

Q.793.0285  
P392w

# WHAT TO DO AFTER YOU HIT RETURN

or

# P.C.C.'s First Book of Computer Games



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Printed by Nowlis Publications 640 Robie Ave., Menlo Park, Calif. 94025 415-326-5580

Q. 793. 0285

P 392 W

## WHY GAMES AT ALL?

Games encourage imaginative and constructive responses. The results of games are unimportant — we take risks, tolerate uncertainty, and proceed with less-than-complete understandings. Our abilities to react creatively to new and unexpected situations are constantly changing. We develop our decision-making capabilities and problem-solving skills. *Games are fun!*

## WHY COMPUTER GAMES?

A computer waits patiently while we experiment with different lines of thought. It's available to play any game we want, as many times as we'd like. *Games are fun!*

## WHY PLAY THESE GAMES WITHOUT A COMPUTER?

*Why not! Most of these games can be played without a computer.*

When we play these games without a computer, one of us is the computer. The "computer" has to be "programmed" for each game; it processes information and always responds logically. Being the computer enables us to see the game from another perspective and better understand its structure. Modifying the games and trying new variations is easy when one of us is the computer; how to actually write a computer program for the games is clearer. *Games are fun!*

## WHY COMPUTER GAMES? — continued

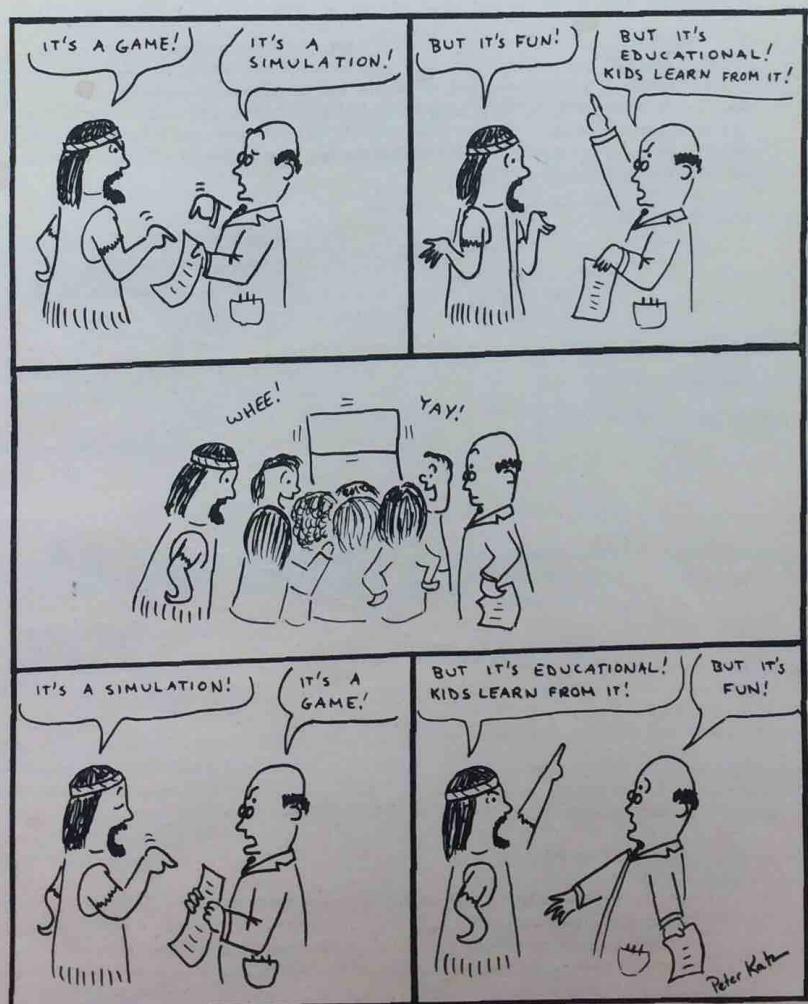
A simulation is a model of a real-life situation. The computer does the complicated bookkeeping — you create the initial conditions, manipulate the parameters, and analyze the results. The effects of each parameter can be isolated; the simulation can be repeated as often as you want. *Games are fun!*

## WHY GAMES AT ALL? — continued

Competition is one relationship among players. We can transform a competitive two-player game into a cooperative five-player game; instead of always playing one side, a person alternates playing each side throughout the game.

Games can introduce new ideas. Games are open-ended, multi-purposed, and can be selected to suit our needs. *Games are fun!*

Classic Definition of Classroom Computer Simulation: "Reproducing on a computer an activity or occurrence that would be impossible or impractical to do in a classroom because of cost, time, danger, and so on."



# PREFACE

This is an interesting and timely book. At all levels it represents a melding of diverse, even polarized, elements. At once it is a potpourri of games, an activity dating back to the roots of man, and a catalog of creative ways to use man's most modern and sophisticated tool, the computer. The contents range from old number games like NIM, that originated in ancient China, to STTR1, a simulation adapted from a modern science fiction television series. The computer version of NIM (and many of the other games) is merely an adaptation of an age-old diversion; these games may be enjoyed equally well without the use of a computer. Games such as STTR1, on the other hand, would never have been possible without the speed and computational abilities of modern computers. (In fact, STTR1 not only requires a computer to be played; it includes a computer as an integral part of the game.)

The educational use of both games and computers has been the subject of some controversy in recent years. Games traditionally have been regarded merely as pastimes or diversions; any learning that occurred was considered to be incidental. Computers were hailed as an efficient way to automate instruction with pre-programmed texts — the teaching machine. Today, however, educators are discovering that game playing is an important learning process. Likewise, modern interactive time-shared computers are now being looked upon as an important resource — not unlike a library — to be used in the capacity of playmate, tool, and teacher. This book, then, provides a starting point for exploring the uses of computers in this context. Moreover, the increasing availability of computers and/or computer terminals to the public in schools, science/technology museums, and community centers emphasizes the need for such an introduction.

The publishing of this book represents a combined effort. The computer games and simulations were contributed by a variety of people, from mathematicians to businessmen, from students to professors, and from computer phreaks to homemakers. Indeed, the book was made possible through the joint cooperation of the People's Computer Company, a store-front, non-profit, educational group (that publishes a funky newspaper) and Hewlett-Packard Company, a more traditional company (that manufactures time-sharing computers, among other things). This, in itself, is significant.

In short, *PCC's First Book of Computer Games* is destined to become one of those books ... It is conspicuous — one of those books that is too big to fit on the shelf, so you find it lying about on a table; it is eclectic — one of those new, soft-cover, newsprint catalogs that is crammed to the margins with interesting tidbits and graphics; it is a curiosity — one of those books you feel compelled to pick up, just to see what is inside; and most important, it is an educational resource — one of those books that will help you find, obtain, or "get into" new materials for the enrichment of learning.

December, 1974

Bob Kahn  
Director of Computer Education  
Lawrence Hall of Science  
University of California, Berkeley

# WELCOME to the Games Book

Come captain a starship, hunt the Wumpus (but watch out for the bottomless pits), beat the Taxman, explore the Caves, play hide-and-seek with the Hinkle, draw a Mandala, Trap my number, govern the ancient kingdom of Sumeria —

A computer and your imagination can take you into unknown universes, inhabited by seemingly intelligent beings where all sorts of exotic obstacles confront you. You can't lose! Catastrophes are opportunities for insights into these worlds. You and the computer cooperate in the exploration of unknown realms.

Think of this book as a newspaper — open it anywhere and start reading. If you're a programming nut or a novice, a games aficionado or a dabbler, if you're a teacher or a student, an artist, a mathematician, or a . . . , whatever your tastes and prejudices, you'll find something here to suit your fancy.

Herein reside some of the computer games that we have found fun and challenging. You might get excited enough to modify some of them or even write your own.

Kick off your shoes, find a comfortable place to sit or lie down, and dig in!

## Do you have a passion for

### MEETING THE COMPUTER

Start with the games in Chapter 1 (the first four are simple number guessing games).

### ANALYZING A FAMILY OF GAMES

One concept is developed throughout the "Nimlike" games. What you learn in one game leads you to the next.

### HEAVY DUTY GAMES PEOPLE

If your group has a few hours a week for the next few months, try Policy or Trader.

### MATH CONCEPTS

X-Y coordinates — try Hinkle.  
Polar coordinates — try Mandala.

### PROGRAMMING

Play some of the simpler games. Then look at the listings in the back. You'll be able to read and understand the programs, even if you don't know much BASIC.

For the "hot-dogs" try modifying a game or designing a new one. Experiment with alternate models in some of the simulations or pattern-generators.

### PATTERNS

Designs, like Dangle or Mandala.  
Personalized, like Sunsign or Biosin.

### SPACE — THE FINAL FRONTIER

Land your own — try Crash, then Lunar.  
Intergalactic war — try STTR 1.  
Intergalactic capitalism — try Trader.

### SOCIAL SCIENCE SIMULATIONS

From mercantilism to pollution.

### ICE CREAM

Try Bud's in San Francisco or Aunt Emma's in Palo Alto.  
(We also recommend Bott's in Berkeley.)

### PUZZLES & BRAIN TEASERS

Start with Bagels, Teaser, or Reverse.

## Who wrote this book?

**PCC**

People's Computer Center, a division of People's Computer Company, is a non-profit community computer workshop, developing and experimenting with games and recreational uses of computers. We believe that computers are for people to "play" with, whether in exploring games and simulations or in writing computer programs.

PCC is a large and pleasant environment containing computers, terminals, a plotter, hand calculators, mathematical diversions, puzzles, and board games. The center is available to people of all ages. Groups can schedule a one-time visit or a series of classes. Individuals can come to Games' Night, rent computer time, or join afternoon or evening classes.

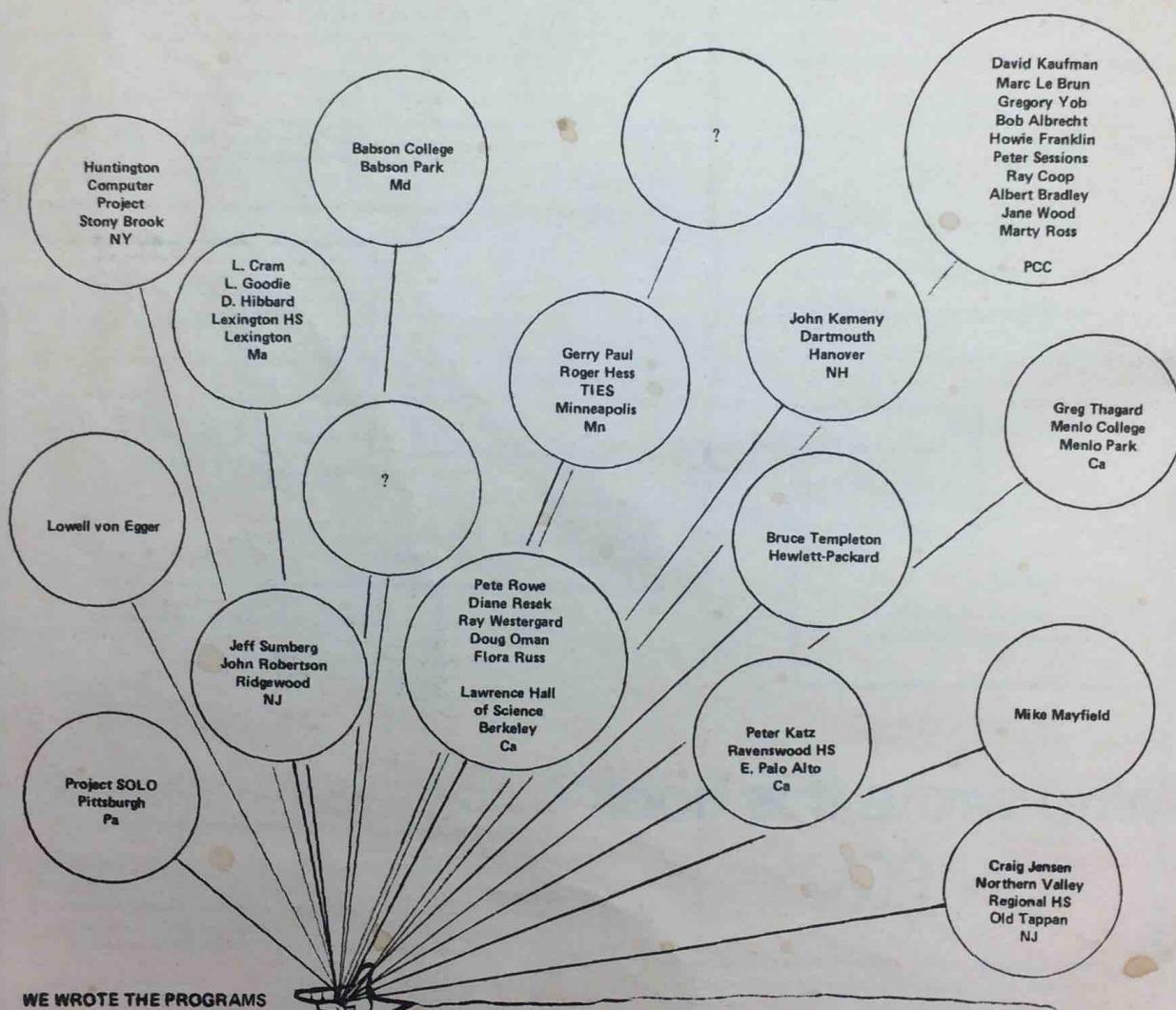
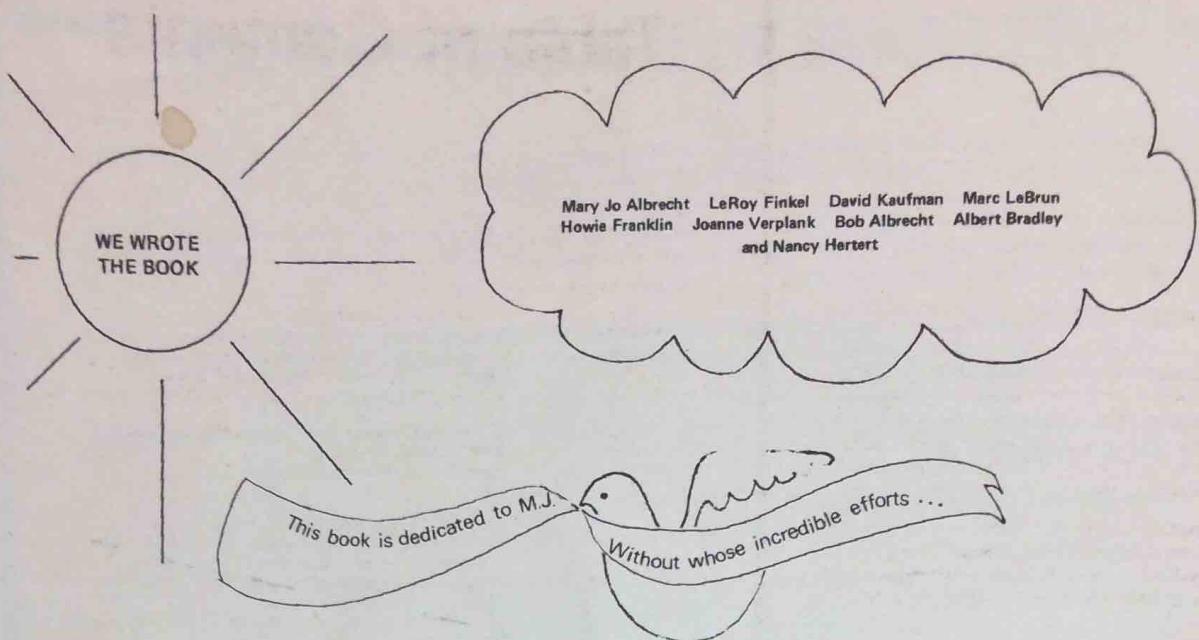
Everyone who worked on this book volunteered the time. The profits will be used to purchase computer hardware. We have two major objectives:

- To provide the capability to support remote terminals in the community (libraries, the community center, hospitals, homes for the aged, the county jail, "random" locations in town) where people will be able to play games, use a community information network, and work on independent projects.
- To expand our activities at the Center to include interactive graphics, the development of computer languages, music, and whatever else we can come up with.

Write to us if you have any suggestions or are interested in finding out more about us. Our address is:

People's Computer Center  
1919 Menlo Avenue  
Menlo Park, California 94025

Our phone number is (415) 326-4444



WE WROTE THE PROGRAMS

Many of these games are part of our folklore — we have no idea how many people contributed their time and creativity to them.

