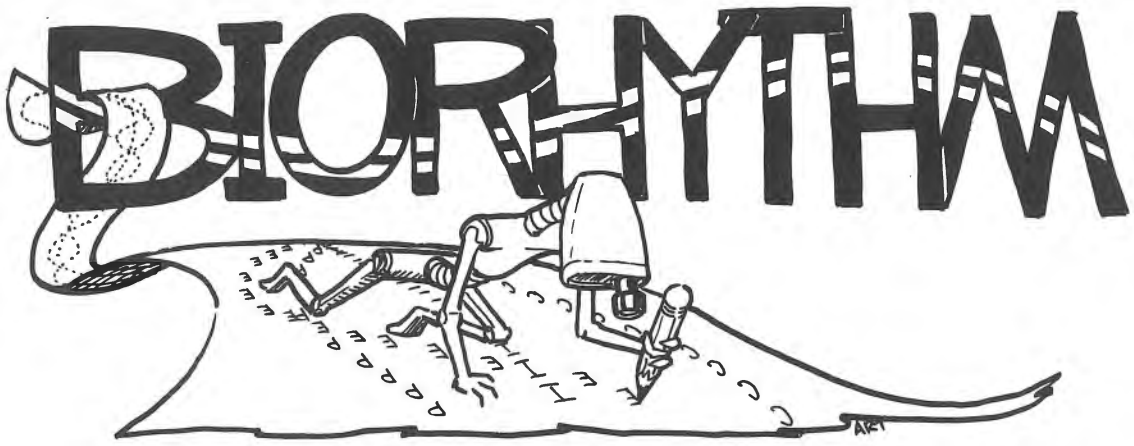

This game is designed to compel the user to define any object that is chosen. This process 'teaches' the computer a definition of up to fifty objects. Although each run starts with the same elementary knowledge, the user adds the information which makes it harder and harder to stump the computer. To see the "setup," list -2030. The only two objects which the computer "knows" are a car and a house. Line 2015 specifies that RA$(1) = car, and WA$(1) = house. Line 2010 gives each of these variables fifty locations, so you can play for a long time. What the DIM statement does is to DIMension memory so that BA$, WA$, etc. will be able to contain up to fifty separate values. In other words, BA$(1), BA$(2), BA$(3) ....BA$(50) each contain a distinct value. This program demonstrates writing to array tables and searching the arrays for matching strings. You could use the routines in this program to write educational programs and tests.

```
10  REM  ********************
11  REM  ***                 ***
12  REM  ** APPLE  LEARNER **
13  REM  ***                 ***
14  REM  ********************
15  REM
16  REM
20  GOSUB 1000: REM  INSTS
30  GOSUB 2000: REM  SETUP
40  GOSUB 3000: REM  PLAY!
50  END
1000 :
1001  REM  *** INSTS
1002 :
1010  TEXT : HOME : NORMAL
1020  VTAB 3: HTAB 9: PRINT "***
     APPLE  LEARNER ***"
1030  VTAB 7: PRINT "THIS IS A GA
     ME THAT HAS THE ABILITY TO
     LEARN.  IT WILL ATTEMPT TO G
     UESS THE    NAME OF AN OBJEC
     T THAT YOU PICK AT      RAND
     OM."
1040  PRINT
1041  PRINT "WHENEVER YOU STUMP T
     HE COMPUTER, YOU AREASKED AB
     OUT THE OBJECT YOU SELECTED.
       BYCOMPILING THIS INFORMATI
     ON, THE COMPUTER'LEARNS'."
1045  PRINT : PRINT
1046  PRINT "ENTER 'STOP' WHEN YO
     U ARE DONE.  "
1050  VTAB 23
1051  INPUT "HIT RETURN WHEN READ
     Y TO CONTINUE : ";ANS$
1990  RETURN
2000 :
2001  REM  *** SETUP
2002 :
2010  DIM QU$(50),RI(50),WR(50),R
     A$(50),WA$(50)
2015 QU$(1) = "DOES IT MOVE ALONG
      THE GROUND":RI(1) = 0:WR(1)
      = 0
```

```
2020 RA$(1) = "CAR":WA$(1) = "HOU
     SE"
2030 FR = 2
2990  RETURN
3000 :
3001  REM  *** PLAY
3002 :
3005 LI = 1
3010  HOME : VTAB 3: HTAB 9: PRINT
     "*** APPLE  LEARNER ***": VTAB
3015  PRINT "I KNOW OF "FR" OBJEC
     TS ...": PRINT
3020  PRINT : PRINT QU$(LI);: INPUT
     " ? ";ANS$:ANS$ =  LEFT$ (AN
     S$,1)
3030  IF  LEFT$ (ANS$,1) = "Y" THEN
     3100
3035  IF  LEFT$ (ANS$,1) = "N" THEN
     3200
3036  IF  LEFT$ (ANS$,1) = "S" THEN
      TEXT : END
3040  PRINT "PLEASE ANSWER 'YES'
     OR 'NO'...": PRINT : GOTO 30
     20
3100  IF RI(LI) THEN LI = RI(LI):
      GOTO 3020
3105 GU$ = RA$(LI): GOTO 3300
3200  IF WR(LI) THEN LI = WR(LI):
      GOTO 3020
3205 GU$ = WA$(LI): GOTO 3300
3300  PRINT "IS IT A ";GU$;
3310  INPUT " ? ";TA$:TA$ =  LEFT$
     (TA$,1): IF TA$ = "Y" THEN  PRINT
     : PRINT "I GOT IT !!!"; CHR$
     (7); CHR$ (7); CHR$ (7): FOR
     PA = 1 TO 1000: NEXT PA: GOTO
     3005
3312  IF TA$ = "S" THEN  TEXT : END

3315  PRINT : PRINT : INPUT "WHAT
      WAS THE OBJECT?";NA$
```

```
3317  IF FR = 51 THEN  PRINT "I C
      AN'T REMEMBER THAT ONE.  MY
      MEMORY   SEEMS TO BE FULL...
      ": FOR PA = 1 TO 1000: NEXT
      PA: GOTO 3005
3320  PRINT : PRINT "WHAT IS A QU
      ESTION THAT I COULD USE TO
      TELL THE DIFFERENCE BETWEEN
      ": PRINT GU$" AND "NA$;: INPUT
      " ? ";QU$
3325  PRINT "FOR "NA$" THE ANSWER
       IS WHAT";: INPUT " ? ";YN$:
      YN$ =  LEFT$ (YN$,1): IF YN$
      <  > "Y" AND YN$ <  > "N
      " THEN 3325
3340  IF AN$ = "Y" THEN RI(LI) =
      FR:LI = FR:FR = FR + 1
3341  IF AN$ = "N" THEN WR(LI) =
      FR:LI = FR:FR = FR + 1
3345 QU$(LI) = QU$
3350  IF YN$ = "Y" THEN RA$(LI) =
      NA$:WA$(LI) = GU$
3351  IF YN$ = "N" THEN RA$(LI) =
      GU$:WA$(LI) = NA$
3355  GOTO 3005
```






This program is designed to interpret input, and from it, graph the user's biorhythms. You can accept the output to be as valid as you please, but don't expect the results to be testimony. Biorhythms, though fascinating, are still considered to be unscientific. There are several features of the program worth noting even if it won't predict the future:

Lines 2010 to 2025 set up a simple calendar printing routine. A few more lines and you could add leap years to it.

Line 3020 asks for a date and tells you exactly how to format the response.

Lines 3025-3028 'error check' the input. Error checking is a vital part of so-called user friendly programs.

Line 3140-3148 position the P, E and C characters into beautiful sine curves. Even if you have forgotten all your high school math you can try out the trig functions by plotting points to give a graphic representation of the function.

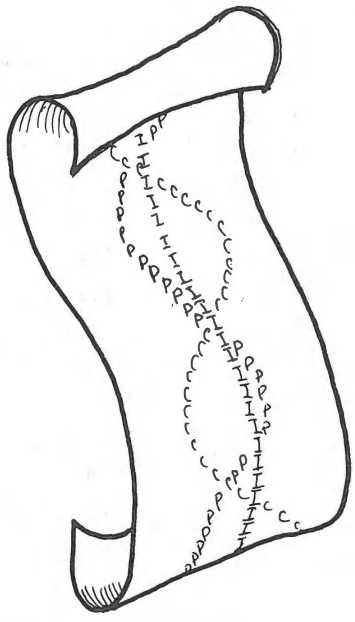
Did you recognize 6.28318 as 2Pi?

Running BIORHYTHM in the TRACE mode will show you very dramatically the FOR-NEXT loops in 3152 and 3208 that create the patterns.

The program uses complicated string functions and nested loops, so don't feel bad if it all looks like Relativity Theory. You can write a lot of programs which never get this complex.

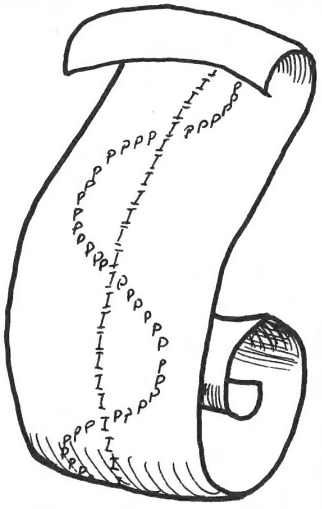
```
10  REM  ********************
11  REM  ***                 ***
12  REM  ***  BIORHYTHM      ***
13  REM  ***                 ***
14  REM  ********************
15  REM
16  REM
18  GOSUB 45
20  GOSUB 1000: REM  INSTS
30  GOSUB 2000: REM  SETUP
40  GOSUB 3000: REM  PLAY!
42  END
45  HOME : VTAB 4
46  PRINT "A GRAPH OF BIORHYTHMS
     IS COMPOSED OF THELETTERS C,
      E, I, AND P.  EACH OF THESE
       IS";
47  PRINT " A REPRESENTATION OF O
     NE OF YOUR      ";
48  PRINT "MEASURABLE BIORHYTHMS.
     "
50  FOR I = 1 TO 4: PRINT : NEXT
     : HTAB 6
51  PRINT "I = INTELLECTUAL STATE
     "
52  PRINT : HTAB 6
53  PRINT "E = EMOTIONAL STATE"
54  PRINT : HTAB 6
55  PRINT "P = PHYSICAL STATE"
56  PRINT : HTAB 6
57  PRINT "C = THE CROSSOVER POIN
     T"
58  FOR I = 1 TO 6: PRINT : NEXT
     : INPUT "PRESS RETURN WHEN R
     EADY TO CONTINUE : ";AN$
70  RETURN
1000 :
1001  REM  *** INSTS
1002 :
1010  TEXT : NORMAL : HOME
1020  VTAB 3: HTAB 11: PRINT "***
      BIORHYTHM ***"
1030  VTAB 7
```

```
1031  PRINT "THIS PROGRAM WILL GR
      APH OUT YOUR UNIQUE BIORHYTH
      MIC CYCLES, EITHER ON THE SC
      REEN OR TO A PRINTER.  "
1040  VTAB 16: PRINT "SHOULD I OU
      TPUT TO:
1042  PRINT : PRINT "         S)CR
      EEN
                -OR-
1045  PRINT "         P)RINTER
1050  VTAB 22
1051  INPUT "WHICH DO YOU WANT (S
      /P) ? ";ANS$:ANS$ =  LEFT$ (
      ANS$,1): IF ANS$ <  > "S" AND
      ANS$ <  > "P" THEN 1050
1060  IF ANS$ = "S" THEN  RETURN

1065  VTAB 22: CALL  - 958: INPUT
      "IN WHICH SLOT IS YOUR PRINT
      ER?";SLOT$:SLOT =  VAL (SLOT
      $): IF SLOT < 1 OR SLOT > 7 OR
      SLOT <  >  INT (SLOT) THEN 1
      065
1990  RETURN
2000 :
2001  REM  *** SETUP
2002 :
2010  DIM A(12),B(12),T(3),A$(21)

2015 C$ = "JANFEBMARAPRMAYJUNJULA
      UGSEPOCTNOVDEC"
2020  FOR I = 1 TO 12: READ A(I):
       NEXT : DATA 0,31,59,90,120,
      151,181,212,243,273,304,334
2025  FOR I = 1 TO 12: READ B(I):
       NEXT : DATA 31,28,31,30,31,
      30,31,31,30,31,30,31
2990  RETURN
3000 :
3001  REM  *** PLAY
3002 :
3010  HOME : VTAB 3: HTAB 11: PRINT
      "*** BIORHYTHM ***"
```

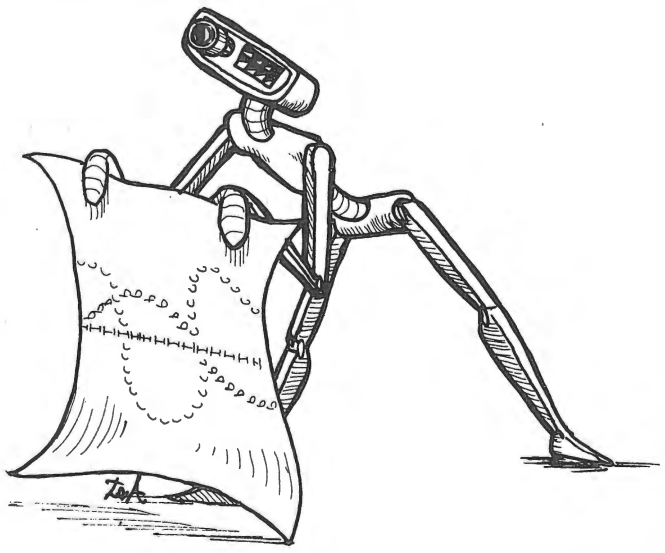


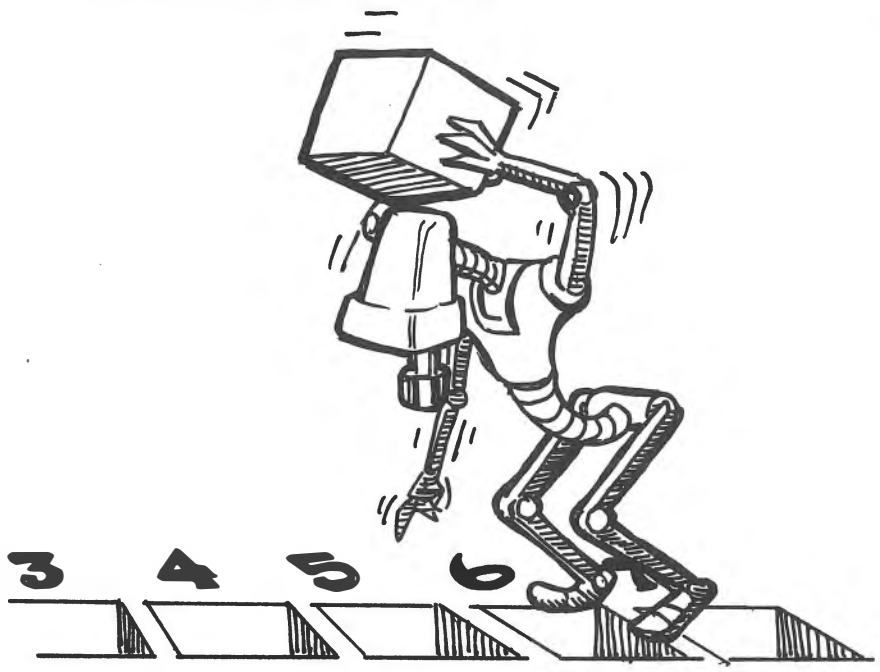
```
3015  INPUT "WHAT IS YOUR NAME? "
     ;N$
3020  PRINT : PRINT "WHAT IS YOUR
      BIRTHDATE? ": INPUT "MM,DD,
     YYYY) ";M,D,Y
3025  IF M < 1 OR M > 12 THEN  PRINT
     "INCORRECT MONTH":ER = 1
3026  IF D < 1 OR D > 31 THEN  PRINT
     "INCORRECT DAY":ER = 1
3027  IF Y < 1900 OR Y > 1999 THEN
      PRINT "INCORRECT YEAR":ER =
     1
3028  IF ER THEN ER = 0: GOTO 302
     0
3030  PRINT : PRINT "WHAT IS THE
     START DATE?": INPUT "MM,DD,Y
     YYY ";M1,D0,Y1
3035  IF M1 < 1 OR M1 > 12 THEN  PRINT
     "INCORRECT MONTH":ER = 1
3036  IF D0 < 1 OR D0 > 31 THEN  PRINT
     "INCORRECT DAY":ER = 1
3037  IF Y1 < 1900 THEN  PRINT "I
     NCORRECT YEAR":ER = 1
3038  IF ER THEN ER = 0: GOTO 303
     0
3040  PRINT : INPUT "HOW MANY DAY
     S? ";Z: IF Z < 1 OR Z <  >  INT
     (Z) THEN 3040
3045 W = D0:W1 = M1:W2 = Y1:W3 =
     Z
3050 J = A(M) + D:D1 = 365 - J +
     ((J <  = 60) AND (Y / 4 =  INT
     (Y / 4))):D2 = 365 * (Y1 - (
     Y + 1)):E = 0: FOR T = Y + 1
      TO Y1 - 1:E = E + (T / 4 =
      INT (T / 4)): NEXT T
3055 D3 = A(M1) + D0:D3 = D3 + ((
     Y / 4 =  INT (Y / 4)) AND (D
     3 >  = 60)):D4 = D1 + D2 + D
     3 + E
3056  IF D4 < 0 THEN  PRINT "STAR
     T DATE BEFORE BIRTH DATE": GOTO
     3030
```

```
3104 P1 = D4 -  INT (D4 / 23) * 2
     3
3108 E1 = D4 -  INT (D4 / 28) * 2
     8
3112 C1 = D4 -  INT (D4 / 33) * 3
     3
3116  IF ANS$ = "P" THEN  PRINT  CHR$
     (4)"PR#"SLOT: PRINT  CHR$ (9
     )"80N"
3117  PRINT  TAB( 22)"BIORHYTHM C
     YCLES": PRINT  TAB( 25)"---
     FOR ---": PRINT  TAB( 22 + (
     17 -  LEN (N$)) / 2)N$
3118  PRINT  TAB( 25); MID$ (C$,3
      * M - 2,3)" "D", "Y: PRINT

3120  PRINT  MID$ (C$,3 * M1 - 2,
     3)" "Y1"              (-)   (
     0)   (+)"
3124  FOR T = 1 TO Z
3128 P2 = P1 + T -  INT ((P1 + T)
      / 23) * 23
3132 E2 = E1 + T -  INT ((E1 + T)
      / 28) * 28
3136 C2 = C1 + T -  INT ((C1 + T)
      / 33) * 33
3140 P3 =  INT (11.5 + 10 *  SIN
     (P2 * 6.28318 / 23))
3144 E3 =  INT (11.5 + 10 *  SIN
     (E2 * 6.28318 / 28))
3148 C3 =  INT (11.5 + 10 *  SIN
     (C2 * 6.28318 / 33))
3152  FOR I = 1 TO 21:A$(I) = " "
     : NEXT
3156 A$(P3) = "P"
3160  IF A$(E3) <  > " " THEN 318
     0
3164 A$(E3) = "E"
3168  IF A$(C3) <  > " " THEN 318
     8
3172 A$(C3) = "C": GOTO 3192
3180 A$(E3) = "*": GOTO 3168
3188 A$(C3) = "*": GOTO 3192
```



```
3192  IF A$(11) = " " THEN A$(11)
      = "I"
3196  IF D0 = 1 THEN  PRINT  MID$
     (C$,3 * M1 - 2,3)" ";: GOTO
     3208
3198  PRINT "     ";
3208  PRINT  RIGHT$ ("    " +  STR$
     (D0),2)"              ";: FOR
     I = 1 TO 21: PRINT A$(I);: NEXT
     : PRINT
3212  IF Y1 - (( INT (Y1 / 4)) *
     4) = 0 THEN B(2) = 29
3224 D0 = D0 + 1: IF D0 > B(M1) THEN
     D0 = 1:M1 = M1 + 1
3244  IF M1 > 12 THEN M1 = 1:Y1 =
     Y1 + 1
3260  NEXT T
3300  IF ANS$ = "P" THEN  PRINT  CHR$
     (4)"PR#0"
3990  RETURN
```






# Connect Five

This classic game requires that you connect five squares either vertically, horizontally, or diagonally. Though not much of a challenge, the game is good for your ego. The graphics are fairly basic, so let's take a closer look. First, type: LIST-2025. Experiment with the color, the line length and location, and the FOR statement. After you are done analyzing those lines, type: LIST -3050. Most noteworthy are lines 3010-3021. Line 3010 asks you to input the desired column NUMBER, but the variable (ANS$) is for numbers and characters. Any variable that ends with a dollar-sign ($) is called a string and is not capable of having any mathematical functions performed upon it. The reason the variable in 3010 is a string variable is that the person choosing the column number might accidentally hit a letter instead of a number. If the variable in 3010 was ANS, and an I were input in place of 1, the program would 'crash'. Each character has a corresponding numeric value, so a letter can be redefined as a numeric. Line 3020 converts the string ANS$ to the numeric ANS. Line 3021 then makes mathematical comparisons based upon the input. You might want to experiment with the VAL command to see how computers alphabetize lists of words.

```
10  REM  ********************
11  REM  ***                 ***
12  REM  *** CONNECT FIVE ***
13  REM  ***                 ***
14  REM  ********************
15  REM
16  REM
20  GOSUB 1000: REM  INSTS
30  GOSUB 2000: REM  SETUP
40  GOSUB 3000: REM  PLAY!
50  GOSUB 4000: REM  !END!
60  END
1000 :
1001  REM  *** INSTS
1002 :
1010  TEXT : NORMAL : HOME
1020  VTAB 3: HTAB 10: PRINT "***
      CONNECT FIVE ***"
1030  VTAB 7: PRINT "THE OBJECT O
     F THE GAME IS TO GET FIVE OF
     YOUR PIECES IN A ROW, EITHER
      VERTICALLY OR HORIZONTALLY."
1035  PRINT
1040  PRINT "WHEN IT IS YOUR TURN
      TO MOVE, ENTER THE NUMBER O
     F THE COLUMN YOU WISH TO DRO
     P   YOUR PIECE INTO. "
1045  PRINT
1050  PRINT "AFTER YOU MOVE, I WI
     LL TAKE A TURN.     THE FIRS
     T ONE TO CONNECT FIVE IS THE
         WINNER. "
1060  VTAB 22: INPUT "PRESS RETUR
     N WHEN READY TO CONTINUE : "
     ;ANS$
1990  RETURN
2000 :
2001  REM  *** SETUP
2002 :
2010  GR
2011  COLOR= 0
2012  FOR I = 0 TO 35
2013  HLIN 0,35 AT I
2014  NEXT
```

```
2015  COLOR= 15
2016  FOR I = 0 TO 35 STEP 5
2017  HLIN 0,35 AT I: VLIN 0,35 AT
     I
2018  NEXT I
2020  COLOR= 6
2021  VLIN 35,39 AT 3
2022  HLIN 2,4 AT 39
2023  PLOT 2,36
2024  HLIN 7,9 AT 35: HLIN 7,9 AT
     37: HLIN 7,9 AT 39
2025  PLOT 9,36: PLOT 7,38
2030  HLIN 12,14 AT 35: HLIN 12,1
     4 AT 37: HLIN 12,14 AT 39: PLOT
     14,36: PLOT 14,38: HLIN 17,1
     9 AT 37: VLIN 35,39 AT 19: VLIN
     35,36 AT 17
2040  HLIN 22,24 AT 35: HLIN 22,2
     4 AT 37: HLIN 22,24 AT 39: PLOT
     22,36: PLOT 24,38: HLIN 27,2
     9 AT 35: HLIN 27,29 AT 37: HLIN
     27,29 AT 39
2050  PLOT 27,38: PLOT 29,38: PLOT
     27,36: HLIN 32,34 AT 35: PLOT
     34,36: VLIN 37,39 AT 33
2900  DEF  FN C(X) = (X - 1) * 5 +
     1
2910  DEF  FN P(X) = (X - 1) * 5 +
     9
2990  RETURN
3000 :
3001  REM  *** PLAY
3002 :
3010  HOME :PL = 1: INPUT "YOUR M
     OVE (COLUMN 1-7) : ";ANS$
3020 ANS =  VAL (ANS$)
3021  IF ANS < 1 OR ANS > 7 OR AN
     S <  >  INT (ANS) THEN  HOME
     : PRINT "PLEASE SELECT A NUM
     BER FROM 1 TO 7 : ": FOR A =
     1 TO 1000: NEXT A: GOTO 3010

3030 AX =  FN C(ANS)
```

```
3040  IF  SCRN( AX,1) <  > 0 THEN
      HOME : PRINT "THAT COLUMN I
     S FULL... ": FOR A = 1 TO 10
     00: NEXT A: GOTO 3010
3050  FOR J = 1 TO 7: COLOR=  FN
     P(PL):JX =  FN C(J): FOR K =
     JX TO JX + 3: HLIN AX,AX + 3
      AT K: NEXT K
3055  IF J = 7 THEN 3080
3060 LX =  FN C(J + 1): IF  SCRN(
     AX,LX) <  > 12 THEN J = 7: GOTO
     3080
3065  COLOR= 0
3070  FOR K = JX TO JX + 3: HLIN
     AX,AX + 3 AT K: NEXT K
3080  NEXT J
3090  FOR I = 1 TO 7: FOR J = 1 TO
     3: FOR K = J TO J + 4:IX =  FN
     C(I):KX =  FN C(K)
3100  IF  SCRN( IX,KX) <  >  FN P
     (PL) THEN K = J + 4: NEXT K:
      GOTO 3110
3105  NEXT K: RETURN
3110  NEXT J,I
3120  FOR J = 1 TO 7: FOR I = 1 TO
     3: FOR K = I TO I + 4:KX =  FN
     C(K):JX =  FN C(J)
3130  IF  SCRN( KX,JX) <  >  FN P
     (PL) THEN K = I + 4: NEXT K:
      GOTO 3140
3135  NEXT K: RETURN
3140  NEXT I,J
3150  IF PL = 2 THEN PL = 1: GOTO
     3010
3160 PL = 2:ANS =  INT ( RND (1) *
     7) + 1:AX =  FN C(ANS): IF  SCRN(
     AX,1) <  > 12 THEN 3160
3170  GOTO 3050
4000 :
4001  REM  *** ALL DONE
4002 :
```

```
4010  HOME : PRINT : PRINT "THE G
     AME IS OVER !!!": PRINT "THE
      WINNER IS ... ";
4020  IF PL = 1 THEN  PRINT "YOU
     !!!": RETURN
4030  PRINT "ME !!!": RETURN
```

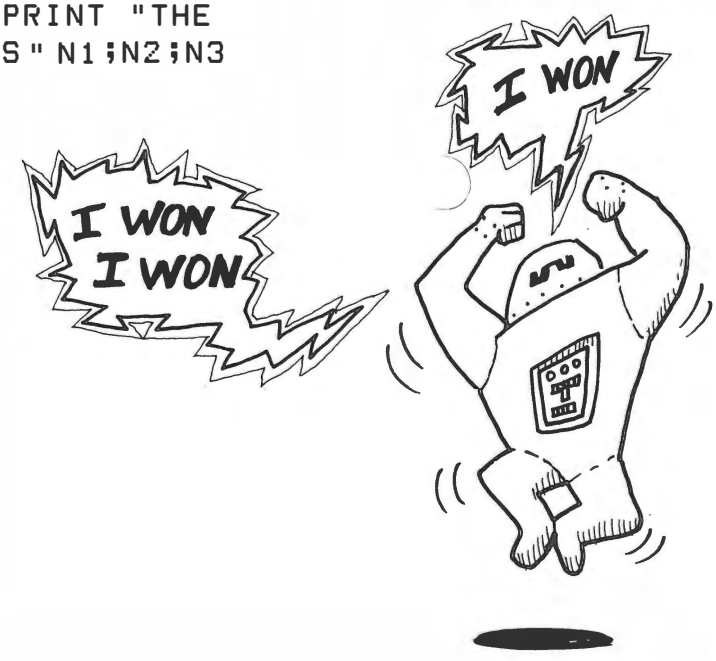

This is definitely a thinking man's game. You are given clues in an attempt to guess a three-number puzzle. Load the program. FN R(10) generates a random integer between 0 and 9. How and why will be discussed elsewhere in the book, for now, just accept that this is true. N1 is any digit between 0 and 9. N2 is any digit between 0 and 9 exept N2 cannot equal N1. N3 is also a number between 0 and 9. N3 cannot be equal to N2 or N1. The result is that the three-digit number represented by N1/N2/N3 will be a random three-digit number comprised of three different digits. Lines 3035-3037 separate your single three-digit guess into three separate guesses (G1, G2, and G3). Here's how. When any number is converted to an integer, the portion of the number which is to the right of the decimal point is truncated (cut off). Here are a few examples: INT 3.4 is 3, INT 9.989 is 9, INT 562.3 is 562, INT 0.3 is 0. Taking line 3035, assume that the guess was 567. 567 divided by 100 is 5.67. When converted to an INTeger, 5.67 becomes 5 (G1 = 5). Line 3036 takes 567, subtracts (5 multiplied by 100), divides the result (67) by 10, and converts 6.7 into the INTeger. Now G1 = 5 and G2 = 6. Lastly, 3037 takes 567 (ANS) and sutracts from it (5 (G1) times 100 plus 6 (G2) times 10) or 560. The result (567 - 560) is now stored in G3. So now G1 = 5, G2 = 6, and G3 = 7. Statistically, even when you are unlucky, the solution can be derived in no more than seven guesses. You've been challenged, now go to it!

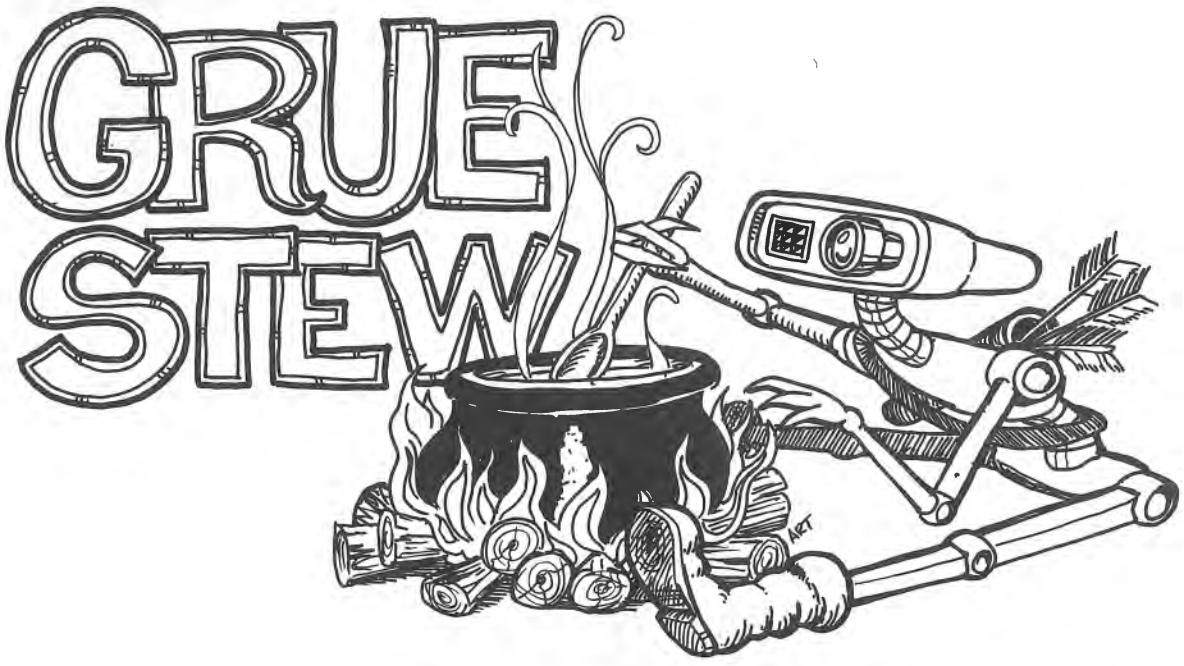
```
10  REM  ********************
11  REM  ***                 ***
12  REM  ***    DIGITS       ***
13  REM  ***                 ***
14  REM  ********************
15  REM
16  REM
20  GOSUB 1000: REM  INSTS
30  GOSUB 2000: REM  SETUP
40  GOSUB 3000: REM  PLAY!
50  GOSUB 4000: REM  !END!
60  END
1000 :
1001  REM  *** INSTS
1002 :
1010  TEXT : NORMAL : HOME
1020  VTAB 2: HTAB 13: PRINT "***
      DIGITS ***"
1030  VTAB 5
1031  PRINT "I WILL THINK OF A NU
     MBER BETWEEN 012 AND987.  EA
     CH DIGIT IN THE NUMBER WILL
     BE  DIFFERENT FROM THE OTHER
      TWO."
1035  PRINT
1040  PRINT "THE OBJECT OF THE GA
     ME IS TO GUESS THE  SOLUTION
      IN AS FEW TRIES AS POSSIBLE
     ."
1050  VTAB 23: INPUT "HIT RETURN
     WHEN READY TO CONTINUE : ";A
     NS$
1060  HOME : VTAB 2: HTAB 13: PRINT
     "*** DIGITS ***": VTAB 5
1070  PRINT "AFTER EACH GUESS, I
     WILL PRINT OUT A    HINT LIN
     E AS FOLLOWS : "
1075  PRINT
1080  PRINT ">FOR EACH DIGIT CORR
     ECT AND IN THE      CORRECT
     POSITION, I WILL PRINT AN 'X
     '. "
1085  PRINT
```

```
1090  PRINT ">FOR EACH DIGIT CORR
      ECT BUT NOT IN THE  CORRECT
      POSITION, I WILL PRINT AN 'O
      '."
1095  PRINT
1100  PRINT ">FOR EACH TOTALLY IN
      CORRECT DIGIT, I    WILL PRI
      NT A '-'. "
1105  PRINT
1110  PRINT "PLAY WILL CONTINUE U
      NTIL YOU GUESS THE  NUMBER.
       TO QUIT EARLY, SIMPLY HIT T
      HE  RETURN KEY FOR YOUR GUES
      S."
1115  VTAB 23
1120  INPUT "HIT RETURN WHEN READ
      Y TO CONTINUE : ";ANS$
1130  HOME : VTAB 6
1140  PRINT "HERE IS A TABLE TO H
      ELP YOU UNDERSTAND  THE INST
      RUCTIONS."
1145  PRINT : PRINT
1150  PRINT "ANSWER      GUESS
        HINT LINE "
1160  PRINT "--------------------
      -----------"
1165  PRINT
1170  PRINT " 065         703
         0--
1171  PRINT
1175  PRINT " 562         463
         X--
1176  PRINT
1180  PRINT " 918         890
         00-": PRINT
1185  PRINT " 390         305
         X0-": PRINT
1190  PRINT " 271         721
         X00": PRINT
1195  PRINT " 425         780
         ---": PRINT
1200  INPUT "PRESS RETURN WHEN RE
      ADY TO CONTINUE : ";ANS$
```

```
1990  RETURN
2000 :
2001  REM  *** SETUP
2002 :
2010  DEF  FN R(X) =  INT ( RND (
     1) * X)
2020 N1 =  FN R(10)
2021 N2 =  FN R(10): IF N2 = N1 THEN
     2021
2022 N3 =  FN R(10): IF N3 = N1 OR
     N3 = N2 THEN 2022
2990  RETURN
3000 :
3001  REM  *** PLAY
3002 :
3010  HOME : VTAB 3: HTAB 13: PRINT
     "*** DIGITS ***": VTAB 7
3020  PRINT "OKAY, I'VE GOT A NUM
     BER...": PRINT
3030  INPUT "WHAT IS YOUR GUESS?
      ";ANS$: IF ANS$ = "" THEN  RETURN
3031  IF  LEN (ANS$) <  > 3 THEN
      PRINT "TYPE ONLY THREE DIGI
     TS PLEASE": GOTO 3030
3032 ANS =  VAL (ANS$): IF ANS <
     0 OR ANS > 999 THEN  PRINT "
     TYPE ONLY THREE DIGITS PLEAS
     E": GOTO 3030
3035 G1 =  INT (ANS / 100)
3036 G2 =  INT ((ANS - G1 * 100) /
     10)
3037 G3 = ANS - (G1 * 100 + G2 *
     10)
3040  IF G1 = G2 OR G1 = G3 OR G2
      = G3 THEN  PRINT "TYPE THRE
     E DIFFERENT DIGITS PLEASE.":
      GOTO 3030
3050 CP = 0:CD = 0:MI = 0
3051  IF G1 = N1 THEN CP = CP + 1

3052  IF G2 = N2 THEN CP = CP + 1

3053  IF G3 = N3 THEN CP = CP + 1
```

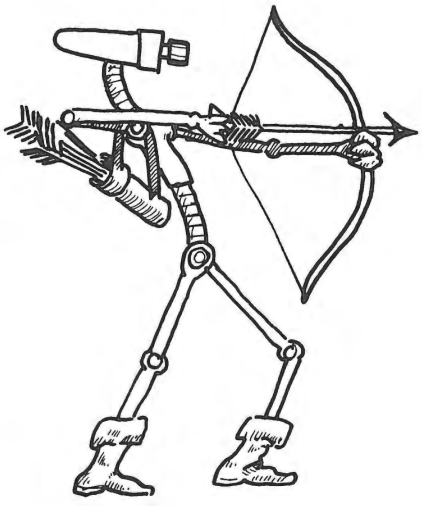
```
3055  IF G1 = N2 OR G1 = N3 THEN
      CD = CD + 1
3056  IF G2 = N1 OR G2 = N3 THEN
      CD = CD + 1
3057  IF G3 = N1 OR G3 = N2 THEN
      CD = CD + 1
3060 MI = 3 - CP - CD
3065  PRINT "FOR YOUR GUESS OF "G
      1;G2;G3", I HINT ";
3070  IF CP > 0 THEN  FOR I = 1 TO
      CP: PRINT "X";: NEXT
3071  IF CD > 0 THEN  FOR I = 1 TO
      CD: PRINT "O";: NEXT
3072  IF MI > 0 THEN  FOR I = 1 TO
      MI: PRINT "-";: NEXT
3075  PRINT : PRINT :NG = NG + 1:
       IF CP = 3 THEN  RETURN
3080  GOTO 3030
4000 :
4001  REM  *** END
4002 :
4010  PRINT "THE GAME IS OVER ...
      ": PRINT
4015  IF CP = 3 THEN  PRINT "YOU
      GUESSED IT IN ONLY "NG" TRIE
      S ! "
4020  IF CP < 3 THEN  PRINT "THE
      CORRECT ANSWER WAS" N1;N2;N3
4990  RETURN
```






To play this game, you should have paper and pencil. You travel through an unseen maze of caverns searching for the Grue. As any good spelunker will tell you, drawing a map will prevent you from making the same mistakes over and over again. In other words, draw a map as you go along. There are no color graphics used in this program, but there are some other interesting features. You may ask, "How come I get different responses each time I run the program?" and here's why. Lines 2100 through 2130 assign certain variables a RANDOM value. Beginning at 3020, this becomes relevant. One of four messages is printed. Which one it is, depends on the RaNDom values of the four variables (EX, P1, B1, GU). Line 3026 reveals that on each move you have a one in fifteen chance of experiencing an earthquake. To paraphrase line 3026: if a RaNDom INTeger between 0 and 14 happens to be equal to 4, then PRINT (BELL$ causes the computer to emit a ringing sound) <<< EARTHQUAKE >>>. Line 3030 really begins each turn. As you go through the program, you will note that the execution of most of the lines depends, either directly or indirectly, on the value of a randomly generated integer.

```
10  REM  ********************
11  REM  ***                 ***
12  REM  ***   GRUE STEW     ***
13  REM  ***                 ***
14  REM  ********************
15  REM
16  REM
20  GOSUB 1000: REM  INSTS
30  GOSUB 2000: REM  SETUP
40  GOSUB 3000: REM  PLAY!
50  GOSUB 4000: REM  !END!
60  END
1000 :
1001  REM  *** INSTS
1002 :
1010  TEXT : NORMAL : HOME
1020  VTAB 3: HTAB 12: PRINT "***
      GRUE STEW ***"
1030  VTAB 7: PRINT "IN THIS GAME
     , YOU ARE A BRAVE HUNTER.
     YOU ARE ALSO VERY HUNGRY.  S
     O, YOU      DECIDE TO GO 'GR
     UE' HUNTING.  A GRUE, ASEVER
     YONE KNOWS, IS THE KEY INGRE
     DIENT INGRUE STEW."
1040  PRINT : PRINT "YOU ARE GOIN
     G TO ENTER A SERIES OF
     UNDERGROUND CAVES, IN SEARCH
      OF THE STEWBASE, THE GRUE."

1050  PRINT : PRINT "IF YOU CAN B
     AG A GRUE, AND GET OUT OF
     THE CAVES, THEN YOU WILL GET
      YOUR STEW  (AND WIN THE GAM
     E!)."
1060  VTAB 23: INPUT "HIT RETURN
     WHEN READY TO CONTINUE : ";A
     NS$
1070  HOME : VTAB 3: HTAB 12: PRINT
     "*** GRUE STEW ***": VTAB 7
```



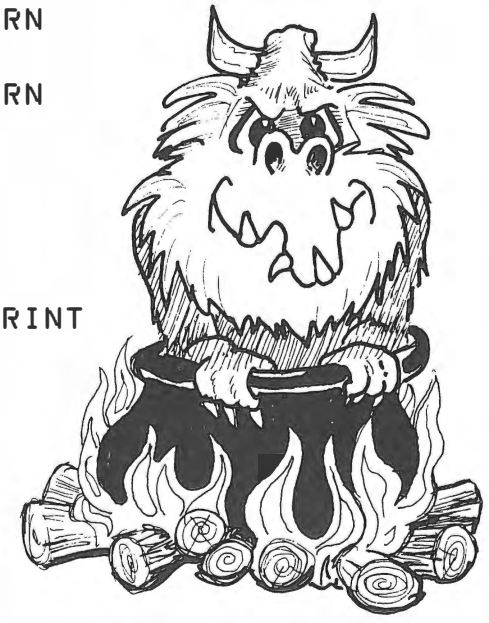
```
1080  PRINT "ONCE IN THE MAZE, YO
      U CAN EITHER MOVE   TO A DIF
      FERENT CAVERN OR SHOOT AN AR
      ROW INTO AN ADJOINING CAVE,
      IN HOPES OF     HITTING A FE
      ROCIOUS GRUE. "
1090  PRINT : PRINT "I WILL ASK:
      MOVE OR SHOOT?, AND YOU MUST
      REPLY WITH 'M' FOR MOVE OR '
      S' FOR      SHOOT."
1095  PRINT : PRINT "IF YOU DECID
      E TO MOVE, YOU CAN DO SO IN
      ANY OF THE FOUR COMPASS DIRE
      CTIONS. WHENASKED WHICH WAY,
       ENTER 'N' FOR NORTH,   'S'
      FOR SOUTH, 'W' FOR WEST, OR
      'E' FOR EAST."
1100  VTAB 23: INPUT "HIT RETURN
      WHEN READY TO CONTINUE : ";A
      NS$
1120  HOME : VTAB 3: HTAB 12: PRINT
      "*** GRUE STEW ***": VTAB 7
1130  PRINT "IF YOU DECIDE TO SHO
      OT, YOU WILL BE     ASKED: S
      HOOT WHICH WAY?, AND YOU MUS
      T   REPLY: 'N' FOR NORTH, 'S
      ' FOR SOUTH, 'E'FOR EAST, 'W
      ' FOR WEST."
1140  PRINT : PRINT "IF YOU HIT T
      HE GRUE, YOU WILL BE TOLD,
      AND YOU MUST TRY TO EXIT THE
       CAVES."
1150  PRINT : PRINT "BUT...THERE
      ARE OTHER THINGS IN THE
      CAVES.  THERE ARE GIANT BATS
       THAT WILL  PICK YOU UP AND
      DROP YOU ELSEWHERE."
1160  VTAB 23: INPUT "HIT RETURN
      WHEN READY TO CONTINUE : ";A
      NS$
1170  HOME : VTAB 3: HTAB 12: PRINT
      "*** GRUE STEW ***": VTAB 7
```

```
1180  PRINT "THERE ARE BOTTOMLESS
      PITS.  IF YOU FALL INTO ONE
      OF THESE YOU'LL NEVER GET O
     UT!"
1190  PRINT : PRINT "OF COURSE TH
     ERE IS THE GRUE HIMSELF.
     THOUGH NOT AN AGGRESSIVE CRE
     ATURE, HE   WILL EAT YOU IF
     YOU COME TOO CLOSE."
1200  PRINT : PRINT "AND THERE AR
     E EARTHQUAKES THAT MOVE
     THINGS AROUND IN THE CAVES (
     BATS, PITS, THE GRUE, AND TH
     E EXIT!)."
1210  VTAB 23: INPUT "HIT RETURN
     WHEN READY TO CONTINUE : ";A
     NS$
1990  RETURN
2000 :
2001  REM  *** SETUP
2002 :
2005 BELL$ =  CHR$ (7)
2010  DIM RO$(20),TR(20,4)
2015  FOR I = 1 TO 20: READ RO$(I
     ): NEXT I
2020  DATA    YOU ARE IN A SMALL
     ROOM WITH ROCKS AND  DEBRIS
     SCATTERED EVERYWHERE.
2021  DATA      DUCK YOUR HEAD IN
      HERE; AS LARGE ROCK   STALA
     CTITES HANG FROM THE CEILING
     .
2022  DATA     THE ROOM HERE SLOP
     ES DOWNWARD.
2023  DATA    THIS ROOM IS VERY S
     MALL; BUT I THINK WE CAN MAK
     E IT THROUGH OK.
2024  DATA     THIS IS A VERY LAR
     GE ROOM WITH A LARGE  BOULDE
     R IN THE CENTER OF IT.
2025  DATA  THIS IS THE CENTER OF
      A NARROW PASSAGE  THAT CONN
     ECTS OTHER ROOMS.
```

```
2026  DATA  THIS PASSAGE IS VERY
      LOW; BUT IF WE     CRAWL WE
      CAN MAKE IT.
2027  DATA   THIS IS A VERY DIRTY
       ROOM; IT HAS BEEN  PARTIALL
      Y FILLED IN BY THE LAST EART
      H-  QUAKE THAT HIT.
2028  DATA     THIS ROOM IS ABOUT
       AVERAGE SIZE; BUT IS FILLED
       WITH A PUNGENT AROMA THAT I
      S VERYNAUSEATING.
2029  DATA  YOU ARE IN A SMALL PA
      SSAGEWAY.
2030  DATA  YOU ARE IN A SMALL PA
      SSAGEWAY.
2031  DATA  YOU ARE IN A SMALL PA
      SSAGEWAY.
2032  DATA  YOU ARE IN A SMALL PA
      SSAGEWAY.
2033  DATA  YOU ARE IN A SMALL PA
      SSAGEWAY.
2034  DATA  YOU ARE IN A SMALL PA
      SSAGEWAY.
2035  DATA     A SMALL HOLE IN TH
      E CEILING LETS LIGHT  FROM O
      UTSIDE THROUGH ... BUT YOU W
      OULD  NEVER FIT THROUGH IT.
2036  DATA   SOMEONE HAS LEFT A L
      IGHTED TORCH ON THE WALL AND
       IT ILLUMINATES YOUR PASSAGE
      .
2037  DATA  A RIVULET OF WATER SL
      OWLY TRICKLES FROM A HOLE IN
       THE WALL.
2038  DATA  A SMALL HOLE TO YOUR
      LEFT ATTRACTS YOUR ATTENTION
      ; BUT IT IS TOO SMALL TO BE
      OF ANY CONCERN.
2039  DATA      YOU ARE IN A LOW
      DEPRESSION IN THE      CENTE
      R OF A MEDIUM-SIZED ROOM.
2050  FOR I = 1 TO 20:F = 0
```

```
2055  FOR J = 1 TO 4: GOSUB 2955:
     F = F + TR(I,J): NEXT J: IF
      NOT F THEN 2055
2075  NEXT I
2100 YO =  INT ( RND (1) * 20) +
     1
2105 GU =  INT ( RND (1) * 20) +
     1
2106  IF GF THEN GU =  - 1
2110 EX =  INT ( RND (1) * 20) +
     1
2115 B1 =  INT ( RND (1) * 20) +
     1
2120 B2 =  INT ( RND (1) * 20) +
     1
2125 P1 =  INT ( RND (1) * 20) +
     1
2130 P2 =  INT ( RND (1) * 20) +
     1
2135  RETURN
2955  IF  INT ( RND (1) * 3) + 1 =
     2 OR TR(I,J) THEN  RETURN
2960 RO =  INT ( RND (1) * 20) +
     1: IF RO = I THEN 2955
2961 DI =  INT ( RND (1) * 4) + 1
     : IF TR(RO,DI) THEN 2955
2965 TR(I,J) = RO:TR(RO,DI) = I
2990  RETURN
3000 :
3001  REM  *** PLAY
3002 :
3010  HOME : VTAB 3: HTAB 12: PRINT
     "*** GRUE STEW ***": VTAB 7
3015  PRINT : PRINT RO$(YO): FOR
     I = 1 TO 10:XX =  PEEK ( - 1
     6336): NEXT I
3020  FOR I = 1 TO 4:CO = TR(YO,I
     )
3021  IF CO = EX THEN  PRINT BELL
     $"EXIT NEARBY ..."
3022  IF CO = GU THEN  PRINT BELL
     $"I SMELL THE GRUE !!!"
```

```
3023  IF CO = B1 OR CO = B2 THEN
      PRINT BELL$"FLAP... FLAP...
      FLAP ..."
3024  IF CO = P1 OR CO = P2 THEN
      PRINT BELL$"I FEEL A DRAFT
     !!!"
3025  NEXT
3026  IF  INT ( RND (1) * 15) = 4
      THEN  PRINT BELL$"<<< EARTH
     QUAKE >>>": GOSUB 2105: GOTO
     3015
3030  PRINT : INPUT "MOVE OR SHOO
     T? ";ANS$: IF ANS$ = "S" THEN
     3500
3035  IF ANS$ <  > "M" THEN  PRINT
     "TYPE IN 'M' OR 'S'...": GOTO
     3030
3040  INPUT "WHICH WAY?";ANS$: FOR
     I = 1 TO 4: IF ANS$ <  >  MID$
     ("NESW",I,1) THEN  NEXT : PRINT
     "ENTER 'N', 'E', 'W', OR 'S'
     ": GOTO 3030
3045  IF  NOT TR(YO,I) THEN  PRINT
     BELL$"YOU CANNOT GO THAT WAY
      ...": GOTO 3015
3050  PRINT "OK ...":YO = TR(YO,I
     )
3051  IF YO = EX THEN WL = 0: RETURN

3052  IF YO = GU THEN WL = 1: RETURN

3053  IF YO = P1 OR YO = P1 THEN
     WL = 2: RETURN
3054  IF YO <  > B1 AND YO <  > B
     2 THEN 3015
3055  PRINT "BATS HAVE YOU !!!": PRINT
     "THEY'RE LIFTING YOU UP !!!"
     : PRINT "OHHHHH, WHERE ARE W
     E NOW ???":YO =  INT ( RND (
     1) * 20) + 1: GOTO 3015
```



```
3500  INPUT "SHOOT WHICH WAY? ";A
     NS$: FOR I = 1 TO 4: IF ANS$
      <  >  MID$ ("NESW",I,1) THEN
      NEXT : PRINT "TYPE IN 'N',
     'E', 'W', OR 'S'": GOTO 3030

3505  IF  NOT TR(YO,I) THEN  PRINT
     BELL$"CLUNK!": PRINT "THE AR
     ROW BOUNCED OFF THE WALL.": GOTO
     3015
3510  IF TR(YO,I) = GU THEN  PRINT
     BELL$BELL$"OUCH !!!": PRINT
     "YOU BAGGED A GRUE !!!": PRINT
     "NOW TO FIND THE WAY OUT ...
     ":GF = 1:GU =  - 1: GOTO 301
     5
3520  PRINT BELL$"THE ARROW MISSE
     D THE GRUE !!!": GOTO 3015
4000 :
4001  REM  *** END
4002 :
4010  IF WL = 0 AND GF THEN  PRINT
     "YOU HAVE REACHED THE EXIT W
     ITH YOUR": PRINT "GRUE !!! Y
     OU WILL HAVE A FILLING SUPPE
     R": PRINT "TONIGHT FOR SURE
     !!!": RETURN
4015  IF WL = 0 THEN  PRINT "YOU
     HAVE REACHED THE EXIT WITHOU
     T": PRINT "ANY GRUE !!! YOU
     ARE SURE TO STARVE ..": RETURN

4020  IF WL = 1 THEN  PRINT "YOU
     BUMPED INTO THE GRUE !!!": PRINT
     "HE ATE YOU BEFORE YOU COULD
      MOVE !!": RETURN
4025  IF WL = 2 THEN  PRINT "YOU
     FELL INTO A PIT !!!": PRINT
     "YOU FELL A LOOOOOONG WAY ..
     .": RETURN
```