We have undoubtedly left out dozens of credits. If you helped in the development of any of the games, please send your name and we'll include it in the next printing (we can expand to as many pages as necessary).

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1919 Menlo Avenue  
Menlo Park, Ca 94025

# Table of Contents

## PUTTING THESE GAMES ON YOUR COMPUTER

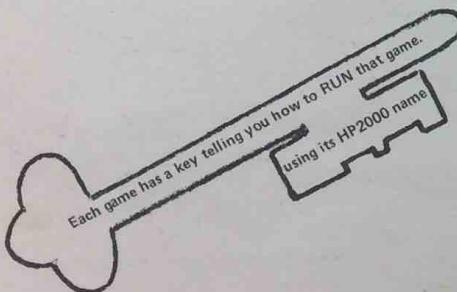
All the games run in Hewlett-Packard 2000F BASIC. You can type in the games you want if you're careful and patient — many are listed in the back (we've left out the really long ones). Or, see the last section in the book for information on ordering magnetic tape or individual paper tapes.

If your computer speaks a different dialect of BASIC — Many of the programs should "almost" work as is. Strings and disk references (if any) may require modifications. (Check a copy of the HP 2000F user's manual.)

To reduce the size of the programs, you can remove REM's and the game's rules (have separate instructions available or how about having our book handy?). Happy crunching if your BASIC allows multiple statements per line.

## PLAYING THESE GAMES WITHOUT A COMPUTER

A + before a game means that it can be played without a computer. Suggestions for "how" appear in the chapter introductions and game descriptions.



iv	Preface	
v	Welcome to the Games Book	
vi	Acknowledgments	
Number Guessing Games		
2	♦ Number	A simple number-guessing game.
4	♦ Abase	Guess my number ... in base 2 or 5 or 8 or ...
5	♦ Trap	Trap my number. Then make the trap smaller and smaller and ...
6	♦ Stars	Guess the cosmic number. Win some stars for yourself.
8	♦ Clocks	Read the metric code words and guess what time the computer has in mind.
10	♦ Bagels	The Pico, Fermi, Bagels game — guess a three-digit number.
12	♦ Quadgt	Bagels too easy? Try Quadgt.
13	♦ Button	Button, button, who's got the button?
Word Games		
16	♦ Letter	
17	♦ Abagel	There are 26 letters in the alphabet, but only 1 of them is <i>it</i> .
18	♦ Hangmn	Like Bagels, but here you try to guess the computer's 3-letter word.
20	♦ Madlib	The game of Hangman — guess the secret word, letter by letter.
22	♦ Word	Complete a zany story by filling in the blanks — before you see the story.
"Nimlike" Games		
24	♦ 23Mtch	A scrambled word appears and you must unscramble it before your time runs out.
26	♦ Batnum	
27	♦ Nim	
30	♦ Chomp	
32	♦ Zot	
Hide & Seek in 2-Dimensional Grids		
34	♦ Hurkle	The Hurkle is a happy beast — find him if you can.
35	♦ Mugwmp	Circles crossing circles will tell you where the Mugwump hides.
36	♦ Snark	Catch the Snark with a well-placed circle.
Pattern Games		
38	Dangle	Use the computer to make a dangling string of stars. For the very young.
39	Sunsngn	Your name and sunsign are used to create a unique artistic pattern.
40	Biosin	Charts your life's physical, sensitive, and cognitive cycles.
42	Mandal	Create your own Mandalas by choosing design parameters.
44	Life	John Conway's cellular board game.
47	Amaze	Creates a random maze. You choose how big.
Board Games		
50	♦ Qubic5	3-D tic-tac-toe. Choose a strategy level for the computer, then try to win.
52	♦ Gomoku	The traditional Japanese game of five-in-a-row. Only here, you play the computer.
54	♦ Teaser	Try to fill the 3-by-3 board with 1's everywhere except the center. Good luck!
56	♦ Rover	Guide Rover Robot across a grid.
Welcome to the Caves		
60	♦ Caves1	
63	♦ Wumpus	Find your way out of the Caves. Three levels of difficulty.
66	♦ Caves2	Hunt the Wumpus in its world of caves, superbas, and bottomless pits. Like Caves1, but you set up the caves for a friend to solve.
Business & Social Science Simulations		
72	Hamrbi	You are Hamurabi, the governor of ancient Sumeria.
73	King	If you survive your eight-year term, we congratulate you.
76	Civil2	A two-team simulation which recreates 14 Civil War battles. You can change the course of history.
78	Market	Two companies compete in a business simulation.
81	Stock	Play the Stock Market.
85	Policy	Six teams interact trying to manage the U.S. economy.
88	Polut	A real-life simulation that permits you to create a water pollution situation and try to clean it up.
Science Fiction Games		
94	Trader	Star Trader is an interstellar game of mercantile skill. Can be played lightly, or with passion.
98	Sttr1	You captain the starship Enterprise in instellar battle.
Last Chapter		
104	♦ Crash	Land a space module on the planet of your choice.
107	Lunar	Try to land a spaceship on the moon.
108	♦ Revers	Unscramble a list of numbers with your ingenuity and lots of patience.
111	♦ Zeros	Two players build bridges until one player cannot move.
112	♦ Taxman	Try to beat the Taxman. Factors are the keys to this one.
115	Selected Listings	
154	Order Information	

*Number* is an excellent game for anyone to start with. The rules and responses are simple; an analysis of the game is straight-forward.

With beginning learners it is a game first, then a practice in number recognition and sequencing. Begin with the numbers 1-10. Have the players help you number a line — on paper, the floor, or a blackboard. Or try laying-out individual markers (numbered 3x5 cards, discs). Tell them that you are a computer. "I am thinking of a number from 1 to 10. Guess a number and point to it. I'll tell you whether you guessed my number, or whether your guess is too small or too big." At this level you are most interested in the practice they get in identifying the numbers and in responding to the clues "too small" and "too big". Expect the players to wander over the number line, guessing without building on previous information. As their abilities develop, lengthen the number line.

Take turns being the computer. The "computer" compares the secret number with each guess and *always* tells the truth.

The players will begin to notice the boundaries created by previous guesses. Try to see how the set of possible right numbers changes with each clue. Help them be aware of the changing possibility set by erasing the numbers that have been eliminated, by marking the number line, or in some other way keeping track of the information.

Finally, encourage them to develop a strategy for guessing the secret number in the fewest possible tries. *Number* is a *partitioning* game — each clue "partitions" the numbers. Analyze each strategy in terms of the partitioning scheme it uses. Then, try to determine the maximum number of guesses needed for *any* range of numbers.

Start slowly with everyone. Players will develop skill at their own speeds. Beginning learners may need a year or two before they are ready for a more involved look at the game.

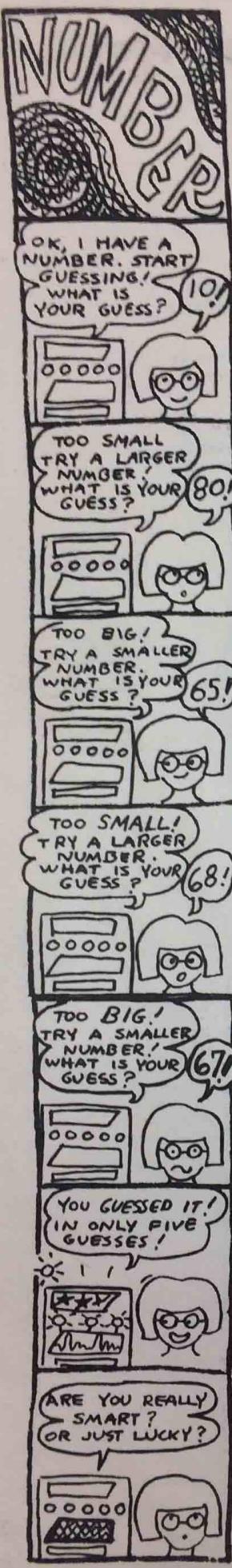
Talk about ways to generate the secret number — dice, numbers in a hat, spinners.

*Abase* is *Number* in *any base* (you pick the base). In *Trap* you guess *two* numbers, trying to sandwich the secret number. In *Stars* the clues are related to how far your guess is from the secret number. *Clocks* is like *Stars* and gives clues in metric units. *Bagels* and *Quadgt* are substantially more difficult to play than *Number*. Try *Button* with people in the circle.

# NUMBER GUESSING GAMES

Number  
Abase  
Trap  
Stars  
Clocks  
Bagels  
Quadgt  
Button

# A NUMBER GUESSING GAME



```

100 REM *** NUMBER *** A NUMBER GUESSING GAME ***
110 REM *** COPYRIGHT PEOPLE'S COMPUTER COMPANY
120 REM *** P. O. BOX 310, MENLO PARK CA 94025

200 REM *** PRINT INSTRUCTIONS ON HOW TO PLAY
210 PRINT "I WILL THINK OF A WHOLE NUMBER FROM 1 TO 100."
220 PRINT "TRY TO GUESS MY NUMBER. AFTER EACH GUESS, I WILL"
230 PRINT "TELL YOU IF YOU HAVE GUESSED MY NUMBER OR IF YOUR"
240 PRINT "GUESS IS TOO SMALL OR TOO BIG."

300 REM *** COMPUTER 'THINKS' OF A NUMBER - CALL IT X
310 LET X=INT(100*RND(0))+1
320 PRINT
330 PRINT "OK, I HAVE A NUMBER. START GUESsing."

400 REM *** HUMAN STARTS GUESsing
410 PRINT
420 PRINT "WHAT IS YOUR GUESS?"
430 INPUT G
440 IF G=X THEN 510
450 IF G>X THEN 480
460 PRINT "TOO SMALL. TRY A LARGER NUMBER."
470 GOTO 410
480 PRINT "TOO BIG. TRY A SMALLER NUMBER."
490 GOTO 410

500 REM *** HUMAN HAS GUESSED THE COMPUTER'S NUMBER
510 PRINT
520 PRINT "YOU GUESSED IT!!!! LET'S PLAY AGAIN."
530 PRINT
540 GO TO 310

999 END
RUN

```

I WILL THINK OF A WHOLE NUMBER FROM 1 TO 100.  
TRY TO GUESS MY NUMBER. AFTER EACH GUESS, I WILL  
TELL YOU IF YOU HAVE GUESSED MY NUMBER OR IF YOUR  
GUESS IS TOO SMALL OR TOO BIG.

OK, I HAVE A NUMBER. START GUESsing.

WHAT IS YOUR GUESS?10  
TOO SMALL. TRY A LARGER NUMBER.

WHAT IS YOUR GUESS?20  
TOO SMALL. TRY A LARGER NUMBER.

WHAT IS YOUR GUESS?30  
TOO SMALL. TRY A LARGER NUMBER.

WHAT IS YOUR GUESS?40  
TOO SMALL. TRY A LARGER NUMBER.

WHAT IS YOUR GUESS?50  
TOO SMALL. TRY A LARGER NUMBER.

WHAT IS YOUR GUESS?60  
TOO SMALL. TRY A LARGER NUMBER.

WHAT IS YOUR GUESS?70  
TOO BIG. TRY A SMALLER NUMBER.

WHAT IS YOUR GUESS?69  
TOO BIG. TRY A SMALLER NUMBER.

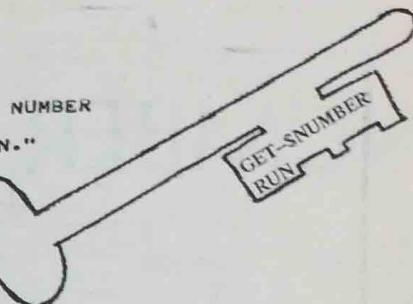
WHAT IS YOUR GUESS?68  
TOO BIG. TRY A SMALLER NUMBER.

WHAT IS YOUR GUESS?67

YOU GUESSED IT!!!! LET'S PLAY AGAIN.

OK, I HAVE A NUMBER. START GUESsing.

WHAT IS YOUR GUESS?



I played the game. Look at my  
guesses — can you discover  
my strategy? There  
are better strategies.  
Can you invent one??

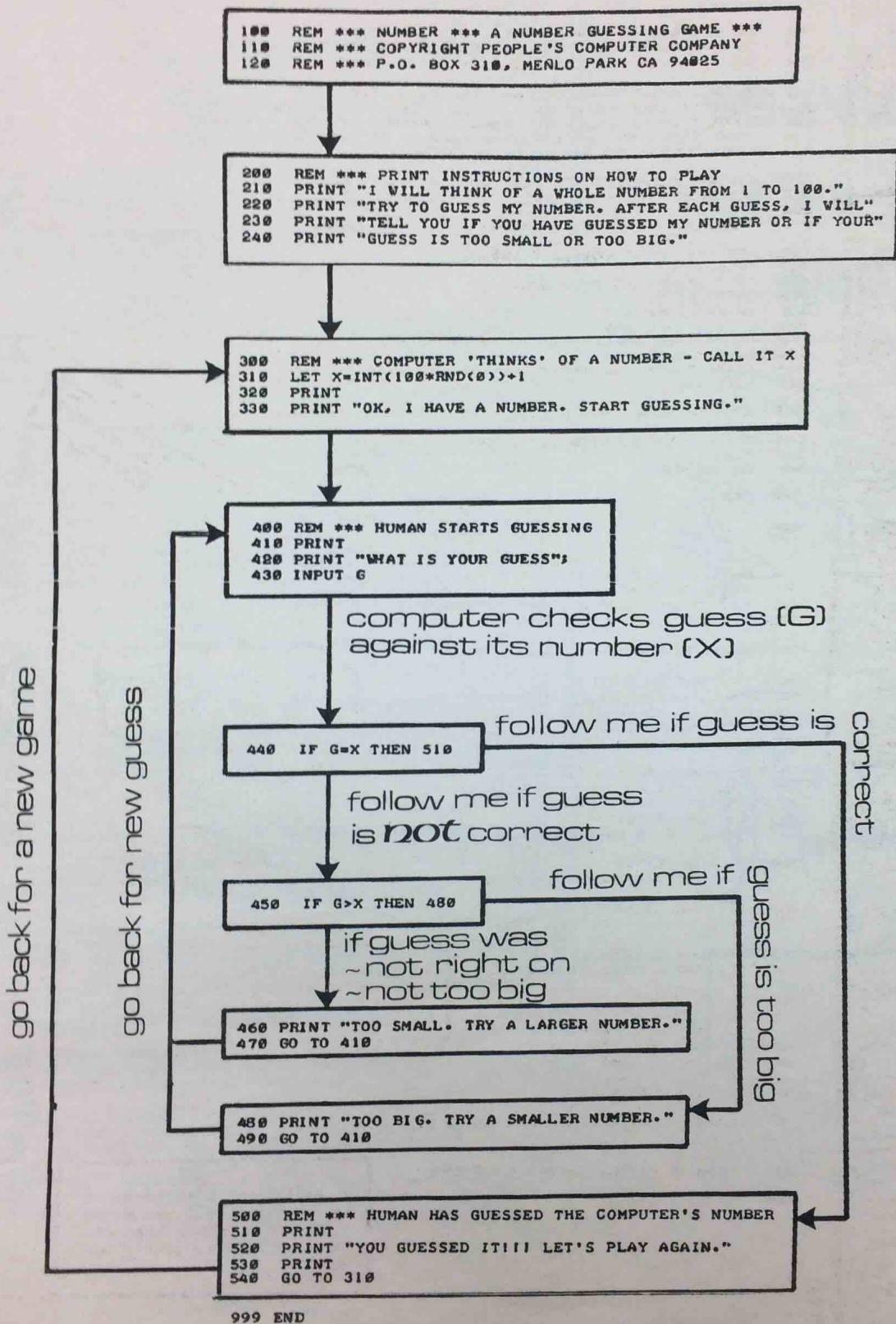


There is a strategy that will let you  
always guess the number in *at most*  
7 guesses. Can you find it?

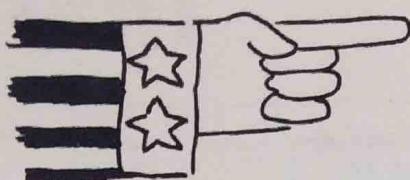
I guessed the number in 10 guesses.  
Using this strategy, how many guesses  
would it have taken me if the number  
had been 66? If it had been 61? How  
about 91?

# HOW DOES IT WORK? FOLLOW THE ↗

Start here



# ABASE



## A NUMBER GUESSING GAME



$4013_5 = (4 \times 5^3) + (1 \times 5) + 3$   
 $632_7 = 31 \cdot 7_{10} = 2227_5$   
 $6218_9 = ?$

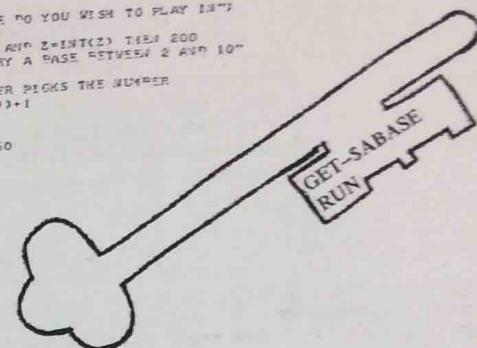
CARTOONS AND  
PROGRAM BY  
PETER KATZ

```

10 REM-ABASE-A NUMBER GUESSING GAME USING DIFFERENT BASES
20 REM-PETER KATZ, 10/5/73, RAVENSWOOD
30 DIM ASC(151)-FC(15)
40 L=8
50 REM THE NUMBER OF GUESSES CAN BE CHANGED BY CHANGING "L" IN LINE 40

60 PRINT "THIS IS A NUMBER GUESSING GAME USING DIFFERENT BASES"
70 PRINT "YOU TELL THE COMPUTER WHAT BASE YOU WISH TO PLAY IN."
80 PRINT "THE COMPUTER WILL SELECT A NUMBER IN YOUR BASE"
90 PRINT "AND YOU TRY TO GUESS THE NUMBER."
100 PRINT "THE COMPUTER WILL TELL YOU IF YOUR GUESS IS TOO HIGH."
110 PRINT "TOLOW OR IN THE WRONG BASE."
120 PRINT "YOU WILL HAVE "L" TRIES TO GUESS THE NUMBER."
130 PRINT
140 PRINT "WHAT BASE DO YOU WISH TO PLAY IN?"
150 INPUT I
160 IF Z<11 AND Z>1 THEN 200
170 PRINT "PLEASE TRY A BASE BETWEEN 2 AND 10"
180 GOTO 140
190 REM THE COMPUTER PICKS THE NUMBER
200 P=INT(100-RND(0))+1
210 X=0
220 A=1
230 IF P<Z+1 THEN 260
240 A=A+1
250 GOTO 230
260 A=A-1
270 IF A=0 THEN 390
280 B=1
290 J=PZ+1
300 IF J>P THEN 330
310 B=B+1
320 GOTO 290
330 B=B-1
340 J=PZ+A
350 Y=P101A
360 X=X+Y
370 P=P+J
380 GOTO 260
390 E=X+P
400 Z=Z-1
410 RESTORE
420 FOR C=1 TO Z
430 READ N
440 NEXT C
450 G=1
460 F=D
470 GOSUB 990
480 PRINT "O.K. I HAVE A NUMBER IN MIND BETWEEN 1 AND "RS" BASE "Z"
490 PRINT TAB(10);"- GUESS #";G
500 INPUT Y
510 IF Y>"N" OR Y<1 THEN 800
520 R=0
530 Q=Y
540 GOSUB 840
550 IF R=1 THEN 730
560 IF Y>E THEN 650
570 G=41
580 IF G=L+1 THEN 740
590 REM THIS COMPUTER FINDS OUT IF YOUR NUMBER IS TOO HIGH OR TOO LOW
600 IF Y>E THEN 630
610 PRINT TAB(5);"TOO LOW. GUESS #";G
620 GOTO 500
630 PRINT TAB(5);"TOO HIGH. GUESS #";G
640 GOTO 500
650 IF G=1 THEN 720
660 PRINT "RIGHT!! IT TOOK YOU "G" GUESSES."
670 PRINT "DO YOU WANT TO PLAY AGAIN?"
680 INPUT ESC123
690 IF ESC123="N" THEN 1130
700 PRINT
710 GOTO 140
720 PRINT "YOU!! YOU GOT IT IN 1 GUESS!!"
730 GOTO 670
740 F=E
750 GOSUB 990
760 PRINT "YOU LOSE. PUCKWEAT! THE NUMBER IN BASE "Z" WAS "RS
770 GOTO 670
780 PRINT "THERE IS NO SUCH NUMBER IN BASE "Z". TRY AGAIN."
790 GOTO 490
800 PRINT "SAY! A NUMBER BETWEEN 1 AND "RS". TRY AGAIN."
810 GOTO 490
820 REM THIS SUBROUTINE FINDS OUT IF THE NUMBER IS ACCEPTABLE
830 REM IN THE GIVEN BASE
840 A=1
850 IF Q<10+A THEN 880
860 A=A+1
870 GOTO 850
880 IF A=0 THEN 940
890 T=INT((I-K+F+.00005)
900 F=F-.10*K*T
910 IF F >= Z THEN 960
920 Q=0-10*I*K*F
930 GOTO 830
940 IF Q >= Z THEN 960
950 GOTO 970
960 F=1
970 RETURN
980 REM THIS SUBROUTINE CHANGES THE NUMBER INTO A STRING
990 AS="1234567890"
1000 RS=""
1010 S=1
1020 K=6
1030 IF F >= 10^K THEN 1070
1040 K=K-1
1050 GOTO 1030
1060 K=K-1
1070 T=INT((I-K+F+.00005)
1080 F=F-.10*K*T
1090 IF T=0 THEN 1140
1100 P$=S,S$=ASC(T,T)
1110 IF K=0 THEN 1160
1120 S=S+1
1130 GOTO 1060
1140 PALS,S$=ASC(I,I)
1150 GOTO 1110
1160 RETURN
1170 DATA 1,10014+06,10201,1210,400,244,202,144,121,100
1180 END

```



...TRY ABASE!

WHY LEARN BASES THIS WAY?

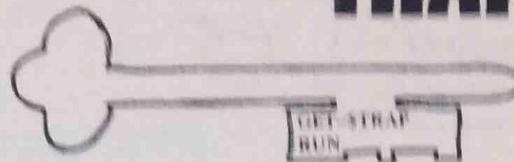
ABASE is like NUMBER (page 2) but you get to pick the base

DO YOU WANT INSTRUCTIONS? YES, PLEASE

I WILL THINK OF A NUMBER FROM 1 TO 100.  
TRY TO GUESS MY NUMBER. ENTER TWO NUMBERS. TRYING  
TO TRAP MY NUMBER BY YOUR TWO TRAP NUMBERS. I'LL  
TELL YOU IF YOU HAVE TRAPPED MY NUMBER OR IF MY  
NUMBER IS SMALLER THAN YOUR TWO TRAP NUMBERS OR  
IF MY NUMBER IS LARGER THAN YOUR TWO TRAP NUMBERS.  
IF I TELL YOU THAT YOU HAVE TRAPPED MY NUMBER, I  
MEAN THAT MY NUMBER IS BETWEEN YOUR TRAP NUMBERS  
OR - PERHAPS MY NUMBER IS THE SAME AS ONE OF YOUR  
TRAP NUMBERS.

!!!!IMPORTANT!!!! IF YOU THINK YOU KNOW MY NUMBER, THEN  
ENTER YOUR GUESS FOR \*BOTH\* TRAP NUMBERS.

# TRAP



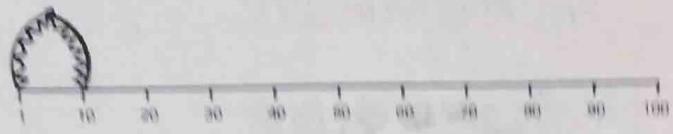
Here's my first trap - didn't catch anything.

I'M THINKING...THINKING...AH! I HAVE A NUMBER!

FIRST TRAP NUMBER? 1

SECOND TRAP NUMBER? 100

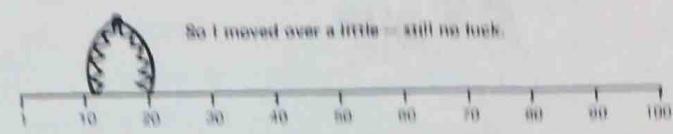
MY NUMBER IS LARGER THAN YOUR TRAP NUMBERS.



FIRST TRAP NUMBER? 28

SECOND TRAP NUMBER? 11

MY NUMBER IS LARGER THAN YOUR TRAP NUMBERS.



So I moved over a little - still no luck.

FIRST TRAP NUMBER? 21

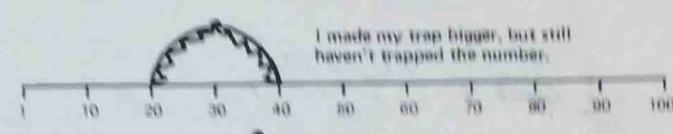
SECOND TRAP NUMBER? 48

MY NUMBER IS LARGER THAN YOUR TRAP NUMBERS.

FIRST TRAP NUMBER? 41

SECOND TRAP NUMBER? 68

MY NUMBER IS LARGER THAN YOUR TRAP NUMBERS.



I made my trap bigger, but still  
haven't trapped the number.

FIRST TRAP NUMBER? 61

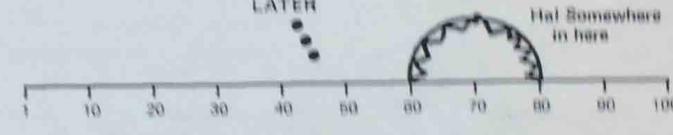
SECOND TRAP NUMBER? 88

MY NUMBER IS TRAPPED BY YOUR NUMBERS.

FIRST TRAP NUMBER? 61

SECOND TRAP NUMBER? 70

MY NUMBER IS TRAPPED BY YOUR NUMBERS.



LATER

Hal Somewhere  
in here

FIRST TRAP NUMBER? 66

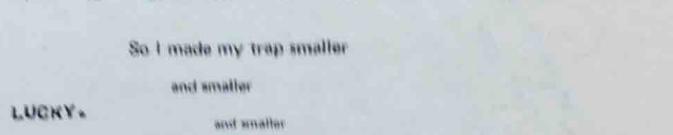
SECOND TRAP NUMBER? 68

MY NUMBER IS LARGER THAN YOUR TRAP NUMBERS.

FIRST TRAP NUMBER? 69

SECOND TRAP NUMBER? 79

MY NUMBER IS LARGER THAN YOUR TRAP NUMBERS.



So I made my trap smaller

and smaller

and smaller

and finally

I'M THINKING...THINKING...AH! I HAVE A NUMBER!

FIRST TRAP NUMBER? 33

SECOND TRAP NUMBER? 66

MY NUMBER IS SMALLER THAN YOUR TRAP NUMBERS.

FIRST TRAP NUMBER? 22

SECOND TRAP NUMBER? 11

MY NUMBER IS TRAPPED BY YOUR NUMBERS.

FIRST TRAP NUMBER? 15

SECOND TRAP NUMBER? 19

MY NUMBER IS TRAPPED BY YOUR NUMBERS.

FIRST TRAP NUMBER? 16

SECOND TRAP NUMBER? 18

MY NUMBER IS TRAPPED BY YOUR NUMBERS.

FIRST TRAP NUMBER? 17

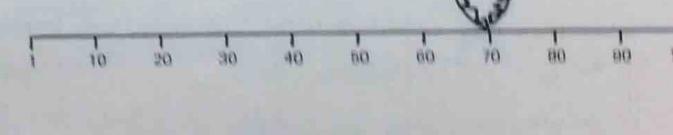
SECOND TRAP NUMBER? 17

MY NUMBER IS SMALLER THAN YOUR TRAP NUMBERS.

FIRST TRAP NUMBER? 16

SECOND TRAP NUMBER? 16

YOU GOT IT IN 6 GUESSES...LET'S PLAY AGAIN, LUCKY.

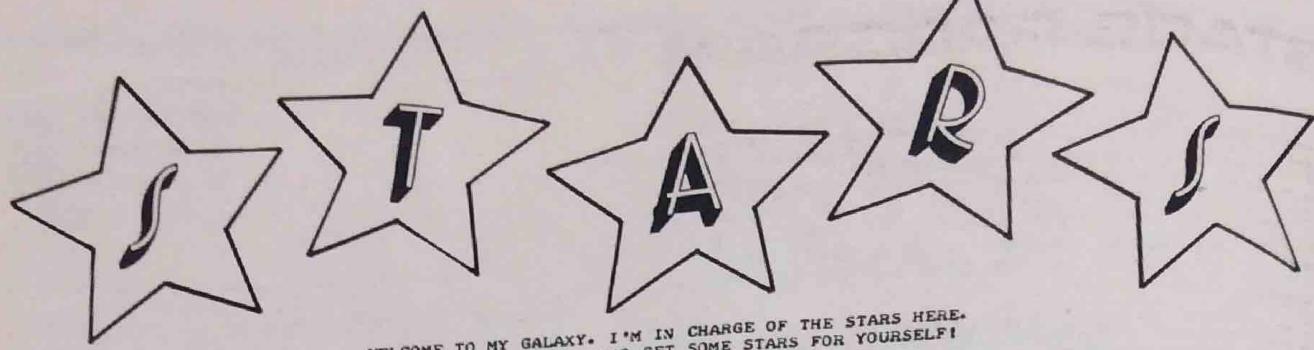


Well - took me 10 guesses - not too good.  
Here, in my second game, I use a much  
better strategy!

gotcha!



EACH GUESS ELIMINATES ABOUT  
TWO THIRDS OF THE REMAINING  
NUMBERS.



WELCOME TO MY GALAXY. I'M IN CHARGE OF THE STARS HERE.  
PLAY MY GAME \*STARS\* AND GET SOME STARS FOR YOURSELF!

WANT TO KNOW HOW TO PLAY? YES

I WILL THINK OF A WHOLE NUMBER FROM 1 TO 100.  
TRY TO GUESS MY NUMBER. AFTER YOU GUESS, I  
WILL TYPE ONE OR MORE STARS (\*). THE CLOSER  
YOU ARE TO MY NUMBER, THE MORE STARS WILL I TYPE.  
ONE STAR (\*) MEANS YOU ARE FAR AWAY FROM MY  
NUMBER. SEVEN STARS (\*\*\*\*\*\*) MEANS YOU ARE VERY,  
VERY, VERY CLOSE TO MY NUMBER!!!

OK, STARSEEKER, I AM THINKING OF A NUMBER. START GUESsing.

WHAT IS YOUR GUESS? 10

\*

WHAT IS YOUR GUESS? 50

\*\*\*

WHAT IS YOUR GUESS? 60

\*\*\*

WHAT IS YOUR GUESS? 90

\*\*\*\*

WHAT IS YOUR GUESS? 95

\*\*\*

WHAT IS YOUR GUESS? 80

\*\*\*\*\*

WHAT IS YOUR GUESS? 81

\*\*\*\*\*

WHAT IS YOUR GUESS? 78

\*\*\*\*\*

WHAT IS YOUR GUESS? 76

\*\*\*\*\*

WHAT IS YOUR GUESS? 77

\*\*\*\*\*

WHAT IS YOUR GUESS? 76

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WHAT IS YOUR GUESS? 77

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WHAT IS YOUR GUESS? 76

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WHAT IS YOUR GUESS? 77

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WHAT IS YOUR GUESS? 76

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WHAT IS YOUR GUESS? 76

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WHAT IS YOUR GUESS? 77

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WHAT IS YOUR GUESS? 76

\*\*\*\*\*

WHAT IS YOUR GUESS? 77

\*\*\*\*\*

## A STARS PROGRAM

```

REM *** STARS *** STARS *** STARS *** STARS *** STARS ***
110 REM *** COPYRIGHT 1974 BY PCC, P.O. BOX 310, MENLO PARK CA
120 PRINT "WELCOME TO MY GALAXY. I'M IN CHARGE OF THE STARS HERE.."
130 PRINT "PLAY MY GAME *STARS* AND GET SOME STARS FOR YOURSELF!!"
140 PRINT
150 PRINT "WANT TO KNOW HOW TO PLAY";
160 INPUT Z$[1,1]
170 IF Z$ <> "Y" THEN 280

180 REM *** HERE IS HOW TO PLAY
190 PRINT
200 PRINT "I WILL THINK OF A WHOLE NUMBER FROM 1 TO 100."
210 PRINT "TRY TO GUESS MY NUMBER. AFTER YOU GUESS, I"
220 PRINT "WILL TYPE ONE OR MORE STARS (*). THE CLOSER"
230 PRINT "YOU ARE TO MY NUMBER, THE MORE STARS WILL I TYPE."
240 PRINT "ONE STAR (*) MEANS YOU ARE FAR AWAY FROM MY"
250 PRINT "NUMBER. SEVEN STARS (******) MEANS YOU ARE VERY,"
260 PRINT "VERY, VERY CLOSE TO MY NUMBER!!!!"

270 REM *** COMPUTER 'THINKS' OF A NUMBER FROM 1 TO 100
280 LET X=INT(100*RND(0))+1
290 PRINT
300 PRINT "OK, STARSEEKER, I AM THINKING OF A NUMBER. START GUESsing.."

310 REM *** GUESsing BEGINS
320 LET N=1
330 PRINT
340 PRINT "WHAT IS YOUR GUESS?";
350 INPUT G
360 IF G=X THEN 550
370 LET D=ABS(G-X) ←
380 IF D == 64 THEN 500
390 IF D == 32 THEN 490
400 IF D == 16 THEN 480
410 IF D == 8 THEN 470
420 IF D == 4 THEN 460
430 IF D == 2 THEN 450
440 PRINT " *";
450 PRINT " *";
460 PRINT " *";
470 PRINT " *";
480 PRINT " *";
490 PRINT " *";
500 PRINT " *";
510 PRINT
520 LET N=N+1
530 GOTO 330

540 REM *** PLAYER HAS GUESSED THE GALACTIC NUMBER ← ← ← ← ← more
550 FOR K=1 TO 18
560 PRINT " *";
570 NEXT K
580 PRINT "!!!!"
590 PRINT "THAT'S IT!! YOU GUESSED MY COSMIC NUMBER IN";N;"GUESSES.."
600 PRINT
610 PRINT "WANT TO PLAY AGAIN?";
620 INPUT Z$[1,1]
630 IF Z$="Y" THEN 280
640 PRINT "OK, GOODBYE FOR NOW. PLAY WITH ME AGAIN SOMEWHEN.."
650 END

```

SUPPOSE D = 23. HERE IS WHAT HAPPENS IN LINES 380 – 500.