A clever premise overshadows an interesting game. The IRSman serves as an excellent mathematical teaching device, while being entertaining and challenging. Everyone wants to beat the IRS, now here's your chance! To play, choose a number (we'll call it 'X'), and the digits 1 through X will appear. Each time you remove a number from the list, all of the factors of that number (which are still on the list) go to the IRSman. The object is to garner as much money as possible, while being as stingy as possible with the IRSman. If you play the number 12, 1-2-3-4-5-6-7-8-9-10-11-12 will appear on the screen. If you begin play by selecting 12, the IRSman will get 6,2,4,3, and 1 (6x2 = 12, 4x3 = 12, 1x12 = 12) for a score of 16 to your 12. The board will now look like this: 11 10 9 8 7 5. As you will note, the only remaining number on the list which has a factor, is 10 (the remaining factor is 5). Remember, to remove a dollar amount (a number) from the list, there must be a factor to go to the IRSman. When you remove 10 from the above example, the score will be 22 (12 + 10) for you, and 21 (16 + 5) for the IRSman. But look . . . the list now reads: 11 9 8 7. None of these numbers has a factor left on the list, so they all revert to the IRSman. The final score would be 22 for you, and 56 (21 + 11 + 9 + 8 + 7) for the IRSman. If you choose 6 before choosing 12, the IRSman scores for 3x2 = 6, (5 dollars) and 1x6 (1 dollar) for a total of 6 dollars for him and 6 dollars for you. The digits may only be used once, so 6,3,2, and 1 are removed from the list. Now when you choose 12, the IRSman only gets 4 dollars (4x3 = 12). Now the score is 18 (6 + 12) for you, and 10 (6 + 4) for the IRSman. Note that 11 is stuck because the only factors of 11 are 11 and 1. Don't waste the universal factor (1) on just any number. It should be used first, to remove the highest prime number from the list. A prime number is one that is only divisible by itself and 1. Examples are 1,2,3,5,7,11,13,17,19,23, etc. To circumvent the loss of 11, choose this number before choosing 6. There are

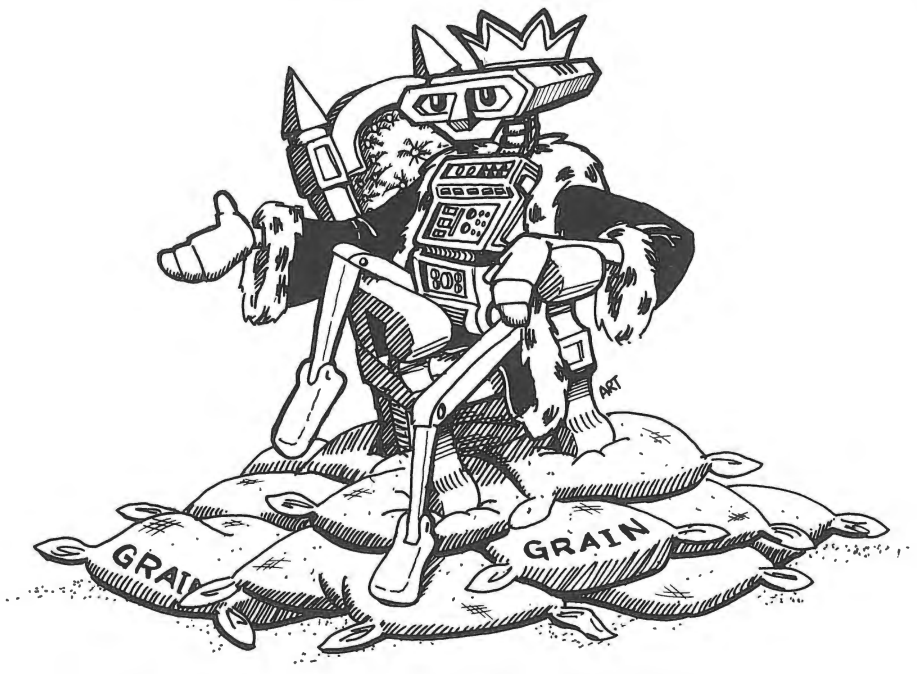
many ways to thwart the IRSman, but you must really try. Remember that all of the unused numbers (at the end of the game) are added to the score of the IRSman. The maximum score you can achieve when choosing 1 through 12, is 48.

```
10  REM  ********************
11  REM  ***                 ***
12  REM  ***     IRSMAN      ***
13  REM  ***                 ***
14  REM  ********************
15  REM
16  REM
20  GOSUB 1000: REM  INSTS
30  GOSUB 2000: REM  SETUP
40  GOSUB 3000: REM  PLAY!
50  GOSUB 4000: REM  !END!
60  END
1000 :
1001  REM  *** INSTS
1002 :
1010  TEXT : NORMAL : HOME
1020  VTAB 2: HTAB 13: PRINT "***
      IRSMAN ***"
1030  VTAB 5: PRINT "THIS IS THE
     GAME OF IRSMAN.  TO WIN, YOU
     TRY TO ACCUMULATE MORE MONEY
      THAN YOUR  NEMESIS, THE IRS
     MAN."
1033  PRINT
1035  PRINT "GIVE ME A NUMBER BET
     WEEN 1 AND 50.       I WILL D
     ISPLAY A CONSECUTIVE NUMBER
         STRING STARTING AT 1, AN
     D CONTINUING    ";
1036  PRINT "THROUGH TO THE NUMBE
     R YOU SELECTED.  YOUWILL THE
     N CHOOSE HOW MUCH MONEY (WHI
     CH  NUMBER) YOU WANT TO REMO
     VE FROM THE     LIST."
1038  PRINT
1040  PRINT "BUT, AND HERE'S THE
     FUN PART, THE IRSMANGETS ALL
      OF THE REMAINING NUMBERS ON
      THE";
```

```
1042  PRINT "LIST THAT ARE FACTOR
      S OF THE NUMBER YOU CHOSE.
      THAT IS HOW THE IRSMAN GETS
      HIS MONEY.  IF YOU CHOOSE 6,
       FOR EXAMPLE,   ";
1043  PRINT "THE IRSMAN GETS ALL
      OF THE REMAINING    FACTORS
      OF 6, (POTENTIALLY 1,2, AND
      3)."
1050  PRINT : INPUT "PRESS RETURN
       WHEN READY TO CONTINUE : ";
      ANS$
1055  TEXT : NORMAL : HOME
1060  VTAB 2: HTAB 13: PRINT "***
       IRSMAN ***"
1065  VTAB 5: PRINT "YOU CANNOT C
      HOOSE A NUMBER THAT HAS NO
      REMAINING FACTORS IN THE LIS
      T, BECAUSE  YOU MUST ALWAYS
      PAY THE IRS."
1066  PRINT
1070  PRINT "WHEN YOU CAN NO LONG
      ER REMOVE ANY OF THEREMAININ
      G NUMBERS FROM THE LIST, THE
          IRSMAN CLAIMS ALL OF THE
       UNUSED MONEY   (NUMBERS) FO
      R HIMSELF."
1080  VTAB 23: INPUT "PRESS RETUR
      N WHEN READY TO CONTINUE : "
      ;ANS$
1990  RETURN
2000 :
2001  REM  *** SETUP
2002 :
2010  DIM LI(50): FOR I = 1 TO 50
      :LI(I) = I: NEXT
2020  VTAB 23: CALL  - 958
2022  PRINT  CHR$ (7): INPUT "HOW
       MANY NUMBERS (1-50) IN THE
      LIST? ";ANS$
```

```
2025 ANS =  VAL (ANS$): IF ANS <
     1 OR ANS > 50 OR ANS <  >  INT
     (ANS) THEN  VTAB 22: CALL  -
     958: PRINT : PRINT "<<< USE
     A NUMBER FROM 1 TO 50 >>>": FOR
     PA = 1 TO 2000: NEXT : GOTO
     2020
2030 NU = ANS
2990  RETURN
3000 :
3001  REM  *** PLAY!
3002 :
3005  HOME : VTAB 3: HTAB 13: PRINT
     "*** IRSMAN ***": PRINT
3010  PRINT : PRINT "HERE IS THE
     LIST : ";: FOR I = 1 TO NU: IF
     LI(I) THEN  PRINT I"  ";
3015  IF  PEEK (36) > 35 THEN  PRINT

3020  NEXT I
3021  IF NU = 1 THEN  PRINT : PRINT
     : PRINT "OOOOPS, YOU CAN'T G
     ET ANYTHING...":TA = 1:LI(1)
      = 0: RETURN
3025  FOR I = 2 TO NU: IF  NOT LI
     (I) THEN 3040
3030  FOR J = 1 TO I: IF  NOT LI(
     J) THEN 3035
3031  IF J = I THEN 3035
3033  IF LI(I) / J =  INT (LI(I) /
     J) THEN 3050
3035  NEXT J
3040  NEXT I: RETURN
3050  PRINT : PRINT : PRINT "THE
     SCORE IS:   IRSMAN: "TA: PRINT
     "                *YOU* : "YO
     U
3060  PRINT : INPUT "WHICH DO YOU
      WANT? ";ANS$
3065 ANS =  VAL (ANS$): IF ANS <
     1 OR ANS > NU OR LI(ANS) = 0
      OR ANS <  >  INT (ANS) THEN
      PRINT : PRINT "THAT IS NOT
     AVAILABLE !": GOTO 3060
```

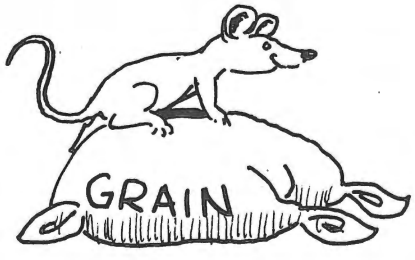
```
3070 SC = 0: IF AN = 1 THEN 3100
3075  FOR I = 1 TO AN: IF LI(I) =
     0 THEN 3090
3076  IF I = AN THEN 3090
3080  IF AN / I =  INT (AN / I) THEN
     SC = SC + I
3090  NEXT I
3100  IF SC = 0 THEN  PRINT : PRINT
     "YOU CAN'T HAVE IT. THAT LEA
     VES NOTHING  FOR THE IRSMAN"
     : GOTO 3010
3105 LI(AN) = 0:YO = YO + AN:TA =
     TA + SC
3110  FOR I = 1 TO AN: IF LI(I) =
     0 THEN 3125
3115  IF I = AN THEN 3125
3120  IF AN / I =  INT (AN / I) THEN
     LI(I) = 0
3125  NEXT I
3130  GOTO 3010
4000 :
4001  REM  *** END
4002 :
4010  PRINT : PRINT : PRINT "***
     THE GAME IS OVER ***": PRINT

4015  FOR I = 1 TO NU: IF LI(I) THEN
     TA = TA + LI(I)
4016  NEXT
4020  PRINT "THE IRSMAN: "TA
4021  PRINT "       YOU: "YO
4022  PRINT "================": PRINT

4025  IF TA > YO THEN  PRINT "THE
      IRSMAN IS THE WINNER !!!"
4030  IF TA < YO THEN  PRINT "YOU
      HAVE BEATEN THE IRSMAN !!!"

4035  IF TA = YO THEN  PRINT "IT'S
      UNBELIEVABLE BUT ITS A TIE
     !!!"
4040  PRINT  CHR$ (7); CHR$ (7); CHR$
     (7)
4990  RETURN
```




# Kingdom

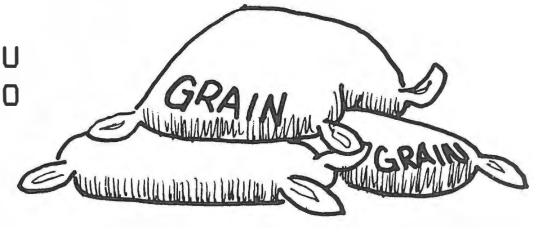
This game is designed to test your leadership ability. You are given a ten year reign, during which time you try to guide your kingdom towards health and prosperity. There are certain conditions which are beyond your control (such as the bountiful nature of the harvest), but try to do the best job possible. When the price of acreage is high, (25 or 26 bushels per acre), you may choose to become a land broker instead of a gentleman farmer. That is, you may sell all but one acre of land (you must keep 1), and hope the price of land drops the following year. If the price of land drops by 4 bushels (say, from 26 to 22), you have, in effect, made a 4 bushel per acre profit. When the price of land is low, (below 20 bushels for an acre), it is recommended that you buy as much land as possible, while retaining enough grain to feed your people and sow your fields. You can easily understand the program by manipulating the beginning values of the variables in line 2010 and changing some of the random number statements which are the unpredictable forces of nature.

```
10  REM  ********************
11  REM  ***                 ***
12  REM  ***    KINGDOM      ***
13  REM  ***                 ***
14  REM  ********************
15  REM
16  REM
20  GOSUB 1000: REM   INSTS
30  GOSUB 2000: REM  SETUP
40  GOSUB 3000: REM  PLAY!
50  GOSUB 4000: REM  !END!
60  END
1000 :
1001  REM  *** INSTS
1002 :
1010  TEXT : NORMAL : HOME
1020  VTAB 3: HTAB 12: PRINT "***
      KINGDOM ***"
1030  VTAB 7: PRINT "THIS IS A SI
     MULATION OF THE COUNTRY OF
     SUMERIA.  YOU ARE THE SOVERE
     IGN RULER,  AND YOU WILL GOV
     ERN FOR 10 YEARS."
1040  PRINT : PRINT "THE DECISION
     S THAT YOU MAKE WILL AFFECT
     THE LIVES OF HUNDREDS OF PEO
     PLE.  YOUR  DICTATORIAL SKIL
     LS WILL BE RATED ONCE   YOUR
      REIGN HAS ENDED."
1050  PRINT : PRINT "YOU WILL BE
     ASKED TO MAKE SEVERAL KEY
     DECISIONS EACH YEAR, WITH EA
     CH ONE BEINGEXPLAINED TO YOU
     ."
1060  VTAB 23: INPUT "HIT RETURN
     WHEN READY TO CONTINUE : ";A
     NS$
1990  RETURN
2000 :
2001  REM  *** SETUP
2002 :
2010 P = 95:S = 2800:H = 3000:E =
     H - S:Y = 3:A = H / Y:I = 5:
     D = 0:Z = 0:Q = 1
```



```
2020  DIM NU$(11): FOR J = 1 TO 1
      1: READ NU$(J): NEXT : DATA
       FIRST,SECOND,THIRD,FOURTH,F
      IFTH,SIXTH,SEVENTH,EIGHTH,NI
      NTH,TENTH,ELEVENTH
2990  RETURN
3000 :
3001  REM  *** PLAY
3002 :
3005  HOME : VTAB 3: HTAB 12: PRINT
      "*** KINGDOM ***": VTAB 7
3010 Z = Z + 1: PRINT : PRINT "HA
      MURABI, I BEG TO REPORT TO Y
      OU: ": PRINT : PRINT "IN THE
       "NU$(Z)" YEAR, "D" PEOPLE "
      : PRINT "STARVED; "I" CAME T
      O THE CITY."
3280 P = P + I: IF Q = 0 THEN P =
       INT (P / 2): PRINT : PRINT
      "A HORRIBLE PLAGUE STRUCK !!
      !  HALF OF   YOUR PEOPLE PER
      ISHED...."
3285  PRINT
3290  PRINT "THE POPULATION IS "P
      ",  THE CITY OWNS ": PRINT A
      " ACRES.  YOU HARVESTED "Y"
      BUSHELS": PRINT "PER ACRE.
      RATS ATE "E" BUSHELS.": PRINT
      "YOU HAVE "S" BUSHELS IN RES
      ERVE."
3300  IF Z = 11 THEN  RETURN
3400 C =  INT ( RND (1) * 10):Y =
      C + 17
3410  PRINT : PRINT "LAND IS TRAD
      ING AT "Y" BUSHELS PER ACRE.
      ": PRINT "HOW MANY ACRES DO
      YOU WISH TO BUY : ": INPUT Q

3440  IF Q < 0 THEN  PRINT "HAMUR
      ABI, YOU CANNOT DO THAT.": PRINT
      "IF YOU WISH TO SELL LAND, "
      : PRINT "FIRST BUY 0 ACRES."
      : GOTO 3410
```

```
3450  IF Y * Q > S THEN  PRINT "H
      AMURABI, THINK AGAIN!  YOU O
      NLY HAVE": PRINT S" BUSHELS
      OF GRAIN.": GOTO 3410
3455  IF Q > 0 THEN A = A + Q:S =
      S - Y * Q:C = 0: GOTO 3500
3460  INPUT "HOW MANY ACRES DO YO
      U WISH TO SELL?";Q
3465  IF Q < 0 THEN  PRINT "HAMUR
      ABI, I CANNOT DO THAT.  IF Y
      OU": PRINT "DON'T WANT TO SE
      LL ANYTHING, THEN": PRINT "S
      ELL 0 ACRES.": GOTO 3460
3470  IF (Q > A) THEN  PRINT "HAM
      URABI, YOU ONLY OWN "A" ACRE
      S....": GOTO 3460
3480 A = A - Q:S = S + Y * Q:C =
      0
3500  PRINT : PRINT "OF THE "S" B
      USHELS REMAINING, HOW MANY":
       PRINT "DO YOU WISH TO FEED
      YOUR PEOPLE:": INPUT Q
3505  IF Q < 1 THEN  PRINT "HAMUR
      ABI, THE PEOPLE WILL STARVE
      !!!": PRINT "YOU MUST FEED T
      HEM SOMETHING.": GOTO 3500
3510  IF Q > S THEN  PRINT "HAMUR
      ABI, YOU ONLY OWN "S" BUSHEL
      S ...": GOTO 3500
3520 S = S - Q:C = 1
3530  PRINT : PRINT "OF THE "A" A
      CRES YOU NOW OWN, HOW": INPUT
      "MANY DO YOU WISH TO PLANT W
      ITH SEED? ";D
3535  IF D < 1 THEN  PRINT "HAMUR
      ABI, YOU MUST PLANT SOMETHIN
      G SO": PRINT "THAT THERE WIL
      L BE FOOD FOR NEXT YEAR... "
      : GOTO 3530
3540  IF (D > A) THEN  PRINT "YOU
       ONLY HAVE "A" ACRES.": GOTO
      3530
```



```
3545  IF D / 2 > S THEN  PRINT "H
      AMURABI, THAT IS TOO MUCH TO
       PLANT...": GOTO 3530
3550  IF D > 10 * P THEN  PRINT "
      YOU CAN ONLY FORCE ONE PERSO
      N TO ": PRINT "WORK TEN ACRE
      S OF LAND.": PRINT "YOUR POP
      ULATION OF "P" ISN'T BIG ENO
      UGH.": GOTO 3530
3555 S = S -  INT (D / 2):C =  INT
      ( RND (1) * 5) + 1
3600 Y = C:H = D * Y:E = 0:C =  INT
      ( RND (1) * 5) + 1: IF  INT
      (C / 2) * 2 = C THEN E =  INT
      (S / C)
3610 S = S - E + H:C =  INT ( RND
      (1) * 5) + 1:I =  INT (C * (
      20 * A + S) / P / 100 + 1):C
       =  INT (Q / 20):Q =  INT (1
      0 * (2 *  RND (1) - .3)): IF
      P < C THEN D = 0: GOTO 3010
3615 D = P - C: IF D > .50 * P THEN
      3630
3620 P1 = ((Z - 1) * P1 + D * 100
       / P) / Z:P = C:D1 = D1 + D:
       GOTO 3010
3630  PRINT : PRINT "YOU STARVED
      "D" PEOPLE IN ONE YEAR !": PRINT
      "YOU HAVE DONE SUCH A MISERA
      BLE JOB": PRINT "THAT YOU HA
      VE BEEN OVERTHROWN": PRINT "
      AND REMOVED FROM OFFICE !!!"
      :WL = 1: RETURN
4000 :
4001  REM  *** END
4002 :
4005  IF WL THEN  RETURN
4010  PRINT : PRINT : PRINT "IN Y
      OUR 10 YEARS OF RULE, "P1"%
      ": PRINT "OF THE POPULATION
      STARVED PER YEAR, ON": PRINT
      "THE AVERAGE.": PRINT "A TOT
      AL OF "D1" PEOPLE DIED.":L =
      A / P
```

```
4015  PRINT
4020  PRINT "YOU STARTED WITH 10
      ACRES PER PERSON,   AND ENDE
      D WITH "L" ACRES PER     PER
      SON !!"
4030  IF P1 > 33 OR L < 7 THEN  PRINT
      "YOU ARE A DISGRACE!!!  THE
      PEOPLE HAVE  EXILED YOU TO A
       REMOTE ISLAND.": RETURN
4035  IF P1 > 10 OR L < 9 THEN  PRINT
      "YOU RULE LIKE THE AYATOLLAH
      ! MOST OF    YOUR SUBJECTS W
      OULD DANCE AT YOUR       FUN
      ERAL!": RETURN
4040  IF P1 > 3 OR L < 10 THEN  PRINT
      "YOU COULD HAVE DONE BETTER,
       " INT (P * .8 *  RND (1))"
      PEOPLE": PRINT "WOULD LOVE T
      O SEE YOU ASSASSINATED!!!": RETURN
4045  PRINT : PRINT "A GREAT JOB!
      !!  YOU CAN RULE MY COUNTRY
      ANY TIME YOU WANT TO !!!": RETURN
```


In this game you try to alphabetize a scrambled list of letters. One square is left blank so that you may move a letter into it. The computer will scramble the completed version approximately 150 times. You must unscramble the letter matrix in as few tries as possible. Remember, practice makes perfect! Before we look at the graphics, it seems appropriate to mention that proper graphics alignment is not a matter of trial and error, but entails working with graph paper and drawing the figure which is to be outputed to the screen. Then, after figuring which coordinates will be filled in with which color, the writing of the program can take place. The nice pictures that you see on the screen are more the result of painstaking work than the result of brilliance. Getting back to Magic Squares, let's look at some of the graphics. Lines 2025-2028 draw the gameboard. Lines 2221-2235 draw the letters onto the game-board. Check this out by typing: 2225 STOP, then run. The first four letters (A,B,C, and D) are drawn. Type: CONT to continue the run. A matrix with two F's will be displayed. To undo any change, type: LOAD (program name). When this is done, the original program (without any changes) will be loaded.

```
10  REM  **********************
11  REM  ***                ***
12  REM  *** MAGIC SQUARES ***
13  REM  ***                ***
14  REM  **********************
15  REM
16  REM
20  GOSUB 1000: REM  INSTS
30  GOSUB 2000: REM  SETUP
40  GOSUB 3000: REM  PLAY!
50  GOSUB 4000: REM  !END!
60  END
1000 :
1001  REM  *** INSTS
1002 :
1010  TEXT : NORMAL : HOME
1020  VTAB 3: HTAB 9: PRINT "***
     MAGIC  SQUARES ***"
1030  VTAB 7: PRINT "IN THIS GAME
     , YOU HAVE A 4 BY 4 GAME-
     BOARD.  THE BOARD CONTAINS T
     HE LETTERS  A-O."
1035  PRINT
1040  PRINT "THE OBJECT IS TO HOR
     IZONTALLY           ALPHABET
     IZE THE SCRAMBLED GAME-BOARD
     .   YOU CAN MOVE A PIECE SID
     EWAYS OR UP AND DOWN, AS LON
     G AS THE EMPTY SQUARE IS
     NEXT TO IT. "
1045  PRINT
1050  PRINT "YOUR PROGRESS WILL B
     E MONITORED, AND YOUWILL BE
     TOLD HOW YOU ARE DOING. "
1055  VTAB 23: INPUT "PRESS RETUR
     N WHEN READY TO CONTINUE : "
     ;ANS$
1990  RETURN
2000 :
2001  REM  *** SETUP
2002 :
2005  DEF  FN C(X) = (X - 1) * 8 +
     2
```

```
2010  DIM B(4,4): FOR I = 1 TO 4:
      FOR J = 1 TO 4:K = K + 1:B(
     J,I) = K: NEXT J,I
2020  DIM DIR(4,2): FOR I = 1 TO
     4: READ DIR(I,1),DIR(I,2): NEXT
     : DATA  1,0,0,1,-1,0,0,-1
2025  GR : COLOR= 12
2026  FOR I = 1 TO 32: HLIN 0,32 AT
     I: NEXT
2027  COLOR= 15
2028  FOR I = 0 TO 32 STEP 8: HLIN
     0,32 AT I: VLIN 0,32 AT I: NEXT

2029 CO = 15: GOSUB 2100
2030  VTAB 23: PRINT "<< I'M NOW
     SCRAMBLING THE GAME BOARD >>
     "
2040 SX = 4:SY = 4:SC =  INT ( RND
     (1) * 50) + 100: FOR K = 1 TO
     SC
2050 D =  INT ( RND (1) * 4) + 1:
     PX = SX + DI(D,1):PY = SY +
     DI(D,2): IF PX < 1 OR PX > 4
      OR PY < 1 OR PY > 4 THEN 20
     50
2060 B(SX,SY) = B(PX,PY)
2061 J = SX:I = SY:CO = 14: GOSUB
     2200
2062 J = PX:I = PY:CO = 12: GOSUB
     2200
2065 B(PX,PY) = 0:SX = PX:SY = PY

2070  NEXT K: RETURN
2100  REM  *** DRAW BOARD
2110  FOR I = 1 TO 4: FOR J = 1 TO
     4:CO = 14: GOSUB 2200: NEXT
     J,I: RETURN
2200  REM  *** DRAW LETTER
2205 X =  FN C(J):Y =  FN C(I): COLOR=
     CO
```

```
2210  ON B(J,I) + 1 GOSUB 2220,22
      21,2222,2223,2224,2225,2226,
      2227,2228,2229,2230,2231,223
      2,2233,2234,2235: RETURN
2220  RETURN
2221  PLOT X + 2,Y: PLOT X + 1,Y +
      1: PLOT X + 3,Y + 1: VLIN Y +
      2,Y + 4 AT X: VLIN Y + 2,Y +
      4 AT X + 4: HLIN X,X + 4 AT
      Y + 3: RETURN
2222  VLIN Y,Y + 4 AT X: HLIN X,X
       + 3 AT Y: HLIN X,X + 3 AT Y
       + 2: HLIN X,X + 3 AT Y + 4:
       PLOT X + 4,Y + 1: PLOT X +
      4,Y + 3: RETURN
2223  HLIN X,X + 4 AT Y: HLIN X,X
       + 4 AT Y + 4: VLIN Y,Y + 4 AT
      X: RETURN
2224  HLIN X,X + 3 AT Y: HLIN X,X
       + 3 AT Y + 4: VLIN Y,Y + 4 AT
      X: VLIN Y + 1,Y + 3 AT X + 4
      : RETURN
2225  HLIN X,X + 4 AT Y: HLIN X,X
       + 3 AT Y + 2: HLIN X,X + 4 AT
      Y + 4: VLIN Y,Y + 4 AT X: RETURN

2226  HLIN X,X + 4 AT Y: HLIN X,X
       + 3 AT Y + 2: VLIN Y,Y + 4 AT
      X: RETURN
2227  HLIN X,X + 3 AT Y: HLIN X,X
       + 4 AT Y + 4: VLIN Y,Y + 4 AT
      X: VLIN Y + 2,Y + 4 AT X + 4
      : PLOT X + 3,Y + 2: RETURN
2228  HLIN X,X + 4 AT Y + 2: VLIN
      Y,Y + 4 AT X: VLIN Y,Y + 4 AT
      X + 4: RETURN
2229  HLIN X,X + 4 AT Y: HLIN X,X
       + 4 AT Y + 4: VLIN Y,Y + 4 AT
      X + 2: RETURN
2230  HLIN X,X + 4 AT Y: HLIN X +
      1,X + 2 AT Y + 4: PLOT X,Y +
      3: VLIN Y,Y + 4 AT X + 2: RETURN
```

```
2231  VLIN Y,Y + 4 AT X: PLOT X +
      1,Y + 2: PLOT X + 2,Y + 1: PLOT
      X + 2,Y + 3: PLOT X + 3,Y: PLOT
      X + 3,Y + 4: RETURN
2232  HLIN X,X + 4 AT Y + 4: VLIN
      Y,Y + 4 AT X: RETURN
2233  VLIN Y,Y + 4 AT X: VLIN Y,Y
       + 4 AT X + 4: PLOT X + 1,Y +
      1: PLOT X + 3,Y + 1: PLOT X +
      2,Y + 2: RETURN
2234  VLIN Y,Y + 4 AT X: VLIN Y,Y
       + 4 AT X + 4: PLOT X + 1,Y +
      1: PLOT X + 2,Y + 2: PLOT X +
      3,Y + 3: RETURN
2235  VLIN Y,Y + 4 AT X: VLIN Y,Y
       + 4 AT X + 4: HLIN X,X + 4 AT
      Y: HLIN X,X + 4 AT Y + 4: RETURN

2990  RETURN
3000 :
3001  REM  *** PLAY!
3002 :
3010  HOME : PRINT "MOVE WHICH PI
      ECE : ";: GET ANS$: PRINT AN
      S$
3015  IF ANS$ < "A" OR ANS$ > "Z"
       THEN  PRINT  CHR$ (7): GOTO
      3010
3020  FOR K = 1 TO 4:PX = SX + DI
      R(K,1):PY = SY + DIR(K,2)
3025  IF PX < 1 OR PX > 4 OR PY <
      1 OR PY > 4 THEN 3040
3030  IF B(PX,PY) =  ASC (ANS$) -
      64 THEN MO = MO + 1: GOTO 31
      00
3040  NEXT K: PRINT  CHR$ (7): GOTO
      3010
3100 B(SX,SY) = B(PX,PY):J = SX:I
       = SY:CO = 14: GOSUB 2200
3110 J = PX:I = PY:CO = 12: GOSUB
      2200:B(PX,PY) = 0:SX = PX:SY
       = PY
```

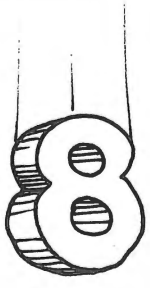
```
3200 K = 0: FOR I = 1 TO 4: FOR J
      = 1 TO 4:K = K + 1: IF K =
     16 THEN K = 0
3210  IF B(J,I) = K THEN  NEXT J,
     I: RETURN
3220  GOTO 3010
3990  RETURN
4000 :
4001  REM  *** END
4002 :
4010  HOME : PRINT "YOU SOLVED IT
      !": PRINT : PRINT "IT WAS S
     CRAMBLED "SC" TIMES, ": PRINT
     "AND YOU SOLVED IT IN "MO" M
     OVES. "
4020  INPUT "DO YOU WISH TO PLAY
     AGAIN? ";ANS$: IF  LEFT$ (AN
     S$,1) = "Y" THEN  RUN
4990  RETURN
```


This game is a spinoff from a popular game show. The object is to eliminate as many numbers as you can from the list before you get stymied. To begin, you are given a list of numbers ranging from 1 through 9. A pair of dice are rolled. The total (2-12) must be subtracted from the list. Most of the numbers can be removed from the list in a multitude of ways. If the first number rolled is a nine, there are eight possible ways to total exactly nine. They are:

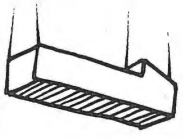
1,2,6 1,3,5 1,8 2,3,4 2,7 3,6 4,5 and 9 by itself.

According to the rules, you may remove any of these combinations as long as the total is nine. There are many different strategies, but you can develop your own. Let's look at the graphics. Lines 2131 through 2139 draw the list of nine numbers. To verify this, type: 2136 and then return. Now when you run the program you will get 1 2 3 4 5 (error message). Line 2210 gives each die a random result between 1 and 6. To help you understand how one of the numbers is set to blinking, look at lines 2200-2336, and experiment with any of these lines.

```
10  REM  ********************
11  REM  ***                 ***
12  REM  *** NUMBERS AWAY ***
13  REM  ***                 ***
14  REM  ********************
15  REM
16  REM
20  GOSUB 1000: REM  INSTS
30  GOSUB 2000: REM  SETUP
40  GOSUB 3000: REM  PLAY!
50  GOSUB 4000: REM  !END!
60  END
1000 :
1001  REM  *** INSTS
1002 :
1010  TEXT : HOME : NORMAL
1020  VTAB 3: HTAB 10: PRINT "***
      NUMBERS AWAY ***"
1030  VTAB 7: PRINT "IN THIS GAME
     , YOU WILL BE PRESENTED WITH
     A LIST OF NUMERS BETWEEN 1 A
     ND 9."
1035  PRINT : PRINT "A PAIR OF DI
     CE WILL BE ROLLED, AND THE
     TOTAL WILL BE NOTED.  YOU MU
     ST REMOVE,  FROM THE LIST, A
      COMBINATION OF NUMBERS WHOS
     E TOTAL MATCHES THE NUMBER O
     N THE   DICE."
1040  PRINT : PRINT "FOR EXAMPLE,
      IF A SEVEN WAS ROLLED, YOU
     COULD REMOVE FROM THE LIST (
     1,2,4),     (1,6), (2,5), (3
     ,4) OR JUST PLAIN (7). "
1045  VTAB 23: INPUT "HIT RETURN
     WHEN READY TO CONTINUE : ";A
     NS$
1050  HOME : VTAB 3: HTAB 10: PRINT
     "*** NUMBERS AWAY ***": VTAB
     7
```

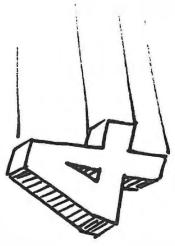


```
1055  PRINT "TO MOVE IN THE LIST,
      USE THE FORWARD ANDBACKWARD
      ARROWS. THE NUMBER YOU ARE
     AT  WILL BLINK. TO SELECT A
     NUMBER, PUSH THERETURN KEY."

1060  PRINT : PRINT "WHEN YOU SEL
     ECT ENOUGH NUMBERS TO REACH
     THE TOTAL ON THE DICE, THE C
     OMPUTER WILLROLL THE DICE FO
     R YOUR NEXT TRY."
1065  PRINT : PRINT "IF YOUR TOTA
     L GOES OVER THE NUMBER, THE
     LIST WILL BE RESTORED, AND Y
     OU WILL HAVETO TRY AGAIN. TO
      GIVE UP, PRESS THE ESC KEY.
     "
1070  VTAB 23: INPUT "HIT RETURN
     WHEN READY TO CONTINUE : ";A
     NS$
1990  RETURN
2000 :
2001  REM  *** SETUP
2002 :
2010  DIM LI(9),L2(9): FOR I = 1 TO
     9:LI(I) = I: NEXT
2020  GR : HOME
2030  FOR I = 1 TO 9:NU = I: GOSUB
     2100: NEXT
2095  RETURN
2100  COLOR= NU: GOTO 2120
2110  COLOR= 0
2120  ON NU GOTO 2131,2132,2133,2
     134,2135,2136,2137,2138,2139

2131  HLIN 2,3 AT 5: VLIN 5,9 AT
     3: HLIN 2,4 AT 9: RETURN
2132  HLIN 6,8 AT 5: VLIN 5,7 AT
     8: HLIN 6,8 AT 7: VLIN 7,9 AT
     6: HLIN 6,8 AT 9: RETURN
2133  HLIN 10,12 AT 5: HLIN 10,12
      AT 7: HLIN 10,12 AT 9: VLIN
     5,9 AT 12: RETURN
```



```
2134  VLIN 5,7 AT 14: VLIN 5,9 AT
     16: HLIN 14,16 AT 7: RETURN

2135  HLIN 18,20 AT 5: HLIN 18,20
      AT 7: HLIN 18,20 AT 9: VLIN
     5,7 AT 18: VLIN 7,9 AT 20: RETURN

2136  HLIN 22,24 AT 5: HLIN 22,24
      AT 7: HLIN 22,24 AT 9: VLIN
     5,9 AT 22: VLIN 7,9 AT 24: RETURN

2137  HLIN 26,28 AT 5: VLIN 5,9 AT
     28: RETURN
2138  HLIN 30,32 AT 5: HLIN 30,32
      AT 7: HLIN 30,32 AT 9: VLIN
     5,9 AT 30: VLIN 5,9 AT 32: RETURN

2139  HLIN 34,36 AT 5: HLIN 34,36
      AT 7: VLIN 5,7 AT 34: VLIN
     5,9 AT 36: RETURN
2200  FOR J = 1 TO  INT ( RND (1)
      * 5) + 5
2210 D1 =  INT ( RND (1) * 6) + 1
     :D2 =  INT ( RND (1) * 6) +
     1
2220  GOSUB 2300: GOSUB 2310
2230  NEXT
2300 DD = D1:DX = 10: GOTO 2320
2310 DD = D2:DX = 24: GOTO 2320
2320  COLOR=  INT ( RND (1) * 14)
      + 1
2325  FOR I = 30 TO 36: HLIN DX,D
     X + 6 AT I: NEXT
2330  COLOR= 15: ON DD GOTO 2331,
     2332,2333,2334,2335,2336
2331  PLOT DX + 3,33: GOTO 2340
2332  PLOT DX + 1,31: PLOT DX + 5
     ,35: GOTO 2340
2333  PLOT DX + 1,31: PLOT DX + 3
     ,33: PLOT DX + 5,35: GOTO 23
     40
2334  PLOT DX + 1,31: PLOT DX + 5
     ,31: PLOT DX + 1,35: PLOT DX
      + 5,35: GOTO 2340
```

```
2335  PLOT DX + 1,31: PLOT DX + 5
     ,31: PLOT DX + 1,35: PLOT DX
      + 5,35: PLOT DX + 3,33: GOTO
     2340
2336  PLOT DX + 1,31: PLOT DX + 5
     ,31: PLOT DX + 1,35: PLOT DX
      + 5,35: PLOT DX + 1,33: PLOT
     DX + 5,33: GOTO 2340
2340  FOR I = 1 TO 5:XX =  PEEK (
      - 16336): NEXT : RETURN
3000 :
3001  REM  *** PLAY
3002 :
3010  FOR I = 1 TO 9: IF  NOT LI(
     I) THEN  NEXT : HOME : PRINT
      CHR$ (7) CHR$ (7) CHR$ (7)"
     YOU GOT THEM ALL !!!": FOR I
      = 1 TO 1000: NEXT I: RETURN

3012  GOSUB 2200: REM  ROLL DICE
3015  FOR I = 1 TO 9:L2(I) = 0: NEXT

3020 TT = D1 + D2:ST = 0
3025  HOME : PRINT "<<< YOU MUST
     GET A TOTAL OF "TT" >>>"
3030  FOR I = 1 TO 9: IF  NOT LI(
     I) THEN  NEXT : HOME : PRINT
      CHR$ (7)"THERE IS NOTHING L
     EFT, AND": PRINT "YOU CANNOT
      REACH THE TOTAL": FOR I = 1
      TO 1000: NEXT I: RETURN
3035 NP = 0: GOSUB 3100
3040 NU = LI(NP): GOSUB 2110: FOR
     I = 1 TO 50: NEXT I: GOSUB 2
     100
3050  IF  PEEK ( - 16384) < 128 THEN
     3040
3055 KEY =  PEEK ( - 16384): POKE
      - 16368,0
3060  IF KEY = 149 THEN  GOSUB 31
     00: GOTO 3040
3061  IF KEY = 136 THEN  GOSUB 32
     00: GOTO 3040
3065  IF KEY = 155 THEN  RETURN
```



```
3070  IF KEY <  > 141 THEN 3040
3072 NU = NP: GOSUB 2110
3075 ST = ST + NP:LI(NP) = 0:L2(N
     P) = 1: IF ST < TT THEN  PRINT
     "YOU'VE GOT "ST", YOU NEED "
     TT - ST"...": GOTO 3030
3080  IF ST = TT THEN GT = GT + T
     T: HOME : PRINT  CHR$ (7) CHR$
     (7) CHR$ (7)"YOU GOT THAT ON
     E !!!": FOR I = 1 TO 500: NEXT
     I: GOTO 3010
3085  FOR I = 1 TO 9: IF L2(I) THEN
     NU = I: GOSUB 2100:LI(I) = I

3090  NEXT :ST = 0: PRINT : PRINT
     "OOOPS, TRY AGAIN!  YOU NEED
      "TT"..." CHR$ (7): GOTO 303
     0
3100 NP = NP + 1: IF NP > 9 THEN
     NP = 1
3110  IF LI(NP) = 0 THEN 3100
3120  RETURN
3200 NP = NP - 1: IF NP < 1 THEN
     NP = 9
3210  IF LI(NP) = 0 THEN 3200
3220  RETURN
4000 :
4001  REM  *** END
4002 :
4010  TEXT : HOME
4020  VTAB 3: HTAB 10: PRINT "***
      NUMBERS AWAY ***": VTAB 15
4030  PRINT "YOU GOT "GT" OUT OF
     A POSSIBLE 45.
4032  PRINT "THAT IS ";
4035  ON  INT (GT / 5) GOTO 4040,
     4041,4042,4043,4044,4045,404
     6,4047,4048,4049
4040  PRINT "THE ABSOLUTE WORST !
     !!": RETURN
4041  PRINT "EXTREMELY POOR !!!":
      RETURN
4042  PRINT "TERRIBLE !!!": RETURN
```

```
4043  PRINT "VERY BAD !!!": RETURN

4044  PRINT "JUST SO-SO !!!": RETURN

4045  PRINT "FAIR ...": RETURN
4046  PRINT "PRETTY GOOD ...": RETURN

4047  PRINT "GREAT !!!": RETURN
4048  PRINT "FANTASTIC !!!!!": RETURN

4049  PRINT "PERFECT !!!!!!!": RETURN
```


This game can be frustrating, challenging, and exciting all at the same time. You are given a list of integers which you must unscramble using a reversing technique. The list is established in lines 2010 by setting up an array table using a FOR NEXT loop. LI (I) becomes LI (1), LI (2) etc. Line 2020 assigns the random order to the list. Line 3050 does the reversing of the numbers that you select as ANS in 3040. These lines have several commands grouped together for speed of operation. If you want to dissect them it is best to rewrite the line as separate statements. You can also print out the variables:

```
3050 MDL = INT ((9 - ANS) / 2)
3051 PRINT "MDL IN LINE 3051 =";MDL
3052 FOR I = ANS TO ANS + MDL
3053 PRINT "I =";I;" ANS + MDL ="; ANS+MDL
3054 T = LI(I)
3055 PRINT "T =";T
3056 LI(I) = LI(9 + ANS - I)
3057 PRINT "LI (I) =";LI(I)
3058 LI(9 + ANS - I) = T
3059 PRINT "T =";T:NEXT
```

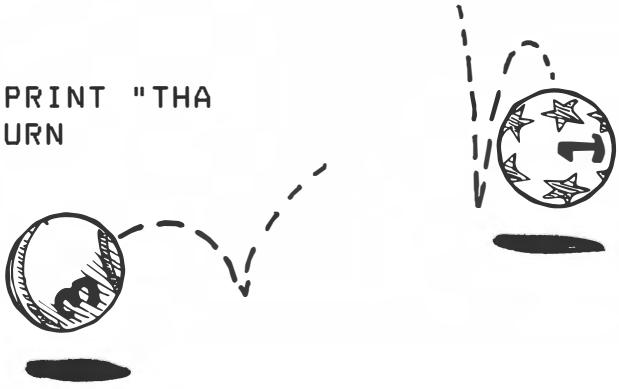
This elaboration of line 3050 will let you watch the program pass the variables using 'T' as a temporary storage location. Practically all the action takes place in this one line. When you run this revised program, print statements will tell you what happens each time you make a reversal.