380 IF D >= 64 THEN 500



390 IF D >= 32 THEN 490



400 IF D >= 16 THEN 480



**480 PRINT "★"**

490 PRINT “★”

**500 PRINT “★”**

so, for  $D = 23$ , three stars are printed.

Your turn.

SUPPOSE  $16 \leq D \leq 31$ . HOW MANY STARS WILL BE PRINTED? \_\_\_\_\_

SUPPOSE  $D \geq 64$ . HOW MANY STARS WILL BE PRINTED? \_\_\_\_\_

SUPPOSE D = 1. HOW MANY STARS WILL BE PRINTED? \_\_\_\_\_

SUPPOSE 2 STARS WERE PRINTED. THIS MEANS THAT  $\underline{\hspace{2cm}} \leq D \leq \underline{\hspace{2cm}}$

# CLOCKS

DO YOU WANT INSTRUCTIONS? YES

I'M THINKING OF A TIME BETWEEN 0:01 (1 MIN. AFTER MIDNIGHT)  
AND 12:00 NOON. YOUR JOB IS TO TRY TO GUESS THE TIME I'M  
THINKING OF.

AFTER YOU ENTER YOUR GUESS, A SET OF CODE WORDS WILL  
TELL YOU HOW FAR YOUR GUESS IS FROM MY TIME.

CODE WORDS :

MEGA	- HOURS CORRECT.
KILO	- MINUTES CORRECT.
HECTO	- HOURS OFF BY AT MOST + OR - 2.
DECA	- MIN. OFF BY AT MOST + OR - 2.
DEC1	- HOURS OFF BY AT MOST + OR - 5.
CENTI	- MIN. OFF BY AT MOST + OR - 5.
ILLI	- MIN. OFF BY AT MOST + OR - 10.
MICRO	- MIN. OFF BY AT MOST + OR - 20.
BLA	- COMPLETELY OFF IN HOURS OR MIN.

FORMAT : HH:MM OR H:MM ONLY.

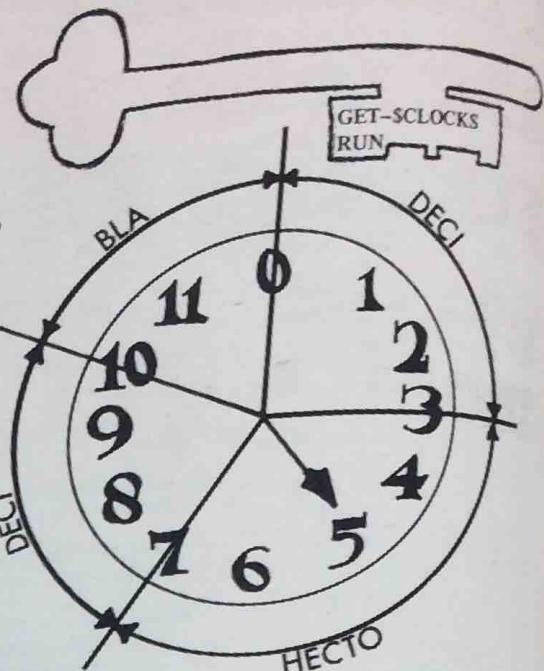
O.K. I HAVE THOUGHT OF A TIME.  
YOUR GUESS? 5:30  
HECTO MICRO YOUR GUESS? 6:45  
HECTO CENTI YOUR GUESS? 7:48  
\*\*\*\*\* YOU GOT IT!!!!!!  
3 GUESSES: AREN'T WE GETTING GOOD!  
TRY TO BETTER YOUR SCORE NEXT TIME ..

ONE MORE TIME? YES  
O.K. I HAVE THOUGHT OF A TIME.  
YOUR GUESS? 5:30  
DECI BLA YOUR GUESS? 2:53  
HECTO BLA YOUR GUESS? 1:05  
HECTO DECA YOUR GUESS? 0:07  
\*\*\*\*\* YOU GOT IT!!!!!!  
4 GUESSES: AREN'T WE GETTING GOOD!  
TRY TO BETTER YOUR SCORE NEXT TIME ..

ONE MORE TIME? YES  
O.K. I HAVE THOUGHT OF A TIME.  
YOUR GUESS? 7:30  
HECTO BLA YOUR GUESS? 9:57  
DECI DECA YOUR GUESS? 5:55  
HECTO DECA YOUR GUESS? 4:56  
HECTO KILO YOUR GUESS? 6:56  
\*\*\*\*\* YOU GOT IT!!!!!!  
5 GUESSES THAT'S ABOUT PAR FOR THE COURSE.  
TRY TO BETTER YOUR SCORE NEXT TIME ..

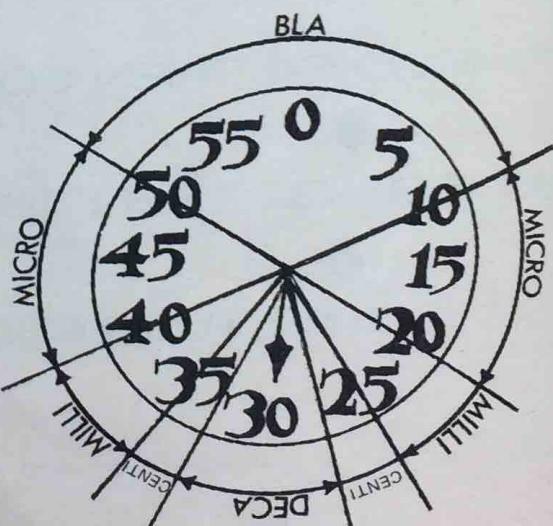
ONE MORE TIME? YES  
O.K. I HAVE THOUGHT OF A TIME.  
YOUR GUESS? 3:45  
BLA BLA YOUR GUESS? 9:20  
HECTO CENTI YOUR GUESS? 10:17  
MEGA DECA YOUR GUESS? 10:15  
MEGA DECA YOUR GUESS? 10:16  
\*\*\*\*\* YOU GOT IT!!!!!!  
5 GUESSES THAT'S ABOUT PAR FOR THE COURSE.  
TRY TO BETTER YOUR SCORE NEXT TIME ..

ONE MORE TIME? YES  
O.K. I HAVE THOUGHT OF A TIME.  
YOUR GUESS? 0:01  
BLA MICRO YOUR GUESS? 6:12  
MEGA DECA YOUR GUESS? 6:13  
\*\*\*\*\* YOU GOT IT!!!!!!  
3 GUESSES: AREN'T WE GETTING GOOD!  
TRY TO BETTER YOUR SCORE NEXT TIME ..



your guess? **5:30**

↑ hours  
↓ minutes



After playing several games,  
I invented a strategy. Here  
are some games using my  
strategy. I claim I can always  
get the correct time in at  
most 5 guesses.

ONE MORE TIME? YES  
O.K. I HAVE THOUGHT OF A TIME.  
YOUR GUESS? 0:01  
DEC1 MICRO YOUR GUESS? 3:12  
MEGA CENTI YOUR GUESS? 3:15  
MEGA DECA YOUR GUESS? 3:16  
MEGA DECA YOUR GUESS? 3:17  
\*\*\*\*\* YOU GOT IT!!!!!!  
5 GUESSES THAT'S ABOUT PAR FOR THE COURSE.  
TRY TO BETTER YOUR SCORE NEXT TIME ..

can you figure  
out my strategy?

ONE MORE TIME? YES  
O.K. I HAVE THOUGHT OF A TIME.  
YOUR GUESS? 0:01  
BLA CENTI YOUR GUESS? 6:04  
HECTO DECA YOUR GUESS? 7:05  
HECTO DECA YOUR GUESS? 8:06  
\*\*\*\*\* YOU GOT IT!!!!!!  
4 GUESSES: AREN'T WE GETTING GOOD!  
TRY TO BETTER YOUR SCORE NEXT TIME ..

are my  
assumptions correct?

ONE MORE TIME? YES  
O.K. I HAVE THOUGHT OF A TIME.  
YOUR GUESS? 0:01  
HECTO BLA YOUR GUESS? 1:22  
MEGA MILLI YOUR GUESS? 1:28  
MEGA CENTI YOUR GUESS? 1:31  
MEGA DECA YOUR GUESS? 1:32  
\*\*\*\*\* YOU GOT IT!!!!!!  
5 GUESSES THAT'S ABOUT PAR FOR THE COURSE.  
TRY TO BETTER YOUR SCORE NEXT TIME ..

what  
assumptions am i making?

ONE MORE TIME? YES  
O.K. I HAVE THOUGHT OF A TIME.  
YOUR GUESS? 0:01  
BLA BLA YOUR GUESS? 6:22  
DEC1 MILLI YOUR GUESS? 9:28  
HECTO CENTI YOUR GUESS? 10:31  
MEGA DECA YOUR GUESS? 10:32  
\*\*\*\*\* YOU GOT IT!!!!!!  
5 GUESSES THAT'S ABOUT PAR FOR THE COURSE.  
TRY TO BETTER YOUR SCORE NEXT TIME ..

ONE MORE TIME? NO

SEE YOU LATER



WOULD YOU LIKE THE RULES? YES

I AM THINKING OF A THREE DIGIT NUMBER. YOU CAN GUESS WHAT NUMBER I HAVE IN MIND AND I WILL TELL YOU:

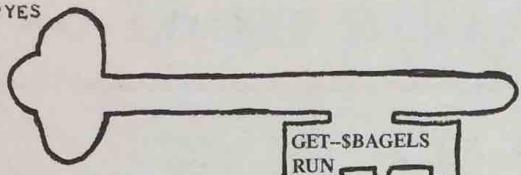
PICO - ONE DIGIT IS IN THE WRONG PLACE  
FERMI - ONE DIGIT IS IN THE CORRECT PLACE  
BAGELS - NO DIGIT IS CORRECT

OKAY, I HAVE A NUMBER IN MIND.

GUESS # 1	:370	PICO
GUESS # 2	:789	BAGELS
GUESS # 3	:102	PICO PICO
GUESS # 4	:014	FERMI
GUESS # 5	:213	PICO
GUESS # 6	:025	FERMI FERMI
GUESS # 7	:026	

YOU GOT IT

AGAIN? YES



Pico Pico means 2 digits in the wrong place.  
Fermi Fermi means 2 digits in the correct place.

Computers No.: 026 026  
My Guess: 102 025

Pico  
Pico

Fermi  
Fermi

Pico Fermi means a digit in the wrong place & a digit in the correct place.

OKAY, I HAVE A NUMBER IN MIND.

GUESS # 1	:123	PICO
GUESS # 2	:345	PICO
GUESS # 3	:637	PICO FERMI
GUESS # 4	:738	FERMI
GUESS # 5	:936	

YOU GOT IT

AGAIN? YES

OKAY, I HAVE A NUMBER IN MIND.

OK. now I know that 3 is the Fermi. Why?  
Well, suppose 3 is not the Fermi. Then it could not be the Pico in guesses 1 & 2. In that case, 1 or 2 must be in the number (#1) & 4 or 5 must be in the number (#2). So... don't you see... guess 3 should have been Bagels.

Since 3 is the Fermi, then 7 and 8 are not in the number - so 6 must have been the Pico in guess #3.

GUESS # 1	:123	BAGELS
GUESS # 2	:456	FERMI
GUESS # 3	:478	PICO PICO
GUESS # 4	:786	

YOU GOT IT

AGAIN? YES

Ha! 4 is not in the number. (No Fermi in #3). So 7 & 8 must be in the number, but in the wrong places &, the Fermi in #2 must be 5 or 6. Therefore (as the mathematicians sometimes say), the computers number must be 786 or 857. Why not 758?

OKAY, I HAVE A NUMBER IN MIND.

GUESS # 1	:098	BAGELS
GUESS # 2	:765	FERMI
GUESS # 3	:743	FERMI
GUESS # 4	:712	PICO PICO FERMI
GUESS # 5	:172	PICO PICO PICO
GUESS # 6	:721	

YOU GOT IT

AGAIN? YES

Whoops I wasted a guess. I should have looked at guess #2 & guess #3.

OKAY, I HAVE A NUMBER IN MIND.

GUESS # 1	:123	FERMI
GUESS # 2	:456	FERMI
GUESS # 3	:157	FERMI
GUESS # 4	:186	FERMI FERMI
GUESS # 5	:106	FERMI FERMI
GUESS # 6	:196	

YOU GOT IT 10

AGAIN? NO

Must be 1 or 5, but not both.

7 is not a number. How do I know?

Must be 1 and 6.

Try your hand at these. Answers at bottom of page upside down.

A.

GUESS # 1	:	789	PICO
GUESS # 2	:	127	PICO
GUESS # 3	:	374	BAGELS
GUESS # 4	:	851	BAGELS

Name two digits that are in the number.

B.

GUESS # 1	:	937	PICO PICO PICO
GUESS # 2	:	379	PICO PICO PICO

What is the number?

C.

GUESS # 1	:	123	PICO
GUESS # 2	:	214	FERMI
GUESS # 3	:	256	BAGELS
GUESS # 4	:	718	FERMI FERMI
GUESS # 5	:	719	FERMI

What is the number?

D.

GUESS # 1	:	630	FERMI
GUESS # 2	:	678	BAGELS
GUESS # 3	:	135	BAGELS
GUESS # 4	:	940	FERMI FERMI
GUESS # 5	:	240	PICO FERMI

What is the number?

A VARIATION OF BAGELS. We call it "BEYOND BAGELS". Instead of Pico, Fermi & Bagels, you get a numerical score.

You get 1 point for each digit in the wrong place &  
2 points for each digit in the correct place.  
For example:

Computer's No.	Your Guess	Score
738	123	1
738	546	0
738	805	1
738	234	2
738	897	2
738	789	3
738	798	4
738	387	3
738	783	4
738	738	6 That's it!

B. 795 C. 018 D. 920

A. 240. We also know, 0 must be in 1st or 2nd place  
(guess #1) ♦ 2 must be in 1st or 2nd place (guess #2). The  
third digit must be 0 or 6.

# bagels too easy? try QUADGT

DO YOU WANT TO SEE THE INSTRUCTIONS? YES  
THIS GAME IS PLAYED AS FOLLOWS:

I WILL CHOOSE A 4 DIGIT NUMBER. NO TWO DIGITS WILL BE THE SAME.  
YOUR JOB WILL BE TO FIGURE OUT WHAT DIGITS I PICKED.

MAKE YOUR GUESS BY ENTERING A 4 DIGIT NUMBER. I WILL  
RESPOND WITH A 2 DIGIT NUMBER. MY RESPONSE INDICATES TWO  
THINGS. FIRST, I TELL YOU HOW MANY DIGITS YOU GUessed ARE  
IN THE NUMBER I CHOSE. SECOND, I TELL YOU HOW MANY DIGITS  
ARE PLACED IN THE CORRECT POSITION WITHIN THE CHOSEN  
NUMBER.