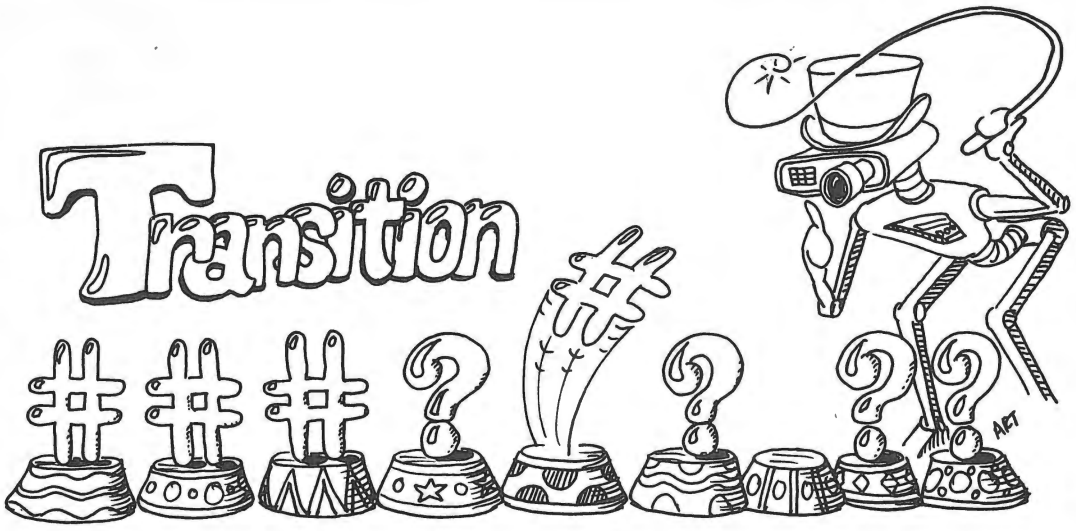
The purpose of combining statements on a single line is speed of execution. When you are developing programs you should have every statement on a separate line. When the program is running correctly you should make two versions. Make a long version with lots of REMS and descriptive variable names, and a short version with combined lines. This will help you modify the program later on. Your own program that you knew my heart a few weeks ago can become a complete mystery if you don't spend enough time on REMS and organization.

```
10  REM  ********************
11  REM  ***                 ***
12  REM  ***   REVERSER      ***
13  REM  ***                 ***
14  REM  ********************
15  REM
16  REM
20  GOSUB 1000: REM  INSTS
30  GOSUB 2000: REM  SETUP
40  GOSUB 3000: REM  PLAY!
50  GOSUB 4000: REM  !END!
60  END
1000 :
1001  REM  *** INSTS
1002 :
1010  TEXT : HOME : NORMAL
1020  VTAB 2: HTAB 12: PRINT "***
      REVERSER ***"
1030  VTAB 5: PRINT "IN THIS GAME
     , YOU ARE GIVEN A LIST OF
     NUMBERS FROM 0 TO 9.  THE LI
     ST WILL NOT BE IN SEQUENCE.
      IT IS YOUR JOB TO SORT THE
     LIST INTO ASCENDING ORDER."
1040  PRINT : PRINT "YOU ARRANGE
     THE LIST BY REVERSING THE
     ORDER OF IT.  YOU INPUT THE
     STARTING    COLUMN THAT IS T
     O BE REVERSED, AND THAT COLU
     MN, ALL THE WAY THROUGH TO C
     OLUMN   NINE, WILL BE REVERS
     ED."
1050  VTAB 23: INPUT "HIT RETURN
     WHEN READY TO CONTINUE :";AN
     S$
```

```
1060  HOME : VTAB 2: HTAB 12: PRINT
      "*** REVERSER ***": VTAB 5
1070  PRINT "IF YOU HAD THIS LIST
      :": PRINT : PRINT "POSITIONS
      : 0 1 2 3 4 5 6 7 8 9": PRINT
      "             ----------------
      ---": PRINT "     LIST: 0 1
      9 8 7 6 5 2 3 4": PRINT
1080  PRINT "AND YOU REVERSED AT
      POSITION 7, IT WOULDLOOK LIK
      E THIS:"
1090  PRINT : PRINT "POSITIONS: 0
       1 2 3 4 5 6 7 8 9": PRINT "
                 -----------------
      --": PRINT "     LIST: 0 1 9
       8 7 6 5 4 3 2": PRINT
1100  VTAB 23: INPUT "HIT RETURN
      WHEN READY TO CONTINUE : ";A
      NS$
1110  HOME : VTAB 3: HTAB 12: PRINT
      "*** REVERSER ***": VTAB 7
1120  PRINT "A FINAL REVERSAL AT
      POSITION 2 WOULD    COMPLETE
       THE LIST AS THIS:"
1130  PRINT : PRINT "POSITIONS: 0
       1 2 3 4 5 6 7 8 9": PRINT "
                 -----------------
      --": PRINT "     LIST: 0 1 2
       3 4 5 6 7 8 9": PRINT
1140  PRINT : PRINT "YOU WIN WHEN
       THE LIST IS SORTED IN
      ASCENDING ORDER AS IS SHOWN
      ABOVE.": PRINT : PRINT "GOOD
       LUCK !!!"
1150  VTAB 23: INPUT "HIT RETURN
      WHEN READY TO CONTINUE : ";A
      NS$
1990  RETURN
2000  :
2001  REM  *** SETUP
2002  :
2010  DIM LI(9): FOR I = 0 TO 9:L
      I(I) = I: NEXT
```

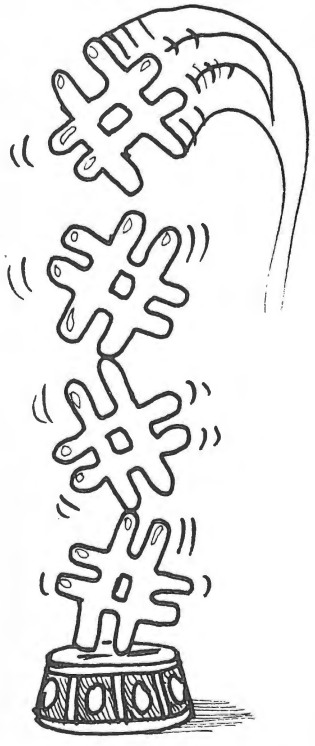
```
2020  FOR I = 0 TO 9:X =  INT ( RND
     (1) * 10):T = LI(I):LI(I) =
     LI(X):LI(X) = T: NEXT
2990  RETURN
3000 :
3001  REM  *** PLAY
3002 :
3010  HOME : VTAB 3: HTAB 12: PRINT
     "*** REVERSER ***": VTAB 7
3020  PRINT : PRINT "POSITIONS: 0
      1 2 3 4 5 6 7 8 9": PRINT "
                 ----------------
     --": PRINT "     LIST: ";
3030  FOR I = 0 TO 9: PRINT LI(I)
     " ";: NEXT : PRINT
3035  FOR I = 0 TO 9: IF LI(I) =
     I THEN  NEXT : RETURN
3040  PRINT : INPUT "REVERSE AT W
     HICH POSITION (0-9) ?";ANS$:
     ANS =  VAL (ANS$): IF ANS <
     0 OR ANS > 9 OR ANS <  >  INT
     (ANS) THEN  PRINT : PRINT "T
     YPE A NUMBER BETWEEN 0-9):GO
     TO 3040
3050 MDL =  INT ((9 - ANS) / 2): FOR
     I = ANS TO ANS + MDL:T = LI(
     I):LI(I) = LI(9 + AN - I):LI
     (9 + AN - I) = T: NEXT
3060 MOVE = MOVE + 1: GOTO 3020
4000 :
4001  REM  *** END
4002 :
4010  PRINT : PRINT "YOU DID IT !
     ": PRINT : PRINT "IT ONLY TO
     OK YOU "MO" MOVES"
4020  PRINT
4030  IF MO < 15 THEN  PRINT "THA
     T'S SUPER!!!": RETURN
4040  PRINT "GOOD JOB!"
4990  RETURN
```





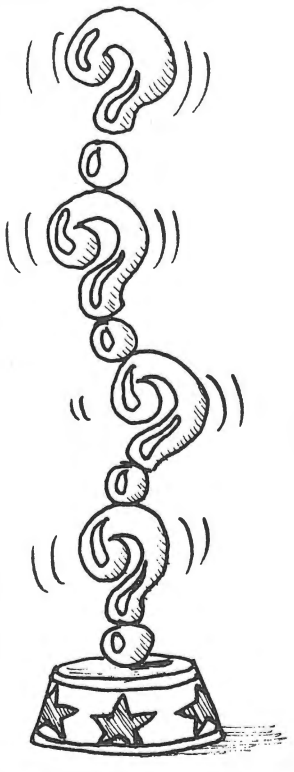

Impossible! It may seem impossible, but it's not. Deriving the key to this challenging game is very satisfying indeed! The object of the game is to transpose this list, # # # # . ? ? ? ? so that it looks like this ? ? ? ? . # # # #. The rules are few. The question marks (?) can only move to the left. Pound signs (#) can only move to the right. Either sign may be moved during a turn, with the following limitations. A sign may be moved into the place currently occupied by the period (this space is referred to as the blank space). A move is made by moving to an empty space or by jumping over one opposing piece. To understand the function of lines in the play section, separate compound lines and print out variables as you did for Reverser.

```
10  REM  ********************
11  REM  ***                 ***
12  REM  ***  TRANSITION   ***
13  REM  ***                 ***
14  REM  ********************
15  REM
16  REM
20  GOSUB 1000: REM  INSTS
30  GOSUB 2000: REM  SETUP
40  GOSUB 3000: REM  PLAY!
50  GOSUB 4000: REM  !END!
60  END
1000 :
1001  REM  *** INSTS
1002 :
1010  TEXT : NORMAL : HOME
1020  VTAB 3: HTAB 11: PRINT "***
      TRANSITION ***"
1030  VTAB 7: PRINT "THE GAME OF
     TRANSITION WILL PRESENT YOU
     WITH A LIST OF NINE DIGITS.
      THE LIST   WILL LOOK LIKE T
     HIS : "
1039  PRINT
1040  PRINT "             1 2 3 4
     5 6 7 8 9
         # # # # . ? ? ? ?"
1050  PRINT : PRINT "THE OBJECT I
     S TO TRANSPOSE THE ORIGINAL
     CHARACTER POSITIONS.  TRY TO
      REVERSE THEPOUND SIGNS (#)
      AND THE QUESTION MARKS INTO
      ONE ANOTHER'S PREVIOUS POSI
     TIONS."
1060  VTAB 23: INPUT "HIT RETURN
     WHEN READY TO CONTINUE : ";A
     NS$
1070  HOME : VTAB 3: HTAB 11: PRINT
     "*** TRANSITION ***": VTAB 7

1080  PRINT "THE '#' CHARACTER CA
     N ONLY MOVE TO THE  RIGHT, A
     ND THE '?' CHARACTER CAN ONL
     Y   MOVE TO THE LEFT."
```



```
1090  PRINT : PRINT "A MOVE IS MA
      DE BY MOVING TO AN EMPTY
      SPACE, OR BY JUMPING OVER ON
      E OPPOSING  PIECE."
1100  PRINT : PRINT "TO MAKE A MO
      VE, YOU ENTER THE POSITION
      NUMBER OF THE MOVING PIECE.
       TO QUIT,   ENTER ZERO (0)."

1110  VTAB 23: INPUT "HIT RETURN
      WHEN READY TO CONTINUE : ";A
      NS$
1990  RETURN
2000 :
2001  REM  *** SETUP
2002 :
2010  DIM LI(9): FOR I = 1 TO 4:L
      I(I) = 1:LI(10 - I) = 2: NEXT

2020 NM = 0
2990  RETURN
3000 :
3001  REM  *** PLAY
3002 :
3010  HOME : VTAB 3: HTAB 11: PRINT
      "*** TRANSITION ***": VTAB 6

3020  FOR I = 1 TO 9: IF (I < 5 AND
      LI(I) = 2) OR (I = 5 AND LI(
      I) = 0) OR (I > 5 AND LI(I) =
      1) THEN  NEXT :WL = 1: RETURN

3022  PRINT : PRINT "[";: FOR I =
      1 TO 9: PRINT I;
3023  IF I < 9 THEN  PRINT " ";:
3024  NEXT : PRINT "]    #--->  <
      ---?"
3025  PRINT "[";: FOR I = 1 TO 9:
       PRINT  MID$ (",#?",LI(I) +
      1,1);
3026  IF I < 9 THEN  PRINT " ";
3027  NEXT : PRINT "     MOVE (0-
      9) : "
```

```
3030  GET ANS$: IF ANS$ < "0" OR
      ANS$ > "9" THEN 3030
3035  IF ANS$ = "0" THEN WL = 0: RETURN
3040 ANS =  VAL (ANS$): PRINT ANS

3045  IF LI(ANS) = 0 THEN  PRINT
      "THAT SPACE IS EMPTY ...": GOTO
      3020
3050  IF LI(ANS) = 1 THEN DI = 1
3051  IF LI(ANS) = 2 THEN DI =  -
      1
3055  IF ANS + DI > 9 OR ANS + DI
       < 1 THEN  PRINT "IT CANNOT
      MOVE FURTHER ...": GOTO 3020

3060  IF LI(ANS + DI) = 0 THEN LI
      (ANS + DI) = LI(ANS):LI(ANS)
       = 0:NM = NM + 1: GOTO 3020
3065  IF ANS + DI + DI > 9 OR ANS
       + DI + DI < 0 THEN  PRINT "
      IT CANNOT MOVE FURTHER ...":
       GOTO 3020
3070  IF (LI(ANS + DI) <  > LI(AN
      S)) AND (LI(ANS + DI + DI) =
      0) THEN LI(ANS + DI + DI) =
      LI(ANS):LI(ANS) = 0:NM = NM +
      1: GOTO 3020
3075  PRINT "IT CANNOT MOVE FURTH
      ER ...": GOTO 3020
3990  RETURN
4000 :
4001  REM  *** END
4002 :
4010  PRINT : PRINT : PRINT "THE
      GAME IS OVER !!!": PRINT
4020  IF WL = 0 THEN  PRINT "YOU
      GOT STUCK AFTER "NM" MOVES."
      : PRINT "BETTER LUCK NEXT TI
      ME !"
4025  IF WL = 1 THEN  PRINT "YOU
      DID IT !!!": PRINT "AND IT O
      NLY TOOK "NM" MOVES."
4990  RETURN
```




For all of you word buffs, here is a game of anagrams geared towards any skill level. For those of you who are not familiar with anagrams, it is a word given in scrambled fashion. The following list should help.

| SCRAMBLED | UNSCRAMBLED | RATING (1=EASY 10=VERY HARD) |
|---|---|---|
| xob | box | 1 (elementary) |
| tahb | bath | 2 (easy) |
| laott | total | 3 (light) |
| betd | debt | 4 (mild) |
| gindru | during | 5 (moderate) |
| ptles | slept | 6 (trying) |
| spumlie | impulse | 7 (tough) |
| yrtaslc | crystal | 8 (difficult) |
| meminscon | mnemonics | 9 (hard) |
| preskulen | spelunker | 10 (very hard) |

In the actual game, the difficulty factor ranges from 1 to 5. The program does not utilize color, but there are some interesting points. You will note that there is a white border encirling each word. Line 3050 puts the computer into the INVERSE mode. Instead of plotting white onto black, the INVERSE is true, black will be plotted onto a white background. Lines 3050, 3060, and 3070 are responsible for drawing the white border. Copy these two short programs to see how the output is changed.

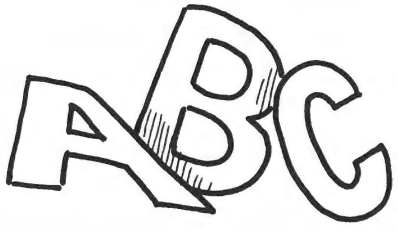
```
10 NORMAL 10 INVERSE
20 FOR A = 1 TO 10 20 FOR A = 1 TO 10
30 VTAB 2*I:HTAB I 30 VTAB 2*I:HTAB I
40 PRINT " " 40 PRINT " "
50 NEXT
```

Line 3080 is a loop which 'makes a pass' for each letter in the word (WL = Word Length). Although you see the entire word appear on the screen at one time, what is really happening is that one letter (WS$) at a time is being printed. Line 3090 instructs the computer to PRINT CHR$(95) once for every letter in the word. CHR(95) is a hyphen (-), so 3090 instructs the computer to print a hyphen for each letter in the word.

```
10  REM  **********************
11  REM  ***                ***
12  REM  *** WORD SCRAMBLE ***
13  REM  ***                ***
14  REM  **********************
15  REM
16  REM
20  GOSUB 1000: REM  INSTS
30  GOSUB 2000: REM  SETUP
40  GOSUB 3000: REM  PLAY!
50  GOSUB 4000: REM  !END!
60  END
1000 :
1001  REM  *** INSTS
1002 :
1010  TEXT : NORMAL : HOME
1020  VTAB 3: HTAB 9: PRINT "***
     WORD  SCRAMBLE ***"
1030  VTAB 7: PRINT "IN THIS GAME
     , THE COMPUTER WILL CHOOSE
     A WORD AND SHOW YOU A SCRAMB
     LED VERSION."
1031  PRINT
1035  PRINT "YOUR PROBLEM IS TO U
     NSCRAMBLE THE WORD  BEFORE T
     HE ALLOTTED TIME EXPIRES."
1040  VTAB 23: INPUT "HIT RETURN
     WHEN READY TO CONTINUE : ";A
     NS$
1990  RETURN
2000 :
2001  REM  *** SETUP
2002 :
2010  HOME : VTAB 3: HTAB 9: PRINT
     "*** WORD  SCRAMBLE ***"
2020  VTAB 7: PRINT "THE FOLLOWIN
     G ARE AVAILABLE : ": VTAB 10

2025  PRINT "      1) VERY EASY"
2026  PRINT "      2) EASY"
2027  PRINT "      3) INTERMEDIATE
     "
2028  PRINT "      4) HARD"
2029  PRINT "      5) VERY HARD"
```

```
2030  VTAB 18: INPUT "WHICH OPTIO
     N (1-5) : ";ANS
2035  IF ANS < 1 OR ANS > 5 OR AN
     S <  >  INT (ANS) THEN  PRINT
      CHR$ (7): VTAB 18: CALL  -
     958: GOTO 2030
2100  DIM WO$(100): FOR I = 1 TO
     100: READ WO$(I): NEXT
2105  DATA  CAT,DOG,TREE,SIT,DOOR
     ,BOX,ARM,WALL,TEA,PEN,PAD,CU
     P,PIN,DIG,GOOD,TIE,SEA,ARE,H
     OW,LIP
2110  DATA  WARM,WIND,LEAF,BLUE,W
     AIT,KITE,SLIP,DRIP,MAZE,PARK
     ,LIFE,GAME,HIGH,DISK,RUIN,CA
     RD,MOLE,ARCH,HARD,VERY,DATA
2115  DATA  PENCIL,LOOSE,NORMAL,T
     IRED,BEFORE,AFTER,BLACK,TARG
     ET,KNOCK,BAGEL,INPUT,RETURN,
     START,ENTRY,GROUND,SHINE,HOR
     SE,PAPER,GREEN,PHONE
2120  DATA  ORIGINAL,BEHIND,MAGAZ
     INE,STORAGE,SCRATCH,COMPUTER
     ,PERSONAL,SOFTWARE,PERFORM,S
     YSTEM,WINDOW,COMBINE,TANGENT
     ,SPECIFY,ANOTHER,EVALUATE,ME
     MORY,INSIDE,IGNORE,HOWEVER
2125  DATA  SEQUOIA,MATRIX,COORDI
     NATE,SPACIAL,DIRECTION,SUBST
     ANTIAL,CONTINUE,SUBSCRIPT,EM
     ULATE,APPROPRIATE,CONICAL,DE
     VELOPMENT,ELEVATION,MECHANIC
     AL,MAGNETIC,TRAJECTORY,STIMU
     LUS,CIRCUMSTANCE,PROBABILITY
     ,PROJECTION
2200  DIM WR$(15),WS$(15),WC$(15)

2990  RETURN
3000 :
3001  REM  *** PLAY
3002 :
3010 WO =  INT ( RND (1) * 20) +
     (ANS - 1) * 20 + 1
```

```
3020 WL =  LEN (WO$(WO)): FOR I =
     1 TO WL:WR$(I) =  MID$ (WO$(
     WO),I,1):WS$(I) = WR$(I): NEXT

3025  FOR I = 1 TO WL:TI =  INT (
      RND (1) * WL) + 1:WS$ = WS$
     (I):WS$(I) = WS$(TI):WS$(TI)
      = WS$: NEXT
3030  HOME : VTAB 3: HTAB 9: PRINT
     "*** WORD  SCRAMBLE ***"
3040  VTAB 7: PRINT "HERE IS YOUR
      SCRAMBLED WORD : "
3050  VTAB 10: HTAB 10: INVERSE :
      FOR I = 1 TO WL + 4: PRINT
     " ";: NEXT
3060  VTAB 11: HTAB 10: PRINT " "
     ;: HTAB 10 + WL + 3: PRINT "
      ";: VTAB 12: HTAB 10: PRINT
     " ";: HTAB 10 + WL + 3: PRINT
     " ";: VTAB 13: HTAB 10: PRINT
     " ";: HTAB 10 + WL + 3: PRINT
     " ";
3070  VTAB 14: HTAB 10: FOR I = 1
      TO WL + 4: PRINT " ";: NEXT
     : NORMAL
3080  VTAB 12: HTAB 12: FOR I = 1
      TO WL: PRINT WS$(I);: NEXT

3090  VTAB 17: HTAB 12: FOR I = 1
      TO WL: PRINT  CHR$ (95);: NEXT

3100  VTAB 20: HTAB 1: PRINT "(EN
     TER A-Z FOR THE LETTER,,, RE
     TURN WHENYOU ARE DONE.)"
3200 WP = 1
3205  FOR I = 250 * ANS TO 1 STEP
      - 1
3206  IF  PEEK ( - 16384) > 127 THEN
      GOTO 3210
3207  IF  INT (I / 50) * 50 = I THEN
      VTAB 12: HTAB 30: PRINT "TI
     ME: " INT (I / 50)" "
3208  NEXT : RETURN
```



```
3210  VTAB 17: HTAB 11 + WP: GET
     ANS$
3220  IF  ASC (ANS$) = 8 THEN 330
     0
3230  IF  ASC (ANS$) = 21 THEN 34
     00
3235  IF  ASC (ANS$) = 13 THEN  RETURN

3240  IF ANS$ < "A" OR ANS$ > "Z"
      THEN ANS$ =  CHR$ (95)
3245 WC$(WP) = ANS$: PRINT ANS$;
3250 WP = WP + 1: IF WP > WL THEN
     WP = 1
3260  GOTO 3207
3300  IF WC$(WP) = "" THEN  PRINT
      CHR$ (95);: GOTO 3320
3310  PRINT WC$(WP);
3320 WP = WP - 1: IF WP < 1 THEN
     WP = WL
3330  GOTO 3207
3340  IF WC$(WP) = "" THEN  PRINT
      CHR$ (95);: GOTO 3420
3410  PRINT WC$(WP);
3420 WP = WP + 1: IF WP > WL THEN
     WP = 1
3430  GOTO 3207
4000 :
4001  REM  *** END
4002 :
4010  FOR I = 1 TO WL: VTAB 12: HTAB
     11 + I: PRINT WR$(I);: IF WC
     $(I) = WR$(I) THEN  INVERSE
     : VTAB 17: HTAB 11 + I: PRINT
     WC$(I);: NORMAL :WC = WC + 1

4020  NEXT : VTAB 20: HTAB 1: CALL
      - 958: IF WC = WL THEN  PRINT
     "CONGRATULATIONS !": PRINT "
     YOU UNSCRAMBLED THE ENTIRE W
     ORD !": GOTO 4040
4030  PRINT "THE GAME IS OVER..."
     : PRINT "OUT OF "WL" LETTERS
     , YOU GOT "WC: PRINT "OF THE
     M CORRECT."
```

```
4040  INPUT "DO YOU WISH TO PLAY
      AGAIN? ";ANS$: IF  LEFT$ (AN
      S$,1) = "Y" THEN  RUN
4050  RETURN
```


This is an addicting game in which you try to consume all of the food squares before the Mubble Eaters consume you. A 9 by 9 arena houses the action. There are 64 food squares and three Mubble Eaters (ME's). If on the first run you do not complete the mission, you still have another Mubble to finish what the first Mubble started. It is up to you to safely guide the Mubble to gluttony. Go to it! This program will be explained line by line. It was chosen because the use of graphics is such that most of the other programs can be understood if this program is understood.

10 to 16 REM means remark. Anything may be construed as a remark. In this case, the REM statement is used to allow the program name to be written. Naturally, ********** is not an actual REMark, but this statement (REM) allows the programmer to write the title in a computer-acceptable format.

15 and 16 The REM statements are followed by nothing. Their purpose is to maintain space between the title and line 20 (for aesthetic reasons).

20 GOSUB 1000 tells the computer to branch to line 1000 and to continue until the statement RETURN is encountered. When it is, the program will RETURN to line 20 and continue on to line 30. The colon which follows GOSUB 1000 is significant. .... A colon announces to the computer that a new instruction is forthcoming. An instruction which is preceded by a colon is exactly the same as an instruction preceded by a line number, with one important exception. If an instruction is a conditional (IF ..... THEN) the computer will perform the next sequential instruction if the condition is not met; but if the condition IS met, then every instruction on that line will be performed—even those instructions set off by a colon. What is present on lines 20-50 is a clumping of more than one instruction per line. You already know that a REM statement instructs the computer to ignore whatever follows it, so REM INSTS is written for your benefit, not the computer's. INSTS stands for INSTRUCTIONS.

30-50 are the same format as line 20. This is the key to the structuring of BASIC programs. All the instructions are in 1000-1999, setup at 2000-2999, etc.

60 When line 50 has been executed, the program is finished. END returns computer control to the user. You can have END anywhere in a program and even have it in several places as long as it does not get executed until the proper time!

1001 REM *** INSTS This line serves to inform the reader that the following lines contain the instructions.

1010 Line 1010 contains three instructions. TEXT is the instruction which changes the computer from the graphics (color) mode, back into the text (black and white) mode. NORMAL sets the the background color to black and the lettering color to white. HOME clears the screen (but only clears the screen of text, not color). It is standard practice to use this line in any program before a title screen is printed to 'clear the decks' of any text, graphics, or even garbage left over from a previous program.

1020 Line 1020 contains three instructions. VTAB 2 translates to Vertical TAB 2 lines. In other words, tab down two lines from the top of the screen. HTAB 10 translates to Horizontal TAB 10 spaces. This means, tab over ten spaces from the left-hand margin. PRINT says, output to the screen whatever is between the quotes. If you give the instruction: PRINT "X" then the output will be X. If you give the instruction: PRINT X then the numeric value contained in the variable 'X' will be printed. In the case of line 1020, the character string *** MUBBLE CHASE *** will be printed on the screen two lines down from the top and ten spaces in from the left margin.

1025 VTAB 5 This line instructs the computer to tab down five lines from the top of the page.

1030 This line PRINTs, verbatim, that which is between the quotes (five lines down from the top of the page).

1035 This line, in effect, PRINTs a blank line. The reason that this line is used is so that the text printed by line 1030 and the text to be printed by line 1040 will be separated by a blank line.

1050 This line contains two instructions. VTAB 23 tabs down 23 lines from the top of the page. The INPUT statement in this case serves only to hold up the program until you are ready to go on.

1060 This line contains five instructions. HOME clears the screen. VTAB 2 tabs down two lines from the top. HTAB 10 tabs over ten spaces from the left margin. PRINT outputs to the screen the material between the quotes, at a beginning position ten spaces from the left and two lines down from the top. After the PRINT statement is executed, the computer reads VTAB 5. This instruction says to skip down to the fifth line.

1070 This line PRINTs the material between the quotes on the fifth line from the top.

1090 (six instructions) HTAB 18 Horizontally TABs 18 spaces right. Next, the word 'UP' is printed. Then a blank line is printed (PRINT). Fourth, the computer is told to Horizontally TAB (to the right) 19 spaces. Then the letter 'I' is printed. Last, another blank line is printed below the 'I'.

1091 and 1092 finish the instructional chart which line 1090 began.

1100 This line is the same as line 1050.

1990 RETURN. The GOSUB 1000 in line 20 is completed by the required RETURN statement. Control is sent back to line 20, and then the program drops to line 30 which says to GOSUB 2000. This may seem a bit roundabout, but it is the basis of structuring the program into modular units.

2000 : This line and 2002 do nothing but aid in the readability of line 2001.

2001 REM *** SETUP This REMark tells you that the program setup is to follow.

2015 This instruction allows the variable ME to assume six different values (ME (1,1) ME (1,2) ME (2,1) ME (2,2) ME (3,1) ME (3,2), and the variable SP to assume three different values. The instruction DIM is short for DIMension. The computer is being told that ME is now a two-DIMensional array, and that SP will become a one-dimensional table. Instead of occupying a single location in memory, ME is now capable of occupying six, and SP can occupy three. A subscript (the numbers in the parentheses, ie. (1,1)) tells the computer where to find a certain value (in memory). Within a subscript there are rows and columns. The first value is always the length of each row (ME and SP both have rows which are three places long), and the second value (if present) is the length of each column. Another way to view subscripts is to envision the numbers as being: row,column. That is, ME(3,1) is located in the third row of the first column. Following will be an illustration of how the arrays are stored:

| | COLUMN 1 | COLUMN 2 |
|---|---|---|
| ROW 1 | ME (1,1) | ME (1,2) |
| ROW 2 | ME (2,1) | ME (2,2) |
| ROW 3 | ME (3,1) | ME (3,2) |


This is a one dimensional array:

| ROW 1 | SP (1) | SP (2) | SP (3) |
|---|---|---|---|

Actually, an array is assumed to have a storage location reserved for all zero subscripts, such as ME(0,0) ME(0,4) ME(3,0), but their use is normally omitted. Also, the computer does not actually store tables or arrays in two or three dimensions. The computer stores the data in one long string. The illustration is to help you visualize how to access various memory locations.

2030 PT is set to 0, and MU is set to 3 for reasons to be explained later.

2040 (two instructions) GR changes the mode from text (black and white) to GRaphics (color). HOME clears the bottom four lines which is the text area when in the GRaphics mode.

2041 This line specifies that all drawing is to be done in color 15 (white), until the color is changed.

2042 (two instructions) This line causes two Horizontal LINes to be printed (in white). Both lines travel from the left of the screen (0) to near the right edge (38, the lowest it could go is 39). The screen is broken down into 40 horizontal units (0-39) and 40 vertical units (0-39). When a horizontal line is to be printed, the computer needs to know which of the 40 rows to draw the line into. In the case of line 2042, the two lines are being drawn in row 0 and row 38.

2043 (two instructions) Line 2043 causes two Vertical LINes to be printed (still in white). This time the computer needs to know the column in which to draw the lines. The two lines are to be drawn in columns 0 and 38. What the result of lines 2040-2043 will be, is a white border traveling around the screen.

2050 This line changes the color of future drawings from 15 (white) to 1 (magenta).

2051 This line also bears close examination. The way to tell the computer to perform an action a certain number of times is by use of the FOR/NEXT loop. If you want a loop to be perform 6 times, the computer offers a number of ways to do this. The statement: FOR I = 1 TO 6 tells the computer to begin a loop with I equal to 1. Unless told otherwise, the value of I is incremented by one each time the loop is completed. After the sixth loop the value of I will change from 6 to 7. Since the FOR statement specifically said to perform the loop while I was equal to 1 through 6, the computer knows to stop looping when I = 7. Another way of telling the computer to loop six times would be: FOR X = 5 TO 10. By using the parameters 5 and 10, the loop will begin at X = 5 and continue until through X = 10. We could say FOR I = 1000 to 1005 and also achieve a loop to be performed six times. There are other ways to create a loop. If you write: FOR X = 3 TO 11, then the value of X is incremented by one each time the loop is performed. But if you write: FOR X = 3 TO 11 STEP 2, then X is incremented by TWO each time the loop is performed. For the first time through the loop X = 3, then two is added to X, so X = 5 for the second time through, then X = 7, X = 9, X = 11, and finally X = 13 (and the loop is done). This additional feature, STEP, merely allows the programmer to regulate the increment of the loop controller. Line 2051 is: FOR I = 2 TO 34 STEP 4. To interpret, this loop is performed when I = 2, 6, 10, 14, 18, 22, 26, 30, and 34. STEP 4 instructs the computer to increment X by 4, instead of by one, each time the loop is performed.

2052 What we have here is a loop within a loop, also referred to as a nested loop. This second loop (referred to as the J-loop) is performed each time the I-loop is performed.

2053 The I-loop gets further nested with the advent of the K-loop. Each time the I-loop is performed, the parameters of the K-loop will change.

2054 This line instructs the computer to draw a magenta line beginning at position J and drawing up to J + 2, and to draw the line at row K. Let's go back to line 2051 and see if we can follow this entire looping sequence. Line 2051 instructs the computer to perform the I-loop from 2 to 34 incrementing by 4. So I = 2. Line 2052 instructs the computer to perform the entire J-loop each time the I-loop is performed. J = 2 to 34 step 4, so to begin, J = 2. K = I to I + 2, so to begin (since I = 2), K = 2 to 4. Next, a Horizontal LINe is printed from J (2) to J+2 (4) at row K (2). Remember, the entire K-loop is performed with each pass of the J-loop. Continuing the K-loop, add one to K (K = 2 to 4, now K = 3). Draw a horizontal line from J (2) to J+2 (4) at row K (3). Completing the first of 81 K-loops, add one to K (K = 2 to 4, now K = 4). Draw horizontal line from 2 to 4 at 4. Now that the K-loop is done, the computer can continue the J-loop by incrementing J by 4. After doing this (line

2052) the computer is again instructed to perform the entire K-loop. The K-loop, remember, makes line 2054 get performed I to I+2 times. Since I still equals 2, line 2053 can be rewritten as: FOR K = 2 to 4. Performing the K-loop for K = 2, 3, and 4, horizontal lines are drawn at 6 (J),8 (J+2) on row K. As you can see, the K-loop is entirely performed each time J is incremented. The J-loop is entirely performed each time the I-loop passes. To summarize, the I-loop is run just once, but has nine passes (a pass is an individual loop). The passes occur at 2,6,10,14,18,22,26,30, and 34. With each pass of the I-loop the entire nine passes of the J-loop are performed. With each of the nine passes of the J-loop, all three passes of the K-loop are performed. A total of 243 passes of the K-loop are made. With each pass a horizontal line is drawn at J,J+2 at row K. The 243 lines comprise the 81 magenta boxes you see on the screen.

2055 As mentioned before, a very easy and useful method of looping is by performing a FOR/NEXT loop. The FOR statement begins the loop (and each pass), conversely, the NEXT statement ends the loop (and each pass). When the NEXT statement is encountered, the computer will increment the variable as instructed. In the given example (line 2055), the variable K will be incremented each time a pass is made. The value of K starts at two and is incremented by one until it is equal to four. When the K-loop is started anew, K reverts to two. The variable J will be incremented each time that K = 4 (unless J = 34). The variable 'I' will be incremented only when K = 4 and J = 34. In other words, when an instuction line (such as line 2055) contains more than one NEXT variable, then the loop represented by the first one (K) is performed until completed. Then J is incremented, and again the K-loop is performed until completed. When J = 34 and the K-loop is done, only then is 'I' incremented. Each time that the 'I' variable is incremented, the J-loop starts with J = 2. The looping process continues until, on the two hundred forty-third pass, K = 4, J = 34, and I = 34.

2060 This line DIMensions the computer's memory to accept MU as a two-dimensional array. Six locations are reserved for MU values, not just one. Two rows with three columns each are set aside in the computer's memory.

2070 A FOR/NEXT loop is started here, with 'I' beginning at 5 and growing to 33 by increments of 4.

2071 Nested within the I-loop is a J-loop, also starting at J = 5 and continuing, by 4, until J = 33. The entire J-loop (eight passes) is performed each time the I-loop makes one of its eight passes.

2072 This line needs to be broken up into more digestible pieces. First, RND (1) will give a RaNDom number between 0 and 1. Actually, RND (7) also gives

you a random number between 0 and 1. Unless your computer has a special RND function, all random numbers are between zero and one. The random result is then multiplied by 4, giving a number between .00000004 and 3.99999996. Next, the number 6 is added to the total. At this point go back and look at the command INT. INT changes RND (1) * 4 from a decimal into an INTeger. This is done by truncating (chopping off) anything to the right of the decimal point. The number 3.996 becomes 3 (not 4). Because of this. INT (RND (1) * 4) + 6 yields a random number between 6 and 9, not between 6 and 10. The result is that on each pass the color can be changed to 6, 7, 8, or 9.

2073 This line instructs the computer to plot a point, in the color given by the RaNDom INTeger function, at X,Y coordinates I,J.

2074 As in line 2055, this line will increment J until J = 33, then 'I' will be incremented, J will revert to 5, and the looping procedure will continue until NEXT J,I is reached when both I and J are equal to 33. At that point, the computer will drop down to line 2990 (the next instruction).

2990 RETURN This line completes line 30, which instructs the computer to start a subroutine at line 2000, and to continue until the command RETURN is encountered.

3001 The REMark *** PLAY informs the reader that lines 3000-RETURN control the play.

3005 (nine instuctions) In this line, nine locations of ME are assigned values.

3006 (six instructions) First, the color is set to 2 (dark blue). Second, a loop is started. Third, the three Mubble Eaters are plotted onto the screen. Fourth, NEXT completes each pass of the loop. Because there is only one loop, the I-loop, the NEXT command needs no argument. Fifth, MD is set to 1. Sixth, the variable HI is set to 0.

3007 (twelve instructions) The first six instructions set values for the MUbble. Then values are given to the mubbles beginning X,Y coordinates, MX,MY. Remember, unlike a typical graph, the origin for the screen is in the UPPER left-hand corner, so the bottom left hand corner is at 0,39. The ninth instruction sets the color (of the MUbble) to 4. Next, a loop is started. The eleventh instruction plots the MUbble at the X,Y coordinates which are given. Finally, the NEXT command completes the I-loop.

3010 (two instructions) First, MU is decremented by one. Then a test is made (MU < 0), and if the test (condition) proves to be true, the subroutine started by line 40 will be completed by RETURN.

3012 (six instructions) COLOR= 0 sets the color to 0 (black). A black, Horizontal LINe going all the way across the screen (from 0 to 39) to be drawn at row 39 is called for in the second instruction. Then the color is set to 15 (white). Next, a condition is made. If true, a loop is started, the point at (I * 2),39 is plotted each time a pass is made, and the NEXT statement marks the end of each pass.

3015 Remember, HOME only clears text, not color. In the GRaphics mode, only the bottom four lines are available for text. Next, a blank line is PRINTed; followed by the material between the quotes. The loop FOR I = 1 TO 2000 is merely a stalling tactic. The result of the loop is that the message <<< READY ..... >>> will stay on the screen while I is incremented by one, from 1 to 2000. This process takes from two to five seconds.

3020 Here we have a nested GOSUB. Line 40 initiated the subroutine beginning at line 3000. Now line 3020 instructs the computer to perform a subroutine within a subroutine. A REMark is made to explain the purpose of the subroutine at line 3300.

3025 This line is performed AFTER the subroutine beginning at line 3300. If you have eaten all 64 food points, then the subroutine (started by line 40) is completed.

3030 Here is another example of a nested GOSUB. The REMark tells us the purpose of the subroutine is to move the mubble eaters.

3040 'HI' is a special value. In most cases it is equal to "no" (which is "NOT HI"). If HI is equal to "yes", then, according to the program, the MUbble has been eaten by a Mubble Eater. If this is the case, then there is no need to go to 3020 (THEN 3020).

3041 To begin with, a loop is to be performed 60 times. In the loop, the variable XX is set to equal PEEK (-16336). This instruction (PEEK (-16336)) causes a clicking sound to be emitted from the speaker. This clicking sound is heard each time the Mubble eats one of the colored foodpoints. The NEXT statement concludes each pass.

3045 The FOR statement marks the start of a loop. The color is set to 0 (black), so when the Mubble Eaters move, after the Mubble moves, the positions on the maze where the Mubble Eaters were will not remain blue, but will be replaced with background colored points.

3050 This line draws the MUbble at its new position in the maze. This line is performed each time that the Mubble is moved.

3055 This line sends the program back to line 3005.

3300 Don't fret! Although this line appears to be a confusing conglomeration of variables, there is a definite purpose for this line. Before starting with an explanation, there are two important facts which you must know. One, MX and MY are the MUbbles X,Y coordinates. Two, the food points are located at specific intervals. Armed with this knowledge, you have a good chance of understanding what follows. The 64 food points are each located at an intersection. The X,Y coordinates at these 64 points are:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 5,5 | 5,9 | 5,13 | 5,17 | 5,21 | 5,25 | 5,29 | 5,33 |
| 9,5 | 9,9 | 9,13 | 9,17 | 9,21 | 9,25 | 9,29 | 9,33 |
| 13,5 | 13,9 | 13,13 | 13,17 | 13,21 | 13,25 | 13,29 | 13,33 |
| 17,5 | 17,9 | 17,13 | 17,17 | 17,21 | 17,25 | 17,29 | 17,33 |
| 21,5 | 21,9 | 21,13 | 21,17 | 21,21 | 21,25 | 21,29 | 21,33 |
| 25,5 | 25,9 | 25,13 | 25,17 | 25,21 | 25,25 | 25,29 | 25,33 |
| 29,5 | 29,9 | 29,13 | 29,17 | 29,21 | 29,25 | 29,29 | 29,33 |
| 33,5 | 33,9 | 33,13 | 33,17 | 33,21 | 33,25 | 33,29 | 33,33 |

These points have one important thing in common. If you add three to any of the eight different X coordinates, the sum will be an exact multiple of four. Therefore, MX + 3 divided by 4 will be an integer, and (MX + 3) / 4 will be equal to INT (the integer value of) (MX + 3) / 4. Also, if you add three to any of the eight Y coordinates, then the sum will be evenly divisible by four; and (MY + 3) / 4 will be equal to INT (MY + 3) / 4. The only times when both (MX + 3) / 4 = INT (MX + 3) / 4 and (MY + 3) / 4 = INT (MY + 3) / 4 is at one of the sixty-four intersections. If, indeed, the Mubble is at an intersection, then FL equals "yes". If the MUbble is not at one of the sixty-four intersections, then FL equals "no".

3301 This line is a conditional (a test). If FL is equal to "yes", then the computer will skip to line 3320.

3304 Each key on the keyboard has a coresponding numeric value referred to as an ASCII value. The keyboard ASCII values begin at 128 and proceed upward. PEEK (-16384) is an instruction which tells the computer to search the entire keyboard to see if any of the keys have been pressed. If they have, PEEK (-16384) will be equal to the ASCII value of whichever key was pressed. In other words, if any character on the keyboard was pressed, the value of PEEK (-16384) is going to be greater than 128.

3305 The variable KEY is set to the ASCII value of the key initially recognized by PEEK (-16384). As was mentioned before, the keyboard character ASCII

values begin at 128. For the sake of understanding, 128 is subtracted from PEEK (16384).

3310 This line checks to see if the KEY pressed was I. The ASCII value for 'I' is 73. If KEY is equal to 73 (I), then the variable MD (Mubble Direction) is set to 2. The computer is then told to branch to line 3319.

3311 This line checks to see if the KEY pressed was K. K is the game command which tells the Mubble to head west. If K was pressed, KEY is equal to 75, and the Mubble's Direction (MD) is set to 1.

3312 This line checks to see if the KEY pressed was M. The ASCII value for the letter M is 77. If, indeed, M was pressed, then Mubble Direction (MD) is set to 4 (undoubtedly this translates to MD = down).

3313 This line checks to see if the KEY pressed was J. If KEY equals 74, then the Mubble is going to head east. As in the previous three statements, the program will branch to line 3319 if the condition is met.

3315 This line will be performed only if KEY does not equal either 73 (I),74 (J),75 (K), or 77 (M). If none of the four conditions is true, then the program will bypass 3319 and go to 3320.

3319 This instruction, POKE 16368,0, rests the keyboard strobe, so that new information can be accepted from it. Simply, it clears the keyboard so that PEEK (-16384) can read new input, not continually reread the first key that was pressed.

3320 This line sets X2 equal to the Mubble's X coordinate, and Y2 equal to the Mubble's Y coordinate.

3321 If Mubble's Direction is equal to 1 (west), then add one to the X coordinate. If the mubble is headed west (right), then the value of the X coordinate increases with each move.

3322 If Mubble's Direction is equal to 2 (up), then subtract one from the Y coordinate. Because the origin is in the upper left-hand corner, the value of the Y coordinate increases as Y travels down the screen. To illustrate, as a point descends from the upper left-hand corner to the lower left-hand corner, the X,Y coordinates would look like this: 0,0 (at the origin), 0,1 0,2 0,3 0,4 0,5 0,6 and so on until, at the bottom of the screen we have 0,39.

3323 If Mubble's Direction is equal to 3 (east), then subtract one from the X

coordinate. As the mubble moves to the left (east), the value of the X coordinate is decremented.

3324 If Mubble's Direction is equal to 4 (south), then add one to the Y coordinate. As the mubble moves down (south), the value of Y is increased. This is due to the fact that the origin is in the upper left-hand corner.

3330 This line checks to see if either coordinate is out of the range of the maze. If it is, the subroutine is completed (RETURN), and the computer waits for you to input a viable keyboard character.

3337 It has already been determined that X2,Y2 are the X,Y coordinates of the mubble. SCRN returns the color value of the present (X,Y) cursor location. If the X,Y coordinates on the screen are equal to COLOR = 4. In other words, if, at coordinates X2,Y2, the SCReeN contains a mubble (the mubble is a greenish color (COLOR = 4)) then skip to line 3345.

3340 This line instructs the computer to check and make sure that the color at X2,Y2 is not black (SCRN X2,Y2 < > 0 (black)), and if it is not black, the variable XX is set to be PEEK (-16336) + PEEK (-16336) - PEEK (-16336) + PEEK (-16336). This equation may appear to be about as clear as a Chinese newspaper, but it is really not difficult to understand. Although XX appears to be set to equal a string of PEEK (-16336)'s, this is not the case. When the computer attempts to locate the value of PEEK (-16336), it is instructed to flick the toggle switch on the speaker. The result is that a short clicking sound is emitted. In the above equation, PEEK (-16336) appears four separate times, so the clicking sound is made four times. Because the clicks are emitted one right after the other, only someone with exceptional hearing can differentiate the one short click as being composed of four, shorter clicks. Remember, line 3300 ascertained that mubble was at a possible foodpoint location. Because the location was not black (line 3340) or mubble colored (line 3337), the location must have contained a foodpoint, and as a result, the player scores a PoinT PT = PT +1). Then the program checks to see if all 64 foodpoints have been scored. If they have, then the subroutine is completed by the RETURN command.

3345 This line is responsible for both moving the mubble ahead and replacing the mubble's last position with a black square. First, the color is set to 0 (black). Then, the hind third of the mubble's previous position, MU(1,1) and MU(1,2) is replaced by a black spot. But don't fret, the color is changed to the mubble's greenish color (COLOR = 4), and the point where the mubble has moved to (the front one-third) is plotted. Last, the mubble's previous middle one-third becomes his rear one-third: MU(2,1 becomes MU(3,1), MU(2,1) becomes MU(2,2), MU(2,2) becomes MU(3,2).

3350 This line sets the new, front one-third coordinates into the memory locations MU(3,1) and MU(3,2). The new X coordinate for the mubble,X2, is now put into MX; and the new Y coordinate is moved into MY. is completes the task to be handled by this subroutine so it RETURNs.

3400 This line begins a loop which consists of three passes.

3402 Since there are three Mubble Eaters, the equation to check to see if they are at one of the 64 intersections has to be repeated three times. As with line 3300, if both conditions are met, then FL is, in effect, equal to 'yes'.

3405 With each pass of the loop, FL is roughly equivalent to 'yes' or to 'no'. If FL is 'no', then the program skips to line 3430.

3407 This line determines the Mubble Eaters' route of pursuit. The equation INT ((RND (1) * 6) + 1 will yield an integer between 1 and 6. The function of the ON command is to send the program to the corresponding line number. What this means is, if the random number turns out to be one, then go to the FIRST line number listed (3410). If the random number is five, then the program will branch to the fifth line in the list of six (3430). There is an equal chance that the random number will be equal to 1,2,3,4,5, or 6. For each of the six possibilities, the program will branch to a certain line number. Following will be a list of the six random numbers, and the line number where the number will cause the program to branch.

1-3410, 2-3410, 3-3410, 4-3420, 5-3430, 6-3430

Each number has a one-in-six chance of being the random number, and because there are only three different line numbers in the list of six, there are different odds of branching to the three lines. If the random result is 1, 2, or 3, then the program will GO TO line 3410. There is a 50-50 chance (three in six) that this will happen. There is only a one-in-six chance that the the RaNDom number will be four, and the program will go to line 3420. The random results five and six both cause the program to GO TO line 3430. The odds of this are two-in-six.

3410 Another ON statement, which utilizes a random number function, is demonstrated in line 3410. The random result will be either one or two. If one, then the program will GO TO 3411; if the random result is two, then the program will branch to line 3413.

3411 Remember that the program is in a three-pass loop. This line compares the mubble's X coordinate to that of one of the three Mubble Eaters. If MX is

less than the Mubble Eater's X coordinate then the MUbble is to the left (east) of the Mubble Eater. Using the numbers 1 through 4 to indicate the four directions, 1 = west (right), 2 = north (up), 3 = east (left), and 4 = south (down), the value of ME(I,0) assumes the value of the direction (1-4) that the Mubble Eater should go.


3412 This line is the companion of line 3411. If the MUbble's X coordinate (MX) is greater than one of the three Mubble Eaters' X coordinate, then the mubble is west (left) of the ME's position, so ME(I,0) assumes the value which will later instruct the ME to move to the left. As in line 3411, if the condition is true (MX > ME(I,1)) then the program branches to line 3430. Notice that if the Mubble Eater is on the same lateral plane (has the same X coordinate), that is, if the ME is on the same vertical line as the mubble, then the program falls through and starts trying to track the mubble by closing in on its Y coordinate (lines 3413 and 3414).

3413 Lines 3413 and 3414 have the same function as 3411 and 3412. The Y coordinate is the argument used for comparison. If the mubble's Y coordinate (MY) is smaller than the ME's Y coordinate, then the mubble is north (up), relative to the position of the ME.

3414 Likewise, if MY is greater than the Mubble Eater's Y coordinate, then the MUbble is south (down), relative to the position of the mubble eater.

3420 If the random number generated by line 3407 is four or if at 3413 MY is equal to ME(I,2), then line 3420 will be performed. This line gives the directional indicator (ME(I,0) a random value of 1,2,3, or 4.

3430 Here the new coordinates for one of the ME's are set (using the information gained in lines 3411-3414).

3435 ME(I,0) is the directional indicator. To interpret, if ME(I,0) is equal to 1, than it is time to head east (right). This is accomplished by adding one to the ME's new X coordinate (X2).

3436 This time the line checks to see if the directional indicator says to "fly north." If so, this movement will be achieved by subtracting one from the ME's new Y coordinate.

3437 If ME(I,0) equals three, then the ME needs to travel west. This is done by summarily decrementing X2. If you find it difficult to visualize how this will result in the ME moving west, take out a piece of graph paper and experiment (keeping the origin in the upper left-hand corner.)

3438 Finally, if the mubble is south (down) in relation to the ME, then by increasing the value of the Mubble Eater's new Y coordinate, the ME will, indeed, move down.

3440 The function of this line, is to see if the ME's new X,Y coordinates (X2,Y2) are headed out of the maze boundaries. If they are, then the program branches to 3490 where corrective action will be taken.

3445 This instruction is very interesting. Its function is to remember what color the SPace the Mubble Eater is on was before it got there. The SCRN command reads the color off the screen and stores it in SP(I). Then, when the Mubble Eater has vacated its previous spot, the space's original color is restored. This way, the mubble eater does not leave a trail void of foodpoints, and it does not leave a dark blue trail either. To experiment, change line 3445 so that it reads: 3445 COLOR= 9, or 3445 COLOR= 2 or 3445 COLOR= 0. After making the change, run the program. Perhaps any misunderstandings will become clear.

3460 The foodpoints are plotted in the colors six through nine. This line checks to see if SP(I), which is equal to SCReeN X2,Y2 (see 3447), is a foodpoint or not. If not, SP(I) reverts to 0.

3490 This line checks to see if a Mubble Eater has caught the MUbble. Because the MUbble occupies three spaces, the test has to verify the Mubble Eaters coordinates on the different points. If the coordinates of a Mubble Eater are the same as one of the three sets of MUbble coordinates, then the MUbble is done for. In this program, when the MUbble is eaten, recorded by setting HI (for HIt) to one.

3495 The NEXT statement ends each pass of the loop begun on line 3400. When I = 3, this instruction ends the loop.

3990 RETURN completes the GOSUB. If this statement is omitted, the computer will stop the run to inform you of the error.

4000 This line merely serves to make 4001 more readable.

4001 This REMark tells us that the following lines comprise the *** END routine.

4002 A filler.

4010 (two instructions) HOME clears the four lines reserved for text. Next, the end-of-game message is printed.

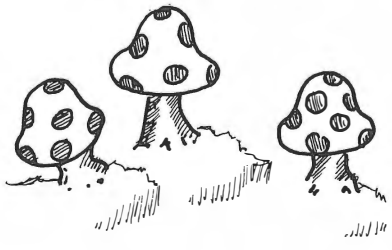
4015 A test is run to see if you scored all 64 points. If you have, the message between the quotes is printed, and then the RETURN statement returns the program to line 50 and then line 60.

4020 The number of foodpoints you score is contained in location PT. Assuming 4015 was an invalid conditional, 4020 will print the exact message you have between the quotes, followed by the contents of the variable PT, and finally, the second half of the message which is between the quotes, will be printed precisely as it was written.

4990 If and when line 4020 is finished, this line RETURNs the program to line 50. Then the program continues on to line 60, where the flow is ended.

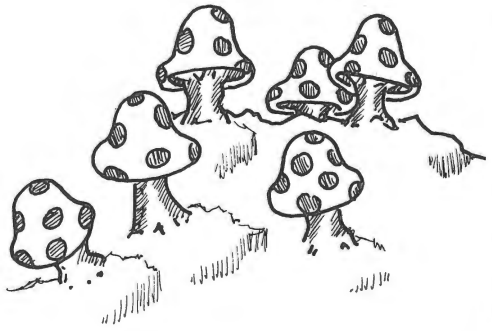
```
10  REM  ********************
11  REM  ***                 ***
12  REM  *** MUBBLE CHASE ***
13  REM  ***                 ***
14  REM  ********************
15  REM
16  REM
20  GOSUB 1000: REM  INSTS
30  GOSUB 2000: REM  SETUP
40  GOSUB 3000: REM  PLAY!
50  GOSUB 4000: REM  !END!
60  END
1000 :
1001  REM  *** INSTS
1002 :
1010  TEXT : NORMAL : HOME
1020  VTAB 2: HTAB 10: PRINT "***
      MUBBLE CHASE ***"
1025  VTAB 5
1030  PRINT "IN THIS EXCITING GAM
     E, YOU CONTROL THE  MOVEMENT
      OF THE HUNGRY LITTLE CREATU
     RE  WE CALL THE MUBBLE.  THE
      MUBBLE SCURRIESTHROUGH A MA
     ZE, TRYING TO EAT UP ALL OF
     THE FOOD POINTS."
1035  PRINT
1040  PRINT "UNFORTUNATELY, THERE
      ARE THREE MUBBLE-  EATERS I
     N THE SAME MAZE, WHO WANT TO
         CATCH AND EAT THE POOR M
     UBBLE."
1050  VTAB 23: INPUT "HIT RETURN
     WHEN READY TO CONTINUE : ";A
     NS$
1060  HOME : VTAB 2: HTAB 10: PRINT
     "*** MUBBLE CHASE ***": VTAB
     5
1070  PRINT "YOU MUST MANEUVER TH
     E MUBBLE TO THE FOODPOINTS A
     ND AWAY FROM THE MUBBLE EATE
     RS. YOU ARE ALLOWED TO LOSE
     TWO MUBBLES, BUTWHEN THE THI
     RD MUBBLE IS EATEN, THE GAME
     IS OVER."
```

```
1075  PRINT
1080  PRINT "MOVEMENT OF THE MUBB
     LE IS CONTROLLED BY USING TH
     E LETTERS I, J, K, AND M."
1090  HTAB 18: PRINT "UP": PRINT
     : HTAB 19: PRINT "I": PRINT

1091  PRINT "       LEFT  - J
      K -  RIGHT": PRINT
1092  HTAB 19: PRINT "M": PRINT :
      HTAB 18: PRINT "DOWN"
1100  VTAB 23: INPUT "HIT RETURN
     WHEN READY TO CONTINUE : ";A
     NS$
1990  RETURN
2000 :
2001  REM  *** SETUP
2002 :
2015  DIM ME(3,2),SP(3)
2030 PT = 0:MU = 3
2040  GR : HOME
2041  COLOR= 15
2042  HLIN 0,38 AT 0: HLIN 0,38 AT
     38
2043  VLIN 0,38 AT 0: VLIN 0,38 AT
     38
2050  COLOR= 1
2051  FOR I = 2 TO 34 STEP 4
2052  FOR J = 2 TO 34 STEP 4
2053  FOR K = I TO I + 2
2054  HLIN J,J + 2 AT K
2055  NEXT K,J,I
2060  DIM MU(3,2)
2070  FOR I = 5 TO 33 STEP 4
2071  FOR J = 5 TO 33 STEP 4
2072  COLOR=  INT ( RND (1) * 4) +
      6
2073  PLOT I,J
2074  NEXT J,I
2990  RETURN
3000 :
3001  REM  *** PLAY
3002 :
```



```
3005 ME(1,1) = 1:ME(1,2) = 1:ME(2
     ,1) = 37:ME(2,2) = 1:ME(3,1)
      = 37:ME(3,2) = 37:ME(1,0) =
     1:ME(2,0) = 4:ME(3,0) = 3
3006  COLOR= 2: FOR I = 1 TO 3: PLOT
     ME(I,1),ME(I,2): NEXT :MD =
     1:HI = 0
3007 MU(1,1) = 1:MU(1,2) = 37:MU(
     2,1) = 2:MU(2,2) = 37:MU(3,1
     ) = 3:MU(3,2) = 37:MX = 3:MY
      = 37: COLOR= 4: FOR I = 1 TO
     3: PLOT MU(I,1),MU(I,2): NEXT

3010 MU = MU - 1: IF MU < 0 THEN
      RETURN
3012  COLOR= 0: HLIN 0,39 AT 39:
COLOR= 15: IF MU > 0 THEN  FOR I=1
 TO
     MU: PLOT I * 2,39: NEXT I
3015  HOME : PRINT : PRINT "
           <<< READY ..... >>>": FOR
     I = 1 TO 2000: NEXT I: HOME

3020  GOSUB 3300: REM  MOVE MUB
3025  IF PT = 64 THEN  RETURN
3030  GOSUB 3400: REM  MOVE MUB E
     ATERS
3040  IF  NOT HI THEN 3020
3041  FOR I = 1 TO 60:XX =  PEEK
     ( - 16336): NEXT
3045  FOR I = 1 TO 3: COLOR= SP(I
     ): PLOT ME(I,1),ME(I,2):SP(I
     ) = 0: NEXT
3050  PLOT MU(1,1),MU(1,2): PLOT
     MU(2,1),MU(2,2): PLOT MU(3,1
     ),MU(3,2)
3055  GOTO 3005
3065 MU(1,1) = 1:MU(1,2) = 37:MU(
     2,1) = 2:MU(2,2) = 37:MU(3,1
     ) = 3:MU(3,2) = 37:MX = 3:MY
      = 37: COLOR= 4: FOR I = 1 TO
     3: PLOT MU(I,1),MU(I,2): NEXT
```

```
3300 FL = ((MX + 3) / 4) =  INT (
     ((MX + 3) / 4)) AND ((MY + 3
     ) / 4) =  INT (((MY + 3) / 4
     ))
3301  IF  NOT FL THEN 3320
3304  IF  PEEK ( - 16384) < 128 THEN
     3320
3305 KEY =  PEEK ( - 16384) - 128

3310  IF KEY = 73 THEN MD = 2: GOTO
     3319
3311  IF KEY = 75 THEN MD = 1: GOTO
     3319
3312  IF KEY = 77 THEN MD = 4: GOTO
     3319
3313  IF KEY = 74 THEN MD = 3: GOTO
     3319
3315  GOTO 3320
3319  POKE  - 16368,0
3320 X2 = MX:Y2 = MY
3321  IF MD = 1 THEN X2 = X2 + 1:
      GOTO 3330
3322  IF MD = 2 THEN Y2 = Y2 - 1:
      GOTO 3330
3323  IF MD = 3 THEN X2 = X2 - 1:
      GOTO 3330
3324  IF MD = 4 THEN Y2 = Y2 + 1:
      GOTO 3330
3330  IF X2 < 1 OR X2 > 37 OR Y2 <
     1 OR Y2 > 37 THEN  RETURN
3337  IF  SCRN( X2,Y2) = 4 THEN 3
     345
3340  IF  SCRN( X2,Y2) <  > 0 THEN
     XX =  PEEK ( - 16336) +  PEEK
     ( - 16336) -  PEEK ( - 16336
     ) +  PEEK ( - 16336):PT = PT
      + 1: IF PT = 64 THEN  RETURN

3345  COLOR= 0: PLOT MU(1,1),MU(1
     ,2): COLOR= 4: PLOT X2,Y2:MU
     (1,1) = MU(2,1):MU(2,1) = MU
     (3,1):MU(1,2) = MU(2,2):MU(2
     ,2) = MU(3,2)
```



```
3350 MU(3,1) = X2:MU(3,2) = Y2:MX
      = X2:MY = Y2: RETURN
3400  FOR I = 1 TO 3
3402 FL = ((ME(I,1) + 3) / 4) =  INT
     (((ME(I,1) + 3) / 4)) AND ((
     ME(I,2) + 3) / 4) =  INT (((
     ME(I,2) + 3) / 4))
3405  IF  NOT FL THEN 3430
3407  ON  INT ( RND (1) * 6) + 1 GOTO
     3410,3410,3410,3420,3430,343
     0
3410  ON  INT ( RND (1) * 2) + 1 GOTO
     3411,3413
3411  IF MX < ME(I,1) THEN ME(I,0
     ) = 3: GOTO 3430
3412  IF MX > ME(I,1) THEN ME(I,0
     ) = 1: GOTO 3430
3413  IF MY < ME(I,2) THEN ME(I,0
     ) = 2: GOTO 3430
3414  IF MY > ME(I,2) THEN ME(I,0
     ) = 4: GOTO 3430
3420 ME(I,0) =  INT ( RND (1) * 4
     ) + 1: GOTO 3430
3430 X2 = ME(I,1):Y2 = ME(I,2)
3435  IF ME(I,0) = 1 THEN X2 = X2
      + 1: GOTO 3440
3436  IF ME(I,0) = 2 THEN Y2 = Y2
      - 1: GOTO 3440
3437  IF ME(I,0) = 3 THEN X2 = X2
      - 1: GOTO 3440
3438  IF ME(I,0) = 4 THEN Y2 = Y2
      + 1: GOTO 3440
3440  IF X2 < 1 OR X2 > 37 OR Y2 <
     1 OR Y2 > 37 THEN 3490
3445  COLOR= SP(I): PLOT ME(I,1),
     ME(I,2):SP(I) =  SCRN( X2,Y2
     ): COLOR= 2: PLOT X2,Y2:ME(I
     ,1) = X2:ME(I,2) = Y2
3460  IF SP(I) < 6 THEN SP(I) = 0
```

```
3490  IF (ME(I,1) = MU(1,1) AND M
      E(I,2) = MU(1,2)) OR (ME(I,1
      ) = MU(2,1) AND ME(I,2) = MU
      (2,2)) OR (ME(I,1) = MU(3,1)
       AND ME(I,2) = MU(3,2)) THEN
      HI = 1
3495  NEXT : RETURN
3990  RETURN
4000 :
4001  REM  *** END
4002 :
4010  HOME : PRINT "THE GAME IS O
      VER !!!"
4015  IF PT = 64 THEN  PRINT "YOU
       GOT ALL THE POINTS (YOU WIN
       !!)": RETURN
4020  PRINT "YOU SCORED "PT" POIN
      TS.....GOOD EFFORT"
4990  RETURN
```


This game requires good timing. You are the pilot of a B19 Bomber trying to sink enemy ships. The graphics used in this game are simple but effective. To illustrate the point, run the program. The plane is green, the ship is purple, and the water is blue. In order to demonstrate how these three distinct forms are drawn, you will need to stop running the game (by typing Ctrl C). Type: LIST-3000. This command will list all of the program lines through (-) 3000, including 3000 (if it exists). Line 2060 sets the water to color=2 (dark blue). Change this line to color = 6 or color = 12. After you are done experimenting, change 2060 back to its original configuration. Lines 2070 and 2080 instruct the computer where to draw the water, and how long to make it. To test this, change 2070 so it reads HLIN 0,20 AT 39, and then run the program. Likewise, experiment with line 2080. Next type: LIST-4000. To determine the function of lines 3100-3300, make changes in these statements and then run the program. The various subroutines are identified with remarks. If you would like to experiment with any of these routines, please do. Don't worry about making program changes. Your modified program will disappear when you turn off your computer or reload the program from the diskette. Unless you type: SAVE AIR ATTACK, none of the changes which you make will affect the program that is stored on the diskette. You should always save any modified versions you create under a new name such as AIR ATTACK 1, AIR ATTACK 2, or even 'JOE'S PROGRAM.'

```
10  REM  ********************
20  REM  ***                 ***
30  REM  ***  AIR ATTACK   ***
40  REM  ***                 ***
50  REM  ********************
60  REM
70  REM
80  GOSUB 1000: REM  INSTS
90  GOSUB 2000: REM  SETUP
100  GOSUB 3000: REM  PLAY!
110  GOSUB 4000: REM  !END!
120  END
130  REM  SL=SHOTS LEFT. YOU MAY
     MAKE A LONGER GAME BY GIVING
      MORE SHOTS IN LINE 2030
1000 :
1010  REM  *** INSTS
1020 :
1030  TEXT : HOME : NORMAL
1040  VTAB 3: HTAB 11: PRINT "***
      AIR ATTACK ***"
1050  VTAB 7
1060  PRINT "IN THIS GAME YOU ARE
      A FIGHTER PILOT.   YOU SCOR
     E BY HITTING ONE OF THE ENEM
     Y   SHIPS WITH ONE OF YOUR B
     OMBS AND SINKING IT."
1070  PRINT
1080  PRINT "TO DROP A BOMB, SIMP
     LY PRESS ANY KEY ON THE KEYB
     OARD.  YOUR SCORE FOR HITTIN
     G A SHIP WILL DEPEND ON WHIC
     H PART OF THE   SHIP YOU HIT
     ."
1090  PRINT
1100  PRINT "IF YOU HIT THE LOWER
      DECK, YOU SCORE 10 POINTS.
      IF YOU HIT THE UPPER DECK,
     YOU SCORE 20 POINTS.  IF YOU
      HIT THE SMOKE- STACK YOU HA
     VE DONE VERY WELL,  AND ARE
     REWARDED WITH 30 POINTS."
1110  VTAB 23
```

```
1120  INPUT "PRESS *RETURN* TO CO
     NTINUE : ";AN$
1130  HOME : VTAB 3: HTAB 11: PRINT
     "*** AIR ATTACK ***": VTAB 7

1140  PRINT "YOU HAVE AN ARSENAL
     OF 15 BOMBS.  THE   SPEED OF
      EACH SHIP WILL VARY, SO MAK
     E   EVERY SHOT COUNT! "
1150  PRINT : PRINT "GOOD LUCK !!
     !"
1160  VTAB 23
1170  INPUT "PRESS *RETURN* TO CO
     NTINUE : ";AN$
1180  RETURN
2000 :
2010  REM  *** SETUP
2020 :
2030 SL = 15
2040  REM   LINE 2020 DRAWS THE W
     ATER
2050  GR
2060  COLOR= 2
2070  HLIN 0,39 AT 39
2080  HLIN 0,39 AT 38
2090 AX = 0:SX = 33:SS = 1
2100  RETURN
3000 :
3010  REM  *** PLAY
3020 :
3030  HOME
3040  VTAB 22: CALL  - 958: PRINT
     "SHOTS LEFT: "SL"     SCORE:
      "TS
3050  GOSUB 3090: REM  PLANE
3060  GOSUB 3130: IF SL = 0 THEN
      RETURN
3070  GOSUB 3270: REM  SHIP
3080  GOTO 3050
3090  COLOR= 0: HLIN AX,AX + 6 AT
     2: HLIN AX + 1,AX + 6 AT 1: PLOT
     AX + 6,0
```

```
3100  REM   LINE 3110 CHECKS TO S
      EEIF THE PLANE IS AT POSITIO
      N -1.  IF SO, THE PLANE IS O
      FF THE SCREEN.  AX REVERTS T
      O 33, THE RIGHT  HAND SIDE O
      F THE PICTURE.  FROM THERE T
      HE CYCLE BEGINS AGAIN.
3110 AX = AX - 1: IF AX =a 0 THEN
      AX = 33
3120  COLOR= 4: HLIN AX,AX + 6 AT
      2: HLIN AX + 1,AX + 6 AT 1: PLOT
      AX + 6,0: RETURN
3130  IF FF THEN 3160
3140  IF  PEEK ( - 16384) =a 128 THEN
       RETURN
3150 FF = 1: POKE  - 16368,0:FX =
      AX + 3:FY = 2
3160  COLOR= 0: PLOT FX,FY
3170 FY = FY + 1
3180  IF  SCRN( FX,FY) = 0 THEN  COLOR=
       13: PLOT FX,FY: RETURN
3190  IF  SCRN( FX,FY) = 2 THEN 3
      230
3200 TS = TS + (38 - FY) * 10
3210 SC = 0: COLOR= 0: HLIN SX,SX
       + 6 AT 37: HLIN SX + 3,SX +
      5 AT 36: PLOT SX + 4,35
3220 SX = 33:SS = 1:SC = 0
3230  COLOR= 2: HLIN FX - 1,FX +
      1 AT 37: PLOT FX - 2,36: PLOT
      FX,36: PLOT FX + 2,36: PLOT
      FX - 3,35: PLOT FX,35: PLOT
      FX + 3,35
3240  COLOR= 0: HLIN FX - 1,FX +
      1 AT 37: PLOT FX - 2,36: PLOT
      FX,36: PLOT FX + 2,36: PLOT
      FX - 3,35: PLOT FX,35: PLOT
      FX + 3,35
3250 FF = 0:SL = SL - 1: POKE  -
      16368,0
3260  VTAB 22: CALL  - 958: PRINT
      "SHOTS LEFT: "SL"     SCORE:
       "TS: RETURN
```

```
3270 SC = SC + 1: IF SC =a SS THEN
      RETURN
3280 SC = Ø: COLOR= Ø: HLIN SX,SX
      + 6 AT 37: HLIN SX + 3,SX +
     5 AT 36: PLOT SX + 4,35
3290 SX = SX + 1: IF SX =A 33 THEN
     SX = Ø:SS =  INT ( RND (1) *
     3) + 1:SC = SS
3300  COLOR= 1: HLIN SX,SX + 6 AT
     37: HLIN SX + 3,SX + 5 AT 36
     : PLOT SX + 4,35: RETURN
4000 :
4010  REM  *** END
4020 :
4030  HOME : PRINT "THE GAME IS O
     VER ": PRINT "YOUR SCORE OF
     "TS" IS ";
4040  IF TS =a 25 THEN  PRINT "ROT
     TEN !!!": RETURN
4050  IF TS =a 50 THEN  PRINT "BAD
      !!!": RETURN
4060  IF TS =a 75 THEN  PRINT "POO
     R !!!": RETURN
4070  IF TS =a 100 THEN  PRINT "FA
     IR ...": RETURN
4080  IF TS =a 150 THEN  PRINT "GO
     OD ...": RETURN
4090  IF TS =a 250 THEN  PRINT "GR
     EAT !!!": RETURN
4100  IF TS =a 450 THEN  PRINT "FA
     NTASTIC !!!": RETURN
```

# Artist Board

To play Picasso, you must have a brush (paddle). It is always a good idea to play a game before you attempt the analysis. Load the program and type: LIST -1000. From this you will see where the subroutines begin. The first subroutine controls the messages and instructions you see before each run. To see how the program really works, list 3000-3040. To see how any instruction functions, type the line number with nothing after it. This deletes both the line and the line number. The lack of some attribute will reveal the line's purpose. Look at line 3003. This line instructs the computer to draw sixteen squares (points) at specific intervals. Line 3005 labels each color with a corresponding letter. Line 3020 merits an explanation. PEEK (-16384) instructs the computer to "survey" the keyboard. That is, the computer checks to see if any key has been pressed. Every keyboard character has a numeric equivalent. These numeric values are known as ASCII values and begin (for keyboard characters) at 128. Therefore, if PEEK (-16384) is less than 128, no key has been pressed. Line 3040 is a logical extension of 3020. The ASCII value for 'A' must be 193, and the ASCII value for 'P' must be 208. So, if the KEY that was pressed was A,B,C,D.....O,P, then the color is changed to the corresponding shade. If you type 3040 <RETURN>, the colors can no longer be chosen. Typing RUN ARTIST BOARD loads in a fresh copy of the program with everything working normally.

The noteworthy feature of the program loop (lines 3010 to 3090) is that it checks the game paddles and the keyboard at each pass. You can draw all day with the paddles but always be able to perform program functions by pressing

appropriate keys. You can use a loop like this in lots of games and other applications to allow for full use of the paddles and keyboard to control the program.

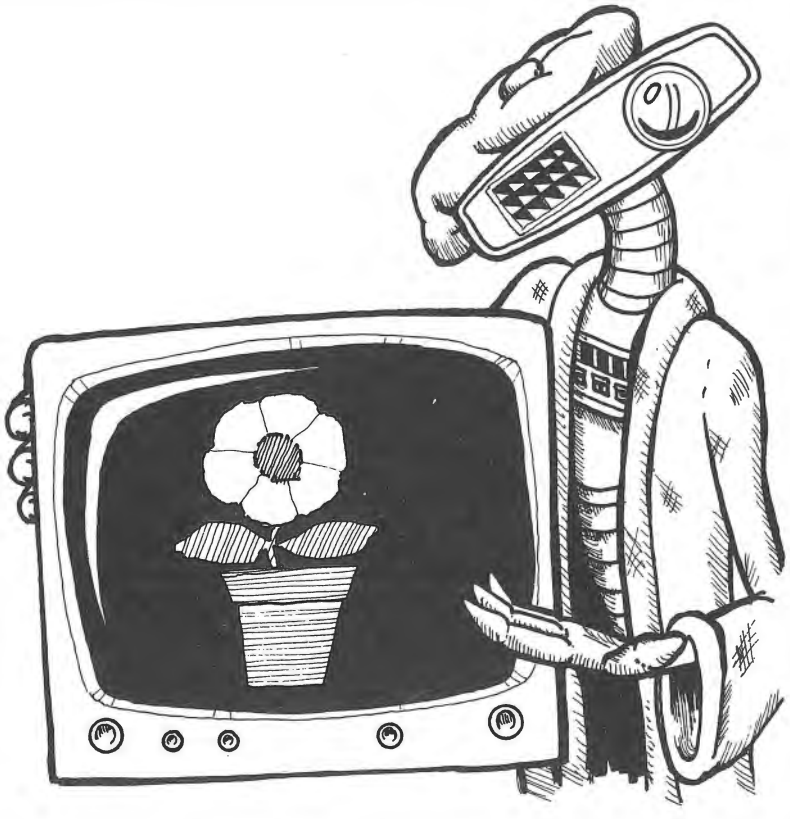
Lines 3110 and 3210 are interesting because they issue disk commands from a print statement by the use of CHR$ (4) which is CONTROL D. The BSAVE and BLOAD commands are followed by the location in memory which holds the contents of the low resolution graphics screen one.

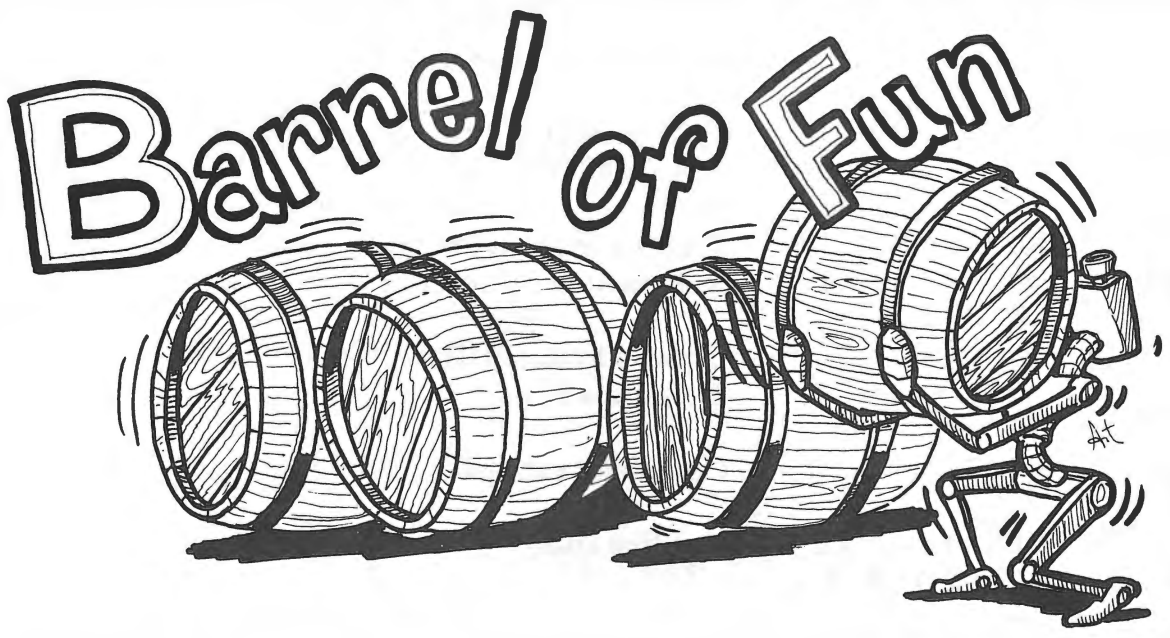
Line 3010 is the heart of the program loop. The game paddles yield values from 0 to 255. This number has to be divided by a factor which will yield numbers from 0 to 39 since these are the limits of the low resolution screen. The INT function delivers whole numbers which are also required. After X and Y are read from the paddles a single small square is plotted in the color determined by line 1340. This color is then read off the screen by the SCRN function and stored in 'C'. Next the color is changed to white (15) and the square replotted in white. Next comes a short delay loop to slow down the cycle and the blink rate. After this wait, the color is reassigned as 'C' and replotted. The effect is a square which marks the location of the paddles by blinking between white and the selected color. The selected color is generated before and after the white square so that you will always leave the right color behind even if you move the paddles fast. Try putting the parts of this line in a different order and see what a colorful hash results.

```
10  REM  ********************
11  REM  ***                 ***
12  REM  *** ARTIST BOARD ***
13  REM  ***                 ***
14  REM  ********************
15  REM
16  REM
20  GOSUB 1000: REM  INSTS
40  GOSUB 3000: REM  PLAY!
50  GOSUB 4000: REM  !END!
60  END
1000 :
1001  REM  *** INSTS
1002 :
1010  TEXT : HOME : NORMAL
1020  VTAB 3: HTAB 10: PRINT "***
      ARTIST BOARD ***"
```

```
1030  VTAB 7: PRINT "BY USING ART
      IST BOARD AND YOUR CREATIVE
      TALENT, YOU CAN CREATE PICTU
      RES IN LOW- RESOLUTION COLOR
      .": PRINT
1040  PRINT : PRINT "THE GAME PAD
      DLES ARE USED TO MOVE THE
      COLORED CURSOR (YOUR PAINT B
      RUSH).  THE TOOLS ARE THERE
      FOR YOU TO DESIGN VERY  ELAB
      ORATE PICTURES....GO TO IT !
      "
1042  PRINT : PRINT "YOU MAY SAV
      E A DRAWING ONTO DISK FOR
      RECALL AT A LATER TIME."
1050  VTAB 23: INPUT "HIT RETURN
      WHEN READY TO CONTINUE : ";A
      NS$
1990  RETURN
3000 :
3001  REM  *** PLAY!
3002 :
3003  GR : FOR I = 1 TO 16: COLOR=
      I: PLOT I * 2,39: NEXT
3005  HOME : PRINT "  A B C D E F
       G H I J K L M N O P": PRINT
      "TYPE IN CHOICE TO CHANGE CO
      LOR": PRINT "TYPE 'R' TO REC
      ALL, 'S' TO SAVE,": PRINT "'
      Q' TO QUIT, 'X' TO ERASE";
3010 X =  INT ( PDL (0) / 6.5):Y =
       INT ( PDL (1) / 6.7): PLOT
      X,Y:C =  SCRN( X,Y): COLOR=
      15: PLOT X,Y: FOR I = 1 TO 5
      0: NEXT I: COLOR= C: PLOT X,
      Y
3020  IF  PEEK ( - 16384) < 128 THEN
      3010
3030 KEY =  PEEK ( - 16384): POKE
       - 16368,0
3040  IF KEY >  = 193 AND KEY <  =
      208 THEN  COLOR= (KEY - 192)
      : GOTO 3010
```

```
3050  IF KEY = 211 THEN 3100
3060  IF KEY = 210 THEN 3200
3070  IF KEY = 209 THEN  RETURN
3080  IF KEY = 216 THEN 3003
3090  GOTO 3010
3100  HOME : INPUT "SAVE AS WHAT
     FILE : ";FI$
3105  IF FI$ = "" THEN 3005
3110  PRINT  CHR$ (4)"BSAVE "FI$"
     ,A$400,L$400": GOTO 3005
3200  HOME : INPUT "RECALL WHAT F
     ILE : ";FI$
3205  IF FI$ = "" THEN 3005
3210  PRINT  CHR$ (4)"BLOAD "FI$"
     ,A$400": COLOR= 0: GOTO 3005

3990  RETURN
4000 :
4001  REM  *** !END!
4002 :
4010  TEXT : HOME : RETURN
```






This game is straightforward. Its use of colors and all graphics makes it a good exemplary program. Type: LOAD BARREL OF FUN, then list through line 2030. To see how each line works, change lines 2020-2029 as follows:

```
                2020 VTAB 19
          omit  2021
do not change line  2022
                2023 COLOR = 1
                2024 FOR I = 4 TO 28 STEP 4
                2025 HLIN 8,30 AT I + 2
       do not change  2026
                2027 FOR I = 4 TO 20 STEP 4
                2028 VLIN 6,28 AT I, do not change I.
```

Run the program after each change to see the new effect. These previously meaningless statements can be understood by using this technique. The following chart will clarify the function of each line:

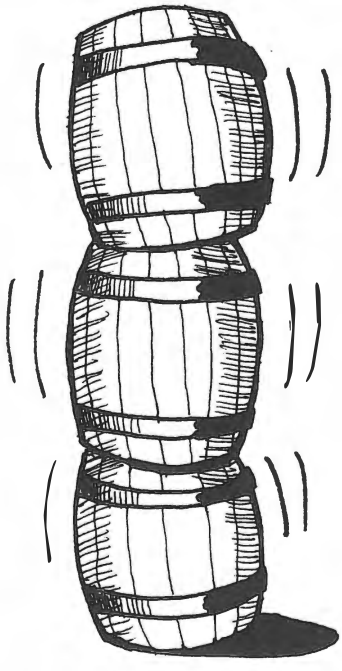
| LINE | COMMAND | FUNCTION |
|---|---|---|
| 2020 | VTAB 23 | The computer tabs down 23 lines from the top of the screen |
| 2021 | CALL -958 | Clears the text beginning at the cursor and continuing through to the bottom margin |

| | | |
|---|---|---|
| 2022 | GR | Switches from the text mode (black and white) into the graphics mode (color) |
| 2023 | COLOR = 5 | Until further notice, all printing will be done in gray (color = 9) |
| 2024 | FOR I = 0 TO 18 STEP 6 | Begins a loop which starts with I = 0 with I being incremented by six each time a pass is completed |
| 2025 | HLIN 11,29 AT I | Draws a horizontal line from column 11 to column 29, on line I |
| 2026 | NEXT | Completes each pass of the loop begun at line 2024 |
| 2027 | FOR I =0 to 18 STEP 6 | (see line 2024) |
| 2028 | VLIN 0,36 AT I | Draws a vertical line beginning at row 0 and continuing to row 36. The line will be drawn at column I |
| 2029 | NEXT | Completes each pass of the loop begun at line 2027 |

```
10  REM  ********************
11  REM  ***                 ***
12  REM  *** BARREL OF FUN **
13  REM  ***                 ***
14  REM  ********************
15  REM
16  REM
20  GOSUB 1000: REM  INSTS
30  GOSUB 2000: REM  SETUP
40  GOSUB 3000: REM  PLAY!
60  END
1000 :
1001  REM  *** INSTS
1002 :
1010  TEXT : NORMAL : HOME
1020  VTAB 3: HTAB 10: PRINT "***
      BARREL OF FUN ***"
1030  VTAB 7
1031  PRINT "IN BARREL OF FUN* YO
     U WILL SEE THREE    COLUMNS
     OF SIX COLORFUL SQUARES.  TH
     E   OBJECT";
1032  PRINT " OF THE GAME IS TO A
     LIGN THE ROWS SUCH THAT EACH
      ROW IS ONE SOLID COLOR.  TH
     ERE ARE ONLY TWO PURPLE SQUA
     RES.  THE BLACK SQUARE MUST
     EVENTUALLY COMPLETE   THE PU
     RPLE ROW."
1040  PRINT : PRINT "THE BOARD OF
      SQUARES WILL BE MIXED UP,
     AND YOUR TASK IS TO UNSCRAMB
     LE IT.  THE FINAL PRODUCT SH
     OULD HAVE ALL OF THE    SQUA
     RES OF ONE COLOR LINED UP IN
      A      HORIZONTAL ROW.
1050  PRINT : PRINT "A SAMPLE OF
     HOW THE FINISHED PRODUCT
     SHOULD LOOK WILL BE SHOWN TO
      YOU. "
1060  PRINT : INPUT "HIT RETURN W
     HEN READY TO CONTINUE : ";AN
     S$
```

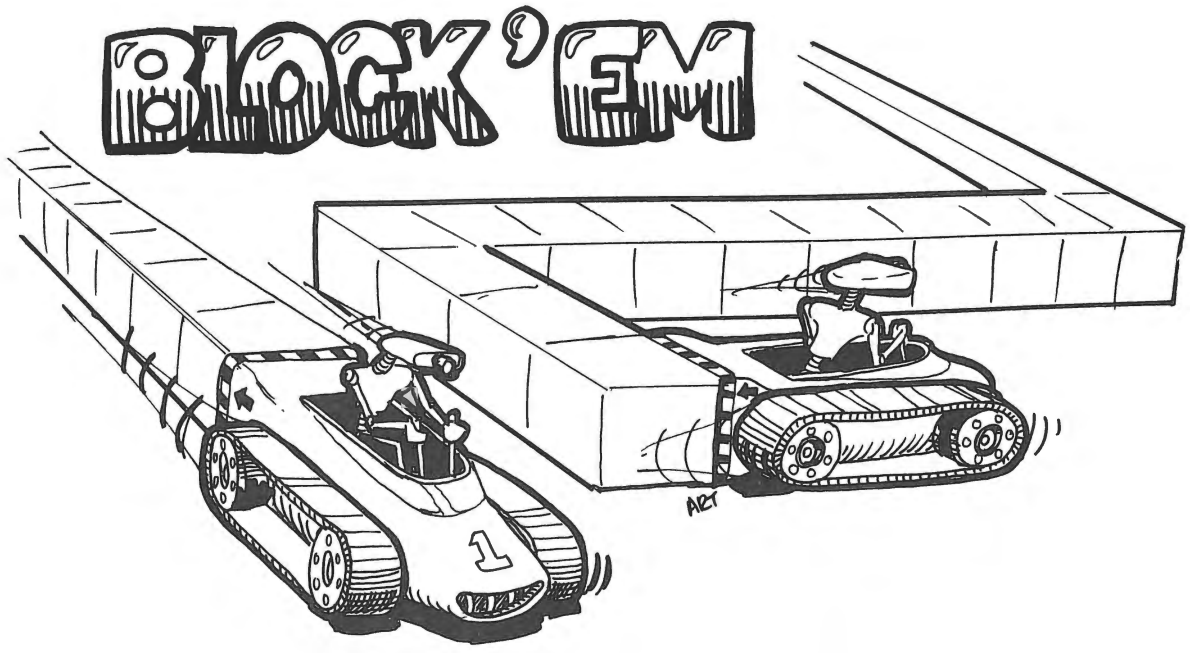
```
1070  HOME : VTAB 3: HTAB 10: PRINT
      "*** BARREL OF FUN ***": VTAB
      7
1080  PRINT "EACH COLUMN OF SQUAR
      ES (COLUMNS 1,2,3)  CAN BE R
      OTATED VERTICALLY BY ENTERIN
      G   THE NUMBER OF THE COLUMN
       YOU WISH TO    ROTATE"
1090  PRINT : PRINT "YOU CAN MOVE
       COLORED SQUARES INTO THE
      EMPTY SQUARE BY USING THE AR
      ROWS ON THE KEYBOARD.  IF TH
      E COLORED SQUARE IS TO  BE M
      OVED TO THE EMPTY SQUARE ON
      ITS     RIGHT, THEN PRESS TH
      E RIGHT ARROW. "
1100  PRINT : PRINT "IF THE COLOR
      ED SQUARE IS TO BE MOVED TO
      THE EMPTY SQUARE ON ITS LEFT
      , THEN PRESSTHE LEFT ARROW.
      "
1110  VTAB 23: INPUT "HIT RETURN
      WHEN READY TO CONTINUE : ";A
      NS$
1120  HOME : VTAB 3: HTAB 10: PRINT
      "*** BARREL OF FUN ***": VTAB
      7
1130  PRINT "NOTE THAT IN THE FIN
      AL SOLUTION ALL     HORIZONT
      AL ROWS MUST BE THE SAME COL
      OR. "
1140  PRINT : PRINT "IT DOESN'T M
      ATTER WHERE THE ROW IS
      LOCATED, AS LONG AS ALL OF T
      HE COLORS   WITHIN THE ROW A
      RE THE SAME. "
1150  VTAB 23: INPUT "HIT RETURN
      WHEN READY TO CONTINUE : ";A
      NS$
1990  RETURN
2000 :
2001  REM  *** SETUP
2002 :
```

```
2010  DIM BA(3,6),CO(6): FOR I =
     1 TO 6: READ CO(I): NEXT : DATA
     1,8,11,12,15,3:BELL$ =  CHR$
     (7)
2015  FOR I = 1 TO 6: FOR J = 1 TO
     3:BA(J,I) = CO(I): NEXT J,I:
     BA(3,6) = 0:BX = 3:BY = 6
2020  VTAB 23
2021  CALL  - 958
2022  GR
2023  COLOR= 5
2024  FOR I = 0 TO 36 STEP 6
2025  HLIN 11,29 AT I
2026  NEXT
2027  FOR I = 0 TO 18 STEP 6
2028  VLIN 0,36 AT 1 + 11
2029  NEXT
2030  FOR I = 1 TO 3: GOSUB 2500:
      NEXT I
2100  HOME : HTAB 5: PRINT "<<< T
     HIS IS THE FINAL PATTERN >>>
     ": FOR I = 1 TO 2000: NEXT I

2110  HOME : HTAB 3: PRINT "<<< I
     'M NOW SCRAMBLING THE BOARD
     >>>"
2120  FOR N = 1 TO  INT ( RND (1)
      * 10) + 20
2130  IF BX = 3 THEN RX = 2: GOTO
     2140
2131  IF BX = 1 THEN RX = 2: GOTO
     2140
2132 RX =  INT ( RND (1) * 2) * 2
      + 1
2140  FOR L = 1 TO  INT ( RND (1)
      * 5) + 1: FOR M = 1 TO 6:BA
     (RX,M - 1) = BA(RX,M): NEXT
     M:BA(RX,6) = BA(RX,0):I = RX
     : NEXT L: GOSUB 2500
2145 BA(BX,BY) = BA(RX,BY):BA(RX,
     BY) = 0
2150 I = BX:J = BY: GOSUB 2510
2155 BX = RX:I = BX:J = BY: GOSUB
     2510
```



```
2160  NEXT N: RETURN
2200  RETURN
2500  FOR J = 1 TO 6: GOSUB 2510:
      NEXT J: RETURN
2510  COLOR= BA(I,J): FOR K = 0 TO
     4: HLIN (I + 1) * 6,(I + 1) *
     6 + 4 AT (J * 6) - 5 + K: NEXT
     K: RETURN
2990  RETURN
3000 :
3001  REM  *** PLAY
3002 :
3010  HOME : PRINT "(TYPE 1 TO RO
     TATE COLUMN 1, 2 FOR      )(
     COLUMN 2, 3 FOR COLUMN 3, RI
     GHT ARROW )(TO SHIFT RIGHT,
     LEFT ARROW FOR LEFT   )";
3020  IF  PEEK ( - 16384) < 128 THEN
     3020
3025 KEY =  PEEK ( - 16384): POKE
      - 16368,0
3030  IF KEY = 177 OR KEY = 178 OR
     KEY = 179 THEN 3100
3035  IF KEY = 136 THEN 3050
3040  IF KEY = 149 THEN 3075
3045  PRINT BELL$: GOTO 3010
3050 RX = BX + 1: IF RX = 4 THEN
      PRINT BELL$: GOTO 3010
3055 BA(BX,BY) = BA(RX,BY):BA(RX,
     BY) = 0
3060 I = BX:J = BY: GOSUB 2510:BX
      = RX:I = BX:J = BY: GOSUB 2
     510
3065  GOTO 3500
3075 RX = BX - 1: IF RX = 0 THEN
      PRINT BELL$: GOTO 3010
3080 BA(BX,BY) = BA(RX,BY):BA(RX,
     BY) = 0
3085 I = BX:J = BY: GOSUB 2510:BX
      = RX:I = BX:J = BY: GOSUB 2
     510
3090  GOTO 3500
3100 RX = KEY - 176
```

```
3110  FOR M = 1 TO 6:BA(RX,M - 1)
      = BA(RX,M): NEXT M:BA(RX,6)
      = BA(RX,0):I = RX: GOSUB 25
     00
3120  IF RX = BX THEN BY = BY - 1
     : IF BY = 0 THEN BY = 6
3125  GOTO 3500
3500 BA(BX,BY) = 3: FOR I = 1 TO
     6
3510  IF BA(1,I) = BA(2,I) AND BA
     (2,I) = BA(3,I) THEN  NEXT I
     : RETURN
3520 BA(BX,BY) = 0:TRY = TRY + 1:
      GOTO 3010
3990  RETURN
4000 :
4001  REM  *** END
4002 :
4010  HOME : PRINT BELL$BELL$"THE
      GAME IS OVER !!!": PRINT "Y
     OU DID IT IN "TRY" TRIES ...
     ": END
4990  RETURN
```



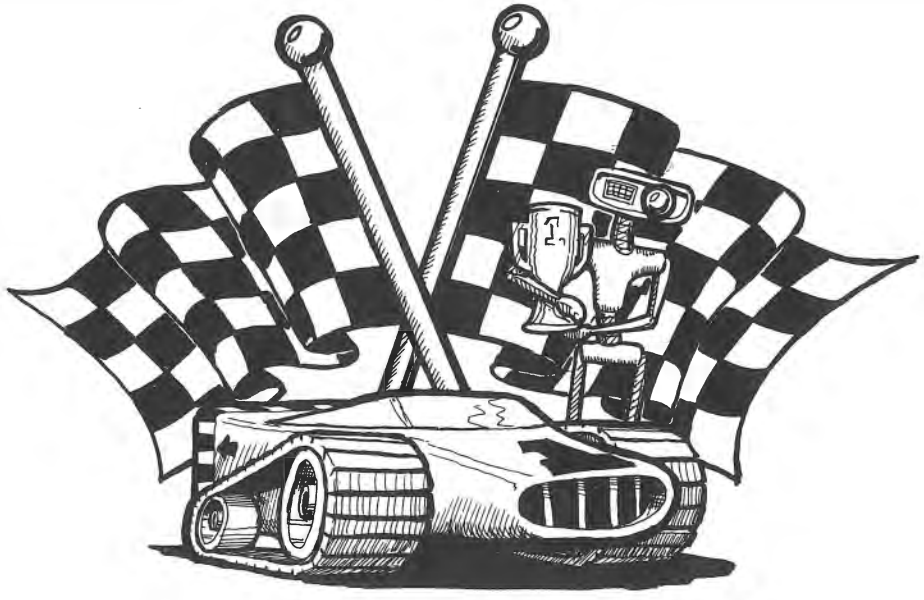

In this game you try to draw a longer line than your opponent. If your progress is impeded either by a border or by the opponent's line, you lose. This is a two man game. List through line 2125. The POKEs constitute an all-purpose sound routine which is explained in STARDODGER. Experiment with any of the lines on the screen. Line 2125 will be described in detail. HLIN stands for Horizontal LINe. A line has 40 characters (0-39), so the numbers 18,22 specify where the line will begin (at 18) and where the line will end (at 22). AT 18 specifies which line (on the Y, or vertical axis) receives the horizontal line. Next, another horizontal line is called for. It is to travel from 18 to 22 and is drawn on line 21.The colon ( : ) serves the same function as a new line and line number. In other words, a colon marks the end of one instruction and the beginning of another. To save space, many instructions may be clumped onto one line. Line 3010 draws the new position of both players. Change 3010 to read: 3010 COLOR= 1:PLOT X1,Y1:COLOR= 2:PLOT X2,Y2. Now when you run the program, the color of Player #1's line will be magenta (COLOR= 1) and the color of Player #2's line will be deep blue (COLOR= 2).

```
10  REM  ********************
11  REM  ***                 ***
12  REM  ***   BLOCK 'EM   ***
13  REM  ***                 ***
14  REM  ********************
15  REM
16  REM
20  GOSUB 1000: REM  INSTS
30  GOSUB 2000: REM  SETUP
40  GOSUB 3000: REM  PLAY!
50  GOSUB 4000: REM  !END!
60  END
1000 :
1001  REM  *** INSTS
1002 :
1010  TEXT : NORMAL : HOME
1020  VTAB 2: HTAB 12: PRINT "***
      BLOCK 'EM ***"
1030  VTAB 5
1031  PRINT "IN THIS GAME, TWO PL
     AYERS CONTROL THE   CREATION
      OF A LINE."
1032  PRINT
1040  PRINT "THE FIRST PLAYER WHO
     SE LINE HITS A WALL,OR THE O
     THER PLAYER'S LINE,LOSES THE
         GAME. "
1050  PRINT : PRINT "PLAYER #1
       DIRECTION     PLAYER #2": PRINT

1051  PRINT "   W              UP
                 I": PRINT
1052  PRINT "A     S      LEFT
     RIGHT     J     K": PRINT
1053  PRINT "   Z             DOW
     N             M"
1090  VTAB 23: INPUT "HIT RETURN
     WHEN READY TO CONTINUE : ";A
     NS$
1990  RETURN
2000 :
2001  REM  *** SETUP
2002 :
```

```
2010  POKE 768,173: POKE 769,48: POKE
      770,192: POKE 771,136: POKE
      772,208: POKE 773,4: POKE 77
      4,198: POKE 775,1: POKE 776,
      240
2015  POKE 777,8: POKE 778,202: POKE
      779,208: POKE 780,246: POKE
      781,166: POKE 782,0: POKE 78
      3,76: POKE 784,0: POKE 785,3
      : POKE 786,96
2020  GR : HOME : COLOR= 15: HLIN
      0,39 AT 0: HLIN 0,39 AT 39: VLIN
      0,39 AT 0: VLIN 0,39 AT 39
2021  PRINT "PLAYER #1
                  PLAYER #2"
2025 X1 =  INT ( RND (1) * 5) + 1
      :Y1 =  INT ( RND (1) * 10) +
      10:X2 = 38 -  INT ( RND (1) *
      5):Y2 =  INT ( RND (1) * 10)
       + 10:D1 = 1:D2 = 3
2030  FOR I = 1 TO 6: READ N,D: POKE
      0,N: POKE 1,D: CALL 768: NEXT
      I: DATA 110,75,70,75,55,75,4
      5,200,55,100,45,255
2100  FOR I = 5 TO 1 STEP  - 1: COLOR=
      0: FOR J = 18 TO 22: VLIN 18
      ,24 AT J: NEXT : COLOR= 15: POKE
      0,200: POKE 1,5: CALL 768
2110  ON I GOTO 2121,2122,2123,21
      24,2125
2121  HLIN 18,22 AT 24: VLIN 18,2
      4 AT 20: HLIN 18,20 AT 18: GOTO
      2130
2122  HLIN 18,22 AT 18: HLIN 18,2
      2 AT 21: HLIN 18,22 AT 24: VLIN
      18,21 AT 22: VLIN 21,24 AT 1
      8: GOTO 2130
2123  HLIN 18,22 AT 18: HLIN 18,2
      2 AT 21: HLIN 18,22 AT 24: VLIN
      18,24 AT 22: GOTO 2130
2124  HLIN 18,22 AT 21: VLIN 18,2
      1 AT 18: VLIN 18,24 AT 22: GOTO
      2130
```

```
2125  HLIN 18,22 AT 18: HLIN 18,2
     2 AT 21: HLIN 18,22 AT 24: VLIN
     18,21 AT 18: VLIN 21,24 AT 2
     2: GOTO 2130
2130  FOR PA = 1 TO 300: NEXT PA,
     I
2135  COLOR= 0: FOR J = 18 TO 22:
      VLIN 18,24 AT J: NEXT : COLOR=
     15: POKE 0,200: POKE 1,5: CALL
     768
2990  RETURN
3000 :
3001  REM  *** PLAY
3002 :
3010  COLOR= 7: PLOT X1,Y1: COLOR=
     9: PLOT X2,Y2
3015 NT = 5 + ((MO < 35) * (30 -
      INT (MO / 15) * 15))
3020  FOR I = 1 TO NT:KEY =  PEEK
     ( - 16384): IF KEY < 128 THEN
     3050
3025  POKE  - 16368,0
3030  IF KEY = 193 THEN D1 = 3
3031  IF KEY = 215 THEN D1 = 4
3032  IF KEY = 211 THEN D1 = 1
3033  IF KEY = 218 THEN D1 = 2
3040  IF KEY = 202 THEN D2 = 3
3041  IF KEY = 201 THEN D2 = 4
3042  IF KEY = 203 THEN D2 = 1
3043  IF KEY = 205 THEN D2 = 2
3050  NEXT I
3100  ON D1 GOTO 3110,3120,3130,3
     140
3110 X1 = X1 + 1: GOTO 3150
3120 Y1 = Y1 + 1: GOTO 3150
3130 X1 = X1 - 1: GOTO 3150
3140 Y1 = Y1 - 1: GOTO 3150
3150  IF X1 < 1 OR X1 > 38 OR Y1 <
     1 OR Y1 > 38 OR  SCRN( X1,Y1
     ) <  > 0 THEN WL = 2: RETURN

3200  ON D2 GOTO 3210,3220,3230,3
     240
```

```
3210 X2 = X2 + 1: GOTO 3250
3220 Y2 = Y2 + 1: GOTO 3250
3230 X2 = X2 - 1: GOTO 3250
3240 Y2 = Y2 - 1: GOTO 3250
3250  IF X2 < 1 OR X2 > 38 OR Y2 <
     1 OR Y2 > 38 OR  SCRN( X2,Y2
     ) <  > 0 THEN WL = 1: RETURN

3300  POKE 0,90: POKE 1,30: CALL
     768:MO = MO + 1: GOTO 3010
4000 :
4001  REM  *** END
4002 :
4010  HOME : PRINT "THE GAME IS O
     VER.....": PRINT "PLAYER NUMB
     ER "WL" HAS WON THE GAME !!!
     "; CHR$ (7); CHR$ (7); CHR$
     (7)
4990  RETURN
```




This game is an intellectual challenge. Random selections will rarely net you a correct solution. It is a good idea to conceptualize how you intend to achieve your goal. Graphically, this program is straight-forward. Type: LIST-3030. Here are four lines (3010-3030) with which you may experiment. Line 3010 draws the original game board. Lines 3020-3030 have functions which are less apparent but just as important. If you look at lines 3505-3530, they help finish what line 3010 began. Verify the function of line 3525. It should draw the X in an occupied square. To check, type in a line 3522 and put STOP after the line number. Do likewise at line 3527. Now when the program is run, a break at 3522 will occur. When ready to continue, type: CONT. The new picture, which has an X in the center box, will be the result of line 3525. Again a break will occur (at line 3527); type CONT. To exit from the graphics mode, type: TEXT. Unless you SAVE a change, it won't be written to disk, so do not fret about undoing any changes that you make.