FOR EXAMPLE, IF YOU GUESS 1463 AND I RESPOND WITH  
31 THEN YOU GOT 3 OF THE DIGITS WHICH APPEAR IN THE  
ANSWER BUT ONLY ONE DIGIT IS IN THE CORRECT POSITION.  
THUS, THE NUMBER I CHOSE COULD POSSIBLY BE 0364.

THE EXPERIENCED PLAYER WILL AVERAGE 5 OR 6 GUESSES PER GAME.

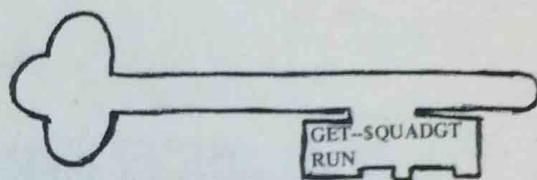
(AS I FOUND OUT... THIS SHOULD SAY "THE EXPERI-  
ENCED AND CLEVER PLAYER" OR PERHAPS " THE  
EXPERIENCED AND LUCKY PLAYER")

HERE IS WHAT HAPPENED TO ME:

MY FIRST GUESS  
GAVE ME A SCORE OF 20  
(2 CORRECT AND NONE IN  
THE RIGHT PLACE)

ENTER YOUR FIRST 4 DIGIT GUESS.

1234 20  
2156 31  
2517 20  
7128 10  
3475 20  
5163 20  
2163 20  
5173 10  
3456 31  
3256 31  
3156 21  
2356 31



WISE GUY COMPUTER!

YOU ARE OBVIOUSLY A BEGINNER. HERE'S A HINT.  
THE FIRST DIGIT IS A 4  
4256 42  
4265 41  
4526 41

NOT A VERY FRIENDLY COMPUTER!

I'M BEGINNING TO LOSE MY PATIENCE.  
THE FIRST TWO DIGITS ARE 46  
IF YOU CAN'T GET IT NOW, GIVE IT UP.  
4625 42  
4652 44  
YOU GOT IT IN 17 GUESSES. PLAY ANOTHER GAME? YES

SO... I TRIED AGAIN

ENTER YOUR FIRST 4 DIGIT GUESS.

1234 20  
2156 20  
7812 38  
9721 44

YOU GOT IT IN 4 GUESSES. PLAY ANOTHER GAME? YES

WOW! I'M REALLY GETTING GOOD!

ENTER YOUR FIRST 4 DIGIT GUESS.

1234 11  
1567 10  
5289 21  
8639 10  
0254 31  
0259 30  
0258 20  
1234 11  
0159 30  
0129 20  
0459 40  
0594 41

YOU ARE OBVIOUSLY A BEGINNER. HERE'S A HINT.  
THE FIRST DIGIT IS A 5

5894 42  
5904 44

YOU GOT IT IN 14 GUESSES. PLAY ANOTHER GAME?

12

OH WELL, NOBODY'S PERFECT. WOULD SOMEBODY, ANYBODY, PLEASE SEND ME SOME  
IDEAS ABOUT HOW TO PLAY THIS GAME?

MYSTERY NUMBER: 5263  
MY GUESS: 1234 21  
2 correct digits  
1 in the right place

MYSTERY NUMBER: 7398  
MY GUESS: 9703 30  
3 correct digits  
none in the correct place



Rare photograph of Quadgt wearing his bagel.

SEND IT TO: PCC  
P.O Box 310  
Menlo Park, Ca. 94025

# BUTTON, BUTTON,

## WHO'S GOT THE BUTTON?



BUTTON is a game of logic with a little twist - when you get very close to the button holder, the button "slips away from you"!

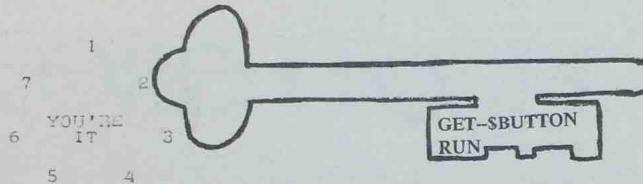
As you play, ask yourself, "Is my new information about where the button is now, or where the button was, one move ago?"



### The Rules:

BUTTON, BUTTON, WHO'S GOT THE BUTTON?

SEVEN FRIENDS ARE SITTING IN A CIRCLE  
AND YOU'RE IN THE CENTER



SOMEONE HAS THE BUTTON AND YOU HAVE TO GUESS WHO  
HE CAN PASS THE BUTTON (IF HE WANTS TO)  
BUT ONLY TO SOMEONE HE'S SITTING NEXT TO  
IF YOU WANT TO STOP, TYPE 0 (ZERO)  
GOOD LUCK !!!

A Long Game, in which we go step by step:

WHO DO YOU GUESS HAS IT? 1 : 'WHO, ME?'

WHOEVER HAS IT, KEEPS IT  
WHO DO YOU GUESS HAS IT? 2 : 'WHO, ME?'

WHOEVER HAS IT, KEEPS IT  
WHO DO YOU GUESS HAS IT? 3 : 'WHO, ME?'

WHOEVER HAS IT, KEEPS IT  
WHO DO YOU GUESS HAS IT? 4 : 'WHO, ME?'

WHOEVER HAS IT, KEEPS IT  
WHO DO YOU GUESS HAS IT? 5 : 'MY NEIGHBOR HAS IT.'

... BUT WHOEVER HAS IT, PASSES IT  
WHO DO YOU GUESS HAS IT? 6 : 'MY NEIGHBOR HAS IT'

... BUT WHOEVER HAS IT, PASSES IT  
WHO DO YOU GUESS HAS IT? 7 : 'MY NEIGHBOR HAS IT'

... BUT WHOEVER HAS IT, PASSES IT  
WHO DO YOU GUESS HAS IT? 5 : 'RIGHT YOU ARE - LUCKY !!!'

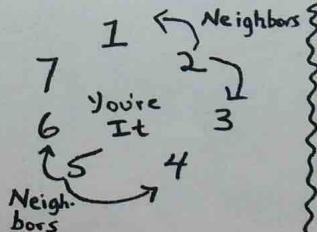
A Very Short Game, in which we know that 7 must have it:

WHO DO YOU GUESS HAS IT? 5 : 'WHO, ME?'

WHOEVER HAS IT, KEEPS IT  
WHO DO YOU GUESS HAS IT? 2 : 'WHO, ME?'

WHOEVER HAS IT, KEEPS IT  
WHO DO YOU GUESS HAS IT? 7 : 'RIGHT YOU ARE - LUCKY !!!'

A Game in which the button comes back to I :



WHO DO YOU GUESS HAS IT? 5 : 'WHO, ME?'

WHOEVER HAS IT, KEEPS IT  
WHO DO YOU GUESS HAS IT? 3 : 'WHO, ME?'

WHOEVER HAS IT, KEEPS IT  
WHO DO YOU GUESS HAS IT? 1 : 'MY NEIGHBOR HAS IT'

... BUT WHOEVER HAS IT, PASSES IT  
WHO DO YOU GUESS HAS IT? 1 : 'RIGHT YOU ARE - LUCKY !!!'

### Some Tips for Button Pushers:

When does the button get passed? The answer to this one is crucial to the game.

If the neighbor has it but passes it, it could come back to the friend you just guessed. Ask

yourself: Who might have it? What are the probabilities?



... a button for your thoughts...

If you write a letter-line on the floor or on paper, *Letter* is essentially *Number*. Beginning learners are practicing letter recognition (say the letter as you point to it) and ordering (dictionary skills).

*Abagel* is *Bagels*, but you use three-letter words instead of 3-digit numbers. Try the extra challenge of disallowing nonsense syllables. As a variation, each side can be both the guesser and the computer. Both players have their own secret word *and* try to guess the other's word before their own is guessed. Minimize the competition of this version: play until both words have been guessed and try to top your previous score.

*Hangman* is simpler than *Abagel*. In *Hangman* you guess one letter at a time; in *Abagel* you guess three. In *Hangman* you are told if your guess is in the word and its position; in *Abagel* you get clues which must be combined with previous information.

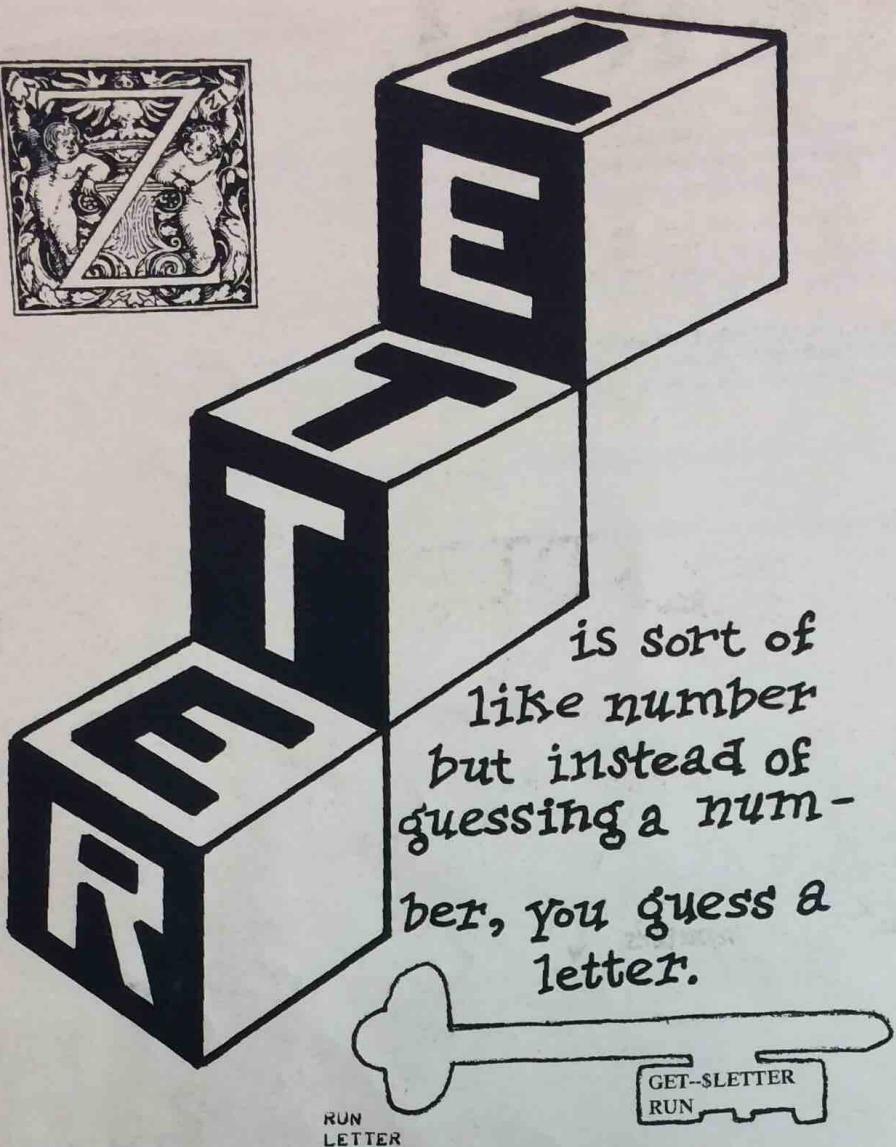
Some of us are offended by the format of *Hangman*. You can keep the *structure* by changing to a point system. One version is: guess either a letter or the entire word; 100 points for uncovering the word, 20-point bonus for each blank that was left when you guessed the word, and -10 for each incorrect guess (either letters or words). Like *Abagel* each side can have a secret word *and* be trying to guess the other's word.

Groups can play *Madlib* without the computer. Write story skeletons and encourage the groups to write their own. Have fun practicing parts of speech.

Play *Word* with paper and pencil, with or without a time limit, with or without other players.

# WORD GAMES

Letter  
Abagel  
Hangman  
Madlib  
Word



I WILL THINK OF A LETTER FROM A TO Z.  
TRY TO GUESS MY LETTER. AFTER EACH GUESS, I WILL  
TELL YOU IF YOU GUessed MY LETTER OR IF YOUR GUESS  
IS TOO HIGH OR TOO LOW. THE LOWEST LETTER IS 'A'  
AND THE HIGHEST LETTER IS 'Z'.

IF YOU WISH, THINK OF THE LETTERS FROM 'A'  
TO 'Z' ARRANGED IN A TOTEM POLE WITH 'A' ON THE  
BOTTOM AND 'Z' ON THE TOP. IF I TELL YOU TO TRY A  
HIGHER LETTER, TRY ONE CLOSER TO THE TOP OF THE  
TOTEM POLE. IF I TELL YOU TO TRY A LOWER LETTER, TRY  
ONE CLOSER TO THE BOTTOM OF THE TOTEM POLE. ENJOY!!!

OK, I HAVE A LETTER. START GUESsing.

WHAT IS YOUR GUESS? A  
TOO LOW. TRY A HIGHER LETTER.

WHAT IS YOUR GUESS? Z  
TOO HIGH. TRY A LOWER LETTER.

WHAT IS YOUR GUESS? \*  
HEY!!! THAT'S NOT A SINGLE LETTER. PLAY FAIR, NOW!

WHAT IS YOUR GUESS? DON'T BE SO GRUMPY  
HEY!!! THAT'S NOT A SINGLE LETTER. PLAY FAIR, NOW!

WHAT IS YOUR GUESS? N  
TOO LOW. TRY A HIGHER LETTER.

WHAT IS YOUR GUESS? T  
TOO LOW. TRY A HIGHER LETTER.

WHAT IS YOUR GUESS? W  
TOO HIGH. TRY A LOWER LETTER.

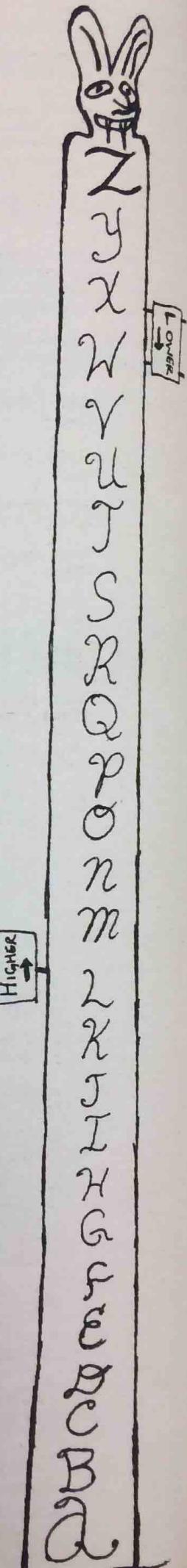
WHAT IS YOUR GUESS? V

YOU GOT IT!!!! LET'S PLAY AGAIN.

OK, I HAVE A LETTER. START GUESsing.

WHAT IS YOUR GUESS?

*Pick a  
letter, any  
letter... .*



# ABAGEL

RUN  
ABAGEL

ALL THE WORDS I KNOW HAVE THREE LETTERS IN THEM.  
I WILL THINK OF A WORD, AND YOU TRY TO GUESS IT -  
EACH TIME, JUST TYPE A THREE LETTER WORD (OF YOUR OWN)  
AND SEE WHAT I SAY.

'BAGELS' MEANS NONE OF YOUR LETTERS ARE IN MY WORD.  
BUT FOR EACH LETTER THAT IS IN MY WORD TOO, I WILL SAY,  
'FERMI' IF IT'S IN THE RIGHT POSITION, OR 'PICO'  
IF IT'S IN A DIFFERENT POSITION.

BUT I WON'T TELL YOU WHICH LETTERS I MEAN - YOU HAVE TO  
USE YOUR READ TO FIGURE THAT OUT !

O.K. I HAVE A WORD.

WHAT IS YOUR GUESS?ART  
BAGELS

WHAT IS YOUR GUESS?EAT  
BAGELS

WHAT IS YOUR GUESS?IRE  
PICO

WHAT IS YOUR GUESS?LIT  
FERMI

WHAT IS YOUR GUESS?HIM  
FERMI

WHAT IS YOUR GUESS?BIG  
FERMI

WHAT IS YOUR GUESS?SIC  
FERMI

WHAT IS YOUR GUESS?DIP  
FERMI PICO

WHAT IS YOUR GUESS?LID  
FERMI

WHAT IS YOUR GUESS?PIN  
FERMI FERMI FERMI  
YOU GOT IT! MY WORD IS PIN

O.K. I HAVE A WORD.

WHAT IS YOUR GUESS?ACE  
BAGELS

WHAT IS YOUR GUESS?ICE  
BAGELS

WHAT IS YOUR GUESS?OUR  
FERMI

WHAT IS YOUR GUESS?OAR  
FERMI

WHAT IS YOUR GUESS?OWN  
FERMI

WHAT IS YOUR GUESS?ODD  
NO TWO LETTERS ARE THE SAME.