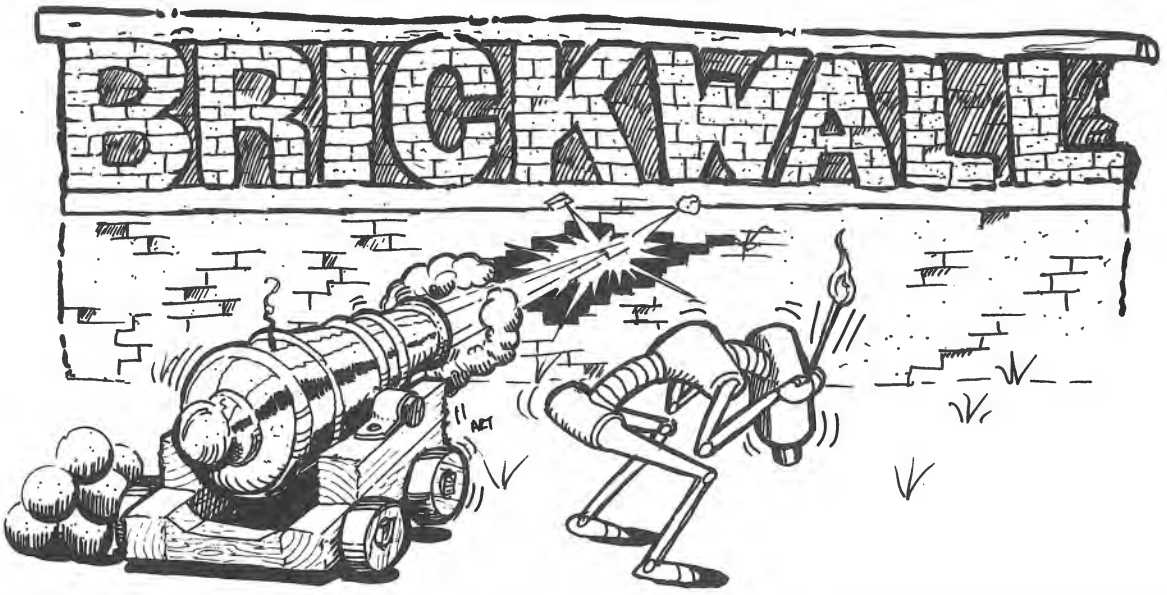
```
10  REM  ********************
11  REM  ***                 ***
12  REM  *** BRAIN TEASER ***
13  REM  ***                 ***
14  REM  ********************
15  REM
16  REM
20  GOSUB 1000: REM  INSTS
30  GOSUB 2000: REM  SETUP
40  GOSUB 3000: REM  PLAY!
50  GOSUB 4000: REM  !END!
60  END
1000 :
1001  REM  *** INSTS
1002 :
1010  TEXT : NORMAL : HOME
1020  VTAB 3: HTAB 10: PRINT "***
      BRAIN TEASER ***"
1030  VTAB 6
1031  PRINT "IN THIS GAME YOU ARE
      GIVEN A 3 BY 3 GAMEBOARD WI
     TH ONE OCCUPIED SPACE (THE
         CENTER).  THE BOARD WILL
      RESEMBLE THIS :"
1040  PRINT : PRINT "    - - -": PRINT
     "    - X -": PRINT "    - -
     -"
1045  PRINT
1050  PRINT "THE TRICK IS TO MOVE
      PIECES SO THAT THE GAME BOA
     RD WINDS UP LOOKING LIKE THI
     S:"
1055  PRINT
1060  PRINT "    X X X
     AND      - - -          X -
     X        NOT LIKE    - - -
             X X X          THIS:
          - - -"
1070  VTAB 23: INPUT "HIT RETURN
     WHEN READY TO CONTINUE : ";A
     NS$
1080  HOME : VTAB 3: HTAB 10: PRINT
     "*** BRAIN TEASER ***": VTAB
     7
```

```
1090  PRINT "YOU MAY ONLY MOVE TO
      AN OCCUPIED SPACE  (A SPACE
      WITH AN X ON IT).  WHEN YOU
         MOVE,CERTAIN SQUARES WIL
     L REVERSE THEIRCONDITION (C
     HANGE FROM AN X TO A BLANK,
     OR VICE-VERSA).
1095  PRINT
1100  PRINT "IF YOU MOVE TO A COR
     NER, ALL OF THE     ADJACENT
      SQUARES REVERSE.
1102  PRINT "IF YOU MOVE TO THE M
     IDDLE OF A SIDE, ALLOF THE S
     QUARES ON THAT SIDE WILL FLI
     P,  AND IF YOU CHOOSE THE CE
     NTER SQUARE,    THAT BOX AND
      THE FOUR MIDDLE BOXES WILL
     ALL BE REVERSED"
1110  VTAB 23
1111  INPUT "HIT RETURN WHEN READ
     Y TO CONTINUE : ";ANS$
1120  HOME : VTAB 3: HTAB 10: PRINT
     "*** BRAIN TEASER ***": VTAB
     7
1130  PRINT "HERE IS A QUICK REVI
     EW OF THE VARIOUS   MOVES, A
     ND THE RESULTING REVERSALS..
     ..."
1135  PRINT
1140  PRINT "     M * -        * M
     *        - * -"
1141  PRINT "     * * -        - -
     -        * M *"
1142  PRINT "     - - -        - -
     -        - * -"
1148  PRINT
1150  PRINT "THE 'M' DENOTES THE
     MOVE POSITION, AND  THE '*'S
      DENOTE THE PIECES THAT WILL
      BE FLIPPED.  THE PIECE AT '
     M' WILL ALSO BE FLIPPED.  TH
     E BOARD IS DESIGNATED LIKE
     THIS : "
```

```
1160  PRINT "          1 2 3": PRINT
      "          4 5 6": PRINT "
            7 8 9"
1170  VTAB 23
1171  INPUT "PRESS RETURN WHEN RE
      ADY TO CONTINUE : ";ANS$
1990  RETURN
2000 :
2001  REM  *** SETUP
2002 :
2010  DIM BO(3,3): FOR I = 1 TO 3
      : FOR J = 1 TO 3:BO(I,J) =  -
      1: NEXT J,I:BO(2,2) = 1
2990  RETURN
3000 :
3001  REM  *** PLAY
3002 :
3010  GR : HOME : FOR I = 1 TO 3:
       FOR J = 1 TO 3: GOSUB 3505:
       NEXT J,I
3020  FOR I = 1 TO 3: FOR J = 1 TO
      3: IF BO(I,J) = 1 OR (I = 2 AND
      J = 2) THEN  NEXT J,I:WL = 1
      : RETURN
3025  FOR I = 1 TO 3: FOR J = 1 TO
      3: IF BO(I,J) =  - 1 THEN  NEXT
      J,I:WL = 0: RETURN
3030  HOME : PRINT "INPUT A POSIT
      ION (1-9) OR": PRINT "ENTER
      RETURN TO QUIT ===> ";: INVERSE
      : PRINT " ";: NORMAL
3040  IF  PEEK ( - 16384) < 128 THEN
      3040
3050 KEY =  PEEK ( - 16384): POKE
       - 16368,0
3060  IF KEY = 141 THEN  RETURN
3070  IF KEY < 177 OR KEY > 185 THEN
      3030
```

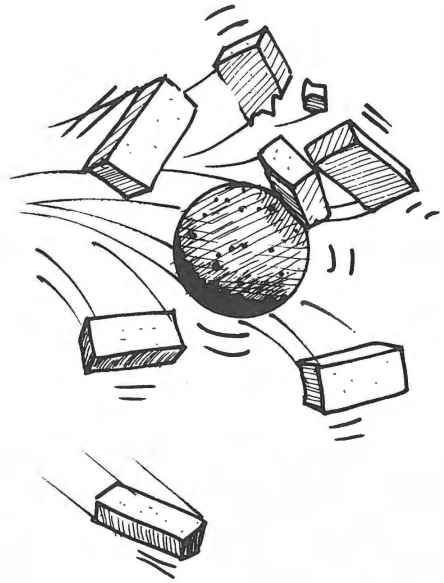
```
3075 KEY = KEY - 176:I =  INT ((K
     EY - 1) / 3) + 1:J = KEY - (
     I - 1) * 3: IF BO(I,J) =  -
     1 THEN  HOME : PRINT "MOVE O
     NLY TO AN OCCUPIED SQUARE": FOR
     I = 1 TO 1500: NEXT : GOTO 3
     030
3080  ON KEY GOTO 3110,3120,3130,
     3140,3150,3160,3170,3180,319
     0
3110 I = 1:J = 1: GOSUB 3500
3111 I = 1:J = 2: GOSUB 3500
3112 I = 2:J = 1: GOSUB 3500
3113 I = 2:J = 2: GOSUB 3500: GOTO
     3020
3120 I = 1:J = 1: GOSUB 3500
3121 I = 1:J = 2: GOSUB 3500
3122 I = 1:J = 3: GOSUB 3500: GOTO
     3020
3130 I = 1:J = 2: GOSUB 3500
3131 I = 1:J = 3: GOSUB 3500
3132 I = 2:J = 2: GOSUB 3500
3133 I = 2:J = 3: GOSUB 3500: GOTO
     3020
3140 I = 1:J = 1: GOSUB 3500
3141 I = 2:J = 1: GOSUB 3500
3142 I = 3:J = 1: GOSUB 3500: GOTO
     3020
3150 I = 1:J = 2: GOSUB 3500
3151 I = 2:J = 1: GOSUB 3500
3152 I = 2:J = 2: GOSUB 3500
3153 I = 2:J = 3: GOSUB 3500
3154 I = 3:J = 2: GOSUB 3500: GOTO
     3020
3160 I = 1:J = 3: GOSUB 3500
3161 I = 2:J = 3: GOSUB 3500
3162 I = 3:J = 3: GOSUB 3500: GOTO
     3020
3170 I = 2:J = 1: GOSUB 3500
3171 I = 2:J = 2: GOSUB 3500
3172 I = 3:J = 1: GOSUB 3500
3173 I = 3:J = 2: GOSUB 3500: GOTO
     3020
```

```
3180 I = 3:J = 1: GOSUB 3500
3181 I = 3:J = 2: GOSUB 3500
3182 I = 3:J = 3: GOSUB 3500: GOTO
     3020
3190 I = 2:J = 2: GOSUB 3500
3191 I = 2:J = 3: GOSUB 3500
3192 I = 3:J = 2: GOSUB 3500
3193 I = 3:J = 3: GOSUB 3500: GOTO
     3020
3500 BO(I,J) =  - BO(I,J)
3505  COLOR= BO(I,J) + 5
3510  FOR I2 = I * 8 TO I * 8 + 7
     : HLIN J * 8,J * 8 + 7 AT I2
     : NEXT I2
3520  IF BO(I,J) =  - 1 THEN  COLOR=
     15: FOR I2 = I * 8 + 3 TO I *
     8 + 4: HLIN J * 8 + 3,J * 8 +
     4 AT I2: NEXT : RETURN
3525  COLOR= 15: FOR I2 = I * 8 +
     1 TO I * 8 + 6: PLOT ((J * 8
     ) + (I2 - (I * 8))),I2: PLOT
     ((J * 8) + 7 + ((I * 8) - I2
     )),I2: NEXT
3540  RETURN
4000 :
4001  REM  *** END
4002 :
4010  HOME : PRINT  CHR$ (7) CHR$
     (7) CHR$ (7)"THE GAME IS OVE
     R !!!"
4020  IF WL = 0 THEN  PRINT "AND
     YOU'VE LOST...SORRY "
4030  IF WL = 1 THEN  PRINT "AND
     YOU'VE WON.....GREAT!!!"
4990  RETURN
```



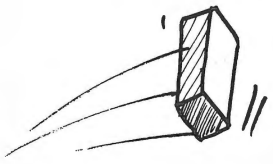

What a challenge! This game tests your quickness and dexterity. The game is similar to some of the arcade games you see. With a little practice YOU could write this program. Let's get to the heart of the program. First, you must LOAD BRICK WALL. You should RUN the program to get the feel of it. Now type: LIST -1960. Look at line 2010. To get into the GRaphics mode (for color) there must be the command GR (for graphics). To dramatize the function of a particular line, type in the line number and return; this deletes the line. Then run. What goes wrong? Does the progam crash or just loose some functions? To see the actual workings of the program, type LIST. What you see is a roadmap telling you where to find various routines. Again, if you would like to know the function of a line, type in the line number, return, and run. Some of the lines that you should experiment with are: 2110, 2310, 2331 and 3020.

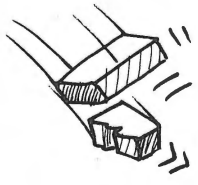
```
10  REM  ********************
11  REM  ***                 ***
12  REM  ***  BRICK WALL   ***
13  REM  ***                 ***
14  REM  ********************
15  REM
16  REM
20  GOSUB 1000: REM  INSTS
30  GOSUB 2000: REM  SETUP
40  GOSUB 3000: REM  PLAY!
50  GOSUB 4000: REM  !END!
60  END
1000 :
1001  REM  *** INSTS
1002 :
1010  TEXT : NORMAL : HOME
1020  VTAB 3: HTAB 12: PRINT "***
      BRICK WALL ***"
1030  VTAB 7: PRINT "IN THIS GAME
     , YOU WILL BE PRESENTED
     WITH A WALL OF BRICKS AT THE
      TOP OF THE SCREEN, AND A PA
     DDLE AT THE BOTTOM.     THE
     GAME PADDLE (PADDLE 0) IS US
     ED TO   HIT A ROCK INTO THE
     WALL OF BRICKS.": PRINT
1031  PRINT "WHEN THE ROCK HITS A
      BRICK, IT WILL     DESTROY
     IT AND POINTS WILL BE ADDED
     TO  YOUR SCORE."
1040  PRINT : PRINT "YOUR MISSION
     , SHOULD YOU ACCEPT, IS TO
     DESTROY AS MUCH OF THE BRICK
      WALL AS    POSSIBLE.": PRINT
     : PRINT "YOU ARE ALLOWED ONL
     Y 5 MISSES."
1060  VTAB 23: INPUT "HIT RETURN
     WHEN READY TO CONTINUE : ";A
     NS$
1990  RETURN
2000 :
2001  REM  *** SETUP
2002 :
2010  GR
```





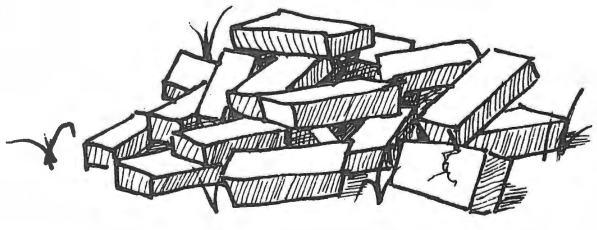
```
2020  GOSUB 2100
2025  GOSUB 2400
2030  DIM DIR(6): FOR I = 1 TO 6:
      READ DIR(I): NEXT : DATA  -
     1.5,-1,-.5,.5,1,1.5
2090  RETURN
2100  REM  *** DO BACKGROUND
2110  FOR I = 5 TO 19 STEP 2:K =
     (I - 1) / 2:K = K - ( INT (K
      / 2) * 2)
2115  COLOR= K * 4 + 9: FOR J = 0
      TO 36 STEP 4: HLIN J,J + 1 AT
     I: NEXT J
2120  COLOR= (1 - K) * 4 + 9: FOR
     J = 2 TO 38 STEP 4: HLIN J,J
      + 1 AT I: NEXT J
2125  NEXT I
2190  RETURN
2200  REM  *** DRAW PADDLE
2201 P = ( PDL (0) - 20) / 6
2202  IF P < 0 THEN P = 0
2203  IF P > 34 THEN P = 34
2210  IF P = PP THEN  RETURN
2215  COLOR= 0: HLIN PP,PP + 5 AT
     39: COLOR= 6: HLIN P,P + 5 AT
     39:PP = P: RETURN
2300  REM  *** MOVE BALL
2305 X2 = BX + DI(BA):Y2 = BY + B
     D
2310  IF X2 < 0 OR X2 > 39 THEN X
     2 = BX - DI(BA):BA = 7 - BA:
      POKE 0,220: POKE 1,10: CALL
     768
2315  IF Y2 < 0 THEN Y2 = BY - BD
     :BD =  - BD:BF = 1: POKE 0,2
     00: POKE 1,10: CALL 768
2320  IF Y2 > 39 THEN  COLOR= 0: PLOT
     BX,BY: POP : GOTO 3060
2325  IF  SCRN( X2,Y2) <  > 6 THEN
     2330
2326  POKE 0,240: POKE 1,10: CALL
     768:BD =  - BD:BF = 0:BA =  INT
     (X2) -  INT (PP) + 1:PB = PB
      + 1: IF PB = 7 THEN BD =  -
     2
```



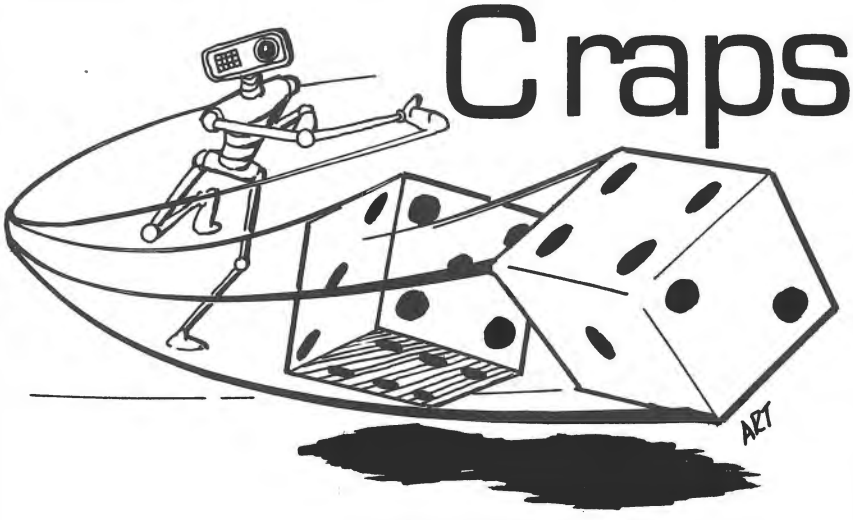


```
2327  COLOR= 0: PLOT BX,BY: COLOR=
      15: PLOT X2,Y2: COLOR= 6: PLOT
      X2,Y2:BX = X2:BY = Y2: RETURN

2330  IF  SCRN( X2,Y2) = 0 THEN 2
      335
2331  COLOR= 0:X3 = ( INT (X2 / 2
      ) * 2): HLIN X3,X3 + 1 AT Y2
      :SC = SC + (10 - (Y2 - 1) /
      2): POKE 0,10: POKE 1,10: CALL
      768
2332  IF SC =  INT (SC / 720) * 7
      20 THEN  POP : RETURN
2333  IF BD < 0 OR BF = 1 THEN BD
       =  - BD
2334  VTAB 22: HTAB 9: PRINT SC
2335  IF  SCRN( BX,BY) <  > 15 THEN
      2345
2340  COLOR= 0: PLOT BX,BY
2345  COLOR= 15: PLOT X2,Y2:BX =
      X2:BY = Y2: RETURN
2400  REM  *** MUSIC TONES
2405  POKE 768,173: POKE 769,48: POKE
      770,192: POKE 771,136: POKE
      772,208: POKE 773,4: POKE 77
      4,198: POKE 775,1: POKE 776,
      240
2410  POKE 777,8: POKE 778,202: POKE
      779,208: POKE 780,246: POKE
      781,166: POKE 782,0: POKE 78
      3,76: POKE 784,0: POKE 785,3
      : POKE 786,96: RETURN
3000 :
3001  REM  *** PLAY
3002 :
3005  HOME : VTAB 22: PRINT "SCOR
      E : "
3006  VTAB 21: PRINT "BALLS LEFT
      : "
3010  FOR I = 1 TO 5: VTAB 21: HTAB
      14: PRINT 5 - I
3015  FOR J = 1 TO 100: GOSUB 220
      0: NEXT J
```

```
3020 BX =  INT ( RND (1) * 20) +
     10:BY = 21:BD = 1:BF = 0:BA =
      INT ( RND (1) * 4) + 2:PB =
     0
3030  GOSUB 2300: REM  BALL
3040  GOSUB 2200: REM  PADDLE
3050  GOTO 3030
3060  POKE 0,250: POKE 1,100: CALL
     768: NEXT : RETURN
4000 :
4001  REM  *** END
4002 :
4010  HOME : PRINT "THE GAME IS O
     VER !!!"
4020  PRINT "YOUR SCORE IS : "SC"
        (";
4030  IF SC < 100 THEN  PRINT "LO
     USY)": RETURN
4031  IF SC < 200 THEN  PRINT "PO
     OR)": RETURN
4032  IF SC < 300 THEN  PRINT "SO
     -SO)": RETURN
4033  IF SC < 400 THEN  PRINT "BL
     AH)": RETURN
4034  IF SC < 500 THEN  PRINT "GO
     OD)": RETURN
4035  IF SC < 600 THEN  PRINT "GR
     EAT)": RETURN
4036  IF SC < 700 THEN  PRINT "EX
     CELLENT)": RETURN
4037  IF SC < 720 THEN  PRINT "FA
     NTASTIC ": RETURN
4038  PRINT "PERFECT!!! ": RETURN
```



# Craps



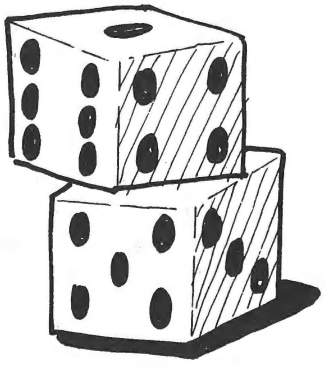

Craps is a simplified version of the popular dice game. You are given a $1500 stake to play with until the money is gone. To stop playing, bet 0 dollars. Let's look into the program. Type: LIST 2190. To better understand the function of any one line, delete the line by typing in the line number, return, and run. List line 2200. D1 and D2 are the variables for the dice. Once you understand line 2200, you will be able to "fix" the dice. As is, the outcome is random. But by changing this line, you can control their total. Line 2011 changes the color to white (COLOR= 15), and lines 2022 and 2023 draw the perimeter. Change 2011 so that it reads: 2011 COLOR= 1. Now when you run the program, the perimeter will be magenta (COLOR= 1). When the dice are rolled, a graphic representation (drawing) of the random number (between one and six) is displayed on the screen. There are two cubes (dies) which, when added together, comprise the total. Line 2330 tells the computer to branch to one of the six given lines, depending on the RaNDom value of DD. The six lines (2331-2336) draw a configuration of a die, equal to 1,2,3,4,5, or 6.

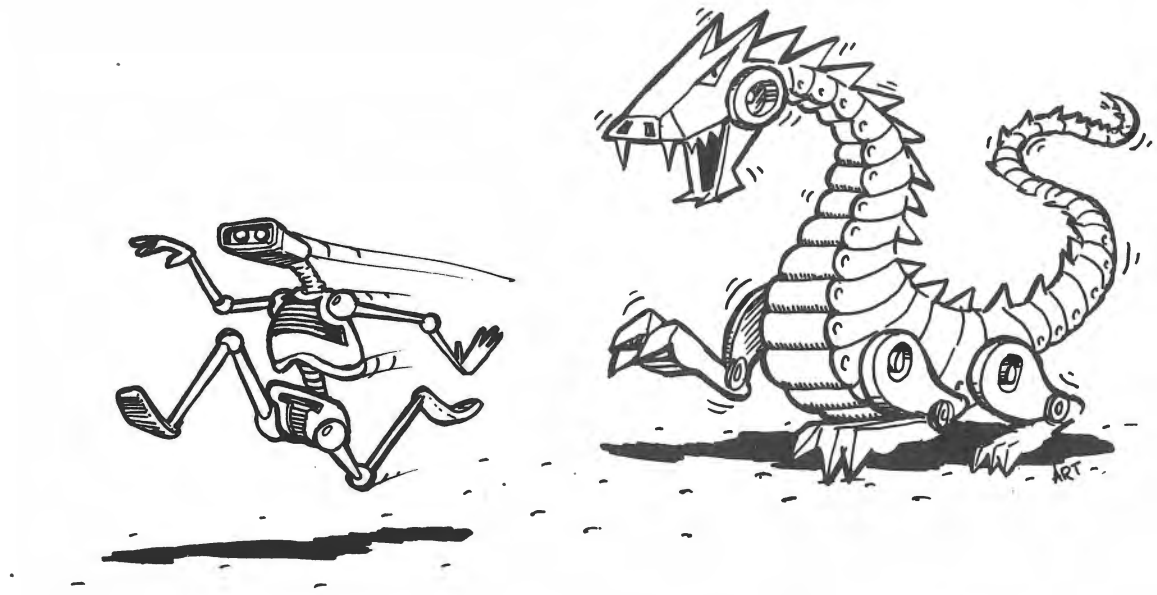
```
10  REM  ********************
11  REM  ***                 ***
12  REM  ***     CRAPS       ***
13  REM  ***                 ***
14  REM  ********************
15  REM
16  REM
20  GOSUB 1000: REM  INSTS
30  GOSUB 2000: REM  SETUP
40  GOSUB 3000: REM  PLAY!
50  GOSUB 4000: REM  !END!
60  END
1000 :
1001  REM  *** INSTS
1002 :
1010  TEXT : NORMAL : HOME
1020  VTAB 3: HTAB 13: PRINT "***
      CRAPS ***"
1030  VTAB 6
1031  PRINT "THIS IS A DICE GAME
     CALLED **CRAPS** ."
1035  PRINT
1040  PRINT "TO PLAY, YOU WAGER A
      PORTION OF YOUR    MONEY ON
      A ROLL OF THE DICE.  HERE A
     RE  THE RULES...."
1045  PRINT
1050  PRINT "YOU WIN IF THE FIRST
      ROLL IS EITHER 7 OR11.  CON
     VERSELY, YOU LOSE IF THE FIR
     ST  ROLL IS 2, 3, OR 12."
1060  PRINT
1065  PRINT "IF YOU GET A 4,5,6,8
     ,9, OR 10 ON YOUR   FIRST RO
     LL, IT IS REFERRED TO AS YOU
     R   *POINT*.  YOU MUST CONTI
     NUE ROLLING "
1070  PRINT "UNTIL YOU: 1) ROLL A
      7, WHICH IS CALLED *CRAPPIN
     G OUT* WHEREBY YOU LOSE, OR
     2)  YOU ROLL A NUMBER EQUAL
     TO YOUR POINT...YOU WIN!"
1075  PRINT
```

```
1078  INPUT "PRESS RETURN WHEN RE
     ADY TO CONTINUE";ANS$
1080  HOME : VTAB 3: HTAB 13: PRINT
     "*** CRAPS ***": VTAB 7
1100  VTAB 12
1110  PRINT "TO QUIT THE GAME, BE
     T 0 DOLLARS."
1990  VTAB 23: INPUT "PRESS RETUR
     N WHEN READY TO CONTINUE : "
     ;ANS$
1995  RETURN
2000 :
2001  REM  *** SETUP
2002 :
2010  GR
2011  COLOR= 15
2020 MNY = 1500
2022  HLIN 0,39 AT 00: HLIN 0,39 AT
     39
2023  VLIN 0,39 AT 00: VLIN 0,39 AT
     39
2190  RETURN
2200 D1 =  INT ( RND (1) * 6) + 1
     :D2 =  INT ( RND (1) * 6) +
     1
2210  GOSUB 2300: GOSUB 2310
2220  IF  PEEK ( - 16384) < 128 THEN
     2200
2230  POKE  - 16368,0: RETURN
2300 DD = D1:DX = 10: GOTO 2320
2310 DD = D2:DX = 24: GOTO 2320
2320  COLOR=  INT ( RND (1) * 14)
      + 1
2325  FOR I = 20 TO 26: HLIN DX,D
     X + 6 AT I: NEXT
2330  COLOR= 15: ON DD GOTO 2331,
     2332,2333,2334,2335,2336
2331  PLOT DX + 3,23: GOTO 2340
2332  PLOT DX + 1,21: PLOT DX + 5
     ,25: GOTO 2340
2333  PLOT DX + 1,21: PLOT DX + 3
     ,23: PLOT DX + 5,25: GOTO 23
     40
```

```
2334  PLOT DX + 1,21: PLOT DX + 5
      ,21: PLOT DX + 1,25: PLOT DX
       + 5,25: GOTO 2340
2335  PLOT DX + 1,21: PLOT DX + 5
      ,21: PLOT DX + 1,25: PLOT DX
       + 5,25: PLOT DX + 3,23: GOTO
      2340
2336  PLOT DX + 1,21: PLOT DX + 5
      ,21: PLOT DX + 1,25: PLOT DX
       + 5,25: PLOT DX + 1,23: PLOT
      DX + 5,23: GOTO 2340
2340  FOR I = 1 TO 5:XX =  PEEK (
       - 16336): NEXT : RETURN
3000 :
3001  REM  *** PLAY
3002 :
3010  HOME : PRINT "YOU HAVE "MNY
      " DOLLARS"
3020  INPUT "HOW MUCH WILL YOU RI
      SK ON THIS BET? ";ANS$
3021 ANS =  VAL (ANS$)
3022  IF ANS < 0 OR ANS > MNY OR
      ANS <  >  INT (ANS) THEN 301
      0
3023  IF ANS = 0 THEN  RETURN
3025  HOME : PRINT "BET: "ANS"
           (ROLLING ...)"
3030  PRINT "<PRESS ANY KEY TO ST
      OP THE ROLL>"
3040  GOSUB 2200
3050  HOME : PRINT "ROLLED: "D1 +
      D2
3055  IF D1 + D2 = 2 OR D1 + D2 =
      3 OR D1 + D2 = 12 THEN  PRINT
      "YOU CRAPPED OUT ...": FOR P
      A = 1 TO 1500: NEXT PA: GOTO
      3100
3060  IF D1 + D2 = 7 OR D1 + D2 =
      11 THEN  PRINT "YOU WON THAT
       TOSS ...": FOR PA = 1 TO 15
      00: NEXT PA: GOTO 3200
3061  PRINT "YOUR POINT IS "D1 +
      D2:PT = D1 + D2: FOR PA = 1 TO
      1200: NEXT PA
```

```
3065  HOME : PRINT "BET: "ANS" PT
      : "PT"   (ROLLING AGAIN...)"
3066  PRINT "<PRESS ANY KEY TO ST
      OP THE ROLL>": GOSUB 2200
3070  HOME : PRINT "ROLLED: "D1 +
      D2
3080  IF D1 + D2 = 7 THEN  PRINT
      "YOU CRAPPED OUT ...": FOR P
      A = 1 TO 1500: NEXT PA: GOTO
      3100
3085  IF D1 + D2 = PT THEN  PRINT
      "YOU GOT YOUR POINT !!!": FOR
      PA = 1 TO 1500: NEXT PA: GOTO
      3200
3090  PRINT "YOU MUST ROLL AGAIN.
      ..": FOR PA = 1 TO 1200: NEXT
      PA: GOTO 3065
3100 MNY = MNY - ANS: IF MNY = 0 THEN
       RETURN
3110  GOTO 3010
3200 MNY = MNY + ANS: GOTO 3010
4000 :
4001  REM  *** END
4002 :
4010  FOR I = 0 TO 39: COLOR=  INT
      ( RND (1) * 15) + 1: HLIN 0,
      39 AT I: HLIN 0,39 AT 39 - I
      : VLIN 0,39 AT I: VLIN 0,39 AT
      39 - I:XX =  PEEK ( - 16336)
       -  PEEK ( - 16336) -  PEEK
      ( - 16336): NEXT
4020  FOR PA = 1 TO 1500: NEXT PA

4030  HOME : PRINT "YOU STOPPED W
      ITH "MNY" DOLLARS"
4040  IF MNY < 100 THEN  PRINT "B
      ETTER STICK TO THE SLOT MACH
      INES!": RETURN
4041  IF MNY < 500 THEN  PRINT "N
      OT SO GOOD": RETURN
4042  IF MNY < 1500 THEN  PRINT "
      NOT BAD AT ALL....": RETURN
4043  PRINT "THAT'S GREAT!  ";
4044  IF MNY > 6000 THEN  PRINT "
      WOW, WHATTA ROLL!!!"
4045  RETURN
```





# Dragon's Lair

In this game the maze is constructed before your eyes but becomes invisible when completed. You must avoid the man-eating dragon and escape the maze. Otherwise you will attend the dragon's dinner—as his main course! Only a good memory will save you from this terrible fate. To experiment with the graphics, type: LIST 2025. Again, change any line whose function is unclear. Specifically, begin by looking at line 2020. Change COLOR=15 to COLOR=4. Lines 3030-3033 check to see which direction you want to move. Each of the four lines which the computer might branch to, either increments or decrements the X or Y coordinate. For instance, line 3100 handles the job when the user has entered K (to move right). When you try to move right, the Y coordinate is unchanged. The X coordinate is increased (X2=PX+1). At the origin the XY coordinates are 0,0. As you move to the right, the Y coordinate stays at 0, but the X coordinate continually increases. Beginning at the origin, 0,0, the coordinates would look like this:

0,1 0,2 0,3 0,4.....0,38 0,39.

```
10  REM  ********************
11  REM  ***                 ***
12  REM  *** DRAGON'S LAIR ***
13  REM  ***                 ***
14  REM  ********************
15  REM
16  REM
20  GOSUB 1000: REM  INSTS
30  GOSUB 2000: REM  SETUP
40  GOSUB 3000: REM  PLAY!
50  GOSUB 4000: REM  !END!
60  END
1000 :
1001  REM  *** INSTS
1002 :
1010  TEXT : NORMAL : HOME
1020  VTAB 3: HTAB 10: PRINT "***
      DRAGONS LAIR ***"
1030  VTAB 7: PRINT "YOU WILL BE
     PLACED IN A MAZE WITH A MAN-
     EATING DRAGON."
1040  PRINT : PRINT "YOUR PROBLEM
      IS TO TRY AND ESCAPE FROM
     THE MAZE BEFORE THE DRAGON M
     AKES A MEAL OUT OF YOU."
1050  PRINT : PRINT "YOU MOVE BY
     PRESSING : ": PRINT : PRINT
     "      UP -       'I'": PRINT
     "    DOWN -       'M'": PRINT
     "   RIGHT -       'K' ": PRINT
     "    LEFT -       'J'"
1060  VTAB 23: INPUT "HIT RETURN
     WHEN READY TO CONTINUE : ";A
     NS$
1070  HOME : VTAB 3: HTAB 10: PRINT
     "*** DRAGONS LAIR ***"
1080  VTAB 7: PRINT "YOU MAY PLAY
      IN ONE OF THE FOLLOWING TWO
     MODES:": PRINT : PRINT "   N
     ORMAL": PRINT "WHERE THE DRA
     GON MOVES ONLY AFTER YOU   M
     AKE A MOVE ..."
```

```
1090  PRINT : PRINT "   REAL-TIME
     ": PRINT "WHERE THE DRAGON'S
      PURSUIT IS CONSTANT, WHETHE
     R YOU MOVE OR NOT ! "
1100  PRINT : PRINT "   WILL YOU
     PLAY:": PRINT : PRINT "
     N)ORMAL       -OR-       R)EAL
     -TIME"
1110  VTAB 23: CALL  - 958: INPUT
     "WHAT IS YOUR CHOICE (N/R)";
     ANS$:ANS$ =  LEFT$ (ANS$,1):
      IF ANS$ <  > "N" AND ANS$ <
      > "R" THEN 1110
1990  RETURN
2000 :
2001  REM  *** SETUP
2002 :
2010  DIM MA(13,13,4)
2015  DEF  FN R(X) =  INT ( RND (
     1) * X) + 1
2020 RX =  FN R(13):RY =  FN R(13
     ): GR : COLOR= 15: FOR I = 0
      TO 18 STEP 3: HLIN 0,39 AT
     I: HLIN 0,39 AT 39 - I: VLIN
     0,39 AT I: VLIN 0,39 AT 39 -
     I: NEXT
2021  HOME : VTAB 22: PRINT "   <
     << I'M NOW BUILDING THE LAIR
      >>>"
2025  COLOR= 0:CNT = 1: GOTO 2070

2035  IF  FN R(10) = 1 THEN 2100
2070  ON  FN R(4) GOTO 2075,2080,
     2085,2090
2075  IF RX = 13 THEN 2035
2076  IF MA(RX,RY,1) THEN 2035
2077  IF MA(RX + 1,RY,0) THEN 203
     5
2078  VLIN 3 * RY - 2,3 * RY - 1 AT
     3 * RX:MA(RX,RY,0) = MA(RX,R
     Y,0) + 1:MA(RX,RY,1) = 1:RX =
     RX + 1:MA(RX,RY,3) = 1:MA(RX
     ,RY,0) = MA(RX,RY,0) + 1
```

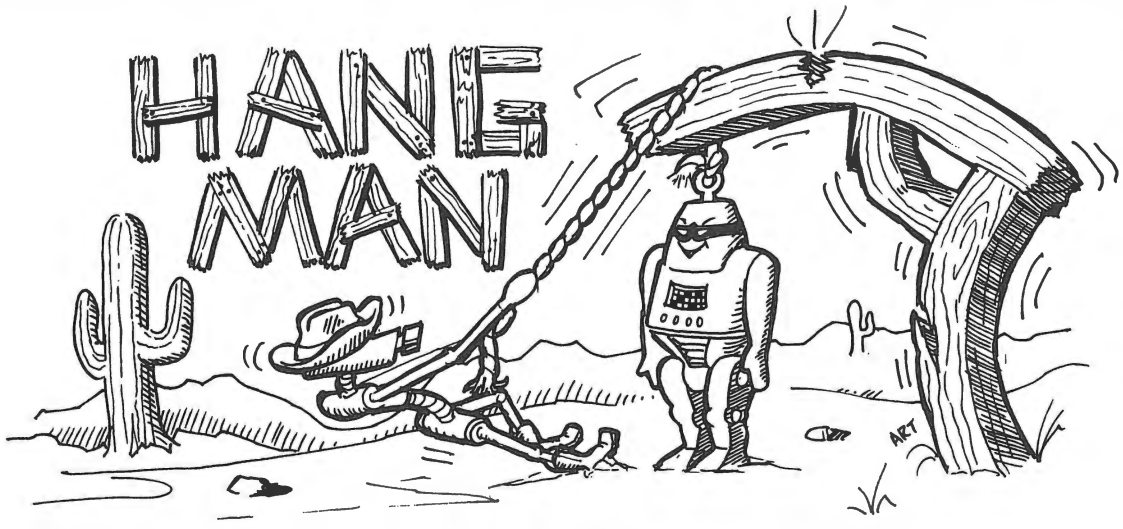
```
2079  GOTO 2095
2080  IF RY = 13 THEN 2035
2081  IF MA(RX,RY,2) THEN 2035
2082  IF MA(RX,RY + 1,0) THEN 203
      5
2083  HLIN 3 * RX - 2,3 * RX - 1 AT
      3 * RY:MA(RX,RY,0) = MA(RX,R
      Y,0) + 1:MA(RX,RY,2) = 1:RY =
      RY + 1:MA(RX,RY,4) = 1:MA(RX
      ,RY,0) = MA(RX,RY,0) + 1
2084  GOTO 2095
2085  IF RX = 1 THEN 2035
2086  IF MA(RX,RY,3) THEN 2035
2087  IF MA(RX - 1,RY,0) THEN 203
      5
2088  VLIN 3 * RY - 2,3 * RY - 1 AT
      3 * (RX - 1):MA(RX,RY,0) = M
      A(RX,RY,0) + 1:MA(RX,RY,3) =
      1:RX = RX - 1:MA(RX,RY,1) =
      1:MA(RX,RY,0) = MA(RX,RY,0) +
      1
2089  GOTO 2095
2090  IF RY = 1 THEN 2035
2091  IF MA(RX,RY,4) THEN 2035
2092  IF MA(RX,RY - 1,0) THEN 203
      5
2093  HLIN 3 * RX - 2,3 * RX - 1 AT
      3 * (RY - 1):MA(RX,RY,0) = M
      A(RX,RY,0) + 1:MA(RX,RY,4) =
      1:RY = RY - 1:MA(RX,RY,2) =
      1:MA(RX,RY,0) = MA(RX,RY,0) +
      1
2094  GOTO 2095
2095  IF MA(RX,RY,0) = 1 THEN CNT
      = CNT + 1: IF CNT = 169 THEN
      2200
2097  GOTO 2035
2100 RX =  FN R(13):RY =  FN R(13
      ): IF MA(RX,RY,0) = 0 OR MA(
      RX,RY,0) = 4 THEN 2100
2105  GOTO 2035
2200  GR : COLOR= 15: VLIN 0,39 AT
      39: HLIN 0,39 AT 39: VLIN 0,
      39 AT 0: HLIN 0,39 AT 0
```

```
2210 PX = 1:PY =  FN R(13): COLOR=
     8:XX = PX:YY = PY: GOSUB 250
     0
2215 WY =  FN R(13): COLOR= 0: VLIN
     WY * 3 - 2,WY * 3 - 1 AT 39
2220 MX = 13:MY = WY: COLOR= 1:XX
      = MX:YY = MY: GOSUB 2500
2300  POKE 768,173: POKE 769,48: POKE
     770,192: POKE 771,136: POKE
     772,208: POKE 773,4: POKE 77
     4,198: POKE 775,1: POKE 776,
     240
2310  POKE 777,8: POKE 778,202: POKE
     779,208: POKE 780,246: POKE
     781,166: POKE 782,0: POKE 78
     3,76: POKE 784,0: POKE 785,3
     : POKE 786,96
2320  FOR I = 1 TO 13: FOR J = 1 TO
     13:MA(I,J,0) = 0: NEXT J,I
2400  HOME : PRINT "K) FOR RIGHT
          I) FOR UP": PRINT "M) F
     OR DOWN        J) FOR LEFT"
2490  RETURN
2500  REM  *** DRAW A SQUARE
2505  FOR I = XX * 3 - 2 TO XX *
     3 - 1: FOR J = YY * 3 - 2 TO
     YY * 3 - 1: PLOT I,J: NEXT J
     ,I: RETURN
3000 :
3001  REM  *** PLAY
3002 :
3010  IF  PEEK ( - 16384) < 128 AND
     ANS$ = "R" THEN 3700
3015  IF  PEEK ( - 16384) < 128 THEN
     3015
3020 KEY =  PEEK ( - 16384): POKE
      - 16368,0
3025 KEY$ =  CHR$ (KEY - 128)
3030  IF KEY$ = "K" THEN 3100
3031  IF KEY$ = "M" THEN 3200
3032  IF KEY$ = "J" THEN 3300
3033  IF KEY$ = "I" THEN 3400
3040  POKE 0,200: POKE 1,100: CALL
     768: GOTO 3700
```

```
3100  IF MA(PX,PY,1) THEN X2 = PX
      + 1:Y2 = PY: GOTO 3500
3110  POKE 0,20: POKE 1,20: CALL
      768: COLOR= 4: VLIN PY * 3 -
      3,PY * 3 AT PX * 3: GOTO 370
      0
3200  IF MA(PX,PY,2) THEN X2 = PX
      :Y2 = PY + 1: GOTO 3500
3210  POKE 0,20: POKE 1,20: CALL
      768: COLOR= 4: HLIN PX * 3 -
      3,PX * 3 AT PY * 3: GOTO 370
      0
3300  IF MA(PX,PY,3) THEN X2 = PX
      - 1:Y2 = PY: GOTO 3500
3310  POKE 0,20: POKE 1,20: CALL
      768: COLOR= 4: VLIN PY * 3 -
      3,PY * 3 AT (PX - 1) * 3: GOTO
      3700
3400  IF MA(PX,PY,4) THEN X2 = PX
      :Y2 = PY - 1: GOTO 3500
3410  POKE 0,20: POKE 1,20: CALL
      768: COLOR= 4: HLIN PX * 3 -
    - 3,PX * 3 AT (PY - 1) * 3: GOTO
      3700
3500  COLOR= 0:XX = PX:YY = PY: GOSUB
      2500: COLOR= 8:XX = X2:YY =
      Y2: GOSUB 2500:PX = X2:PY =
      Y2: GOTO 3700
3700  IF PX = 13 AND PY = WY THEN
      WIN = 1: RETURN
3705  IF PX = MX AND PY = MY THEN
      XX = MX:YY = MY: COLOR= 1: GOSUB
      2500:WIN = 0: RETURN
3709  ON  FN R(4) GOTO 3710,3711,
      3712,3713
3710  IF MX < PX THEN 3720
3711  IF MY < PY THEN 3730
3712  IF MX > PX THEN 3740
3713  IF MY > PY THEN 3750
3714  GOTO 3710
3720  IF MX = 13 THEN 3730
3722  IF MA(MX,MY,0) > 5 THEN 372
      6
```

```
3724  IF  NOT MA(MX,MY,1) THEN 37
      30
3726 X2 = MX + 1:Y2 = MY:XX = MX:
      YY = MY: COLOR= 0: GOSUB 250
      0:XX = X2:YY = Y2: COLOR= 1:
       GOSUB 2500:MX = X2:MY = Y2:
      MA(MX,MY,0) = MA(MX,MY,0) +
      1: GOTO 3800
3730  IF MY = 13 THEN 3740
3732  IF MA(MX,MY,0) > 5 THEN 373
      6
3734  IF  NOT MA(MX,MY,2) THEN 37
      40
3736 X2 = MX:Y2 = MY + 1:XX = MX:
      YY = MY: COLOR= 0: GOSUB 250
      0:XX = X2:YY = Y2: COLOR= 1:
       GOSUB 2500:MX = X2:MY = Y2:
      MA(MX,MY,0) = MA(MX,MY,0) +
      1: GOTO 3800
3740  IF MX = 1 THEN 3750
3742  IF MA(MX,MY,0) > 5 THEN 374
      6
3744  IF  NOT MA(MX,MY,3) THEN 37
      50
3746 X2 = MX - 1:Y2 = MY:XX = MX:
      YY = MY: COLOR= 0: GOSUB 250
      0:XX = X2:YY = Y2: COLOR= 1:
       GOSUB 2500:MX = X2:MY = Y2:
      MA(MX,MY,0) = MA(MX,MY,0) +
      1: GOTO 3800
3750  IF MY = 1 THEN 3720
3752  IF MA(MX,MY,0) > 5 THEN 375
      6
3754  IF  NOT MA(MX,MY,4) THEN 37
      20
3756 X2 = MX:Y2 = MY - 1:XX = MX:
      YY = MY: COLOR= 0: GOSUB 250
      0:XX = X2:YY = Y2: COLOR= 1:
       GOSUB 2500:MX = X2:MY = Y2:
      MA(MX,MY,0) = MA(MX,MY,0) +
      1: GOTO 3800
3800  IF PX = 13 AND PY = WY THEN
      WIN = 1: RETURN
```

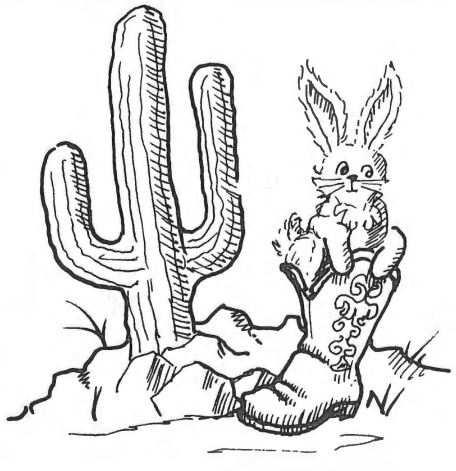
```
3805  IF PX = MX AND PY = MY THEN
     WIN = 0: RETURN
3810  GOTO 3010
3990  RETURN
4000 :
4001  REM  *** END
4002 :
4010  IF (WIN) THEN 4100
4020  HOME : FOR I = 10 TO 50: POKE
     0,I: POKE 1,20: CALL 768: NEXT
     : FOR I = 1 TO 3: POKE 0,200
     : POKE 1,150: CALL 768: NEXT
     : POKE 0,240: POKE 1,250: CALL
     768
4035  VTAB 22: PRINT "SORRY, BUT
     THE DRAGON GOT YOU...."
4095  RETURN
4100  HOME : FOR I = 50 TO 20 STEP
      - 1: POKE 0,I: POKE 1,20: CALL
     768: POKE 0,I - 1: POKE 1,20
     : CALL 768: NEXT
4110  VTAB 22: PRINT "***** YOU W
     ON *****  (BUT NOW THE DRAGO
     NIS EVEN HUNGRIER!)"
4990  RETURN
```




In this popular word game, you try to surmise the 'secret word' by guessing individual letters contained therein. Failure to divine the complete word will result in the completed figure being hanged. Because the graphics are quite clear in this program, a few lines will be highlighted. Type: LIST-2140. Line 2100 draws a white border around the gallows. Line 2110 draws the gallows. Line 2120 completes what line 2110 started. Lines 2130-2135 draw the stairs leading up to the hanging platform. Each time you make an incorrect guess, line 3070 instructs the program to perform a subroutine. These subroutines each draw a separate part of the prisoner's body. Each line (2200-2900) draws a piece of the man. Line 2200 draws the head, line 2300 draws the eyes, line 2400 draws the mouth, and so on. You are encouraged to experiment with these lines and to change or omit any line whose function is unclear.

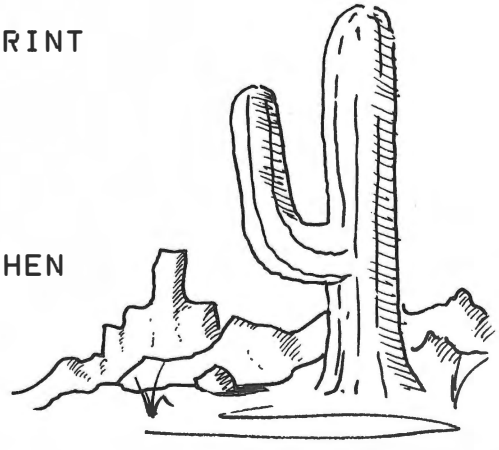
```
10  REM  ********************
11  REM  ***                 ***
12  REM  ***   HANG MAN      ***
13  REM  ***                 ***
14  REM  ********************
15  REM
16  REM
20  GOSUB 1000: REM  INSTS
30  GOSUB 2000: REM  SETUP
40  GOSUB 3000: REM  PLAY!
50  GOSUB 4000: REM  !END!
60  END
1000 :
1001  REM  *** INSTS
1002 :
1010  TEXT : NORMAL : HOME
1020  VTAB 3: HTAB 12: PRINT "***
      HANG MAN ***"
1025  VTAB 7
1030  PRINT "IN THIS GAME YOU ARE
      GIVEN THE FORMAT OFA WORD,
      YOU TRY TO SPELL OUT THE
         MYSTERY WORD BY GUESSING
      ONE LETTER AT ATIME.  "
1035  PRINT
1040  PRINT "IF THE LETTER IS IN
     THE WORD, I WILL    EXPOSE A
     LL OCCURRENCES OF THAT LETTE
     R,  IN THEIR CORRECT POSITIO
     N WITHIN THE    WORD.  IF YO
     U GUESS A LETTER NOT FOUND
     IN THE WORD, THEN I WILL ADD
      A PART TO THE MAN IN THE GA
     LLOWS.
1045  PRINT
1050  PRINT "WHEN THE MAN IS COMP
     LETE, (HEAD, MOUTH, EYES, AR
     MS, AND LEGS), HE IS HUNG  A
     ND  YOU LOSE.  TO WIN, GUESS
      THE ENTIRE WORD CORRECTLY."
1055  PRINT
1060  INPUT "HIT RETURN WHEN READ
     Y TO CONTINUE : ";ANS$
```

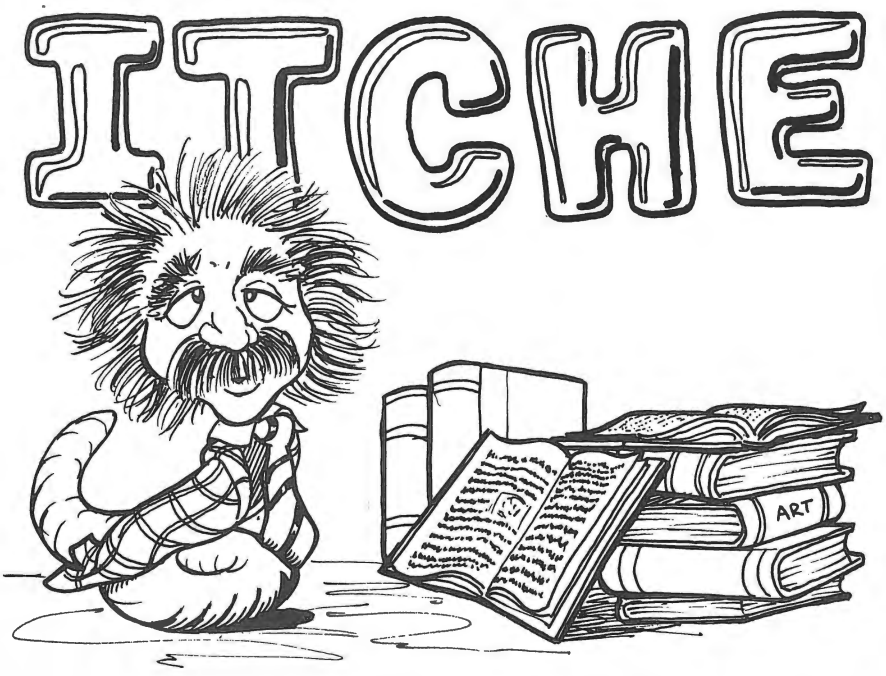
```
1990  RETURN
2000 :
2001  REM  *** SETUP
2002 :
2010  RESTORE
2020  FOR I = 1 TO  INT ( RND (1)
      * 30) + 1: READ WRD$: NEXT

2030  DATA "PENCIL","COMPUTER","P
     RINTER","ELEPHANT","NOTEBOOK
     "
2031  DATA "HANGMAN","POSTER","CE
     ILING","FOOTBALL","EVERGREEN
     "
2032  DATA "YESTERDAY","MIRROR","
     PICTURE","CARPET","MONOPOLY"

2033  DATA "SCOUNDREL","PROFILE",
     "EQUIPMENT","FOUNTAIN","LAVI
     SH"
2034  DATA "COOKIES","PLEASURE","
     ROUTINE","TEACHER","REGULAR"

2035  DATA "BARBECUE","BARRIER","
     PAVEMENT","THOUGHTFUL","MARR
     IAGE"
2050  DIM GU$(15):WL =  LEN (WRD$
     ): FOR I = 1 TO WL:GU$(I) =
      CHR$ (95): NEXT
2055 GUESSED$ = ""
2100  GR : COLOR= 15: HLIN 0,39 AT
     0: HLIN 0,39 AT 39: VLIN 0,3
     9 AT 39: VLIN 0,39 AT 0
2110  HLIN 5,34 AT 28: VLIN 7,35 AT
     5: VLIN 29,35 AT 34: HLIN 6,
     21 AT 7
2120  PLOT 6,11: PLOT 7,10: PLOT
     8,9: PLOT 9,8: PLOT 20,8: PLOT
     20,9
2130  COLOR= 8: HLIN 19,21 AT 29:
      HLIN 17,23 AT 31: HLIN 15,2
     5 AT 33: HLIN 13,27 AT 35
2135  COLOR= 9: HLIN 18,22 AT 30:
      HLIN 16,24 AT 32: HLIN 14,2
     6 AT 34
```



```
2190  RETURN
2200  COLOR= 2: HLIN 19,21 AT 10:
      HLIN 19,21 AT 16: VLIN 12,1
     4 AT 17: VLIN 12,14 AT 23: PLOT
     18,11: PLOT 22,11: PLOT 18,1
     5: PLOT 22,15: RETURN
2300  COLOR= 7: PLOT 18,12: PLOT
     19,12: PLOT 21,12: PLOT 22,1
     2: PLOT 19,13: PLOT 21,13: RETURN

2400  COLOR= 6: PLOT 19,15: PLOT
     20,14: PLOT 21,15: RETURN
2500  COLOR= 3: VLIN 17,22 AT 20:
      RETURN
2600  COLOR= 12: HLIN 17,19 AT 19
     : VLIN 19,21 AT 17: RETURN
2700  COLOR= 12: HLIN 21,23 AT 19
     : VLIN 19,21 AT 23: RETURN
2800  COLOR= 4: PLOT 19,23: PLOT
     18,24: HLIN 16,18 AT 25: RETURN

2900  COLOR= 4: PLOT 21,23: PLOT
     22,24: HLIN 22,24 AT 25: RETURN

3000 :
3001  REM  *** PLAY
3002 :
3010  HOME : PRINT "WORD: ";: FOR
     I = 1 TO WL: PRINT GU$(I);: NEXT
     : PRINT
3015  FOR I = 1 TO WL: IF GU$(I) <
      > CHR$ (95) THEN  NEXT :WO
     L = 1: RETURN
3020  PRINT "GUESSES: ";GU$
3030  PRINT : PRINT "WHAT IS YOUR
      GUESS ===> ";: GET ANS$
3040  IF ANS$ < "A" OR ANS$ > "Z"
      THEN 3010
3045  FOR I = 1 TO WL
3050  IF  MID$ (GU$,I,1) = ANS$ THEN
      VTAB 23: HTAB 1: CALL  - 95
     8: PRINT "<<< THAT'S ALREADY
      BEEN GUESSED >>>": FOR PA =
     1 TO 1000: NEXT PA: GOTO 301
     0
```

```
3055  NEXT
3060 RC = 0: FOR I = 1 TO WL: IF
      MID$ (WR$,I,1) = ANS$ THEN
     GU$(I) = ANS$:RC = RC + 1
3065  NEXT : IF RC > 0 THEN 3010
3070 GU$ = GU$ + ANS$: ON  LEN (G
     U$) GOSUB 2200,2300,2400,250
     0,2600,2700,2800,2900
3075 XX =  PEEK ( - 16336) +  PEEK
     ( - 16336) +  PEEK ( - 16336
     ) +  PEEK ( - 16336)
3080  IF  LEN (GU$) < 8 THEN 3010

3090 WOL = 0: RETURN
4000 :
4001  REM  *** END
4002 :
4010  FOR I = 0 TO 39: COLOR=  INT
     ( RND (1) * 15) + 1: VLIN 0,
     39 AT I:XX =  PEEK ( - 16336
     ) -  PEEK ( - 16336) - XX =
      PEEK ( - 16336) - XX =  PEEK
     ( - 16336): NEXT
4020  FOR PA = 1 TO 1500: NEXT PA

4030  TEXT : HOME : VTAB 3
4040  PRINT "THE GAME IS OVER !!!
     "
4050  IF WOL THEN  PRINT : PRINT
     : PRINT "YOU GUESSED THE COR
     RECT WORD, AND THE": PRINT "
     PRISONER WILL GO FREE !!!"
4055  IF  NOT WOL THEN  PRINT : PRINT
     : PRINT "THE PRISONER HAS BE
     EN HUNG, AS YOU": PRINT "FAI
     LED TO GUESS: "WRD$" !!!"
4060  PRINT : PRINT  INPUT "DO YO
     U WISH TO PLAY AGAIN? ";ANS$
     : IF  LEFT$ (ANS$,1) = "Y" THEN
      RUN
4990  RETURN
```





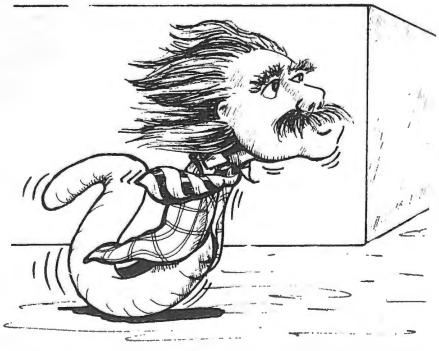

In this game you build a maze for the maze-loving Itche worm. Upon instruction, the worm will attempt to solve the maze. Though not a game per se, it is an ingenious utilization of graphics. The two routines which control color begin at 2000 and 2700. Line 2210 sets the color of the maze perimeter and then branches to 2700. Whether you are moving, plotting, or erasing, you must specify which direction you intend to travel. Lines 2715-2740 check to see which of the four directions you chose and will cause the program to branch to the accommodating line (2750-2780). Lines to experiment with include 2010, 2210, and 3010.

```
10  REM  ********************
11  REM  ***                 ***
12  REM  ***    ITCHE        ***
13  REM  ***                 ***
14  REM  ********************
15  REM
16  REM
20  GOSUB 1000: REM  INSTS
30  GOSUB 2000: REM  SETUP
40  GOSUB 3000: REM  PLAY!
50  GOSUB 4000: REM  !END!
60  END
1000 :
1001  REM  *** INSTS
1002 :
1010  TEXT : NORMAL : HOME
1020  VTAB 2: HTAB 13: PRINT "***
      ITCHE ***"
1030  VTAB 4: PRINT "THIS IS THE
     GAME OF ITCHE.  THE ITCHE IS
     A SPECIAL WORM WHO LIKES TO
     SOLVE MAZES.YOU ARE TO CREAT
     E A MAZE FOR THE ITCHE  TO S
     OLVE."
1040  PRINT : PRINT "BY USING THE
      FOLLOWING INSTRUCTIONS, YOU
     WILL BUILD THE MAZE WALLS.
     UPON        COMMAND, (G), IT
     CHE WILL WIND HIS WAY   THRO
     UGH THE MAZE."
1050  PRINT : PRINT "G)O   TO HAV
     E THE ITCHE WORM FIND THE
           EXIT TO YOUR MAZE."
1051  PRINT "X)IT   TO EXIT THE G
     AME."
1052  PRINT "C)LEAR   TO START TH
     E MAZE OVER."
1053  PRINT : PRINT "E)   FOR ERA
     SE:  FOLLOWED BY THESE..."
1054  PRINT "M)   FOR MOVE
             U=UP"
1055  PRINT "P)   FOR PLOT
      R=RIGHT    L=LEFT"
```

```
1056  PRINT "
            D=DOWN"
1058  PRINT
1060  INPUT "PRESS RETURN WHEN RE
     ADY TO CONTINUE : ";ANS$
1065  RETURN
2000 :
2001  REM  *** SETUP
2002 :
2010  GR : HOME :CL = 1: COLOR= 4
     : HLIN 0,39 AT 0: HLIN 0,39 AT
     39: VLIN 0,39 AT 0: VLIN 0,3
     9 AT 39: COLOR= 0: PLOT 0,1:
      PLOT 39,1
2012 IX = 2:IY = 1: COLOR= 7: PLOT
     IX,IY:CLR = 16:CLR2 = 0
2015  POKE 768,173: POKE 769,48: POKE
     770,192: POKE 771,136: POKE
     772,208: POKE 773,4: POKE 77
     4,198: POKE 775,1: POKE 776,
     240
2017  POKE 777,8: POKE 778,202: POKE
     779,208: POKE 780,246: POKE
     781,166: POKE 782,0: POKE 78
     3,76: POKE 784,0: POKE 785,3
     : POKE 786,96
2019  HOME : PRINT "G)O     C)LEA
     R      X)IT   U)P   D)OWN  P
     )LOT   E)RASE      M)OVE ===
     >   L)EFT  R)IGHT"
2020  GET ANS$
2030  IF ANS$ = "G" THEN 2100
2035  IF ANS$ = "P" THEN 2200
2040  IF ANS$ = "M" THEN 2300
2045  IF ANS$ = "E" THEN 2400
2050  IF ANS$ = "C" THEN 2500
2055  IF ANS$ = "X" THEN 2600
2056  IF ANS$ =  CHR$ (3) THEN 26
     00
2060  POKE 0,10: POKE 1,5: CALL 7
     68: GOTO 2020
2100  REM  *** GO ROUTINE
2110  RETURN
```

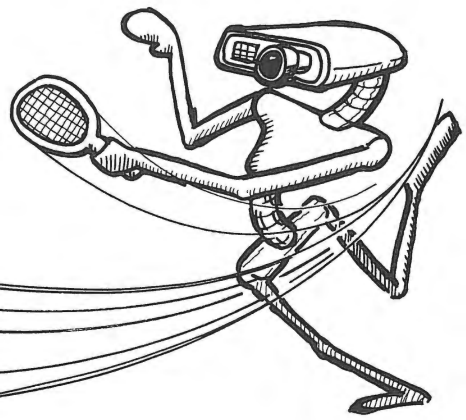
```
2200  REM  *** PLOT ROUTINE
2210 CLR = 9: GOTO 2700
2300  REM  *** MOVE ROUTINE
2310 CLR = 16: GOTO 2700
2400  REM  *** ERASE ROUTINE
2410 CLR = 0: GOTO 2700
2500  REM  *** CLEAR ROUTINE
2510  GOTO 2010
2600  REM  *** EXIT ROUTINE
2610  HOME : PRINT : INPUT "Do yo
     u wish to quit : ";ANS$: IF
      LEFT$ (ANS$,1) = "Y" THEN  POP
     : GOTO 50
2620  HOME : GOTO 2019
2700  REM  *** DIRECTIONS
2710  GET ANS$:X2 = IX:Y2 = IY
2715  IF ANS$ = "R" THEN 2750
2720  IF ANS$ = "D" THEN 2760
2730  IF ANS$ = "L" THEN 2770
2740  IF ANS$ = "U" THEN 2780
2745  GOTO 2030
2750  REM  *** RIGHT
2752 X2 = IX + 1: IF X2 < 39 THEN
     2790
2754 X2 = 38: POKE 0,200: POKE 1,
     15: CALL 768: GOTO 2790
2760  REM  *** DOWN
2762 Y2 = IY + 1: IF Y2 < 39 THEN
     2790
2764 Y2 = 38: POKE 0,200: POKE 1,
     15: CALL 768: GOTO 2790
2770  REM  *** LEFT
2772 X2 = IX - 1: IF X2 > 0 THEN
     2790
2774 X2 = 1: POKE 0,200: POKE 1,1
     5: CALL 768: GOTO 2790
2780  REM  *** UP
2782 Y2 = IY - 1: IF Y2 > 0 THEN
     2790
2784 Y2 = 1: POKE 0,200: POKE 1,1
     5: CALL 768: GOTO 2790
2790  COLOR= CLR: IF CLR = 16 THEN
      COLOR= C2
```

```
2792  PLOT IX,IY:C2 =  SCRN( X2,Y
      2): COLOR= 7: PLOT X2,Y2:IX =
      X2:IY = Y2: GOTO 2700
3000 :
3001  REM  *** PLAY
3002 :
3005  HOME : PRINT : PRINT "<<< I
      TCHE IS NOW SOLVING THE MAZE
       >>>"
3010 X2 = 1:Y2 = 1: COLOR= 13: PLOT
      X2,Y2
3015  COLOR= CLR: IF CLR = 16 THEN
       COLOR= C2
3016  PLOT IX,IY
3020 X3 = 0:Y3 = 1:DIR = 2
3030  IF X2 + X3 = 0 AND Y2 + Y3 =
      1 THEN  RETURN
3035  IF X2 + X3 = 39 AND Y2 + Y3
       = 1 THEN  RETURN
3040  IF X2 + X3 > 0 AND X2 + X3 <
      39 AND Y2 + Y3 > 0 AND Y2 +
      Y3 < 39 AND  SCRN( X2 + X3,Y
      2 + Y3) = 0 THEN 3100
3045 DI = DI - 1: IF DI < 1 THEN
      DI = 4
3050  IF DI = 1 THEN X3 = 1:Y3 =
      0: GOTO 3030
3055  IF DI = 2 THEN X3 = 0:Y3 =
      1: GOTO 3030
3060  IF DI = 3 THEN X3 =  - 1:Y3
       = 0: GOTO 3030
3065  IF DI = 4 THEN X3 = 0:Y3 =
       - 1: GOTO 3030
3100  COLOR= 0: PLOT X2,Y2: COLOR=
      13:X2 = X2 + X3:Y2 = Y2 + Y3
      : PLOT X2,Y2:CL = CL + 1:DI =
      DI + 1: IF DI > 4 THEN DI =
      1
3110  POKE 0,25: POKE 1,3: CALL 7
      68: GOTO 3050
4000 :
4001  REM  *** END
4002 :
```



```
4010  COLOR= 0: PLOT X2,Y2:X2 = X
      2 + X3:Y2 = Y2 + Y3: FOR I =
      1 TO 10: COLOR= 13: PLOT X2,
      Y2: POKE 0,20: POKE 1,20: CALL
      768: COLOR= 0: PLOT X2,Y2: POKE
      0,40: POKE 1,20: CALL 768: NEXT
      I
4020  HOME : PRINT
4025  IF  LEFT$ (ANS$,1) = "Y" THEN
       PRINT "<< ITCHE SAYS YOU SP
      OILED HIS FUN !!! >>": RETURN

4030  IF X2 = 39 THEN  PRINT "<<<
       ITCHE HAS SOLVED THE MAZE >
      >>": PRINT "HE DID IT IN "CL
      " CLICKS...": RETURN
4040  PRINT "<<< ITCHE CANNOT SOL
      VE YOUR MAZE >>>": PRINT "HE
       IS STUCK AT THE BEGINNING..
      .": RETURN
```

# Knock Out



This game is similar to the video dinosaur, Pong. You have five men, as does your opponent. Using the paddles, you try to deflect the ball into your opponent's men and also protect your own. The winner is the first player to eliminate all of the other player's men. The graphics are very straightforward and easy to understand. Start by typing: LIST -2043. The setup is handled almost entirely in lines 2030-2043. Line 2031 controls the color of the court's perimeter. If you want to verify this, change the color to any number through 15. Rewrite line 2032 so that it reads: 2032 HLIN 4,32 AT 12:HLIN 6,27 AT 34. Run the program to see what changes occur. Make similar changes to line 2033, then run the program. Line 2040 sets the color of the five men. Experiment with different colors. Rewrite line 2041 so that it reads: 2041 FOR I = 1 TO 33 STEP 8. Run the program. Change line 2042 so that it reads: 2042 VLIN I,I+4 AT 8:VLIN I,I+2 AT 31. Hopefully, these visual modifications will help you to understand the function of each line. Next, we will look at how the ball is controlled, and why it is white. Line 3075 sets the color to white, (color =15). If you want to change the color of the ball, then change line 3075. Lines 3070,3071,3080,3085-6-7, and others, control the movement of the ball. Line 3090 specifically cntrols the ball when it hits either back wall. To confirm this, type: 3090. Hit RETURN, then rerun the program.

```
10  REM  ********************
11  REM  ***                 ***
12  REM  ***  KNOCK  OUT   ***
13  REM  ***                 ***
14  REM  ********************
15  REM
16  REM
20  GOSUB 1000: REM  INSTS
30  GOSUB 2000: REM  SETUP
40  GOSUB 3000: REM  PLAY!
50  GOSUB 4000: REM  !END!
60  END
1000 :
1001  REM  *** INSTS
1002 :
1010  TEXT : NORMAL : HOME
1020  VTAB 3: HTAB 11: PRINT "***
      KNOCK  OUT ***"
1030  VTAB 7: PRINT "*KNOCK OUT*
     IS A TWO PLAYER GAME THAT IS
     SIMILAR TO PONG.  EACH PLAYE
     R HAS A     PADDLE WITH WHIC
     H HE TRIES TO RETURN THEBALL
      INTO HIS OPPONENT'S COURT."

1040  PRINT
1050  PRINT "THE OBJECT OF THE GA
     ME IS TO KO (KNOCK  OUT) YOU
     R OPPONENT'S MEN WHILE DEFEN
     DINGYOUR OWN."
1055  PRINT
1060  PRINT "THE FIRST PLAYER TO
     KNOCK OUT ALL OF THEOPPOSITI
     ON'S MEN IS THE WINNER."
1070  VTAB 22: INPUT "HIT RETURN
     WHEN READY TO CONTINUE : ";A
     NS$
1080  RETURN
2000 :
2001  REM  *** SETUP
```

```
2002 :
2010  POKE 768,173: POKE 769,48: POKE
      770,192: POKE 771,136: POKE
      772,208: POKE 773,4: POKE 77
      4,198: POKE 775,1: POKE 776,
      240
2020  POKE 777,8: POKE 778,202: POKE
      779,208: POKE 780,246: POKE
      781,166: POKE 782,0: POKE 78
      3,76: POKE 784,0: POKE 785,3
      : POKE 786,96
2030  GR : HOME
2031  COLOR= 15
2032  HLIN 0,39 AT 0: HLIN 0,39 AT
      39
2033  VLIN 0,39 AT 0: VLIN 0,39 AT
      39
2040  COLOR= 12
2041  FOR I = 6 TO 30 STEP 6
2042  VLIN I,I + 3 AT 3: VLIN I,I
       + 3 AT 36
2043  NEXT I
2050  LET O0 = 1: LET O1 = 1
2060  PRINT "PLAYER # 1
                PLAYER # 2"
2070  FOR I = 1 TO 100: GOSUB 210
      0: NEXT I
2080  LET SF = 1
2090  RETURN
2100 :
2110  REM  *** PADDLE CONTROL
2120 :
2130 P0 =  INT ( PDL (0) * 10 / 7
      5 + 1):P1 =  INT ( PDL (1) *
      10 / 75 + 1)
2140  IF P0 <  > O0 THEN  COLOR=
      0: VLIN O0,O0 + 3 AT 14: COLOR=
      4:O0 = P0: VLIN O0,O0 + 3 AT
      14
2150  IF P1 <  > O1 THEN  COLOR=
      0: VLIN O1,O1 + 3 AT 25: COLOR=
      1:O1 = P1: VLIN O1,O1 + 3 AT
      25
```

```
2160  RETURN
3000 :
3001  REM  *** PLAY
3002 :
3060 L1 = 5:L2 = 5
3070 BX =  INT ( RND (1) * 10) +
     16:BY =  INT ( RND (1) * 10)
      + 16:BD =  INT ( RND (1) *
     2) * 2 - 1
3071 BS =  INT ( RND (1) * 7) - 3
     : IF BS = 0 THEN 3071
3075  COLOR= 15: PLOT BX,BY
3080 X2 = BX + BD:Y2 = BY + BS: GOSUB
     2100
3085  IF  SCRN( BX,BY) = 15 THEN
     3090
3086 BX = BX - BD:BY = BY - BS:BD
      =  - BD:BS =  - BS: COLOR=
     15: PLOT BX,BY: POKE 0,50: POKE
     1,10: CALL 768
3087  IF BY < 1 OR BY > 38 THEN B
     Y = BY + BS:BS =  - BS
3089  GOTO 3080
3090  IF X2 < 1 OR X2 > 38 THEN B
     D =  - BD: POKE 0,100: POKE
     1,10: CALL 768: GOTO 3080
3100  IF Y2 < 1 OR Y2 > 38 THEN B
     S =  - BS: POKE 0,100: POKE
     1,10: CALL 768: GOTO 3080
3110  IF  SCRN( X2,Y2) = 0 THEN 3
     150
3111  IF  SCRN( X2,Y2) <  > 12 THEN
     3125
3112  COLOR= 0: VLIN  INT (Y2 / 6
     ) * 6, INT (Y2 / 6) * 6 + 3 AT
     X2: POKE 0,25: POKE 1,2: CALL
     768
3115  IF X2 = 3 THEN L1 = L1 - 1
3116  IF X2 = 36 THEN L2 = L2 - 1

3117  IF L1 = 0 OR L2 = 0 THEN 35
     00
3120  GOTO 3150
```

```
3125  POKE 0,50: POKE 1,10: CALL
      768
3130  IF X2 <  > 25 THEN BD =  -
      BD:BS = (Y2 - 00) - (Y2 - 00
       < 2) * 3: GOTO 3080
3140 BD =  - BD:BS = (Y2 - 01) -
      (Y2 - 01 < 3) * 3: GOTO 3080

3150  COLOR= 0: PLOT BX,BY: COLOR=
      15: PLOT X2,Y2:BX = X2:BY =
      Y2: GOTO 3080
3500  RETURN
4000 :
4001  REM  *** END
4002 :
4010  HOME : PRINT "THE GAME IS O
      VER !!!"
4020  PRINT "THE WINNER IS PLAYER
       # ";2 - (L2 = 0)
4030  RETURN
```

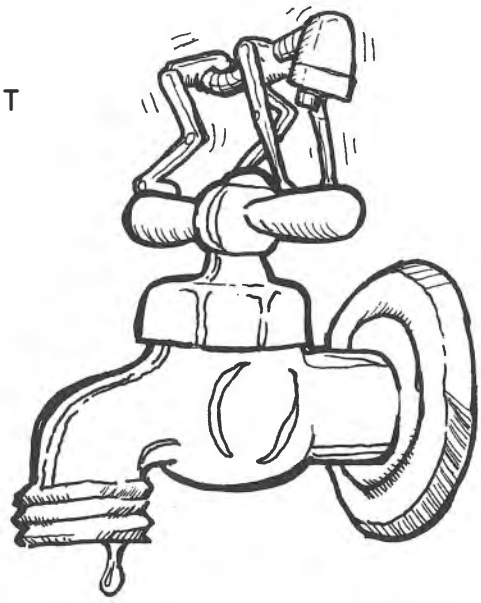

# Leaky Faucet

This is not a game. Rather, it is an excellent demonstration of how to use graphics. The idea is to simulate the effect of a dripping faucet. List through line 3035. Remember that color 0 is black. With that in mind, can you guess the function of line 3010? Line 3010 gives the color a random value between 0 and 14. The assorted colors are for the original droplet configuration. If this is not clear, change line 3016 to read: 3016 COLOR= 2. Enter and then RUN. Line 3030 draws the faucet. Experiment with these commands to confirm their function. Likewise, experiment with lines 3660-3717, and see if you can deduce their function.

```
10  REM  ********************
11  REM  ***                 ***
12  REM  *** LEAKY FAUCET ***
13  REM  ***                 ***
14  REM  ********************
15  REM
16  REM
20  GOSUB 1000: REM  INSTS
30  GOSUB 2000: REM  SETUP
40  GOSUB 3000: REM  PLAY!
60  END
1000 :
1001  REM  *** INSTS
1002 :
1010  TEXT : HOME : NORMAL
1020  VTAB 3: HTAB 8: PRINT "***
     THE LEAKY FAUCET ***"
1030  VTAB 7: PRINT "THIS IS NOT
     REALLY A GAME, BUT AN
     EXTREMELY ENTERTAINING GRAPH
     ICS DEMO.": PRINT : PRINT "W
     E HOPE YOU ENJOY IT !!!"
1040  VTAB 23: INPUT "HIT RETURN
     WHEN READY TO CONTINUE : ";A
     NS$
1990  RETURN
2000 :
2001  REM  *** SETUP
2002 :
2010  GR :NU = 200: HOME : PRINT
     : PRINT "<<< TURN PADDLE 0 T
     O MOVE FAUCET >>>": PRINT "<
     << HOLD BUTTON 0 TO START AG
     AIN >>>"
2990  RETURN
3000 :
3001  REM  *** PLAY
3002 :
3010  COLOR= 0: FOR I = 0 TO 19: HLIN
     0,39 AT I: HLIN 0,39 AT 39 -
     I: NEXT : FOR I = 1 TO NU: COLOR=
      INT ( RND (1) * 15): PLOT (
      INT ( RND (1) * 38)) + 1, INT
     ( RND (1) * 20) + 20: NEXT I
```

```
3030  COLOR= 4: HLIN 0,2 AT 5: HLIN
     0,2 AT 6: HLIN 0,2 AT 7: COLOR=
     1: HLIN 3,5 AT 4: HLIN 3,5 AT
     5: HLIN 3,5 AT 6: HLIN 3,5 AT
     7: COLOR= 6: PLOT 5,8: PLOT
     5,3: HLIN 3,7 AT 2
3110 I = 5
3120 SX = I:SY = 9:XX =  PEEK ( -
     16336) +  PEEK ( - 16336) +
      PEEK ( - 16336) +  PEEK ( -
     16336)
3130  COLOR= 15: PLOT SX,SY: GOSUB
     3600
3135 S2 = SY + 1: IF S2 > 39 THEN
     3200
3140  IF  SCRN( SX,S2) <  > 0 THEN
     3200
3145  COLOR= 0: PLOT SX,SY:SY = S
     2: GOTO 3130
3200 LR =  INT ( RND (1) * 2) * 2
      - 1: IF  SCRN( SX + LR,SY) <
      > 0 AND  SCRN( SX - LR,SY) <
      > 0 THEN 3500
3215  IF  SCRN( SX + LR,SY) <  >
     0 THEN LR =  - LR: GOTO 3215

3220 S2 = SX + LR: IF S2 < 1 OR S
     2 > 38 THEN 3500
3225  IF  SCRN( S2,SY) <  > 0 THEN
     3500
3230  COLOR= 0: PLOT SX,SY:SX = S
     2: COLOR= 15: PLOT SX,SY: GOSUB
     3600
3235  IF SY < 39 THEN  IF  SCRN(
     SX,SY + 1) = 0 THEN 3135
3240  GOTO 3220
3500  IF  PEEK ( - 16287) < 128 THEN
     3120
3510  GOTO 3010
3600 P =  PDL (0)
3605  IF P < 90 THEN 3700
3607  IF P < 180 THEN  RETURN
3640  IF I = 35 THEN  RETURN
```

```
3650  COLOR= 0: PLOT I - 2,2: PLOT
      I - 2,4: PLOT I,8: PLOT I,3
3655 I = I + 1
3660  COLOR= 4: VLIN 5,7 AT I - 3

3670  COLOR= 1: VLIN 4,7 AT I
3680  COLOR= 6: PLOT I + 2,2: PLOT
      I,3: PLOT I,8
3690  RETURN
3700  IF I = 5 THEN  RETURN
3710  COLOR= 0: PLOT I + 2,2: VLIN
      3,8 AT I
3715 I = I - 1
3716  COLOR= 1: VLIN 4,7 AT I - 2

3717  COLOR= 6: PLOT I - 2,2: PLOT
      I,3: PLOT I,8
3799  RETURN
```



# Match the Key

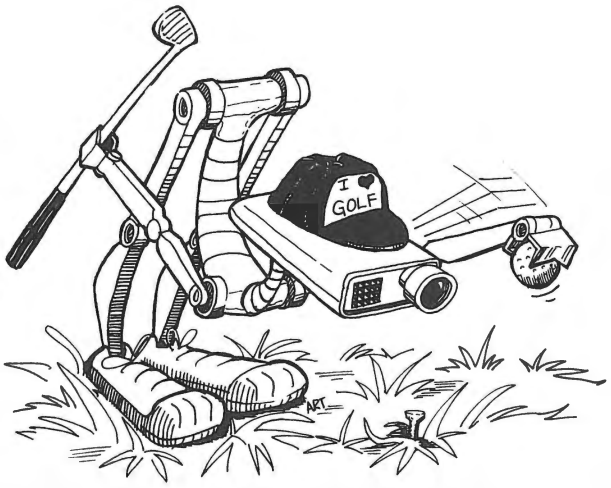
If you have ever played or ever seen Simon, then you will recognize this game. You must give the numeric equivalent of a lighted box sequence. There are a number of mnemonic devices which make it easier to recall a long string, but try to develop your own. A very good player can repeat a sequence of twenty boxes, and an expert can repeat a chain of thiry. The graphics in this program are interesting. Let's take a look. Lines 2020-2025 are responsible for the four brown squares being drawn. To verify this, change line 2021 so that it reads: 2021 COLOR = 1. When you run the program the four boxes will be red. To change the size and shape of the four boxes, experiment with line 2024. Experiment with any lines that have an unclear function.

```
10  REM  ********************
11  REM  ***                 ***
12  REM  *** MATCH THE KEY **
13  REM  ***                 ***
14  REM  ********************
15  REM
16  REM
20  GOSUB 1000: REM  INSTS
30  GOSUB 2000: REM  SETUP
40  GOSUB 3000: REM  PLAY!
50  GOSUB 4000: REM  !END!
60  END
1000 :
1001  REM  *** INSTS
1002 :
1010  TEXT : NORMAL : HOME
1020  VTAB 3: HTAB 9: PRINT "***
     MATCH THE KEY ***"
1030  VTAB 7: PRINT "THIS GAME WI
     LL TEST YOUR MEMORY. YOU
     WILL BE SHOWN A SCREEN WITH
     FOUR COLOREDBLOCKS ON IT.  T
     HE COMPUTER WILL LIGHT  UP O
     NE OF THE BLOCKS, AND SOUND
     ITS     CORRESPONDING TONE."

1035  PRINT
1040  PRINT "INPUT THE NUMBER OF
     THE LIGHTED KEY/S.  IF YOU A
     RE CORRECT, THE COMPUTER WIL
     L   REPEAT THE SEQUENCE AND
     ADD ANOTHER     COLOR TO IT.
     "
1045  PRINT
1050  PRINT "AFTER EACH ADDITION,
      YOU MUST RETYPE THEENTIRE S
     EQUENCE.  YOU ARE ALLOWED TH
     REE MISTAKES PER GAME. "
1060  VTAB 22: INPUT "HIT RETURN
     WHEN READY TO CONTINUE : ";A
     NS$
1990  RETURN
2000 :
```

```
2001  REM  *** SETUP
2002 :
2010  DIM SEQ(50): FOR I = 1 TO 5
     0:SE(I) =  INT ( RND (1) * 4
     ) + 1: NEXT I
2020  GR : HOME
2021  COLOR= 8
2022  FOR I = 5 TO 29 STEP 8
2023  FOR J = 29 TO 35
2024  HLIN I,I + 5 AT J
2025  NEXT J,I
2030  VTAB 21: FOR I = 5 TO 29 STEP
     8: HTAB I + 4: PRINT (I + 3)
      / 8;: NEXT
2040  POKE 768,173: POKE 769,48: POKE
     770,192: POKE 771,136: POKE
     772,208: POKE 773,4: POKE 77
     4,198: POKE 775,1: POKE 776,
     240
2045  POKE 777,8: POKE 778,202: POKE
     779,208: POKE 780,246: POKE
     781,166: POKE 782,0: POKE 78
     3,76: POKE 784,0: POKE 785,3
     : POKE 786,96
2990  RETURN
3000 :
3001  REM  *** PLAY
3002 :
3010 FOR I = 1 TO 50:SC = (I - 1
     ) - M: VTAB 22: HTAB 10: PRINT
     "MISSES: "M"      SCORE: "SC
     3020  FOR J = 1 TO I: COLOR= 15: FOR
     K = 29 TO 35: HLIN SE(J) * 8
     - 3,SE(J) * 8 + 2 AT K: NEXT
     K: POKE 0, (5 - SE(J)) * 60: POKE
     1,50: CALL 768
3020  FOR J = 1 TO I: COLOR= 15: FOR
     K = 29 TO 35: HLIN SE(J) * 8
      - 3,SE(J) * 8 + 2 AT K: NEXT
     K: POKE 0,(5 - SE(J)) * 60: POKE
     1,50: CALL 768
3030  COLOR= 8: FOR K = 29 TO 35:
      HLIN SE(J) * 8 - 3,SE(J) *
     8 + 2 AT K: NEXT K: NEXT J
```

```
3100  FOR J = 1 TO I
3110  IF  PEEK ( - 16384) < 128 THEN
      3110
3120 X =  PEEK ( - 16384): POKE  -
      16368,0
3130  IF X < 177 OR X > 180 THEN
      3110
3135  COLOR= 15: FOR K = 29 TO 35
      : HLIN (X - 176) * 8 - 3,(X -
      176) * 8 + 2 AT K: NEXT K: POKE
      0,(5 - (X - 176)) * 60: POKE
      1,50: CALL 768
3140  COLOR= 8: FOR K = 29 TO 35:
       HLIN (X - 176) * 8 - 3,(X -
      176) * 8 + 2 AT K: NEXT K
3150  IF X - 176 = SE(J) THEN 320
      0
3155  POKE 0,250: POKE 1,100: CALL
      768:M = M + 1: IF M < 3 THEN
      3300
3160  RETURN
3200  NEXT J
3300  FOR PA = 1 TO 500: NEXT PA:
       NEXT I: RETURN
3990  RETURN
4000 :
4001  REM  *** END
4002 :
4010  HOME
4020  FOR J = 0 TO 39
4030  COLOR=  INT ( RND (1) * 12)
       * 1: HLIN 0,39 AT J
4031  COLOR=  INT ( RND (1) * 12)
       * 1: VLIN 0,39 AT 39 - J
4032  COLOR=  INT ( RND (1) * 12)
       * 1: HLIN 0,39 AT 39 - J
4033  COLOR=  INT ( RND (1) * 12)
       * 1: VLIN 0,39 AT J
4040  POKE 0,J * 2: POKE 1,5: CALL
      768: NEXT J
4045  PRINT
```

```
4050 IF M = 3 THEN PRINT "<<< I
     'M SORRY YOU LOST . . .>>>": IF
     SC < 1 THEN PRINT "YOU GOT
     THEM ALL WRONG!!!": RETURN
4055  PRINT "<<< YOU GOT ALL 50 O
     F THEM !!! >>>": RETURN
```



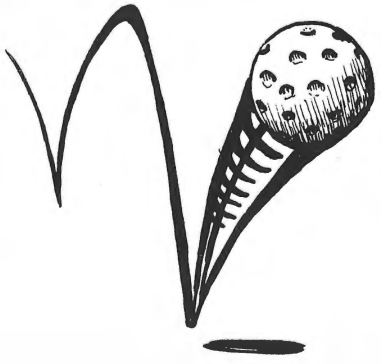

# Miniature GOLF

This game is a simulation of miniature golf. There are hazards, obstacles, and unplayable lies, just as in the real thing. The graphics are interesting, and merit a closer look. Type: LIST -2060. Lines 2050-2058 draw the yellow-green background. For practice, change line 2050 so that it reads: 2050 COLOR= 6. Enter and run. Next, list through 2115. Lines 2105-2115 draw hole #1. Lines 2106-7-8 draw the red frame around the hole. Line 2110 draws the brown square which represents the hole. Line 2115 draws the white square which represents the ball. Line 2200 begins the graphics for hole #2. Line 2300 begins hole #3. Line 2400 begins hole #4, and so on through hole #9 (begins at 2900). It would be to your benefit to experiment with any of the lines (2000-2915) that are unclear. As with most programs, the hard part is moving the ball and charting its path. The ball is white, (color = 15), so look for statements preceded by 'COLOR = 15' Look at statements 3110 thru 3124. The SCRN function returns the number of the color of X2,Y2 and therefore tells the program what color surface the ball has landed on. The SCRN function is very useful for detecting 'hits' in all sorts of action games.

```
10  REM  ********************
11  REM  ***                 ***
12  REM  ** MINIATURE GOLF **
13  REM  ***                 ***
14  REM  ********************
15  REM
16  REM
20  GOSUB 1000: REM  INSTS
30  GOSUB 2000: REM  SETUP
40  GOSUB 3000: REM  PLAY!
50  GOSUB 4000: REM  !END!
60  END
1000 :
1001  REM  *** INSTS
1002 :
1010  TEXT : NORMAL : HOME
1020  VTAB 1: HTAB 9: PRINT "***
     MINIATURE GOLF ***"
1030  VTAB 5: PRINT "WELCOME TO T
     HE CAPELLA COUNTRY CLUB.
     THIS BEAUTIFUL NINE-HOLE MIN
     IATURE GOLF COURSE IS OPEN A
     ND WAITING FOR YOU ! "
1035  PRINT
1040  PRINT "YOU SHOULD KNOW THE
     IDIOSYNCRASIES OF   THE COUR
     SE BEFORE YOU BEGIN PLAY. "
1045  PRINT : PRINT "TO PUTT THE
     BALL, YOU HAVE TO INPUT
     WHICH DIRECTION YOU WANT TO
     AIM IT.     THERE ARE EIGHT
     DIRECTIONS, SHOWN BELOW.YOUR
      BALL IS ASSUMED TO BE AT *
     . "
1050  PRINT : PRINT "
     2 1 8": PRINT "            3
      * 7": PRINT "           4
     5 6"
1060  VTAB 23: INPUT "HIT RETURN
     WHEN READY TO CONTINUE : ";A
     NS$
```

```
1070  HOME : VTAB 1: HTAB 9: PRINT
      "*** MINIATURE GOLF ***": VTAB
      5
1080  PRINT "THEN YOU MUST INPUT
      HOW HARD TO HIT THE BALL.  T
      HE SPEED SHOULD BE SOME NUMB
      ER  BETWEEN 0.00 AND 5.00.
      FOR EXAMPLE, YOUCOULD HIT TH
      E BALL A RELATIVE SPEED OF
      3.2. "
1085  PRINT
1090  PRINT "IT WILL TAKE A FEW T
      RIES BEFORE YOU GET THE FEEL
       OF HOW HARD TO PUTT THE BAL
      L. "
1095  PRINT
1100  PRINT "ALSO, THERE ARE FOUR
       TYPES OF HAZARDS ONTHE COUR
      SE.  YOU SHOULD BE AWARE OF
      WHATTHEY ARE AND WHAT AFFECT
       THEY HAVE ON   YOU AND YOUR
       BALL. "
1110  VTAB 23: INPUT "HIT RETURN
      WHEN READY TO CONTINUE : ";A
      NS$
1120  HOME : VTAB 1: HTAB 9: PRINT
      "*** MINIATURE GOLF ***": VTAB
      5
1130  PRINT "BLOCKS: THESE ARE LI
      KE WALLS.  YOU MUST PUTT ARO
      UND THEM. "
1135  PRINT
1140  PRINT "YELLOW TRAPS REPRESE
      NT SAND.  YOUR BALL CANNOT P
      ENETRATE THROUGH A SAND TRAP
      .   THE PENALTY FOR LANDING
      IN SAND IS ONE  STROKE. "
1145  PRINT
1150  PRINT "WATER: LIKE SAND, TH
      ESE BLUE HAZARDS    WILL SLO
      W AND STOP YOUR BALL.  THE
          PENALTY FOR LANDING IN W
      ATER IS ONE     STROKE. "
```

```
1155  PRINT
1160  PRINT "UNEVEN SURFACES: THE
      SE ORANGE HAZARDS   CAUSE TH
      E BALL TO ROLL IN A DIRECTIO
      N   WHICH IS UNPREDICTABLE.
       THERE IS NO    PENALTY FOR
      HITTING THIS HAZARD. "
1170  VTAB 23: INPUT "PRESS RETUR
      N WHEN READY TO CONTINUE : "
      ;ANS$
1180  HOME : VTAB 1: HTAB 9: PRINT
      "*** MINIATURE GOLF ***": VTAB
      5
1190  PRINT "YOU ARE TRYING TO SI
      NK THE BALL IN AS   FEW TRIE
      S AS POSSIBLE.  THE HOLE IS
      THE BROWN SQUARE. "
1195  PRINT
1200  PRINT "IF YOU HIT THE BALL
      TOO HARD, IT WILL   JUMP OVE
      R THE HOLE AND CONTINUE ROLL
      ING.IT MAY ALSO CHANGE DIREC
      TION, SO BE SURE TO HIT THE
      BALL JUST HARD ENOUGH. "
1210  VTAB 23: INPUT "HIT RETURN
      WHEN READY TO CONTINUE : ";A
      NS$
1990  RETURN
2000 :
2001  REM  *** SETUP
2002 :
2005 BELL$ =  CHR$ (7)
2010  DIM HA(9,5): FOR I = 1 TO 9
      : FOR J = 1 TO 5: READ HA(I,
      J): NEXT J,I
2011  DATA   0,0,0,0,2
2012  DATA   1,0,0,0,3
2013  DATA   0,1,0,0,3
2014  DATA   1,1,0,0,3
2015  DATA   0,0,0,1,3
2016  DATA   0,0,1,1,3
2017  DATA   1,0,1,0,3
2018  DATA   0,1,1,0,4
2019  DATA   0,0,1,1,3
```