WHAT IS YOUR GUESS?OLD  
FERMI

WHAT IS YOUR GUESS?OWL  
FERMI

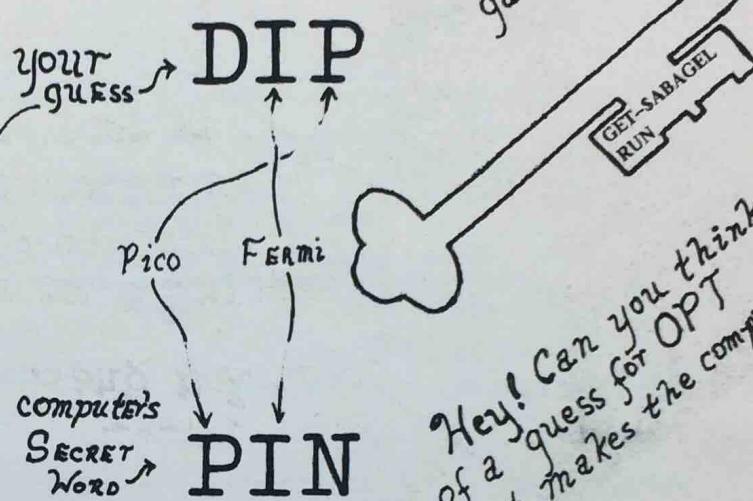
WHAT IS YOUR GUESS?OPT  
FERMI FERMI

WHAT IS YOUR GUESS?OPT  
FERMI FERMI FERMI  
YOU GOT IT! MY WORD IS OPT

O.K. I HAVE A WORD.

WHAT IS YOUR GUESS?

If you like ABAGEL,  
you'll like Bagels,  
a number-guessing  
game (in Chapter 1)



Hey! Can you think  
of a guess for OPT  
that makes the compu-  
ter say,  
PICO  
PICO  
PICO?  
PICO

# BAGELS

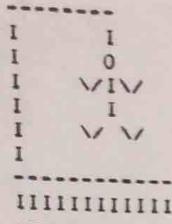
none of the 3 letters  
in your guess is in  
the secret word

# FERMI

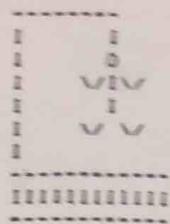
One of your 3 letters  
is in the secret word  
and it's in the correct  
place

# PICO

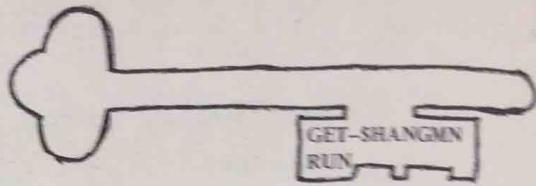
Same as FERMI, but  
it's in the wrong  
place



# HANGMAN



RUN  
HANGMN



DO YOU WANT INSTRUCTIONS (YES OR NO)? YES

THIS IS THE GAME OF HANGMAN. YOU CHOSE THE LANGUAGE THAT YOU WANT TO PLAY IN, AND I THINK OF A WORD IN THAT LANGUAGE. YOU TRY TO GUESS, LETTER BY LETTER, WHAT THE WORD IS. SIMPLE HIMP?

WHEN I THINK OF A WORD, I WILL PRINT A LINE OF DASHES WHICH CORRESPONDS TO THE NUMBER OF LETTERS IN THE WORD.

IF YOU GIVE UP, TYPE 'GIVE'. IF YOU WANT TO QUIT,  
SIMPLY TYPE 'QUIT'.

A FEW SPECIAL INSTRUCTIONS:  
SPANISH - THE ' IS COUNTED AS ONE LETTER, AND THE  
-CH- IS COUNTED AS TWO.

IN WHAT LANGUAGE WOULD YOU LIKE TO PLAY?  
(ENGLISH, FRENCH, SPANISH, OR GERMAN)  
?ENGLISH

Hangman  
is one of the oldest  
games around (it's even  
older than Computers)

Hey! you don't even need a computer for this one!

Anybody remember  
how to use a pencil  
and paper?

HAVE FUN!!  
THE WORD IS -----

YOUR GUESS? A  
WRONG.

THE WORD IS -----  
YOU HAVE USED A

YOUR GUESS? E  
RIGHT!  
THE WORD IS -----  
YOU HAVE USED AE

YOUR GUESS? I  
WRONG.

IOI

THE WORD IS -----  
YOU HAVE USED AFI

YOUR GUESS? O  
RIGHT!  
THE WORD IS O-O-E  
YOU HAVE USED AFIO

YOUR GUESS? S  
WRONG.

I  
I  
I  
I

-----  
IIIIIIIIII  
-----  
THE WORD IS 0-0-E

YOUR GUESS? Z  
RIGHT!  
THE WORD IS OZ-E  
YOU HAVE USED AEIOSZ

YOUR GUESS? N  
RIGHT!  
YOU GOT IT!!  
THE WORD WAS OZONE

What to do while you're just

## Hanging Around

\* HAVE SEVERAL FILES IN A LANGUAGE (SPAN1, SPAN2, ETC.)  
SO YOU CAN HAVE SEVERAL LEVELS OF DIFFICULTY OR TOPICS OF FOCUS.

\* MAKE A SET OF FILES - EACH SET HAS A RHYME PATTERN; ALL THE WORDS IN THE FILE HAVE THE SAME RHYME. LIKE HOUND, FOUND, ABOUND, RESOUND, MOUND...

\* MAKE A FILE OF FAMOUS NAMES, LIKE LINCOLN, KOUFAX, CHER, KENNEDY, DYLAN, ALEXANDER, ETC.

\* USE A FAMOUS QUOTE (LIKE "HERE TODAY GONE TOMORROW") FOR ALL THE WORDS IN A FILE. SINCE HANGMN WON'T REPEAT A WORD UNTIL THE FILE IS FINISHED, THIS WILL MAKE IT A GAME WITHIN A GAME!

\* HAVE A FILE OF WORDS ENDING IN -ING (HUNTING, SHUNTING, PUNTING) OR -ENT (ARGUMENT, ESTABLISHMENT, COMMENT)

\* ANYTHING YOU CAN DO IN ENGLISH YOU CAN DO WITH SPANISH,  
ETC.

\* FILES \*

here's how to make a new language file:

you can find  
the listing  
for Hangfl  
in the back  
of this book  
(It's about  
25 lines long)

RUN  
HANGFL  
WHICH HANGMAN FILE ?ENGLISH  
ENGLISH DOESN'T EXIST; WHEN THE PROGRAM ENDS, TYPE

OPEN-ENGLIS,2

DONE  
OPEN-ENGLIS,2  
RUN  
HANGFL

WHICH HANGMAN FILE ?ENGLISH

HOW MANY WORDS ?10  
WORD # 1 ?EVERYDAY  
WORD # 2 ?SOMETIMES  
WORD # 3 ?QUINTUPLETS  
WORD # 4 ?ABRACADABRA  
WORD # 5 ?CARAVANSERAI  
WORD # 6 ?CORNUCOPIA  
WORD # 7 ?CONUNDRUMS  
WORD # 8 ?PROGRAMMING  
WORD # 9 ?EXACTLY  
WORD # 10 ?OZONE

THAT'S IT FOR ENGLISH  
ANOTHER HANGMAN FILE ?NO

DONE

HP file names  
can be up  
to 6 letters  
long, so English  
is spelled funny  
\*BUT\* Hangfl and  
Hangmn let you  
spell their full  
names



# MADLIB



RUN  
MADLIB

HELLO. THIS IS THE MADLIB PROGRAM TYPING.  
THERE ARE SEVERAL STORIES IN THIS PROGRAM. YOU CAN  
GET ONE PICKED AT RANDOM, OR CHOOSE ONE YOURSELF.  
WHICH DO YOU WANT - CHOOSE OR RANDOM ?RANDOM

GIVE ME A PLACE? EARTH  
GIVE ME A TEMPERATURE? 72 DEGREES  
NOW I NEED A VERB? EAT  
WHAT IS YOUR NAME? DAVID



WEATHER REPORT

GOOD EVENING, TV VIEWERS. THIS IS THE EVENING  
WEATHER REPORT FOR EARTH AND VICINITY.

THE 72 DEGREES WILL BE WARM, AND THE HUMIDITY IN THE LOW  
30'S. THERE WILL BE A SLIGHT RAIN THAT WILL EAT  
AND THAT IS ALL.

SIGNING OFF FOR KLMN TV, THIS IS DAVID



WHICH DO YOU WANT - CHOOSE OR RANDOM ?RANDOM

I NEED A WORD FOR SOMETHING BIG ?SKYSCRAPER  
NOW A WORD FOR A LITTLE ONE ?DOGHOUSE  
GIVE ME A SHORT, SECRET MESSAGE ?XXX...XXX  
WHAT'S ANOTHER WORD FOR 'PREPARE' ?MAKE READY  
WHO WOULD PREPARE IT ?BUTCHER  
ANOTHE WORD FOR MESSAGE ?CODE  
A PERSON IN CHARGE IS CALLED A . . . ?SARGEANT  
GIVE ME A NUMBER ?123456  
ANOTHER NUMBER ?7890  
SOMETHING VERY IMPORTANT ?LIFE  
I NEED AN ACTION WORD ?SWEEP



COMPUTER TALK



THE 3-BIT SKYSCRAPER GENERATES THE CONTROL SIGNALS  
FOR THE DOGHOUSE BY A DECODING OF THE XXX...XXX.  
IT IS LOADED AND MAKE READY BY A BUTCHER AND THEREFORE  
THE TIMING OF I/O CODE IS UNDER SARGEANT.

THERE ARE 123456 OUTPUT MODES AND 7890 INPUT MODES.  
WHEN THIS LIFE IS A 1-BIT, THE LIFE IS  
SUBSTITUTED FOR THE SKYSCRAPER, THUS PROVIDING A SOURCE  
OF DATA WHEN SWEEP AND EXTERNAL I/O CODE.

WHICH DO YOU WANT - CHOOSE OR RANDOM ?CHOOSE  
WHICH STORY NUMBER (TYPE A 0 TO GET A MENU) ?0  
HERE'S THE MENU :

- 1 WEATHER REPORT
- 2 STAR TREK INTRODUCTION
- 3 COMPUTER TALK
- 4 HOW TO <BLANK> YOUR FIRST <BLANK> PROGRAM
- 5 HOW TO WIN FRIENDS AND INFLUENCE PEOPLE
- 6 ATOP THE NARGOIDS

WHICH STORY NUMBER (TYPE A 0 TO GET A MENU) ?2

I NEED A FAMOUS NAME?SPIRO AGNEW  
WHAT WOULD YOU LIKE TO DO MOST OF ALL ?TRAVEL AROUND THE WORLD  
LEAST OF ALL ?MOW THE GRASS  
GIVE ME A NAME ?ALFRED  
AND A DATE?1492  
A NAME OF A DISTANT PLACE?ARGENTINA  
THE NAME OF YOUR BEST FRIEND?SCOTT



#### STAR TREK INTRODUCTION



SPACE, THE FINAL FRONTIER  
THESE ARE THE VOYAGES OF THE STARSHIP SPIRO AGNEW  
ITS FIVE-YEAR MISSION : TRAVEL AROUND THE WORLD  
TO SEEK OUT NEW LIFE AND NEW CIVILIZATIONS,  
TO MOW THE GRASS... .  
TO BOLDLY GO WHERE NO MAN HAS GONE BEFORE . . .

#### STAR TREK

CAPTAIN ALFRED: CAPTAIN'S LOG, STARDATE 1492

WE ARE RESPONDING TO A DISTRESS CALL FROM THE  
SCIENTIFIC EXPEDITION TO ARGENTINA

CAPTAIN ALFRED: LIEUTENANT SCOTT, PLEASE TAKE OVER  
THE HELM WHILE MR. SPOCK AND I BEAM DOWN  
TO INVESTIGATE.

#### COMMERCIAL BREAK

\* STORIES \*

## here's how to make up your own stories:

If you look  
at a listing of  
Mazzib, you'll  
see that start-  
ing with line 1000  
there are scripts  
for 6 stories, plus  
2 open slots.

Line numbers  
7000→7999 and  
8000→8999 can  
be used for  
your new stor-  
ies (these are  
the open slots).

A hint towards  
understanding  
the scripts:  
GOSUB skips all REM and DATA statements.

Tired of the same old stories?

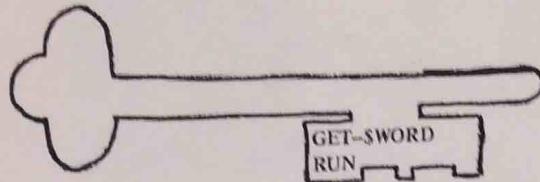
```
2000 REM *** STAR TREK ***
2002 REM * FIRST, THE TITLE
2010 DATA "STAR TREK INTRODUCTION"
2020 REM *-SECOND, THE QUERIES FOR INPUT
2030 DATA "I NEED A FAMOUS NAME"
2040 DATA "WHAT WOULD YOU LIKE TO DO MOST OF ALL "
2050 DATA "LEAST OF ALL "
2060 DATA "GIVE ME A NAME "
2070 DATA "AND A DATE"
2080 DATA "A NAME OF A DISTANT PLACE"
2090 DATA "THE NAME OF YOUR BEST FRIEND"
2099 DATA "*"
2100 REM * AND THIRD, THE STORY GETS PRINTED OUT
2102 PRINT "SPACE, THE FINAL FRONTIER"
2110 PRINT "THESE ARE THE VOYAGES OF THE STARSHIP "JAS
2120 PRINT "ITS FIVE-YEAR MISSION : "JBS
2130 PRINT "TO SEEK OUT NEW LIFE AND NEW CIVILIZATIONS,"
2140 PRINT "TO "JCS". . . "
2142 PRINT "TO BOLDLY GO WHERE NO MAN HAS GONE BEFORE . . . "
2150 PRINT -
2160 PRINT TAB(15);"STAR TREK "
2170 PRINT -
2180 PRINT "CAPTAIN "JDS";: CAPTAIN'S LOG, STARDATE "JES
2190 PRINT -
2200 PRINT " WE ARE RESPONDING TO A DISTRESS CALL FROM THE"
2210 PRINT "SCIENTIFIC EXPEDITION TO "FS
2220 PRINT -
2230 PRINT "CAPTAIN "JDS";: LIEUTENANT "JGS";, PLEASE TAKE OVER"
2240 PRINT " THE HELM WHILE MR. SPOCK AND I BEAM DOWN"
2250 PRINT " TO INVESTIGATE."
2260 PRINT -
2270 PRINT TAB(5);"COMMERCIAL BREAK "
2299 RETURN
```

Write  
your  
own!  
- or -  
change  
the old  
ones...  
there  
are lots  
of line  
numbers  
that you  
can use.

21



# Unscramble the WORD before Overtime



RUN  
WORD

## A WORD GAME

HOW MANY SECONDS DO YOU NEED TO ANSWER?

THE SCRAMBLED WORD IS: WHELE

OVERTIME!!

THE CORRECT ANSWER IS: WHEEL

TOTALS:  
CORRECT 0 , WRONG 0 , OVERTIME 1

ANOTHER? YES

*My goal  
today is 5  
seconds...*

M D  
H F U B  
V Q A K  
X T H I  
W P S  
N O C  
R G

HOW MANY SECONDS DO YOU NEED TO ANSWER?

THE SCRAMBLED WORD IS: UDLAT

ADULT

CORRECT!!

YOU ANSWERED IN 5 SECONDS

TOTALS:  
CORRECT 1 , WRONG 0 , OVERTIME 1

ANOTHER? YES

*I... but  
I have to  
work towards  
my goal  
gradually*

X T H I  
W P S  
N O C  
R G

HOW MANY SECONDS DO YOU NEED TO ANSWER?

THE SCRAMBLED WORD IS: RHTDI

THIRD

CORRECT!!

YOU ANSWERED IN 2 SECONDS

TOTALS:  
CORRECT 2 , WRONG 0 , OVERTIME 1

ANOTHER? YES



HOW MANY SECONDS DO YOU NEED TO ANSWER?

THE SCRAMBLED WORD IS: ARPHG

GRAPH

CORRECT!!