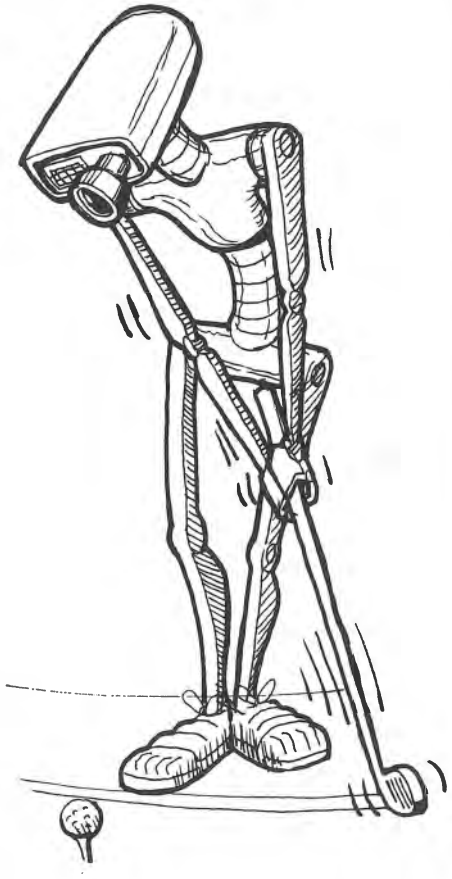
```
2020  DIM DI(8,2): FOR I = 1 TO 8
      : READ DI(I,1),DI(I,2): NEXT
      : DATA   0,-1,  -1,-1,  -1,0
      ,  -1,1,  0,1,  1,1,  1,0,
      1,-1
2045  GR : HOME : RETURN
2050  COLOR= 12
2052  FOR I = 0 TO 19
2054  HLIN 0,39 AT I: HLIN 0,39 AT
      39 - I
2056  VLIN 0,39 AT I: VLIN 0,39 AT
      39 - I
2058  NEXT : RETURN
2100  REM  *** HOLE 1
2105  GOSUB 2050
2106  COLOR= 1
2107  HLIN 10,24 AT 6: HLIN 10,24
      AT 33
2108  VLIN 6,33 AT 10: VLIN 6,33 AT
      24
2110  COLOR= 8: PLOT 17,9
2115 BY = 32:BX =  INT ( RND (1) *
      11) + 12: COLOR= 15: PLOT BX
      ,BY: RETURN
2200  REM  *** HOLE 2
2205  GOSUB 2050: COLOR= 1: HLIN
      10,24 AT 33: VLIN 6,33 AT 10
      : VLIN 16,33 AT 24: HLIN 10,
      35 AT 6: HLIN 24,35 AT 16: VLIN
      6,16 AT 35
2207  COLOR= 2: VLIN 18,19 AT 20:
      VLIN 17,21 AT 21: VLIN 17,2
      3 AT 22: VLIN 16,26 AT 23
2210  COLOR= 8: PLOT 32,11
2215 BY = 32:BX =  INT ( RND (1) *
      11) + 12: COLOR= 15: PLOT BX
      ,BY: RETURN
2300  REM  *** HOLE 3
2305  GOSUB 2050: COLOR= 1: HLIN
      24,35 AT 6: HLIN 10,24 AT 15
      : HLIN 24,35 AT 24: HLIN 10,
      24 AT 33: VLIN 6,15 AT 24: VLIN
      15,33 AT 10: VLIN 24,33 AT 2
      4: VLIN 6,24 AT 35
```

```
2307  COLOR= 13: PLOT 30,23: VLIN
     22,23 AT 31: VLIN 20,23 AT 3
     2: VLIN 19,23 AT 33: VLIN 17
     ,23 AT 34
2310  COLOR= 8: PLOT 32,9
2315 BY = 32:BX =  INT ( RND (1) *
     11) + 12: COLOR= 15: PLOT BX
     ,BY: RETURN
2400  REM  *** HOLE 4
2405  GOSUB 2050: COLOR= 1: HLIN
     5,35 AT 6: HLIN 15,25 AT 15:
      HLIN 25,35 AT 24: HLIN 5,15
      AT 33: VLIN 6,33 AT 5: VLIN
     15,33 AT 15: VLIN 15,24 AT 2
     5: VLIN 6,24 AT 35
2407  COLOR= 13: PLOT 15,7: VLIN
     7,8 AT 16: VLIN 7,9 AT 17: VLIN
     7,9 AT 18: VLIN 7,8 AT 19: PLOT
     20,7
2408  COLOR= 2: PLOT 15,14: VLIN
     13,14 AT 16: VLIN 13,14 AT 1
     7: VLIN 13,14 AT 18: VLIN 13
     ,14 AT 19: VLIN 13,14 AT 20:
      VLIN 12,14 AT 21: VLIN 11,1
     4 AT 22
2410  COLOR= 8: PLOT 32,21
2415 BY = 32:BX =  INT ( RND (1) *
     9) + 6: COLOR= 15: PLOT BX,B
     Y: RETURN
2500  REM  *** HOLE 5
2505  GOSUB 2050: COLOR= 1: HLIN
     10,24 AT 6: HLIN 10,24 AT 33
     : VLIN 6,33 AT 10: VLIN 6,33
      AT 24: HLIN 13,21 AT 17: VLIN
     12,17 AT 13: VLIN 12,17 AT 2
     1
2510  COLOR= 8: PLOT 17,9
2515 BY = 32:BX =  INT ( RND (1) *
     11) + 12: COLOR= 15: PLOT BX
     ,BY: RETURN
2600  REM  *** HOLE 6
```

```
2605  GOSUB 2050: COLOR= 1: HLIN
      10,24 AT 33: VLIN 6,33 AT 10
      : VLIN 16,33 AT 24: HLIN 10,
      35 AT 6: HLIN 24,35 AT 16: VLIN
      6,16 AT 35
2607  HLIN 26,29 AT 9: HLIN 26,29
       AT 13: VLIN 9,13 AT 26
2608  COLOR= 9: VLIN 13,18 AT 21:
       VLIN 13,18 AT 22: VLIN 13,1
      8 AT 23: VLIN 13,15 AT 24: VLIN
      14,15 AT 25: PLOT 26,15
2610  COLOR= 8: PLOT 32,11
2615 BY = 32:BX =  INT ( RND (1) *
      11) + 12: COLOR= 15: PLOT BX
      ,BY: RETURN
2700  REM  *** HOLE 7
2705  GOSUB 2050: COLOR= 1: HLIN
      5,15 AT 6: HLIN 15,35 AT 12:
       HLIN 5,25 AT 24: HLIN 25,35
       AT 33: VLIN 6,24 AT 5: VLIN
      6,12 AT 15: VLIN 24,33 AT 25
      : VLIN 12,33 AT 35
2707  COLOR= 2: VLIN 16,23 AT 6: VLIN
      17,23 AT 7: VLIN 18,23 AT 8:
       VLIN 18,23 AT 9: VLIN 20,23
       AT 10: PLOT 11,23
2708  COLOR= 9: VLIN 13,28 AT 31:
       VLIN 13,28 AT 32: VLIN 13,2
      8 AT 33: VLIN 13,28 AT 34: HLIN
      25,30 AT 13: HLIN 25,30 AT 1
      4: HLIN 25,30 AT 15
2710  COLOR= 8: PLOT 10,9
2715 BY = 32:BX =  INT ( RND (1) *
      7) + 26: COLOR= 15: PLOT BX,
      BY: RETURN
2800  REM  *** HOLE 8
2805  GOSUB 2050: COLOR= 1: HLIN
      5,35 AT 6: HLIN 15,25 AT 15:
       HLIN 5,15 AT 24: HLIN 25,35
       AT 33: VLIN 6,24 AT 5: VLIN
      15,24 AT 15: VLIN 15,33 AT 2
      5: VLIN 6,33 AT 35
```

```
2807  COLOR= 9: VLIN 7,8 AT 25: VLIN
      7,9 AT 26: VLIN 7,11 AT 27: VLIN
      7,11 AT 28: VLIN 7,12 AT 29:
       VLIN 7,12 AT 30: VLIN 7,17 AT
      31: VLIN 7,18 AT 32: VLIN 7,
      19 AT 33: VLIN 7,20 AT 34
2808  COLOR= 13: VLIN 11,13 AT 8:
       VLIN 10,15 AT 9: VLIN 9,15 AT
      10: VLIN 9,16 AT 11: VLIN 9,
      16 AT 12
2810  COLOR= 8: PLOT 10,21
2815 BY = 32:BX =  INT ( RND (1) *
      7) + 26: COLOR= 15: PLOT BX,
      BY: RETURN
2900  REM  *** HOLE 9
2905  GOSUB 2050: COLOR= 1: HLIN
      5,35 AT 6: HLIN 5,25 AT 18: HLIN
      25,35 AT 33: VLIN 6,18 AT 5:
       VLIN 18,33 AT 25: VLIN 6,33
       AT 35
2907  HLIN 8,11 AT 9: VLIN 9,15 AT
      11
2908  COLOR= 9: HLIN 25,34 AT 7: HLIN
      27,34 AT 8: HLIN 29,34 AT 9:
       HLIN 30,34 AT 10: HLIN 31,3
      4 AT 11
2910  COLOR= 8: PLOT 8,12
2915 BY = 32:BX =  INT ( RND (1) *
      7) + 26: COLOR= 15: PLOT BX,
      BY: RETURN
3000 :
3001  REM  *** PLAY
3002 :
3010  FOR HO = 1 TO 9:BC = 12
3020  ON HO GOSUB 2100,2200,2300,
      2400,2500,2600,2700,2800,290
      0
3030  HOME : PRINT "HOLE NUMBER:
      "HO" PAR: "HA(HO,5)" SCORE:
      "SC
3031  PRINT "TRAPS: ";: IF HA(HO,
      1) THEN  PRINT "WATER ";
3032  IF HA(HO,2) THEN  PRINT "SA
      ND ";
```

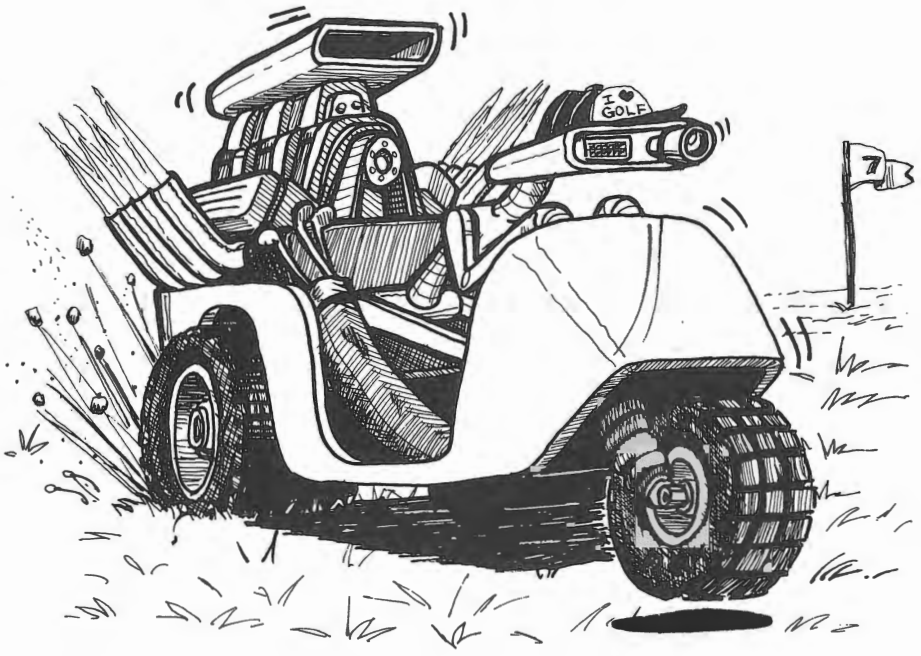
```
3033  IF HA(HO,3) THEN  PRINT "UN
      EVEN ";
3034  IF HA(HO,4) THEN  PRINT "BL
      OCKS ";
3035  VTAB 23: HTAB 1: CALL  - 95
      8: INPUT "DIRECTION (1-8): "
      ;DIR
3040  IF DIR < 1 OR DIR > 8 OR DI
      R <  >  INT (DIR) THEN  VTAB
      23: CALL  - 958: PRINT "THE
      DIRECTION IS FROM 1 TO 8 ...
      ": FOR PA = 1 TO 1500: NEXT
      PA: GOTO 3035
3045  VTAB 23: CALL  - 958: INPUT
      "SPEED (0-5): ";SP
3050  IF SP < 0 OR SP > 5 THEN  VTAB
      23: CALL  - 958: PRINT "THE
      SPEED IS FROM 0 TO 5 ...": FOR
      PA = 1 TO 1500: NEXT PA: GOTO
      3045
3055 UF = 0: REM  CLEAR UNEVEN FL
      AG
3056 TF = 0: REM  CLEAR TRAP FLAG

3100 X2 = BX + DI(DI,1):Y2 = BY +
      DI(DI,2)
3110  IF  SCRN( X2,Y2) = 12 THEN
       COLOR= BC: PLOT BX,BY: COLOR=
      15: PLOT X2,Y2:BX = X2:BY =
      Y2:BC = 12: GOTO 3900
3120  IF  SCRN( X2,Y2) = 01 THEN
      3200
3121  IF  SCRN( X2,Y2) = 02 THEN
      3300
3122  IF  SCRN( X2,Y2) = 13 THEN
      3400
3123  IF  SCRN( X2,Y2) = 09 THEN
      3500
3124  IF  SCRN( X2,Y2) = 08 THEN
      3600
```



```
3200  IF DI = 1 OR DI = 3 THEN DI
      = DI + 4: GOTO 3100
3201  IF DI = 7 OR DI = 5 THEN DI
      = DI - 4: GOTO 3100
3210  ON DI / 2 GOTO 3220,3240,32
     60,3280
3220  IF  SCRN( X2 + 1,Y2) = 1 AND
      SCRN( X2,Y2 + 1) = 1 THEN D
     I = 6: GOTO 3100
3225  IF  SCRN( X2 + 1,Y2) = 1 THEN
     DI = 4: GOTO 3100
3230  IF  SCRN( X2,Y2 + 1) = 1 THEN
     DI = 8: GOTO 3100
3235 DI = 6: GOTO 3100
3240  IF  SCRN( X2 + 1,Y2) = 1 AND
      SCRN( X2,Y2 - 1) = 1 THEN D
     I = 8: GOTO 3100
3245  IF  SCRN( X2 + 1,Y2) = 1 THEN
     DI = 2: GOTO 3100
3250  IF  SCRN( X2,Y2 - 1) = 1 THEN
     DI = 6: GOTO 3100
3255 DI = 8: GOTO 3100
3260  IF  SCRN( X2 - 1,Y2) = 1 AND
      SCRN( X2,Y2 - 1) = 1 THEN D
     I = 2: GOTO 3100
3265  IF  SCRN( X2 - 1,Y2) = 1 THEN
     DI = 8: GOTO 3100
3270  IF  SCRN( X2,Y2 - 1) = 1 THEN
     DI = 4: GOTO 3100
3275 DI = 2: GOTO 3100
3280  IF  SCRN( X2 - 1,Y2) = 1 AND
      SCRN( X2,Y2 + 1) = 1 THEN D
     I = 4: GOTO 3100
3285  IF  SCRN( X2 - 1,Y2) = 1 THEN
     DI = 6: GOTO 3100
3290  IF  SCRN( X2,Y2 + 1) = 1 THEN
     DI = 2: GOTO 3100
3295 DI = 4: GOTO 3100
3300  IF TF THEN 3310
3305 TF = 3:SC = SC + 1: REM  TRA
     P FLAG
3310  COLOR= BC: PLOT BX,BY: COLOR=
     15: PLOT X2,Y2:BX = X2:BY =
     Y2:BC = 2
```

```
3320  GOTO 3900
3400  IF TF THEN 3410
3405 TF = 3:SC = SC + 1: REM  TRA
     P FLAG
3410  COLOR= BC: PLOT BX,BY: COLOR=
     15: PLOT X2,Y2:BX = X2:BY =
     Y2:BC = 13
3420  GOTO 3900
3500  IF UF THEN 3520
3505 UF = 1: REM  UNEVEN FLAG, HA
     VE WE ROLLED BALL OFF COURSE
      YET ?...
3510 DI = DI +  INT ( RND (1) * 2
     ) * 2 - 1
3515  IF DI = 0 THEN DI = 8
3516  IF DI = 9 THEN DI = 1
3520  COLOR= BC: PLOT BX,BY: COLOR=
     15: PLOT X2,Y2:BX = X2:BY =
     Y2:BC = 9: GOTO 3900
3600  COLOR= 12: PLOT BX,BY: COLOR=
     15: PLOT X2,Y2: COLOR= 8: PLOT
     X2,Y2
3602 DI = DI +  INT ( RND (1) * 2
     ) * 2 - 1
3604  IF DI = 0 THEN DI = 8
3605 SP = SP - .4: IF SP > 0 THEN
     X2 = X2 + DI(DI,1):Y2 = Y2 +
     DI(DI,2): GOTO 3110
3606  IF DI = 9 THEN DI = 1
3610  PRINT BELL$BELL$BELL$:SC =
     SC + 1: GOTO 3990
3900 XX =  PEEK ( - 16336) -  PEEK
     ( - 16336)
3902  IF TF > 0 THEN TF = TF - 1:
      IF TF = 0 THEN 3910
3905 SP = SP - .2: IF SP > 0 THEN
     3100
3910 SC = SC + 1: GOTO 3030
3990  NEXT HO: RETURN
4000 :
4001  REM  *** END
4002 :
```

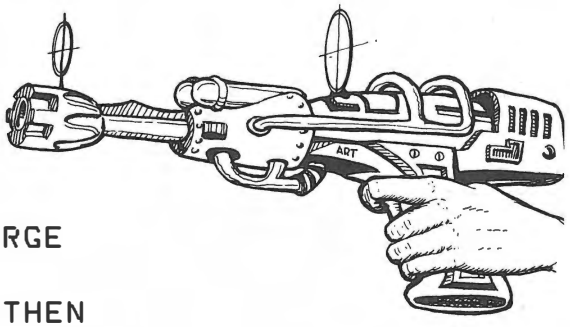
```
4010  TEXT : HOME : VTAB 3: HTAB
     9: PRINT "*** MINIATURE GOLF
      ***": VTAB 7
4020  PRINT BELL$BELL$BELL$"THE G
     AME IS OVER !!!"
4022  PRINT
4025  PRINT "ON THE PAR 27 COURSE
     , YOU SHOT ": PRINT "A ROUND
      OF "SC".  THAT IS AN": PRINT
     "AVERAGE OF "SC / 9" SHOTS P
     ER HOLE. "
4030  VTAB 22: PRINT "HOPE YOU EN
     JOYED THE GAME! "
4990  RETURN
```




This is a one-man paddle game. The object is to shoot the moving targets. Different colored targets are worth different point scores. For the most part, this game is a measure of timing, but there is also a little luck involved. If you read through MUBBLE CHASE and understood it all, then these short graphic hints and explanations may seem mundane. First, load the program. Type: LIST-2030. In terms of drawing the original game setup, lines 2020 through 2024 do the majority of the work. 2020 instructs the computer to switch from the text mode into the GRaphics (color) mode. 2021 starts a loop consisting of ten individual loops (passes). 2022 will change the color each time I changes. 2023 draws the lines that will comprise the launching pad (a collection of ten lines). To get a better idea of line 2021, type: 2021 FOR I = 1 TO 11 STEP 2. Check line 3547. You will note that the first of the two instructions sets the color to 15 (white). Since the missle that you launch is the only all-white figure you see, it follows that SX,SY are the missile's X,Y coordinates.

```
10  REM  **********************
11  REM  ***                  ***
12  REM  *** MOVING TARGET ***
13  REM  ***                  ***
14  REM  **********************
15  REM
16  REM
20  GOSUB 1000: REM  INSTS
30  GOSUB 2000: REM  SETUP
40  GOSUB 3000: REM  PLAY!
50  GOSUB 4000: REM  !END!
60  END
1000 :
1001  REM  *** INSTS
1002 :
1010  TEXT : NORMAL : HOME
1020  VTAB 3: HTAB 10: PRINT "***
      MOVING TARGET ***"
1030  VTAB 7: PRINT "IN THIS GAME
     , YOU CONTROL A MISSLE'S
     LAUNCH SITE.  THE LAUNCHER I
     S CONTROLLEDBY PADDLE 0..
     "
1040  PRINT : PRINT "PRESSING THE
      BUTTON ON THE PADDLE WILL
     RELEASE A ROCKET.  TRY TO HI
     T ONE OF THETHREE MOVING TAR
     GETS ABOVE YOU."
1050  PRINT : PRINT "DIFFERENT CO
     LORS ARE WORTH DIFFERENT
     AMOUNTS OF POINTS. SHOOT FOR
      THE BEST   SCORE."
1060  VTAB 23: INPUT "HIT RETURN
     WHEN READY TO CONTINUE : ";A
     NS$
1990  RETURN
2000 :
2001  REM  *** SETUP
2002 :
2010  DIM TA(3,4)
2015  FOR I = 1 TO 3:TA(I,1) =  INT
     ( RND (1) * 37):TA(I,2) =  INT
     ( RND (1) * (4 + (I * 2))) +
     1:TA(I,0) =  INT ( RND (1) *
     2) * 2 - 1
```

```
2016 TA(I,3) = 0:TA(I,4) =  INT (
      RND (1) * 20) + 1: NEXT
2020  GR
2021  FOR I = 1 TO 10
2022  COLOR= I
2023  HLIN (I - 1) * 4,(I - 1) *
     4 + 3 AT 39
2024  NEXT
2030  HOME : PRINT " 10  20  30
     40  50  60  70  80  90  100"

2990  RETURN
3000 :
3001  REM  *** PLAY
3002 :
3010  REM
3020  GOSUB 3600: REM  MOVE TARGE
     TS
3040 NM = NM + 1: IF NM < 200 THEN
     3020
3500 P =  INT ( PDL (0) / 6.5): IF
     PP = P THEN 3520
3510  COLOR= 0: VLIN 37,38 AT PP:
      COLOR= 12: VLIN 37,38 AT P:
     PP = P
3520  IF F THEN 3540
3525  IF  PEEK ( - 16287) < 128 THEN
      RETURN
3530 F = 1:SX = PP:SY = 36
3540  COLOR= 0: PLOT SX,SY:SY = S
     Y - 1
3542  IF  PEEK ( - 16287) > 127 THEN
     3530
3545  IF SY < 0 THEN F = 0: RETURN
3546  IF  SCRN( SX,SY) <  > 0 THEN
     3551
3547  COLOR= 15: PLOT SX,SY: RETURN

3551 Z = (SY > 22) + (SY > 12) +
     (SY > 2)
3552 PT = PT +  SCRN( SX,SY) * (4
      - Z)
3553 F = 0:TA(Z,3) = 0:TA(Z,4) =
      INT ( RND (1) * 20) + 1
```



```
3554 TA(Z,0) =  INT ( RND (1) * 2
     ) * 2 - 1:TA(Z,2) =  INT ( RND
     (1) * (4 + (I * 2))) + 1
3555 XX =  PEEK ( - 16336) +  PEEK
     ( - 16336) -  PEEK ( - 16336
     ) +  PEEK ( - 16336)
3560  HOME : PRINT : PRINT "<<< Y
     OUR SCORE IS "PT" >>>"
3565  RETURN
3600  FOR I = 1 TO 3
3602  GOSUB 3500
3605  COLOR= 0: FOR J = I * 10 -
     5 TO I * 10 - 3: HLIN TA(I,1
     ),TA(I,1) + 2 AT J: NEXT
3615 TA(I,1) = TA(I,1) + TA(I,0)
3616 TA(I,3) = TA(I,3) + 1: IF TA
     (I,3) = TA(I,4) THEN TA(I,3)
      = 0:TA(I,4) =  INT ( RND (1
     ) * 20) + 1:TA(I,0) =  INT (
      RND (1) * 2) * 2 - 1:TA(I,2
     ) =  INT ( RND (1) * (4 + (I
      * 2))) + 1
3621  IF TA(I,1) < 0 THEN TA(I,1)
      = 36
3622  IF TA(I,1) > 36 THEN TA(I,1
     ) = 0
3625  COLOR= TA(I,2): FOR J = I *
     10 - 5 TO I * 10 - 3: HLIN T
     A(I,1),TA(I,1) + 2 AT J: NEXT

3630  NEXT I: RETURN
4000 :
4001  REM  *** END
4002 :
4010  HOME : PRINT "THE GAME IS O
     VER !!!": PRINT "YOUR FINAL
     SCORE IS "PT
4990  RETURN
```


This one-man paddle game is a test of dexterity. The challenge is to maneuver the paddle so that the flying points do not collide with you. To be sure, there is some luck involved. There is an abundance of easy to understand GRaphics in this program, so it is time to begin looking at them. Line 2010 draws a white perimeter around the game board (field of play). To better understand the function of 3040 and 3041, type: 3040 COLOR=2. When you run the program, all of the points will be blue (COLOR=2). Line 3041 draws the points at their new X,Y coordinates (BP(K,1),BP(K,2)). Back at line 3020, the old X,Y coordinates of each point are blacked out (COLOR= 0). If you do not perceive the significance of this line, type: 3020 and return. Now when you run the program, the path of each point will be seen.

```
10  REM  ********************
11  REM  ***                 ***
12  REM  *** POINT ATTACK ***
13  REM  ***                 ***
14  REM  ********************
15  REM
16  REM
20  GOSUB 1000: REM  INSTS
30  GOSUB 2000: REM  SETUP
40  GOSUB 3000: REM  PLAY!
50  GOSUB 4000: REM  !END!
60  END
1000 :
1001  REM  *** INSTS
1002 :
1010  TEXT : NORMAL : HOME
1020  VTAB 3: HTAB 10: PRINT "***
      POINT ATTACK ***"
1030  VTAB 7: PRINT "IN THIS GAME
      YOU WILL CONTROL THE MOVE-
     MENT OF A PADDLE IN THE MIDD
     LE OF THE   SCREEN BY MOVING
      PADDLE 0."
1040  PRINT : PRINT "THERE WILL B
     E A FLYING POINT THAT WILL
     BOUNCE AROUND ON THE WALLS.
      THE POINT  WILL TRY TO HIT
     YOU, BUT DON'T LET IT."
1050  PRINT : PRINT "AFTER AWHILE
     , ANOTHER POINT WILL BE
     ADDED TO THE FIELD OF PLAY,
     AND YOUR    PADDLE WILL GROW
      LARGER.  AVOID BEING   HIT
     FOR AS LONG AS YOU CAN."
1060  VTAB 23: INPUT "HIT RETURN
     WHEN READY TO CONTINUE : ";A
     NS$
1990  RETURN
2000 :
2001  REM  *** SETUP
2002 :
2010  GR : COLOR= 15: HLIN 0,39 AT
     0: HLIN 0,39 AT 39: VLIN 0,3
     9 AT 0: VLIN 0,39 AT 39
```

```
2020  DIM BP(10,2),BD(10,2)
2030  FOR I = 1 TO 10:BP(I,1) = 2
     :BP(I,2) =  INT ( RND (1) *
     37) + 2:BD(I,1) = 1:BD(I,2) =
      INT ( RND (1) * 2) * 2 - 1:
      NEXT
2040 X = 20
2105  POKE 768,173: POKE 769,48: POKE
     770,192: POKE 771,136: POKE
     772,208: POKE 773,4: POKE 77
     4,198: POKE 775,1: POKE 776,
     240
2110  POKE 777,8: POKE 778,202: POKE
     779,208: POKE 780,246: POKE
     781,166: POKE 782,0: POKE 78
     3,76: POKE 784,0: POKE 785,3
     : POKE 786,96
2990  RETURN
3000 :
3001  REM  *** PLAY
3002 :
3010  FOR H = 1 TO 30:X = X - 1: HOME
     : PRINT : PRINT "<<< SCORE =
     ==> "H" >>>": FOR J = 1 TO 2
     5
3015 I = H: IF I > 10 THEN I = 10

3016  FOR K = 1 TO I
3020  COLOR= 0: PLOT BP(K,1),BP(K
     ,2)
3025 BP(K,1) = BP(K,1) + BD(K,1):
     BP(K,2) = BP(K,2) + BD(K,2)
3030  IF BP(K,1) = 1 OR BP(K,1) =
     38 THEN BD(K,1) =  - BD(K,1)
     : POKE 0, INT ( RND (1) * 25
     6): POKE 1,10: CALL 768
3031  IF BP(K,2) = 1 OR BP(K,2) =
     38 THEN BD(K,2) =  - BD(K,2)
     : POKE 0, INT ( RND (1) * 25
     6): POKE 1,10: CALL 768
3035  IF  SCRN( BP(K,1),BP(K,2)) =
     15 THEN  RETURN
3040  COLOR= K
```

```
3041  PLOT BP(K,1),BP(K,2)
3045  IF X < 1 THEN X = 1
3050  COLOR= 0: VLIN X,X + H + 2 AT
      20
3052 P =  PDL (0): IF P > 128 THEN
      X = X + 1: GOTO 3056
3055 X = X - 1
3056  IF X > 38 - (H + 2) THEN X =
      38 - (H + 2)
3057  IF X < 1 THEN X = 1
3060  COLOR= 15: VLIN X,X + H + 2
      AT 20
3070  POKE 0,2: POKE 1,1: CALL 76
      8
3099  NEXT K,J,H
3990  RETURN
4000 :
4001  REM  *** END
4002 :
4010  HOME : PRINT "THE GAME IS O
      VER !!!"
4020  PRINT "YOU'RE SCORE IS "H",
      CONGRATULATIONS !!!"
4990  RETURN
```

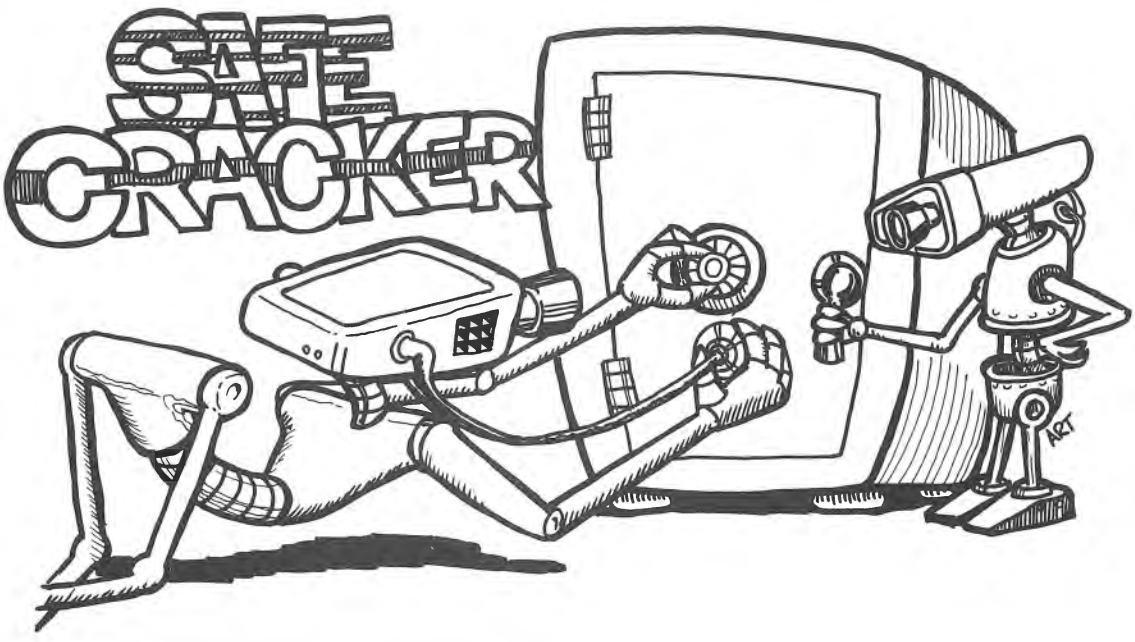

In this game you try to avoid being captured by the killer robots. Actually, escaping from the robot's relentless pursuit is most difficult. Because the pursuit is entirely pre-determined, it might be a good idea to chart your course before you make your first move. Starting at line 2100, the text mode is completed and the graphics mode is begun. Remember, once you are in the graphics mode, the HOME command only clears the bottom four rows,which are reserved for text. Note that line 2090 sets all values of FI%(I,0) equal to two. Line 2095 does the same thing to FI(0,I). Now, when line 2110 is executed, a deep blue perimeter is drawn (COLOR= FI(I,J). Line 2075 sets FI(OX,OY) to 15. Line 3025 sets the color to 15 (white). Since you are represented by the white square, it would be understandable for you to experiment with these two instructions to see what and how they function.

```
10  REM  ********************
11  REM  ***                 ***
12  REM  ***  ROBOT CHASE ***
13  REM  ***                 ***
14  REM  ********************
15  REM
16  REM
20  GOSUB 1000: REM  INSTS
30  GOSUB 2000: REM  SETUP
40  GOSUB 3000: REM  PLAY!
50  GOSUB 4000: REM  !END!
60  END
1000 :
1001  REM  *** INSTS
1002 :
1010  TEXT : NORMAL : HOME
1020  VTAB 2: HTAB 10: PRINT "***
      ROBOT CHASE ***"
1030  VTAB 5: PRINT "IN ROBOT CHA
     SE, YOU ARE AN EXPLORER WHO
     HAS LANDED HIS SPACESHIP ON
     A HOSTILE   PLANET."
1040  PRINT : PRINT "SEVERAL PROT
     ECTOR ROBOTS ARE TRYING TO
     CAPTUE YOU.  IF YOU CAN REAC
     H A BASE,   YOU WILL BE SAFE
      BEHIND ITS PROTECTIVE  FORC
     E FIELD."
1050  PRINT : PRINT "HERE'S HOW T
     HINGS WORK: ": PRINT : PRINT
     "   BLUE  - AN EXPLOSIVE FEN
     CE (BAD!)"
1060  PRINT "   WHITE - YOU"
1070  PRINT "   GREEN - ATTACKING
      ROBOT (BAD!)"
1080  PRINT "   ORANGE- PROTECTIV
     E BASE (GOOD!!!)"
1090  VTAB 23: INPUT "HIT RETN
     WHEN READY TO CONTINUE : ";A
     NS$
1100  HOME : VTAB 11
1110  PRINT "     3 2 1"
1111  PRINT "      I/         TH
     IS IS YOUR CHOICE"
```

```
1112  PRINT "      4-+-8         OF
      MOVEMENT"
1113  PRINT "       /I          TH
     ROUGH THE MAZE"
1114  PRINT "      5 6 7"
1120  VTAB 23: INPUT "HIT RETURN
     WHEN READY TO CONTINUE : ";A
     NS$
1990  RETURN
2000 :
2001  REM  *** SETUP
2002 :
2010  DIM FI%(21,11)
2015  DEF  FN R(X) =  INT ( RND (
     1) * X) + 1
2020 NR = 4 +  FN R(5): DIM RO%(9
     ,2)
2021 NO =  INT ((NR - 4) / 2) + 1

2025  FOR I = 1 TO NR
2030 RX =  FN R(20):RY =  FN R(10
     )
2035  IF FI%(RX,RY) THEN 2030
2040 FI%(RX,RY) = 4:RO%(I,1) = RX
     :RO%(I,2) = RY: NEXT I
2045  FOR I = 1 TO NO
2050 OX =  FN R(20):OY =  FN R(10
     )
2055  IF FI%(OX,OY) THEN 2050
2060 FI%(OX,OY) = 9: NEXT I
2070 YX =  FN R(20):YY =  FN R(10
     )
2075 FI%(YX,YY) = 15
2090  FOR I = 0 TO 21:FI%(I,0) =
     2:FI%(I,11) = 2: NEXT I
2095  FOR I = 0 TO 11:FI%(0,I) =
     2:FI%(21,I) = 2: NEXT I
2100  GR : HOME
2110  FOR I = 0 TO 21: FOR J = 0 TO
     11: COLOR= FI%(I,J): PLOT I +
     9,J + 14: NEXT J,I
```

```
2200  DIM DI(8,2): FOR I = 1 TO 8
      : READ DI(I,1),DI(I,2): NEXT
      I: DATA  1,-1,0,-1,-1,-1,-1,
      0,-1,1,0,1,1,1,1,0
2990  RETURN
3000 :
3001  REM  *** PLAY
3002 :
3010  HOME : PRINT "3 2 1": PRINT
      "4 + 8": PRINT "5 6 7      W
      HICH DIRECTION ===> "; CHR$
      (7);: GET ANS$:ANS =  VAL (A
      NS$): IF ANS < 1 OR ANS > 8 THEN
      3010
3015  HOME
3020 X2 = YX + DI(AN,1):Y2 = YY +
      DI(AN,2)
3025  COLOR= 0: PLOT YX + 9,YY +
      14: COLOR= 15: PLOT X2 + 9,Y
      2 + 14
3030  IF FI%(X2,Y2) = 2 THEN WL =
      0: RETURN : REM   FENCE
3031  IF FI%(X2,Y2) = 4 THEN WL =
      0: RETURN : REM   ROBOT
3032  IF FI%(X2,Y2) = 9 THEN WL =
      1: RETURN : REM   BASE
3035 FI%(YX,YY) = 0:YX = X2:YY =
      Y2:FI%(YX,YY) = 15
3040  FOR I = 1 TO NR
3045  IF  FN R(4) = 1 THEN X2 =  FN
      R(3) - 2:Y2 =  FN R(3) - 2: GOTO
      3055
3050 X2 =  SGN (YX - RO%(I,1)):Y2
       =  SGN (YY - RO%(I,2))
3055 X2 = X2 + RO%(I,1):Y2 = Y2 +
      RO%(I,2): IF FI%(X2,Y2) = 2 OR
      FI%(X2,Y2) = 4 OR FI%(X2,Y2)
       = 9 THEN 3045
3060  COLOR= 0: PLOT RO%(I,1) + 9
      ,RO%(I,2) + 14: COLOR= 4: PLOT
      X2 + 9,Y2 + 14
3065  IF FI%(X2,Y2) = 15 THEN WL =
      0: RETURN : REM   HUMAN
```

```
3070 FI%(RO%(I,1),RO%(I,2)) = 0:R
     O%(I,1) = X2:RO%(I,2) = Y2:F
     I%(RO%(I,1),RO%(I,2)) = 4
3075  NEXT I: GOTO 3010
3990  RETURN
4000 :
4001  REM  *** END
4002 :
4010  HOME : PRINT "THE GAME IS O
     VER !!!"
4011  IF WL THEN  PRINT "YOU'VE B
     EATEN THE KILLER ROBOTS (YEA
     H!)"
4012  IF  NOT WL THEN  PRINT "THE
      KILLER ROBOTS GOT YOU !!! (
     SORRY,,)"
4013  PRINT  CHR$ (7); CHR$ (7); CHR$
     (7)
4990  RETURN
```




In this exciting game, you try to discern the combination to a safe. Your ears, as well as your eyes, are important tools. The object of the game is to open an enemy agent's safe before the thirty second delayed explosion kills you. Once you grasp all of the rules, you will discover that being a safe cracker is not too easy! Armed with a sophisticated safe cracking device, you try to detect the numbers in the combination one by one. Each time you pinpoint a number, you turn the paddle the other way until you pinpoint the next number in the combination. When you have identified the entire three-number combination, then the safe will open, and the explosion will be postponed. The three numbers in the combination are set by lines 2010, 2011, and 2012. You will note the word 'INVERSE' in line 2030. NORMAL sets the print mode to white letters on a black background. INVERSE reverses this so that you get black letter on a white background. Lines 2030 and 2035 draw the outline of the safe while in the INVERSE mode. That is how a white outine is drawn around the safe.

Our resident critic did not think that

<<< B O O M >>>

fulfilled the promise of a "terrible explosion". As a programmer trainee this is just the sort of routine you can manufacture to match your own expectations.

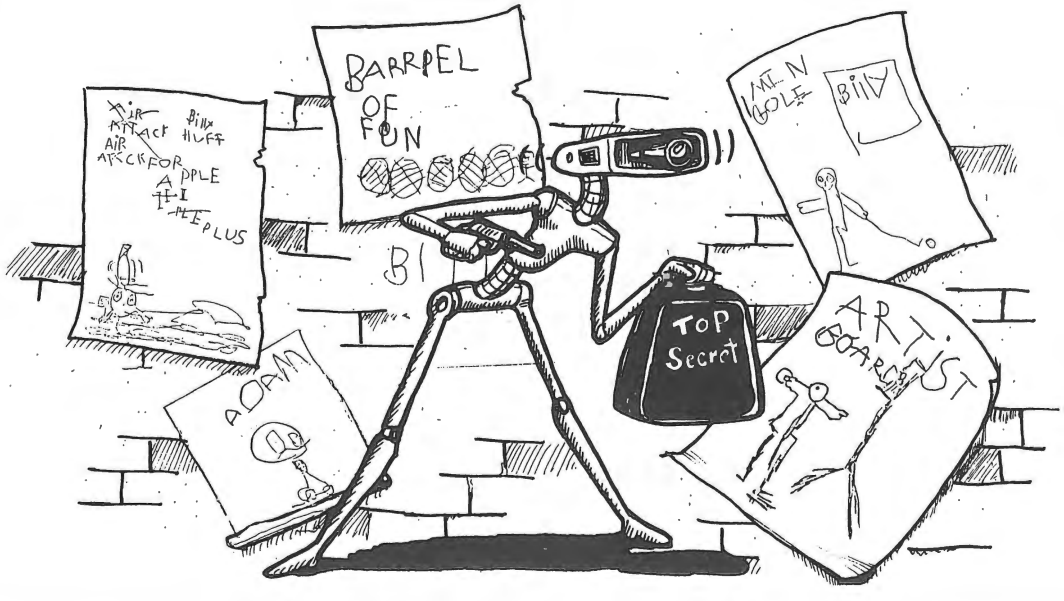
```
10  REM  ********************
11  REM  ***                 ***
12  REM  *** SAFE CRACKER ***
13  REM  ***                 ***
14  REM  ********************
15  REM
16  REM
20  GOSUB 1000: REM  INSTS
30  GOSUB 2000: REM  SETUP
40  GOSUB 3000: REM  PLAY!
50  GOSUB 4000: REM  !END!
60  END
1000 :
1001  REM  *** INSTS
1002 :
1010  TEXT : NORMAL : HOME
1020  VTAB 3: HTAB 10: PRINT "***
      SAFE CRACKER ***"
1030  VTAB 7: PRINT "YOU ARE A GO
     VERNMENT SPY, AND YOU MUST
     RETRIEVE SOME CLASSIFIED DOC
     UMENTS WHICHWERE STOLEN BY F
     OREIGN AGENTS."
1040  PRINT : PRINT "THE DOCUMENT
     S ARE KEPT IN A VAULT WHICH
     YOU MUST OPEN."
1050  PRINT : PRINT "YOU HAVE BEE
     N GIVEN A SOPHISTICATED SAFE
     CRACKING DEVICE.  WHENEVER T
     HE TUMBLERS IN A SAFE CLICK
     INTO PLACE, THE DEVICE  WILL
      ALSO MAKE A CLICKING SOUND.
       IF YOUEITHER DIRECTLY HIT
     OR PASS BY A NUMBER"
1052  PRINT "IN THE COMBINATION,
     THEN THE DEVICE WILL EMIT A
     CLICK."
1055  PRINT : PRINT
1060  INPUT "HIT RETURN WHEN READ
     Y TO CONTINUE : ";ANS$
1070  HOME : VTAB 3: HTAB 10: PRINT
     "*** SAFE CRACKER ***": VTAB
     7
```

```
1080  PRINT "START BY TURNING PAD
      DLE Ø ALL THE WAY TOTHE LEFT
        (VALUE OF Ø).  THEN MOVE T
      HE  PADDLE TO THE RIGHT UNTI
      L YOU GET THE   FIRST NUMBER
      . "
1090  PRINT : PRINT "WHEN YOU DIS
      COVER THE FIRST NUMBER, THEN
      TURN TO THE LEFT UNTIL YOU G
      ET THE 2ND  NUMBER.  FINALLY
      , TURN THE DIAL BACK TO THE
      RIGHT FOR THE THIRD AND LAST
       NUMBER. "
1095  PRINT : PRINT "IF YOU GO PA
      ST A NUMBER, THEN YOU MUST
      TURN THE DIAL ALL THE WAY TO
       THE LEFT,  AND START OVER."

1100  VTAB 23: INPUT "HIT RETURN
      WHEN READY TO CONTINUE : ";A
      NS$
1110  HOME : VTAB 3: HTAB 10: PRINT
      "*** SAFE CRACKER ***": VTAB
      7
1120  PRINT "OH, BY THE WAY, ONCE
       YOU HAVE TOUCHED   THE SAFE
      , YOU WILL HAVE THIRTY SECON
      DS  TO OPEN IT.  WHEN THIRTY
       SECONDS HAS    PASSED, THE
      SAFETY MECHANISM WILL CAUSE
      A TERRIBLE EXPLOSION."
1130  VTAB 23: INPUT "HIT RETURN
      WHEN READY TO CONTINUE : ";A
      NS$
1990  RETURN
2000  :
2001  REM  *** SETUP
2002  :
2010 N1 =  INT ( RND (1) * 60) +
      1
2011 N2 =  INT ( RND (1) * 60) +
      1: IF N2 >  = N1 THEN 2010
```

```
2012 N3 =  INT ( RND (1) * 60) +
     1: IF N3 <  = N2 THEN 2010
2020  HOME : VTAB 3: HTAB 10: PRINT
     "*** SAFE CRACKER ***"
2030  INVERSE : VTAB 5: HTAB 14: PRINT
     "            ": VTAB 15: HTAB
     14: PRINT "            "
2035  FOR I = 6 TO 14: VTAB I: HTAB
     14: PRINT " ";: HTAB 25: PRINT
     " ";: NEXT : NORMAL
2040 TI = 300:F = 1:D = 1
2045 V2 = 10:H2 = 19
2990  RETURN
3000 :
3001  REM  *** PLAY
3002 :
3010 TI = TI - 1:T =  INT (TI / 1
     0): VTAB 17: HTAB 15: PRINT
     "TIME :     ";: VTAB 17: HTAB
     22: PRINT T + 1
3015  IF T + 1 = 0 THEN WL = 0: RETURN

3020 P =  INT ( PDL (0) / 4.25)
3022  VTAB 7: HTAB 19: PRINT "  "
     ;: VTAB 7: HTAB 19: PRINT P;

3023  GOSUB 3700
3024  IF P > 0 AND F THEN  VTAB 9
     : HTAB 1: PRINT "TURN DIAL":
      VTAB 10: HTAB 1: PRINT "TO
     THE LEFT": GOTO 3010
3025  IF P = 0 AND F THEN F = 0: VTAB
     9: HTAB 1: PRINT "         "
     ;: VTAB 10: HTAB 1: PRINT "
               ";
3030  VTAB 7: HTAB 19: PRINT "  "
     ;: VTAB 7: HTAB 19: PRINT P;

3035  ON D GOTO 3040,3050,3060
3040  IF P < N1 THEN 3010
3041  IF P > N1 THEN  GOSUB 3500:
      GOSUB 3600:F = 1: GOTO 3010
```

```
3042  GOSUB 3500:D = 2: GOTO 3010

3050  IF P > N1 THEN  GOSUB 3600:
     F = 1:D = 1: GOTO 3010
3054  IF P > N2 THEN 3010
3056  IF P < N2 THEN  GOSUB 3500:
      GOSUB 3600:F = 1: GOTO 3010

3058  GOSUB 3500:D = 3: GOTO 3010

3060  IF P < N2 THEN  GOSUB 3600:
     F = 1:D = 1: GOTO 3010
3064  IF P < N3 THEN 3010
3066  IF P > N3 THEN  GOSUB 3500:
      GOSUB 3600:F = 1: GOTO 3010

3068  GOSUB 3500:WL = 1: RETURN
3500  VTAB 5 + D: HTAB 30: PRINT
     "<CLICK>": FOR I = 1 TO 10:X
     X =  PEEK ( - 16336): NEXT :
      RETURN
3600  VTAB 6: HTAB 30: PRINT "
         ": VTAB 7: HTAB 30: PRINT
     "         ": VTAB 8: HTAB 30: PRINT
     "          ": RETURN
3700 PP = P -  INT (P / 4) * 4: ON
     PP + 1 GOTO 3701,3702,3703,3
     704
3701 V = 10:H = 19: GOTO 3705
3702 V = 11:H = 20: GOTO 3705
3703 V = 12:H = 19: GOTO 3705
3704 V = 11:H = 18: GOTO 3705
3705  VTAB V2: HTAB H2: PRINT " "
     ;: VTAB V: HTAB H: PRINT "*"
     ;:V2 = V:H2 = H: RETURN
3710  VTAB 23: HTAB 1: PRINT PP: RETURN
4000 :
4001  REM  *** END
4002 :
4010  IF WL = 1 THEN 4040
```

```
4015  HOME : INVERSE : FOR I = 1 TO
      10: VTAB I: PRINT "*********
      ****************************
      ***";: VTAB 21 - I: PRINT "*
      ****************************
      **********";: NEXT I: NORMAL

4020  VTAB 10: HTAB 10: PRINT " <
      < < B O O M ! > > > ": FOR
      I = 1 TO 100:XX =  PEEK ( -
      16336) +  PEEK ( - 16336) -
       PEEK ( - 16336): NEXT
4030  VTAB 22: PRINT "THE COMBINA
      TION WAS : ";N1"-"N2"-"N3: RETURN

4040  VTAB 21: PRINT  CHR$ (7); CHR$
      (7); CHR$ (7);"THE PAPERS AR
      E YOURS !!!": PRINT "YOUR CO
      LLEAGUES WILL BE QUITE IMPRE
      SSED.": RETURN
```



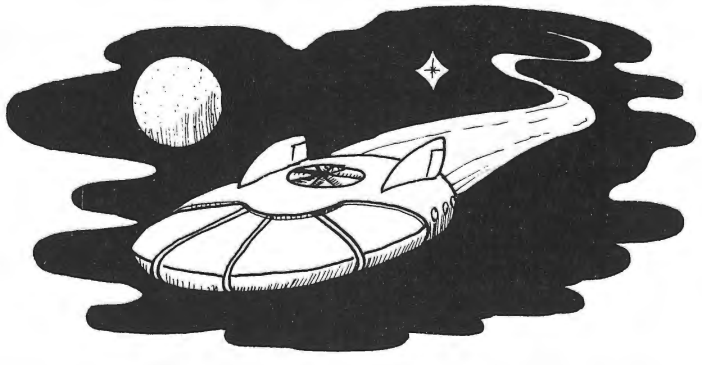

This is another two-player paddle game. Each player controls the up-and-down movements of a flying saucer. The object is to shoot your opponent's ship. The first player to do this three times is the winner. Line 3010 is responsible for, among other things, drawing the field of stars through which you must shoot. Lines 3520 and 3570 black out the prior position of each ship. To verify this, change COLOR= 0 to COLOR=1. Each time saucer #1 is moved, line 3605 draws the saucer in the new position. Line 3705 does the same for saucer #2. Line 3872 blacks out the previous position of each bomb that you shoot. Change COLOR= 0 to COLOR=8. If you manage to shoot your opponent, line 3950 draws the magenta (COLOR= 1) squares, and makes the corresponding noises (PEEK ( - 16336)).

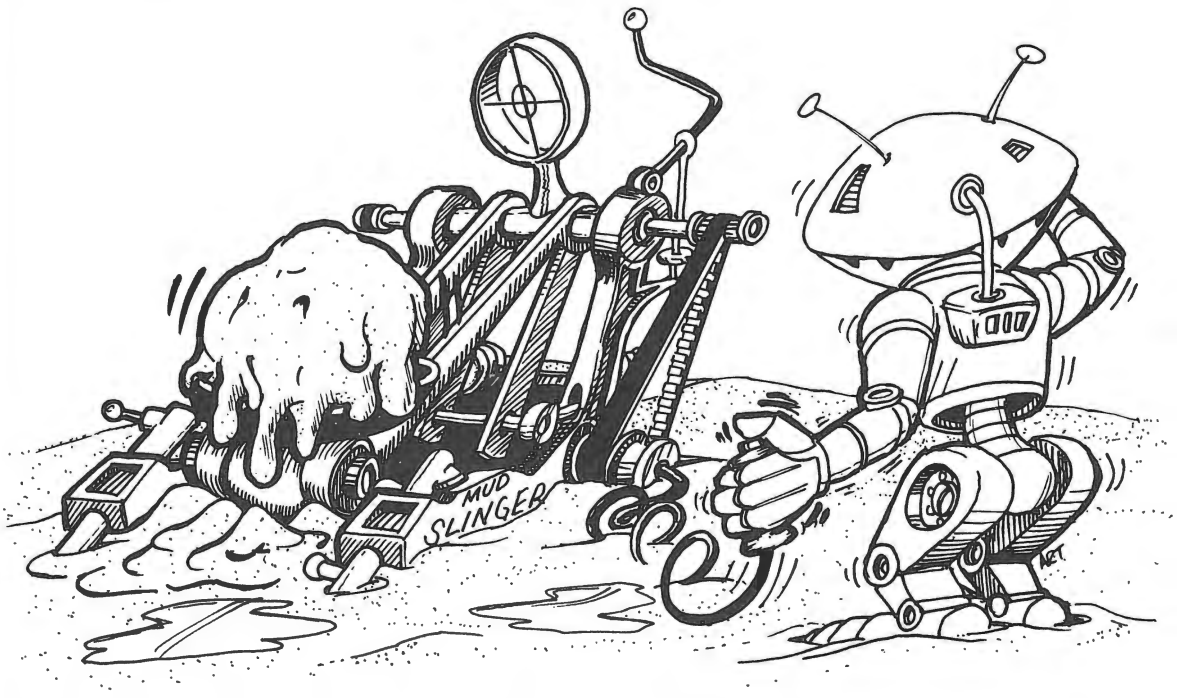
```
10  REM  ********************
11  REM  ***                 ***
12  REM  *** SAUCER DUELS ***
13  REM  ***                 ***
14  REM  ********************
15  REM
16  REM
20  GOSUB 1000: REM  INSTS
30  GOSUB 2000: REM  SETUP
40  GOSUB 3000: REM  PLAY!
50  GOSUB 4000: REM  !END!
60  END
1000 :
1001  REM  *** INSTS
1002 :
1010  TEXT : NORMAL : HOME
1020  VTAB 3: HTAB 10: PRINT "***
      SAUCER DUELS ***"
1030  VTAB 7: PRINT "THIS IS A TW
     O-PLAYER GAME.  EACH PLAYER
     CONTROLS A FLYING SAUCER BY
     USING THE   PADDLES."
1035  PRINT
1040  PRINT "PADDLE 0 IS FOR PLAY
     ER #1, AND IS ON THELEFT SID
     E OF THE SCREEN.  PADDLE 1 I
     S   FOR PLAYER #2, AND IS ON
      THE RIGHT SIDE OF THE SCREE
     N."
1045  PRINT
1050  PRINT "MOVE THE SAUCERS UP
     AND DOWN WITH THE   PADDLE C
     ONTROL.  TO SHOOT AT THE ENE
     MY  SHIP, PRESS YOUR BUTTON.
       THE FIRST ONE TO SCORE THR
     EE HITS WINS THE GAME."
1060  VTAB 23: INPUT "HIT RETURN
     WHEN READY TO CONTNUE : ";AN
     S$
1990  RETURN
2000 :
2001  REM  *** SETUP
2002 :
```

```
2010 P1 = 0:P2 = 0
2020  DEF  FN R(X) =  INT ( RND (
     1) * X)
2990  RETURN
3000 :
3001  REM  *** PLAY
3002 :
3005 F1 = 0:F2 = 0:HI = 0:L2 =  -
     1:L4 =  - 1
3010  GR : HOME : FOR I = 1 TO 50
     :X =  FN R(24) + 8:Y =  FN R
     (40): COLOR=  FN R(14): PLOT
     X,Y: NEXT
3020  PRINT "PLAYER #1
                  PLAYER 2";: PRINT
     "   "P1"
                "P2
3030  GOSUB 3500: REM  MOVE SHIPS

3040  GOSUB 3800: REM  MOVE SHOTS

3050  IF HI = 0 THEN 3030
3060  IF HI = 1 THEN P1 = P1 + 1:
      GOTO 3080
3070  IF HI = 2 THEN P2 = P2 + 1:
      GOTO 3080
3080  IF P1 < 3 AND P2 < 3 THEN 3
     005
3090  RETURN
3500 L1 =  INT ( PDL (0) / 6.8):L
     3 =  INT ( PDL (1) / 6.8)
3510  IF L2 = L1 THEN 3550
3520  IF L2 < L1 THEN  COLOR= 0: GOSUB
     3600:L2 = L2 + 1: COLOR= 15:
      GOSUB 3600: GOTO 3550
3530  COLOR= 0: GOSUB 3600:L2 = L
     2 - 1: COLOR= 15: GOSUB 3600
     : GOTO 3550
3550  IF L4 = L3 THEN 3590
3560  IF L4 < L3 THEN  COLOR= 0: GOSUB
     3700:L4 = L4 + 1: COLOR= 15:
      GOSUB 3700: GOTO 3590
```

```
3570  COLOR= 0: GOSUB 3700:L4 = L
     4 - 1: COLOR= 15: GOSUB 3700
     : GOTO 3590
3590  RETURN
3600  IF L2 < 0 THEN  RETURN
3605  HLIN 2,4 AT L2: HLIN 0,2 AT
     L2 + 1: HLIN 4,6 AT L2 + 1: HLIN
     1,5 AT L2 + 2: RETURN
3700  IF L4 < 0 THEN  RETURN
3705  HLIN 35,37 AT L4: HLIN 33,3
     5 AT L4 + 1: HLIN 37,39 AT L
     4 + 1: HLIN 34,38 AT L4 + 2:
      RETURN
3800  IF F1 THEN 3850
3805  IF  PEEK ( - 16287) < 128 THEN
     3850
3810 F1 = 1:X1 = 7:Y1 = L2 + 1: COLOR=
     12: PLOT X1,Y1
3850  IF F2 THEN 3870
3855  IF  PEEK ( - 16286) < 128 THEN
     3870
3860 F2 = 1:X2 = 32:Y2 = L4 + 1: COLOR=
     12: PLOT X2,Y2
3870  FOR I = 1 TO 5
3871  IF  NOT F1 THEN 3880
3872  COLOR= 0: PLOT X1,Y1
3873 X1 = X1 + 1: IF X1 > 39 THEN
     F1 = 0: GOTO 3880
3875  IF  SCRN( X1,Y1) = 0 THEN  COLOR=
    12: PLOT X1,Y1: GOTO 3880
3876  IF  SCRN( X1,Y1) <  > 15 THEN
      COLOR= 0: PLOT X1,Y1: GOSUB
     3900:F1 = 0: GOTO 3880
3878  GOSUB 3950:HI = 1: RETURN
3880  IF  NOT F2 THEN 3890
3882  COLOR= 0: PLOT X2,Y2
3883 X2 = X2 - 1: IF X2 < 0 THEN
     F2 = 0: GOTO 3890
3885  IF  SCRN( X2,Y2) = 0 THEN  COLOR=
    12: PLOT X2,Y2: GOTO 3890
3886  IF  SCRN( X2,Y2) <  > 15 THEN
      COLOR= 0: PLOT X2,Y2: GOSUB
     3900:F2 = 0: GOTO 3890
```

```
3888  GOSUB 3960:HI = 2: RETURN
3890  NEXT : RETURN
3900  FOR J = 1 TO 5:XX =  PEEK (
      - 16336): NEXT : RETURN
3950  COLOR= 1: FOR I = 1 TO 12: PLOT
     X1 - 6 +  FN R(7),Y1 - 1 +  FN
     R(3):XX =  PEEK ( - 16336) -
      PEEK ( - 16336) +  PEEK ( -
     16336) -  PEEK ( - 16336): NEXT
     : RETURN
3960  COLOR= 1: FOR I = 1 TO 12: PLOT
     X2 +  FN R(7),Y2 - 1 +  FN R
     (3):XX =  PEEK ( - 16336) -
      PEEK ( - 16336) +  PEEK ( -
     16336) -  PEEK ( - 16336): NEXT
     : RETURN
4000 :
4001  REM  *** END
4002 :
4010  HOME : PRINT "THE GAME IS O
     VER !!!"
4020  IF P1 = 3 THEN  PRINT "PLAY
     ER NUMBER 1 IS THE WINNER !!
     !"
4021  IF P2 = 3 THEN  PRINT "PLAY
     ER NUMBER 2 IS THE WINNER !!
     !"
4990  RETURN
```






# Schmoo

This whimsical name and the humorous object of the game serve to camoflage an excellent thinking-man's game. It is hard to imagine how a person could play, and not come away with a better understanding of the X,Y coordinate system. The premise is that you are trying to splat a mudball on the mud-loving Schmoo. The elevation at which you aim the automatic mudball slinger determines how far the mudball will travel. The angle at which you shoot will be determined by the coordinates of the Schmoo. Following will be a list of coordinates and the angles they represent.

| X | Y | ANGLE |
|---|---|---|
| 12239 | 0 | 0 |
| 17866 | 17866 | 45 |
| 0 | 23910 | 90 |
| -5888 | 5888 | 135 |
| -9400 | 0 | 180 |
| -25727 | -25727 | 225 |
| 0 | -18992 | 270 |
| 31101 | -31101 | 315 |

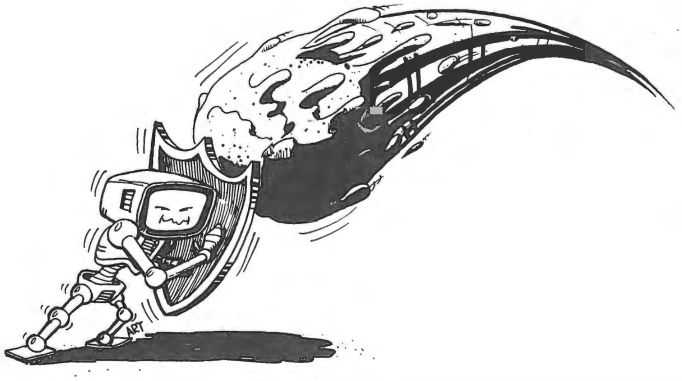
We hope this chart will help you to understand how the various coordinates relate to the angles.

```
10  REM  ********************
11  REM  ***                 ***
12  REM  ***     SCHMOO      ***
13  REM  ***                 ***
14  REM  ********************
15  REM
16  REM
20  GOSUB 1000: REM  INSTS
30  GOSUB 2000: REM  SETUP
40  GOSUB 3000: REM  PLAY!
50  GOSUB 4000: REM  !END!
60  END
1000 :
1001  REM  *** INSTS
1002 :
1010  TEXT : HOME : NORMAL
1020  VTAB 1: HTAB 13: PRINT "***
      SCHMOO ***"
1030  VTAB 5: PRINT "THIS IS THE
     GAME OF SCHMOO.  IN IT YOU
     THROW MUD AROUND IN HOPES OF
      HITTING THEMUD-LOVING SCHMO
     O."
1040  PRINT : PRINT "YOU ARE SITU
     ATED IN THE CENTER OF AN X,Y
     COORDINATE SYSTEM; AT POSITI
     ON 0,0.  THESCHMOO WILL BE L
     OCATED SOMEWHERE ON THE SAME
      PLANE.  HIS COORDINATES ARE
      GIVEN  TO YOU BEFORE EACH T
     URN."
1045  VTAB 23: INPUT "HIT RETURN
     WHEN READY TO CONTINUE : ";A
     NS$
1047  HOME : VTAB 1: HTAB 13: PRINT
     "*** SCHMOO ***": VTAB 5
1050  PRINT : PRINT "YOU HAVE YOU
     R TRUSTY AUTOMATIC MUDBALL
     SLINGER WHICH YOU USE TO TOS
     S MUDBALLS  AT THE SCHMOO.
     YOU INPUT THE ELEVATION AND
     THE ANGLE AT WHICH YOU WISH
     TO FIRE"
```

```
1055  PRINT "THE MUDBALL.  AFTER
     EACH SHOT YOU WILL  BE GIVEN
      THE COORDINATES WHERE THE M
     UD  LANDED.  "
1060  PRINT : PRINT "FOR EXAMPLE,
      IF THE SCHMOO'S COORDINATES
     ARE (-5,10) THEN THE SCHMOO
     IS ABOUT    FIVE FEET TO YOU
     R LEFT AND ABOUT TEN    FEET
      IN FRONT OF YOU."
1070  PRINT : PRINT "THE ELEVATIO
     N FOR THE SHOT WOULD BE
     ABOUT 89.95 DEGREES WHILE TH
     E ANGLE     WHERE THE SCHMOO
      CAN BE FOUND IS ABOUT  110
     DEGREES."
1080  PRINT : INPUT "HIT RETURN W
     HEN READY TO CONTINUE : ";AN
     S$
1090  HOME : VTAB 1: HTAB 13: PRINT
     "*** SCHMOO ***": VTAB 5
1100  PRINT "THE MUDBALLS ARE LAR
     GE ENOUGH TO MUDDY  THE SCHM
     OO AS LONG AS THEY LAND WITH
     IN  100 FEET OF HIM."
1110  PRINT : PRINT : PRINT "NOW
     THAT YOU KNOW HOW TO MAKE TH
     E SCHMOOHAPPY, GO GET HIM.
     GOOD LUCK!"
1120  VTAB 23: INPUT "HIT RETURN
     WHEN READY TO CONTINUE : ";A
     NS$
1990  RETURN
2000 :
2001  REM  *** SETUP
2002 :
2010 S1 =  INT ( RND (1) * 2) * 2
      - 1:S2 =  INT ( RND (1) * 2
     ) * 2 - 1
2020 SX = ( INT ( RND (1) * 26000
     ) + 5000) * S1:SY = ( INT ( RND
     (1) * 26000) + 5000) * S1
2030 BELL$ =  CHR$ (7)
2035 CNSTR = 3.1415926357989 / 18
     0
```

```
2990  RETURN
3000 :
3001  REM  *** PLAY
3002 :
3005  HOME : VTAB 3: HTAB 13: PRINT
     "*** SCHMOO ***": VTAB 7
3010  PRINT : PRINT BELL$"THE SCH
     MOO IS AT COORDINATES : ": PRINT
     "("SX","SY")"
3015  PRINT : PRINT "WHAT ELEVATI
     ON FOR THE": INPUT "MUDBALL
     SLINGER (0-90) : ";EL
3020  IF EL > 90 OR EL < 1 THEN  PRINT
     "THE ELEVATION RANGES FROM 1
      TO 90...": GOTO 3015
3025  IF EL = 90 THEN  PRINT "THA
     T WOULD SHOOT THE MUD STRAIG
     HT UP....AND IT WOULD COME D
     OWN ON TOP OF YOU!": GOTO 30
     15
3030  PRINT : PRINT "WHAT ANGLE O
     F DIRECTION FOR THE": INPUT
     "MUDBALL SLINGER (0-360) : "
     ;AN
3035  IF AN < 0 OR AN > 360 THEN
      PRINT "THE ANGLES RANGES FR
     OM 0 TO 360.": GOTO 3030
3040 DM =  ABS ( INT (93000 *  SIN
     (EL * CN) *  COS (EL * CN)))

3045 XM = DM *  COS (AN * CN):YM =
     DM *  SIN (AN * CN)
3050 DS =  SQR ((SX - XM) ^ 2 + (
     SY - YM) ^ 2)
3055  PRINT : PRINT "THE MUD SPLA
     TTERED AT COORDIATES :": PRINT
     "(" INT (XM)"," INT (YM)")"
3060 TRY = TRY + 1
3065  IF DS <  = 100 THEN  PRINT
     : PRINT BELL$BELL$"THAT'S GO
     OD ENOUGH TO": PRINT "SPLAT
     THE SCHMOO !!!": RETURN
3070  GOTO 3010
4000 :
```

```
4001  REM  *** END
4002 :
4010  PRINT : PRINT "YOU SPLATTED
      THE SCHMOO IN "TRY" TRIES."

4020  INPUT "DO YOU WISH TO PLAY
     AGAIN?";ANS$
4030  IF  LEFT$ (ANS$,1) = "Y" THEN
      RUN
4035  PRINT : PRINT "THANKS FOR S
     PLATTING THE SCHMOO !!"
4990  RETURN
```




True to its name, the object is to dodge the stars for as long as possible. Don't try to intercept the stars. If you do, you lose! This program is run entirely in the TEXT mode. This is done to aid your understanding of the graphics by using text format commands in place of graphic commands. You may notice the absence of certain commands, such as: HLIN, PLOT COLOR, GR, and others. Line 3055 uses an HTAB and a VTAB and a PRINT statement instead of: PLOT (variable name) AT SX,SY.

What do those POKES do in lines 2100 and 2110 do? If you add 2099 GOTO 2990 to isolate these lines from the program you will be suprised. The program runs just the same! But does it? If you already ran the program the POKES put a machine language routine in memory that stays there even when you type RUN, NEW, or even PR#6. Turn the computer off and on. Load Stardodger (don't run it). Type 2099 GOTO 2990 and run the program. Now you see that these lines created the sounds that accompanied the stars as they popped onto the screen. The sounds are CALL(ed) in line 3035. You can make your own music with this machine language routine and add sounds to your own programs.

DEL(ete) all of the program except lines 2100 and 2110

ADD:

```
2120 X = PDL(0):Y = PDL(1)
2130 POKE 0,X :POKE 1,Y
2140 CALL 768
2150 GOTO 2120
```

You will have an instrument that plays background music for low budget science fiction movies.

Another variation on that theme:

```
2120 GET A$
2130 X = ASC (A$)
2140 POKE 0,X:POKE 1,50
2150 CALL768
2160 GOTO 2120
```

Turns the Apple keyboard into a piano; even the control keys and RETURN play music.

```
10  REM  ********************
11  REM  ***                 ***
12  REM  ***  STARDODGER     ***
13  REM  ***                 ***
14  REM  ********************
15  REM
16  REM
20  GOSUB 1000: REM  INSTS
30  GOSUB 2000: REM  SETUP
40  GOSUB 3000: REM  PLAY!
50  GOSUB 4000: REM  !END!
60  END
1000 :
1001  REM  *** INSTS
1002 :
1010  TEXT : NORMAL : HOME
1020  VTAB 3: HTAB 11: PRINT "***
      STARDODGER ***"
1030  VTAB 5: PRINT "IN THIS GAME
     , YOU WILL BE USING THE GAME
     PADDLE TO PILOT A SPACESHIP.
       THE OBJECTIS TO MANEUVER T
     HE SHIP THROUGH A FIELD OF S
     TARS, AND TO SUCCESSFULLY RE
     ACH THE BOTTOM OF THE SCREEN
     ."
```

```
1035  PRINT : PRINT "YOU MUST TRY
      TO AVOID COLLIDING WITH THE
     STARS.  EACH COLLISION WITH
     THE STARS   DRAINS POWER FRO
     M YOUR SHIP'S PROTECTIVESHIE
     LDS."
1040  PRINT : PRINT "YOU HAVE FIV
     E ATTEMPTS TO REACH THE HOME
     BASE BEFORE YOUR SHIELDS GIV
     E OUT.  AT  THIS POINT, THE
     NEXT COLLISION WILL FINDYOUR
      SHIP WITH NO POWER AND THE
     SHIP    WILL BE DESTROYED >
     BOOM! <"
1043  PRINT
1045  CALL  - 958: PRINT "HOW DO
     YOU RATE YOURSELF ?": INPUT "
     1=POOR ... 10=GREAT.  ";ANS:
      IF ANS < 1 OR ANS > 10 OR A
     NS <  >  INT (ANS) THEN 1045

1990  RETURN
2000 :
2001  REM  *** SETUP
2002 :
2010  DEF  FN R(X) =  INT ( RND (
     1) * X) + 1
2015 NT = 5
2020 DUR = (11 - ANS) * 5
2025 BE$ =  CHR$ (7)
2100  POKE 768,173: POKE 769,48: POKE
     770,192: POKE 771,136: POKE
     772,208: POKE 773,4: POKE 77
     4,198: POKE 775,1: POKE 776,
     240
2110  POKE 777,8: POKE 778,202: POKE
     779,208: POKE 780,246: POKE
     781,166: POKE 782,0: POKE 78
     3,76: POKE 784,0: POKE 785,3
     : POKE 786,96
2990  RETURN
3000 :
3001  REM  *** PLAY
```

```
3002 :
3010  HOME : VTAB 10: IF NT > 1 THEN
      PRINT NT" ATTEMPTS REMAIN !
     !!": GOTO 3014
3012  PRINT "1 ATTEMPT REMAINS !!
     !"
3014  FOR I = 1 TO 1000: NEXT I
3015 SX =  FN R(38):SY = 1: HOME

3017 X2 = SX:Y2 = SY
3020  VTAB SY: HTAB SX: PRINT "
      ";:SX = X2:SY = Y2
3025  FOR I = 1 TO ANS / 3: VTAB
     24: HTAB  FN R(40): PRINT  MID$
     ("*+#X", FN R(4),1);: NEXT I
     : VTAB 24: HTAB 40: PRINT
3035  POKE 0, FN R(50) + 200: POKE
     1,DUR: CALL 768
3040  IF  SCRN( SX - 1,SY * 2) <
      > 0 OR  SCRN( SX,SY * 2) <
      > 0 OR  SCRN( SX + 1,SY * 2
     ) <  > 0 THEN 3100
3045  IF  PDL (0) < 20 THEN X2 =
     SX - 2: GOTO 3050
3046  IF  PDL (0) < 90 THEN X2 =
     SX - 1: GOTO 3050
3047  IF  PDL (0) > 165 THEN X2 =
     SX + 1: GOTO 3050
3048  IF  PDL (0) > 235 THEN X2 =
     SX + 2: GOTO 3050
3050  IF X2 < 1 THEN X2 = 1
3051  IF X2 > 38 THEN X2 = 38
3055  VTAB SY: HTAB SX: PRINT "<*
     >";:Y2 = SY
3060 CNT = CNT + 1: IF CNT = 8 THEN
     CNT = 0:Y2 = Y2 + 1: IF Y2 =
     20 THEN 3200
3065  FOR I = 1 TO 50: NEXT
3070  GOTO 3020
3100 SX = SX - 2: IF SX < 1 THEN
     SX = 1
3110 SY = SY - 2: IF SY < 1 THEN
     SY = 1
```

```
3120  FOR I = 1 TO 5: FOR J = SY TO
      SY + 4: HTAB X2 + I - 1: VTAB
      J
3130  PRINT  MID$ (",,,,,,,,,,---
      --+++++XXXXX",(I - 1) * 5 +
      1,5);: NEXT J: PRINT BE$;: NEXT
      I
3160 NT = NT - 1: IF NT > 0 THEN
      3010
3200  RETURN
4000 :
4001  REM  *** END
4002 :
4010  VTAB 21: HTAB 1: CALL  - 95
      8: VTAB 22
4020  IF NT = 0 THEN  PRINT BE$BE
      $BE$"I'M SORRY, BUT YOU LOST
       ...": RETURN
4030  PRINT BE$BE$BE$"YOU WON !!!
       CONGRATULATIONS !!!": RETURN

4990  RETURN
```


Grab a friend and get ready for some heated competition. The object of this game is to wall-in your opponent and to prevent him from moving. On each turn, you enter the coordinates of the adjacent square you would like to move into, plus, you enter the coordinates of a square you wish to become uninhabitable. The first player unable to move loses the game. Line 2030 switches the mode to GRaphics. Next, the color is set to a yellowish-green (COLOR= 12). Line 2031 draws a Horizontal LINe starting at position zero and continuing to position thirty-two. The result is a solid yellowish-green block, 32 by 32. Line 2033 sets the color to 15 (white), and then begins a loop (consisting of nine passes). Line 2034 draws a white Horizontal LINe on top of every fourth green line. This line also instructs the computer to draw a Vertical LINe at each value of "I". The result is an 8 by 8 matrix, comprised of 64 green squares, each with a white border. Lines 2040 and 2041 (and 5001) draw the magenta (COLOR= 1) and the light green (COLOR= 14) squares which mark each player's beginning position. To verify this, type: 2041 STOP (then return). Now when you run the program, it will STOP at line 2041. Only the square drawn by line 2040 be displayed. To undo any change, type: LOAD STRANDED. When this is done, a copy of the old, unaltered program is moved from permanent storage on diskette into the computer's memory, where it can be modified and/or run.

```
10  REM  ********************
11  REM  ***                 ***
12  REM  ***   STRANDED      ***
13  REM  ***                 ***
14  REM  ********************
15  REM
16  REM
20  GOSUB 1000: REM  INSTS
30  GOSUB 2000: REM  SETUP
40  GOSUB 3000: REM  PLAY!
50  GOSUB 4000: REM  !END!
60  END
1000 :
1001  REM  *** INSTS
1002 :
1010  TEXT : NORMAL : HOME
1020  VTAB 3: HTAB 12: PRINT "***
      STRANDED ***"
1030  VTAB 7: PRINT "THIS IS A GA
     ME FOR TWO PLAYERS.  BOTH OF
     YOU WILL BE PLACED IN AN 8*8
      MATRIX.    A PLAYER MAY MOV
     E IN ANY OF THE EIGHT   DIRE
     CTIONS.  ENTER THE COORDINAT
     ES OF   THE TARGET SQUARE. "

1035  PRINT
1040  PRINT "AFTER YOU MOVE, YOU
     WILL BE ASKED FOR   THE COOR
     DINATES OF A SECOND SQUARE.
     THISSQUARE WILL THEN BE BLAC
     KED OUT, AND BE UNENTERABLE.
       "
3040  IF  SQR (((X1 - X) ^ 2) + (
     (Y1 - Y) ^ 2)) >  = 2 THEN  PRINT
      CHR$ (7): GOTO 3020
3050  IF M(X1,Y1) <  > 0 THEN  PRINT
      CHR$ (7): GOTO 3020
3060 M(X,Y) = 0:CO = 12: GOSUB 50
     00
3070 M(X1,Y1) = PL:CO =  FN P(PL)
     :P(PL,PL) = X1:P(PL,PL + 1) =
     Y1:X = X1:Y = Y1: GOSUB 5000
```

```
3100  INPUT "BLOCK AT : ";X2,Y2: IF
      X2 < 1 OR X2 > 8 OR Y2 < 1 OR
      Y2 > 8 OR X2 <  >  INT (X2) OR
      Y2 <  >  INT (Y2) THEN 3100
3110  IF M(X2,Y2) <  > 0 THEN 310
      0
3120 M(X2,Y2) = 3:CO = 0:X = X2:Y
      = Y2: GOSUB 5000
3200 K = 3 - PL: FOR J = 1 TO 8:X
      4 = DIR(J,1) + P(K,K):Y4 = D
      IR(J,2) + P(K,K + 1)
3210  IF X4 < 1 OR X4 > 8 OR Y4 <
      1 OR Y4 > 8 THEN 3250
3220  IF M(X4,Y4) <  > 0 THEN 325
      0
3230 J = 8: NEXT J: GOTO 3990
3250  NEXT J: RETURN
3990  NEXT
3995  GOTO 3010
4000 :
4001  REM  *** END
4002 :
4010  HOME : PRINT "THE GAME IS O
      VER.....": PRINT "PLAYER NUM
      BER "PL" IS THE WINNER !"
4020  RETURN
5000  REM  *** DRAW A SQUARE
5001  COLOR= CO: FOR I =  FN C(X)
       TO  FN C(X) + 2: HLIN  FN C
      (Y), FN C(Y) + 2 AT I: NEXT
      : RETURN
```


This game requires good timing. A small, moving target is the object of your marksman talent. The angle of each shot depends on the angle of the pad. Unlike most of the games where the game board is drawn in the the '2000' subroutine, here, all of the GRaphics are drawn in the '3000' subroutine. Looking at the graphics, line 3010 draws a light blue (COLOR= 7) perimeter around the target area. This can be verified by typing: 3012 STOP. Now when you run the program, the execution will STOP immediately following the completion of 3010. All that will be on the screen is the blue outline. Line 3030 draws the launching pad in a symmetrical configuration, but at a RaNDom location and utilizing a RaNDom five-dot design. Again, to confirm the function of line 3030, type: 3029 STOP and 3031 STOP. When the program encounters a STOP command, you can CONTinue the execution (the run) by typing CONT. Line 3040 draws the pink (COLOR= 11) target at its original position and each time it moves down the screen. Also, note that before the color equals eleven, the color is set to zero (black). To understand the function of the first part of line 3030, change COLOR= 0 to COLOR= 1. The function of line 3075 is similar to that of line 3030. Experiment with this group of instructions to see if you can discover 3075's purpose.

```
10  REM  ********************
11  REM  ***                 ***
12  REM  ***    TARGET       ***
13  REM  ***                 ***
14  REM  ********************
15  REM
16  REM
20  GOSUB 1000: REM  INSTS
40  GOSUB 3000: REM  PLAY!
60  END
1000 :
1001  REM  *** INSTS
1002 :
1010  TEXT : NORMAL : HOME
1020  VTAB 3: HTAB 13: PRINT "***
      TARGET ***"
1030  VTAB 7: PRINT "IN THIS GAME
      YOU TRY TO HIT A MOVING
     TARGET.  BY PRESSING ANY KEY
     , A SMALL   BALL WILL BE FIR
     ED FROM THE PADDLE ON   THE
     SCREEN."
1040  PRINT : PRINT "YOU MUST TIM
     E THE RELEASE SUCH THAT THE
     SMALL BALL HITS THE LARGER O
     NE.  THE    DIRECTION AND DI
     STANCE WILL VARY WITH   EACH
      NEW TARGET."
1090  VTAB 23: INPUT "HIT RETURN
     WHEN READY TO CONTINUE : ";A
     NS$
1990  RETURN
3000 :
3001  REM  *** PLAY
3002 :
3010  GR : HOME : COLOR= 7: HLIN
     0,39 AT 0: HLIN 0,39 AT 39: VLIN
     0,39 AT 0: VLIN 0,39 AT 39
3015  HOME : VTAB 22: HTAB 10: PRINT
     "SCORE: ";SC;"    SHOTS: ";S
     H
3020  IF SH THEN  VTAB 23: HTAB 1
     4: PRINT "PCENT: "; INT (SC /
     SH * 100);"%"
```

```
3025 PM =  INT ( RND (1) * 2) * 2
      - 1:XP =  INT ( RND (1) * 1
     Ø) + 10:YP =  INT ( RND (1) *
     10) + 15:SP =  INT ( RND (1)
      * 3) * PM:FLAG = Ø
3030  COLOR= 9: PLOT XP + (2 * SP
     ),YP - 2: PLOT XP + SP,YP -
     1: PLOT XP,YP: PLOT XP - SP,
     YP + 1: PLOT XP - (2 * SP),Y
     P + 2
3035 X2 =  INT ( RND (1) * 10) +
     25:Y2 = 1:S2 =  INT ( RND (1
     ) * 2) + 1:X3 = X2:Y3 = Y2
3040  COLOR= Ø: FOR I = X3 - 1 TO
     X3 + 1: VLIN Y3,Y3 + 2 AT I:
      NEXT : COLOR= 11: FOR I = X
     2 - 1 TO X2 + 1: VLIN Y2,Y2 +
     2 AT I: NEXT
3045 X3 = X2:Y3 = Y2: IF FL THEN
     3070
3050  IF  PEEK ( - 16384) < 127 THEN
     3600
3055  POKE  - 16368,Ø:FL = 1:B1 =
     XP + 1:B2 = YP:B3 = B1:B4 =
     B2:SH = SH + 1
3060  HOME : VTAB 22: HTAB 10: PRINT
     "SCORE: ";SC;"    SHOTS: ";S
     H
3065  VTAB 23: HTAB 14: PRINT "PC
     ENT: "; INT (SC / SH * 100);
     "%": IF B1 <  > B3 AND  SCRN(
     B3,B4) <  > 15 THEN 3095
3070  IF  SCRN( B3,B4) = 11 THEN
     3095
3075  COLOR= Ø: PLOT B3,B4: COLOR=
     15: PLOT B1,B2:B3 = B1:B4 =
     B2:B1 = B1 + 1:B2 = B2 + SP
3080  IF B2 < 1 OR B2 > 38 THEN B
     2 = B4:SP =  - SP: GOTO 3600

3085  IF B1 > 36 THEN  COLOR= Ø: PLOT
     B3,B4:FLAG = Ø:SP =  ABS (SP
     ) * PM: GOTO 3600
```

```
3090  IF  SCRN( B1,B2) = 0 THEN 3
      600
3095 SC = SC + 1: GOTO 3010
3600 Y2 = Y2 + 1: IF Y2 > 36 THEN
      Y2 = 1
3610  GOTO 3040
3990  RETURN
```


In this game the object is to avoid the relentless pursuit of the horrible Twinky, and to escape from the danger-filled labyrinth. There are a plethora of obstacles which impede your escape. There are twenty squares which relocate you somewhere in the maze. There are twenty squares which cannot be entered. There is one square which contains an extremely sensitive exploding device. If you move onto this space, the ensuing blast will end your perilous journey . . . and your life.

```
10  REM  ********************
11  REM  ***                 ***
12  REM  ***    TWINKY       ***
13  REM  ***                 ***
14  REM  ********************
15  REM
16  REM
20  GOSUB 1000: REM  INSTS
30  GOSUB 2000: REM  SETUP
40  GOSUB 3000: REM  PLAY!
60  END
1000 :
1001  REM  *** INSTS
1002 :
1010  TEXT : HOME : NORMAL
1020  VTAB 2: HTAB 13: PRINT "***
      TWINKY ***"
1030  VTAB 5: PRINT "THIS IS THE
     GAME OF TWINKY.  IN IT YOU
     PRETEND TO BE A SPACE EXPLOR
     ER WHO HAS  LANDED ON A HOST
     ILE PLANET. "
1040  PRINT : PRINT "CAPTURED BY
     THE UNFRIENDLY NATIVES, YOU
     ARE TOSSED INTO A LARGE PRIS
     ON ALONG    WITH A FEROCIOUS
      TWINKY."
1050  PRINT : PRINT "A TWINKY IS
     A HORRIBLE CREATURE THAT
     WILL CATCH YOU AND ABSORB YO
     UR BODY INTOHIS IF HE GETS C
     LOSER THAN TWO UNITS    AWAY
      FROM YOU."
1060  VTAB 23: INPUT "HIT RETURN
     WHEN READY TO CONTINUE :";AN
     S$
1070  HOME : VTAB 2: HTAB 13: PRINT
     "*** TWINKY ***": VTAB 5
1080  PRINT "IN THE INTEREST OF F
     AIR PLAY, YOU ARE   GIVEN A
     ZAP GUN THAT WILL TEMPORARIL
     Y   CHASE THE TWINKY AWAY."
```

```
1090  PRINT : PRINT "ALSO, IF YOU
      CAN MAKE IT TO THE SPECIAL
     OBJECTIVE SQUARE BEFORE BEIN
     G ABSORBED, YOU WILL BE SET
     FREE."
1100  PRINT : PRINT "AFTER YOU MO
     VE, YOU WILL BE INFORMED OF
     YOUR DISTANCE FROM THE OBJEC
     TIVE SQUARE AS WELL AS FROM
     THE TWINKY.  "
1110  VTAB 23: INPUT "HIT RETURN
     WHEN READY TO CONTINUE :";AN
     S$
1120  HOME : VTAB 2: HTAB 13: PRINT
     "*** TWINKY ***": VTAB 5
1130  PRINT "THERE ARE SEVERAL OT
     HER OBJECTS WITHIN  THE MAZE
      WHICH ARE OF INTEREST."
1140  PRINT : PRINT "THERE ARE TW
     ENTY RELOCATION SQUARES.
     THESE SQUARES SEND YOU TO SO
     ME OTHER    SECTION OF THE M
     AZE.  "
1150  PRINT : PRINT "THERE ARE TW
     ENTY IMPREGNABLE SQUARES
     WHICH YOU CANNOT ENTER."
1160  PRINT : PRINT "THERE IS ONE
      SUPER DEADLY AUTOMATIC KILL
     SQUARE WHICH ENDS YOUR ORDEA
     L QUICKLY   AND PAINLESSLY."

1170  PRINT : PRINT : PRINT "THAT
     'S IT... TRY TO ENJOY IT !"
1180  VTAB 23: INPUT "HIT RETURN
     WHEN READY TO CONTINUE :";AN
     S$
1990  RETURN
2000 :
2001  REM  *** SETUP
2002 :
2010  DIM MA(15,15)
2015  DEF  FN R(X) =  INT ( RND (
     1) * X) + 1: DEF  FN A(X) =
     .001 *  INT (X * 1000 + .5)
```

```
2020  FOR I = 1 TO 20
2025 X =  FN R(15):Y =  FN R(15):
      IF MA(X,Y) THEN 2025
2030 MA(X,Y) = 1: NEXT I: REM  **
     * BLOCKED
2040  FOR I = 1 TO 20
2045 X =  FN R(15):Y =  FN R(15):
      IF MA(X,Y) THEN 2045
2050 MA(X,Y) = 2: NEXT I: REM  **
     * RELOCATION
2065 X =  FN R(15):Y =  FN R(15):
      IF MA(X,Y) THEN 2065
2070 MA(X,Y) = 3: REM  *** SUPER
     KILL
2075 XO =  FN R(15):YO =  FN R(15
     ): IF MA(XO,YO) THEN 2075
2080 MA(XO,YO) = 4: REM  *** OBJE
     CTIVE
2085 XT =  FN R(15):YT =  FN R(15
     ): IF MA(XT,YT) THEN 2085
2090 MA(XT,YT) = 5: REM  *** TWIN
     KY
2095 XP =  FN R(15):YP =  FN R(15
     ): IF MA(XP,YP) THEN 2095
2100 MA(XP,YP) = 6: REM  *** PLAY
     ER
2110 ST = 0:SP = 0
2990  RETURN
3000 :
3001  REM  *** PLAY
3002 :
3010  HOME : VTAB 3: HTAB 13: PRINT
     "*** TWINKY ***": PRINT : PRINT
     : PRINT
3020 DT =  FN A( SQR ((XT - XP) ^
     2 + (YT - YP) ^ 2))
3021 DO =  FN A( SQR ((XP - XO) ^
     2 + (YP - YO) ^ 2))
3025  PRINT : PRINT "THE TWINKY I
     S "DT" UNITS AWAY"
3026  PRINT : PRINT "THE OBJECTIV
     E IS "DO" UNITS AWAY"
```

```
3028  IF DT < 2 THEN : PRINT : PRINT
      "<<<< S C H L  O O R P ! ! !
       >>>>>": PRINT "YOU'VE BEEN
      ABSORBED BY THE TWINKY !!!!":
       PRINT "YOU LOSE.":WL = 1: GOSUB
      3600: RETURN
3030  PRINT : INPUT "MOVE OR SHOO
      T (M/S) : ";ANS$
3035 ANS$ =  LEFT$ (ANS$,1): IF A
      NS$ <  > "M" AND ANS$ <  > "
      S" THEN  PRINT "TYPE IN 'M'
      OR 'S'": GOTO 3030
3040  IF ANS$ = "S" THEN 3300
3100  PRINT : PRINT "FORWARD, BAC
      KWARD,": INPUT "RIGHT OR LEF
      T (F/B/R/L) : ";ANS$
3105 ANS$ =  LEFT$ (ANS$,1): IF A
      NS$ <  > "F" AND ANS$ <  > "
      B" AND ANS$ <  > "R" AND ANS
      $ <  > "L" THEN  PRINT "TYPE
       IN 'F' OR 'B' OR 'R' OR 'L'
      ": GOTO 3100
3110  IF ANS$ = "F" THEN X = 0:Y =
       - 1: GOTO 3120
3111  IF ANS$ = "B" THEN X = 0:Y =
      1: GOTO 3120
3112  IF ANS$ = "R" THEN X = 1:Y =
      0: GOTO 3120
3113  IF ANS$ = "L" THEN X =  - 1
      :Y = 0: GOTO 3120
3120 X = X + XP:Y = Y + YP
3125  IF X < 1 OR X > 15 OR Y < 1
       OR Y > 15 THEN  PRINT "THAT
       WOULD TAKE YOU OUT OF THE M
      AZE": PRINT "MOVE NOT ALLOWE
      D": GOTO 3500
3130  IF MA(X,Y) = 1 THEN  PRINT
      "THAT SPACE IS BLOCKED": PRINT
      "MOVE NOT ALLOWED": GOTO 350
      0
3135  IF MA(X,Y) = 2 THEN 3200
```

```
3140  IF MA(X,Y) = 3 THEN  PRINT
      "YOU FOUND THE SUPER KILL SQ
      UARE!!!": PRINT "MOVE ALLOWE
      D BUT,": PRINT "YOU'VE BEEN
      KILLED!!!":WL = 1: RETURN
3145  IF MA(X,Y) = 4 THEN  PRINT
      "YOU FOUND THE OBJECTIVE !!!
      ": PRINT "MOVE ALLOWED AND,"
      : PRINT "YOU WIN A TRIP OFF
      THIS PLANET !!!":WL = 0: RETURN

3150  IF MA(X,Y) = 5 THEN  PRINT
      "MOVE ALLOWED": PRINT : PRINT
      : PRINT "<<<<< S C H L O O R
       P ! ! ! >>>>>": PRINT "YOU'
      VE BEEN ABSORBED BY THE TWIN
      KY !!!": PRINT "YOU LOSE.":W
      L = 1: GOSUB 3600: RETURN
3155  PRINT "MOVE ALLOWED":MA(XP,
      YP) = SP:XP = X:YP = Y:SP =
      MA(XP,YP):MA(XP,YP) = 6: GOTO
      3500
3200  PRINT ".... YOU'VE BEEN RE
      LOCATED ...."
3205 X =  FN R(15):Y =  FN R(15)
3210  IF MA(X,Y) = 1 THEN 3205
3215  GOTO 3135
3300  PRINT : PRINT "FORWARD, BAC
      KWARD,": INPUT "RIGHT OR LEF
      T (F/B/R/L) : ";ANS$
3305 ANS$ =  LEFT$ (ANS$,1): IF A
      NS$ <  > "F" AND ANS$ <  > "
      B" AND ANS$ <  > "R" AND ANS
      $ <  > "L" THEN  PRINT "TYPE
       IN 'F' OR 'B' OR 'R' OR 'L'
      ": GOTO 3300
3310  IF ANS$ = "F" THEN X = 0:Y =
       - 1: GOTO 3320
3311  IF ANS$ = "B" THEN X = 0:Y =
      1: GOTO 3320
3312  IF ANS$ = "R" THEN X = 1:Y =
      0: GOTO 3320
3313  IF ANS$ = "L" THEN X =  - 1
      :Y = 0: GOTO 3320
```

```
3320 SX = XP:SY = YP
3325 SX = SX + X:SY = SY + Y: PRINT
     "ZAP--";
3330  IF SX < 1 OR SX > 15 OR SY <
     1 OR SY > 15 THEN  PRINT "FI
     ZZLE...": PRINT "THE SHOT LE
     FT THE MAZE.": PRINT "THE SH
     OT MISSED THE TWINKY!": GOTO
     3500
3335  IF MA(SX,SY) = 0 OR MA(SX,S
     Y) = 2 OR MA(SX,SY) = 3 OR M
     A(SX,SY) = 4 THEN 3325
3345  IF MA(SX,SY) = 1 THEN  PRINT
     "BLAST !!": PRINT "THE SHOT
     HIT A WALL": PRINT "THE SHOT
      MISSED": GOTO 3500
3350  PRINT "OUCH !!!": PRINT "TH
     E SHOT HIT THE TWINKY": PRINT
     "THE TWINKY RETREATES"
3355 MA(SX,SY) = ST:XT =  FN R(15
     ):YT =  FN R(15):ST = MA(XT,
     YT):MA(XT,YT) = 5: GOTO 3500

3500  REM  *** TWINKY MOVE LOGIC
3520 DT =  FN A( SQR ((XT - XP) ^
     2 + (YT - YP) ^ 2))
3521 DO =  FN A( SQR ((XP - XO) ^
     2 + (YP - YO) ^ 2))
3525  PRINT : PRINT "THE TWINKY I
     S "DT" UNITS AWAY."
3526  PRINT "THE OBJECTIVE IS "DO
     " UNITS AWAY."
3527  PRINT : PRINT "THE TWINKY M
     OVES ...": FOR I = 1 TO 500:
      NEXT I
3528  IF DT < 2 THEN  PRINT : PRINT
     "<<<< S C H L  O O R P ! ! !
      >>>>>": PRINT "YOU'VE BEEN
     ABSORBED BY THE TWINKY !!!":
      PRINT "YOU LOSE.":WL = 1: GOSUB
     3600: RETURN
3530  IF XP < XT THEN X =  - 1:Y =
     0: GOTO 3540
```

```
3531  IF XP > XT THEN X = 1:Y = 0
     : GOTO 3540
3532  IF YP < YT THEN X = 0:Y =  -
     1: GOTO 3540
3533  IF YP > YT THEN X = 0:Y = 1
     : GOTO 3540
3540 MA(XT,YT) = ST:XT = XT + X:Y
     T = YT + Y:ST = MA(XT,YT):MA
     (XT,YT) = 5: GOTO 3020
3600  FOR I = 1 TO 40:XX =  PEEK
     ( - 16336) +  PEEK ( - 16336
     ) +  PEEK ( - 16336): FOR J =
     1 TO 5: NEXT J,I: RETURN
3990  RETURN
```

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