YOU ANSWERED IN 4 SECONDS

TOTALS:  
CORRECT 3 , WRONG 0 , OVERTIME 1

ANOTHER? NO

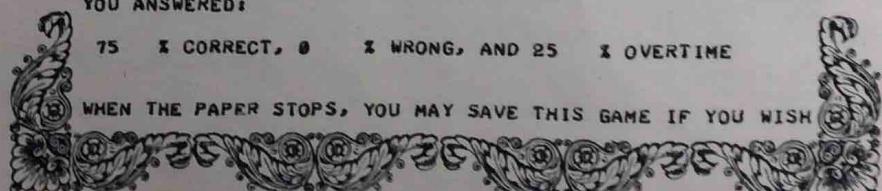
*I finally, on  
my fourth try,  
I get it with a  
5-second limit*

N S  
C R

YOU ANSWERED:

75 % CORRECT, 0 % WRONG, AND 25 % OVERTIME

WHEN THE PAPER STOPS, YOU MAY SAVE THIS GAME IF YOU WISH

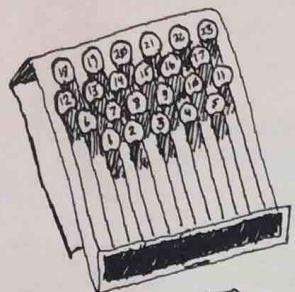
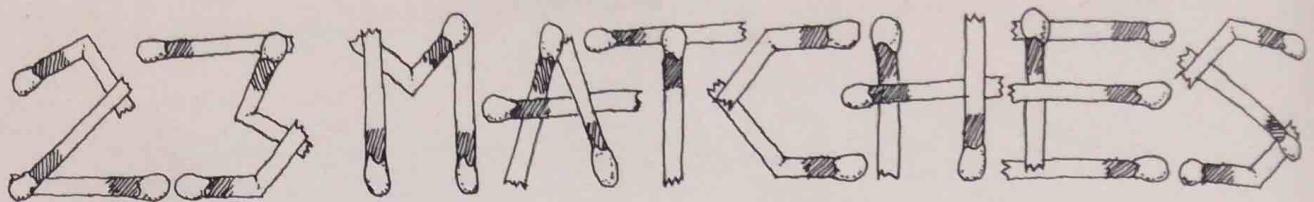


DOGO - EYB !!!

*Nim* is an ancient game in which two players take turns removing objects from piles. A winning strategy involves always moving so as to guarantee a win, no matter what the other player does. The games in this chapter are "Nimlike". They are presented in such a way that the concepts and techniques developed in one game are useful in understanding the next.

# "NIMLIKE" GAMES

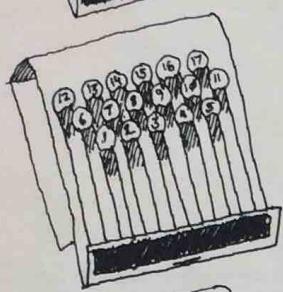
**23** Matches  
Battle of Numbers  
Nim  
Chomp  
Zot



WE START WITH A PILE OF 23 MATCHES.

WE TAKE TURNS. ON EACH TURN WE CAN REMOVE 1, 2, OR 3 MATCHES FROM THE PILE. THE ONE WHO HAS TO TAKE THE LAST MATCH LOSES.

YOU GO FIRST. GOOD LUCK AND MAY THE BEST COMPUTER (HA HA) WIN.



THERE ARE NOW 23 MATCHES.  
HOW MANY DO YOU TAKE? 3

I TOOK 3 . . . THERE ARE NOW 17 MATCHES.  
HOW MANY DO YOU TAKE? 1

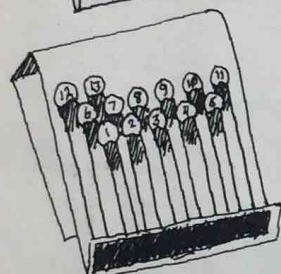
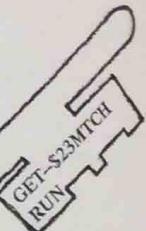
I TOOK 3 . . . THERE ARE NOW 13 MATCHES.  
HOW MANY DO YOU TAKE? 2

I TOOK 2 . . . THERE ARE NOW 9 MATCHES.  
HOW MANY DO YOU TAKE? 3

I TOOK 1 . . . THERE ARE NOW 5 MATCHES.  
HOW MANY DO YOU TAKE? 1

I TOOK 3 . . . THERE ARE NOW 1 MATCHES.  
HOW MANY DO YOU TAKE? 1

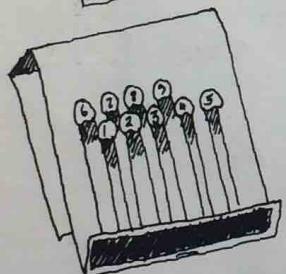
I WON!!! BETTER LUCK NEXT TIME.



Too bad! I wonder how I can improve my game. Let's go back and see what happened.

I TOOK 3 . . . THERE ARE NOW 1 MATCHES.  
HOW MANY DO YOU TAKE?

Not much I can do at this point.

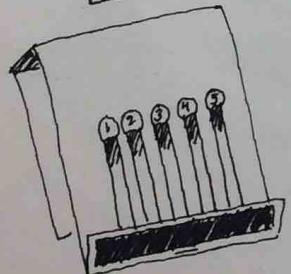


I TOOK 1 . . . THERE ARE NOW 5 MATCHES.  
HOW MANY DO YOU TAKE?

Let's see — I took 1 and he took 3 which left 1. No good!

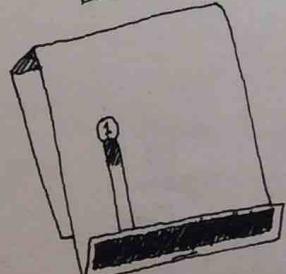
Maybe I should have taken 2. But then the computer would take 2 and that would leave 1 — oops!  
Ah, ha — I guess I should have taken 3. But if he takes 1, zap!

5 matches left but I'm going to lose no matter what I do. Maybe if I had done something else on the turn before, I wouldn't have been stuck with 5.



I TOOK 2 . . . THERE ARE NOW 9 MATCHES.  
HOW MANY DO YOU TAKE?

If the computer leaves me with 5 matches after his next turn, I've had it. How can I avoid this?  
It would sure be nice if I could leave him with 5 matches but I'd have to take 4 to do it and the most I can take is 3.



Well, if I take 1 he takes 3 --> 5  
if I take 2 he takes 2 --> 5  
if I take 3 he takes 1 --> 5

I'm going to lose no matter what I do even though there are still 9 matches in the pile.

Where did I go wrong? Am I always going to lose or was there some move I could have made earlier so that I wouldn't be in this fix now?

*A position is safe or unsafe depending on whether or not it guarantees a win for the player who leaves it.*



Back to the game we just played.

. . . THERE ARE NOW 9 MATCHES.

HOW MANY DO YOU TAKE? 3

I TOOK 1 . . .

. . . THERE ARE NOW 5 MATCHES.

HOW MANY DO YOU TAKE? 1

I TOOK 3 . . .

. . . THERE ARE NOW 1 MATCHES.



9 is a *safe* position. Whatever I move changes the position to make it *unsafe*. That is, the computer could beat me.

I took 3 leaving 6 matches. 6 is an *unsafe* position.

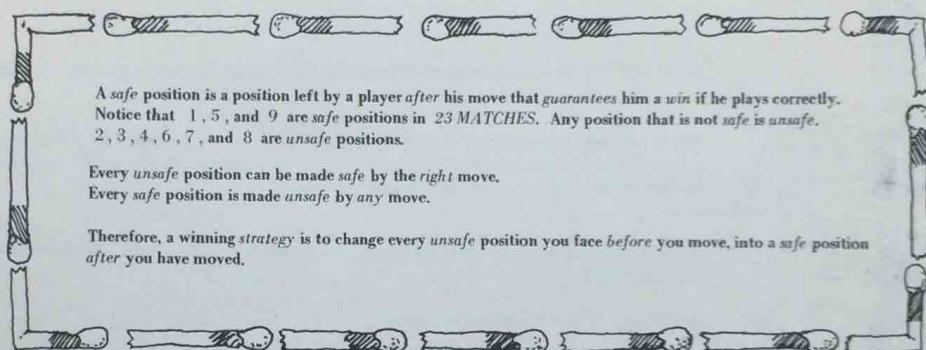
The computer changed an *unsafe* position, 6, into a *safe* position, 5, by making the right move, 1. If he made a wrong move, 2 or 3, he would have left an *unsafe* position and I could have won — too bad.

5 is a *safe* position. Whatever I do will leave an *unsafe* position.

I took 1 leaving 4 matches. 4 is an *unsafe* position.

He did it again! Changed an *unsafe* position, 4, into a *safe* position, 1.

It's all over, folks!!

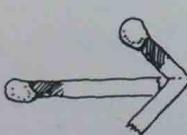


*A safe* position is a position left by a player after his move that guarantees him a *win* if he plays correctly. Notice that 1, 5, and 9 are *safe* positions in 23 MATCHES. Any position that is not *safe* is *unsafe*. 2, 3, 4, 6, 7, and 8 are *unsafe* positions.

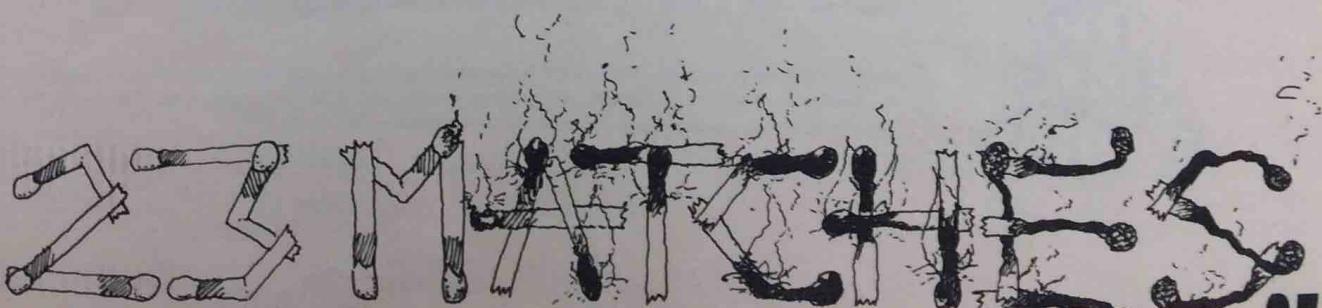
Every *unsafe* position can be made *safe* by the *right* move. Every *safe* position is made *unsafe* by *any* move.

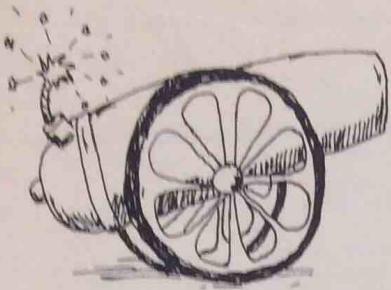
Therefore, a winning strategy is to change every *unsafe* position you face before you move, into a *safe* position after you have moved.

O.K. If 23 is a *safe* position then I will always lose by moving first. But if 23 is an *unsafe* position, then I can leave a *safe* position after my first move and *win* by changing every *unsafe* position to a *safe* position on each of my moves.



Is it safe or unsafe to play with 23 matches





# BATTLE OF NUMBERS

WE BEGIN WITH A PILE OF OBJECTS (YOU DECIDE HOW MANY).

WE TAKE TURNS REMOVING OBJECTS FROM THE PILE.  
YOU DECIDE WHAT THE MINIMUM (LEAST) AND THE MAXIMUM (MOST) ARE THAT WE CAN  
TAKE ON EACH TURN. FOR EXAMPLE, IF 2 IS THE MINIMUM AND 5 IS THE MAXIMUM, THEN  
ON EACH TURN WE MUST TAKE 2, 3, 4, OR 5 OBJECTS.†

TWO MORE THINGS TO DECIDE. IS TAKING THE LAST OBJECT WINNING OR LOSING?  
AND, DO YOU WANT TO GO FIRST?

HERE WE GO . . . GOOD LUCK.

†The only exception is that if  
the number of objects left is  
less than the minimum, you  
must take what's left.

HOW MANY OBJECTS IN THE PILE? 37  
WHAT IS THE MINIMUM YOU CAN TAKE? 3  
WHAT IS THE MAXIMUM YOU CAN TAKE? 7

DO YOU WIN OR LOSE BY TAKING THE LAST OBJECT (TYPE WIN OR LOSE)? LOSE  
DO YOU WANT TO GO FIRST (YES OR NO)? YES

THERE ARE 37 OBJECTS IN THE PILE.  
HOW MANY DO YOU TAKE?

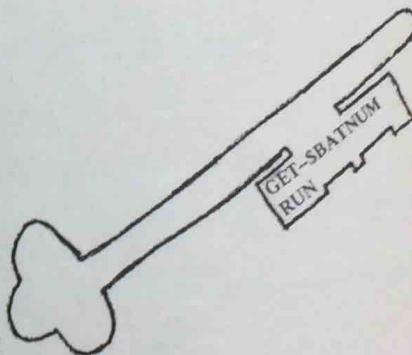
9  
8  
7  
6  
5  
4  
3  
2  
1  
0

"BATNUM" is a bit more complicated than 23 MATCHES (as you've probably already realized).

Try to discover a general formula for finding safe positions. (The pages on 23 MATCHES explain what safe and unsafe positions are.) The parameters in this formula are the minimum, the maximum, and whether taking the last object is winning or losing.

Start simple and then see what happens as the parameters are changed. As an example, let's dissect 23 MATCHES.

- We'll begin with 23 objects in the pile.
- The minimum is 1, the maximum is 3.  
Taking the last object is losing.  
O.K. What are the safe positions?
  - Suppose we change the maximum to 4.  
Now what are the safe positions?
  - Let's complicate things. Suppose the minimum is 2 and the maximum is 3.  
What are the safe positions?  
How is the minimum related to the number of safe positions?
  - Ready? Answer these questions again but this time make taking the last object winning!

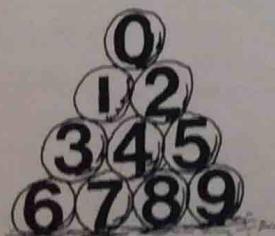


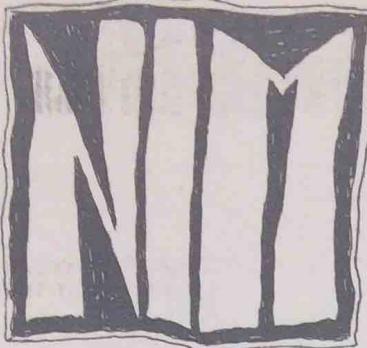
Let's go back to the example above. There are 37 objects in the pile. The minimum is 3 and the maximum is 7. Taking the last object is losing. Does the decision to go first guarantee you a win? What will your first move be?

Suppose we start with an empty pile and on each turn we add objects to the pile. The number a player may add is bounded by a minimum and a maximum. The first player to exceed a specified number is the winner (or should he be the loser?).

Yup - you guessed it. What's a general formula for determining the safe positions?

Here's a variation suggested by Wally Judd in *Games, Tricks, and Puzzles for a Hand Calculator*, published by Dymax. Start with an empty pile. At each turn you can add 1, 4, or 7 to the pile. The loser is the first player who causes the pile to exceed a specified number. Have fun!!





NIM IS PLAYED WITH PILES OF STARS (YOU DECIDE HOW MANY PILES AND HOW MANY STARS IN EACH PILE).

WHEN IT IS YOUR TURN, YOU MAY TAKE AS MANY \*s AS YOU LIKE BUT FROM ONE PILE ONLY.

THE PLAYER WHO TAKES THE LAST \* WINS.

FOR EXAMPLE, SUPPOSE THE PILES ARE:

PILE 1: \* \*  
PILE 2: \* \* \*  
PILE 3: \* \*

TO TAKE THREE \*s FROM PILE 2, YOU MOVE 3,2 . THAT LEAVES

PILE 1: \* \*  
PILE 2:  
PILE 3: \* \*

NOW IF I MOVE 2,3 (TAKING 2 \*s FROM PILE 3) YOU WIN BY MOVING 2,1 (2 \*s FROM PILE 1)!!

HERE WE GO . . .

HOW MANY PILES? 3  
HOW MANY \*s IN PILE 1? 3  
HOW MANY \*s IN PILE 2? 5  
HOW MANY \*s IN PILE 3? 7

DO YOU WANT TO GO FIRST (YES OR NO)? YES

PILE 1: \* \* \*  
PILE 2: \* \* \* \* \*  
PILE 3: \* \* \* \* \* \* \*



YOUR MOVE? 3,2  
I MOVE 6,3

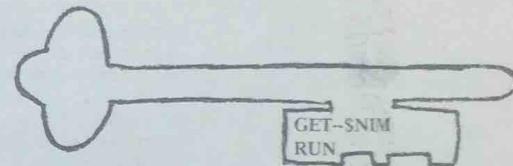
PILE 1: \* \* \*  
PILE 2: \* \*  
PILE 3: \*



YOUR MOVE? 1,3  
I MOVE 1,1

PILE 1: \* \*  
PILE 2: \* \*  
PILE 3:

YOUR MOVE? 2,1  
I MOVE 2,2



I WON. BETTER LUCK NEXT TIME.



We shall attempt to discover some of the *safe* and *unsafe* positions in NIM. (*Safe* and *unsafe* positions are explained in the pages on 23 MATCHES.)

*Discover* is the key word. There is a general formula for *safe* positions (if you haven't seen it before, you could check out Martin Gardner, *The Scientific American Book of Mathematical Puzzles and Diversions* published by Simon & Schuster). *Forget* about the formula. That's right — *forget* about the answer. The formula is completely non-intuitive anyway — like would you have ever guessed that's what it would be? Folks played NIM for a long time *before* anybody discovered the formula.

We will start simple and expand our analysis as things get more complicated. The point is this — education is *discovery*, not memorizing facts. It is not *necessary* to always have answers — lots of famous problems in mathematics don't even have answers. Down with dehydrated answers! Long live discovery!



### THE SIMPLEST CASE - ONLY ONE PILE.

Wow, we've solved an *infinite* number of cases already — NIM with *one pile only* but with an *arbitrary* number of \*'s in it. Since we've solved an *infinite* number of cases, we must be done, right? Well, that's another subject . . .



Remember, the object of the game is to take the *last* \* and you can take as many from any *one* pile as you want. So what's the winning move?

*Answer:* Take all of them

O.K., so *every* position with only *one* pile left is *unsafe*.

### NEXT - TWO PILES LEFT.

What happens when there are only two piles left? Try some examples yourself before continuing. O.K. See what's happening? If there are two piles left, the position is *safe* if they are the *same size* — otherwise it's *unsafe*. After leaving a *safe* position with two piles of the *same size*, I can play *symmetrically* and win. Watch.

PILE 1: \* \* \* \* \*  
PILE 2: \* \* \* \* \* \* \*

I move 3, 2 changing an *unsafe* position (two piles of *different size*) into a *safe* position (two piles of the *same size*). Now whatever you do to one pile, I do the same thing to the other.

PILE 1: \* \* \* \* \*  
PILE 2: \* \* \* \* \*

If you move 2, 1 then I move 2, 2. My *symmetric* move changes an *unsafe* position (*uneven* piles) into a *safe* position (*even* piles).

### MOVING ALONG - THREE PILES LEFT.

We'll discover *safe* positions by building on information we've already learned.

If two of the three piles have the *same size*, then the position is *unsafe* — it is made *safe* by taking everything in the other pile, leaving two piles with the *same size*.

[1, 2, 3] is *safe*. Whatever you move, I can leave two piles of the *same size*. So [1, 2, 4], [1, 12, 3], and [7, 2, 3] are *unsafe* because each can be changed to [1, 2, 3] by the *right move*.

Now, let's analyze *all* the positions with 3 piles where one of the piles has only *one* \*. [1, 2, k] and [1, 3, k] we already know about.

[1, 4, 5] is *safe* (after *any* move the resulting position can be reduced to [1, 2, 3] or [k, k]). So [1, 4, 10] and [1, 9, 5] are *unsafe*, right (they can be changed to [1, 4, 5])?

Next — [1, 6, 7] is *safe* (can you use the last examples to show why?). Why is [1, 5, 6] *unsafe*?

O.K. — so [1, 2, 3], [1, 4, 5], and [1, 6, 7] are *safe*. You guessed it — [1, 8, 9] is too. In general, [1, 2k, 2k+1] is *safe* (for any positive integer k) and all others with 3 piles having one pile with 1 are *unsafe*.



### HERE WE GO AGAIN!

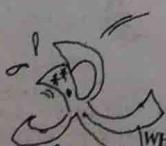
Suppose there are three piles and 2 is the smallest number left in any of the piles. [2, 3, k] is *unsafe* — it can be changed to [2, 3, 1] which is *safe*. What about [2, 4, k]? Well, [2, 4, 5] is *unsafe* since [1, 4, 5] is *safe*. But [2, 4, 6] is *safe* — no move makes it *safe* but after *any* move the resulting piles can be changed to a *safe* position — check it out. We are building on what we have discovered and each piece we build helps us discover another. How about [2, 5, k]? Not [2, 5, 6] since [2, 4, 6] is *safe*. Yup — [2, 5, 7] is *safe*. But not [2, 6, 8] because [2, 6, 4] is *safe*. Similarly, [2, 7, 9] is *unsafe* because of [2, 7, 5].

What happens if k = 0?

In general [2, 4k, 4k+2] and [2, 4k+1, 4k+3] (for any positive integer k) are *safe*.

### MORE, MORE.

[3, 4k, 4k+3] and [3, 4k+1, 4k+2] are *safe*.



### WHAT ABOUT FOUR PILES?

WHAT ABOUT EIGHT MILLION FOUR HUNDRED THIRTY NINE THOUSAND TWO HUNDRED SIXTEEN?

**8,439,216**



Now, you *might* be ready to consider attempting to construct the general case. See the difference between giving the answer when *NIM* is introduced vs. analyzing some special cases first and then generalizing? How do you think the formula was discovered in the first place? (If you're interested Martin Gardner also gives some references for *NIM* in his book we mentioned.)

There is a *simple* modification of strategy in the case where the player to take the last object is the *loser*, instead of the *winner*. At some point only one pile will have more than one \* — you must take either all or all but one so as to leave an odd number of one \* piles. (Thanks again, M.G.)

How about some variations that combine *NIM* and *THE BATTLE OF NUMBERS*, like a maximum number a player can take from one pile (or maybe from P piles)?

Another nice modification that you can analyze in the same way: Instead of removing from only one pile, a player may remove \*s from *any* number of piles not exceeding some designated number, N, and as many from each pile as he wants.

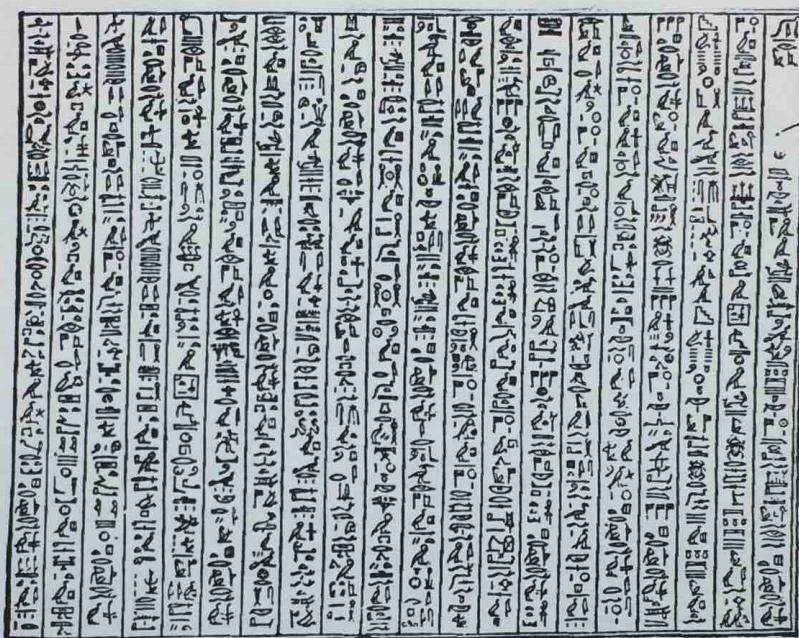


FIGURE 4.

OH YEAH, BY THE WAY, WE ALMOST FORGOT . . .

Here are some operators we've made up!

- $k \bullet [P_1, P_2, \dots, P_n] = [kP_1, kP_2, \dots, kP_n]$  for any positive integer  $k$   
Example:  $6 \bullet [1, 2, 2, 3] = [6, 12, 12, 18]$

- $[P_1, P_2, \dots, P_n] \square [Q_1, Q_2, \dots, Q_m] = [P_1, P_2, \dots, P_n, Q_1, Q_2, \dots, Q_m]$   
Example:  $[1, 2, 2, 3] \square [5, 7] = [1, 2, 2, 3, 5, 7]$

- \*  $[P_1, P_2, \dots, P_n] \dagger [Q_1, Q_2, \dots, Q_m] = [P_1 + Q_1, P_2 + Q_2, \dots, P_n + Q_n]$   
Example:  $[1, 2, 3] \dagger [2, 4, 6] = [3, 6, 9]$

[ How is  $\dagger$  defined for  
 $[P_1, P_2, \dots, P_n] \dagger [Q_1, Q_2, \dots, Q_m]$   
 when  $n$  and  $m$  are different?  
 You make up a way which makes sense to you! ]

See what effects these operators have on *safe* and *unsafe* positions. Since we just made these up, we strongly suspect that this is an unsolved problem. You too can make original contributions to mathematics!



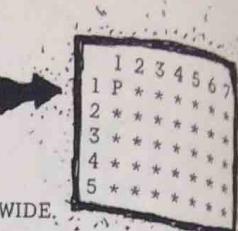
# GOT THE MUNCHIES?

The game of CHOMP was introduced in Martin Gardner's mathematical games department of *Scientific American*, January 1973. It was invented by David Gale at UC Berkeley. We changed the rules somewhat from the published version.



THIS IS THE GAME OF CHOMP (SCIENTIFIC AMERICAN, JAN 1973)  
CHOMP IS FOR 2 OR MORE PLAYERS (HUMANS ONLY).

HERE'S HOW A BOARD LOOKS (THIS ONE IS 5 BY 7).



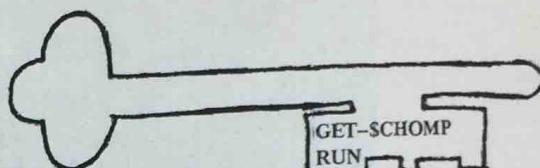
THE BOARD IS A BIG COOKIE - R ROWS HIGH AND C COLUMNS WIDE.  
YOU SPECIFY R AND C AT THE START.  
IN THE UPPER LEFT CORNER OF THE COOKIE IS A POISON SQUARE P. THE PLAYER WHO CHOMPS THE POISON SQUARE LOSES.

TO TAKE A CHOMP, TYPE THE ROW AND COLUMN OF ONE OF THE SQUARES ON THE COOKIE, ALL OF THE SQUARES BELOW AND TO THE RIGHT OF THAT SQUARE (INCLUDING THAT SQUARE, TOO) DISAPPEAR - CHOMP!!  
NO FAIR CHOMPING SQUARES THAT HAVE ALREADY BEEN CHOMPED, OR THAT ARE OUTSIDE THE ORIGINAL DIMENSIONS OF THE COOKIE.

HERE WE GO . . .

HOW MANY PLAYERS? 3  
HOW MANY ROWS? 4  
HOW MANY COLUMNS? 5

	1	2	3	4	5
1	P	*	*	*	*
2	*	*	*	*	*
3	*	*	*	*	*
4	*	*	*	*	*



PLAYER 1  
COORDINATES OF CHOMP (ROW, COLUMN)? 3 , 2

	1	2	3	4	5
1	P	*	*	*	*
2	*	*	*	*	*
3	*	.	.	.	.
4	*	.	.	.	.

PLAYER 2  
COORDINATES OF CHOMP (ROW, COLUMN)? 2 , 4

	1	2	3	4	5
1	P	*	*	*	*
2	*	*	*	*	*
3	*	.	.	.	.
4	*	.	.	.	.

PLAYER 3  
COORDINATES OF CHOMP (ROW, COLUMN)? 1 , 3

	1	2
1	P	*
2	*	*
3	*	.
4	*	.

PLAYER 1  
COORDINATES OF CHOMP (ROW, COLUMN)? 2 , 3  
NO FAIR. YOU'RE TRYING TO CHOMP ON EMPTY SPACE!

PLAYER 1  
COORDINATES OF CHOMP (ROW, COLUMN)? 2 , 1

	1	2
1	P	*
2	.	.
3	.	.
4	.	.

PLAYER 2  
COORDINATES OF CHOMP (ROW, COLUMN)? 1 , 2

	1
1	P

PLAYER 3  
COORDINATES OF CHOMP (ROW, COLUMN)? 1 , 1  
YOU LOSE, PLAYER 3.

## HAVE A BYTE...

Let's look at a few of the simpler *safe* positions for the 2 player game. (The pages on *23 MATCHES* explain *safe* and *unsafe* positions.)

1	2	3	4
1	P	*	*
2	*		
3	*		
4	*		

Notice that  $[1, 1]$  is  
 $\begin{array}{c} 1 \\ 1 \\ \hline P \end{array}$   
which is obviously a *safe* position to leave.

Let's call this position  $[4, 4]$ . It's *safe*. Just play *symmetrically* to the other player.  
In general  $[k, k]$  is *safe* for any positive integer  $k$ .

Let's call

1	2	3
1	P	*
2	*	*

$[2, 3, 1]$

$[2, 3, 1]$  is *safe* (see why?).  
2 rows  
3 columns  
1 extra on the main diagonal.

So is  $[4, 5, 1]$  which looks like

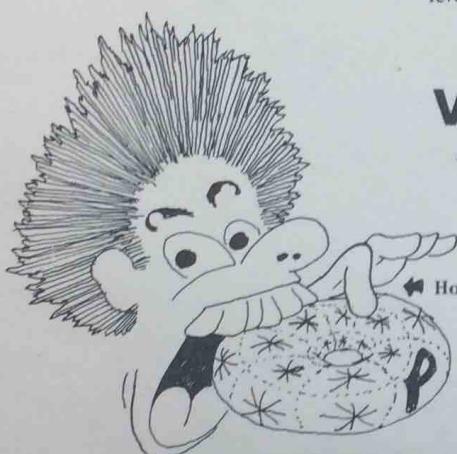
1	2	3	4	5
1	P	*	*	*
2	*	*		
3	*			
4	*			

Now, look again at the pages on *NIM*. Notice any similarities?

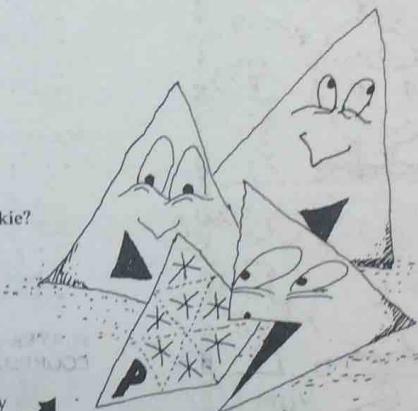
Are there any *safe* positions when there are more than 2 players?

The *loser* is the player who takes the *last* square on the cookie. Can you devise a strategy for the reverse game where the *winner* is the one who chomps last?  
*Answers: The Big Byte!*

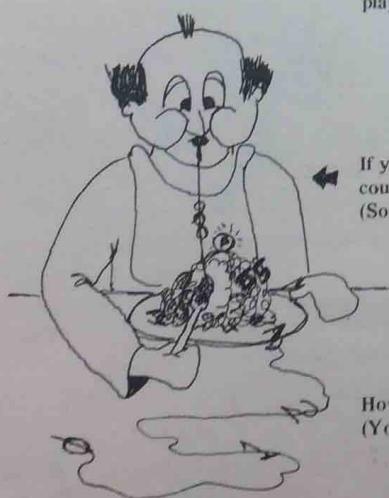
## VARIATIONS



How about chomping a torus, instead of a cookie?

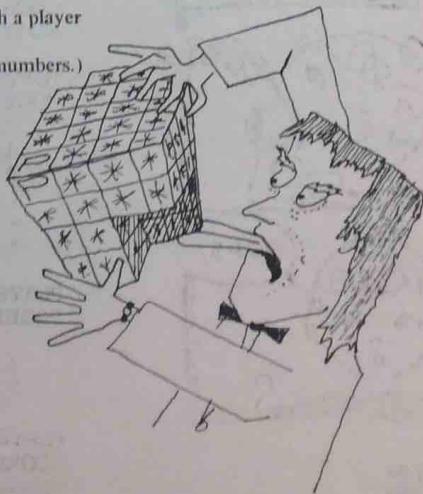


What about chomping an equilateral triangle by players who have equilateral-triangular mouths?



If you specified the *minimum* and *maximum* length a player could chomp, what about chomping on a line?  
(Some folks might call this a *continuous battle of numbers*.)

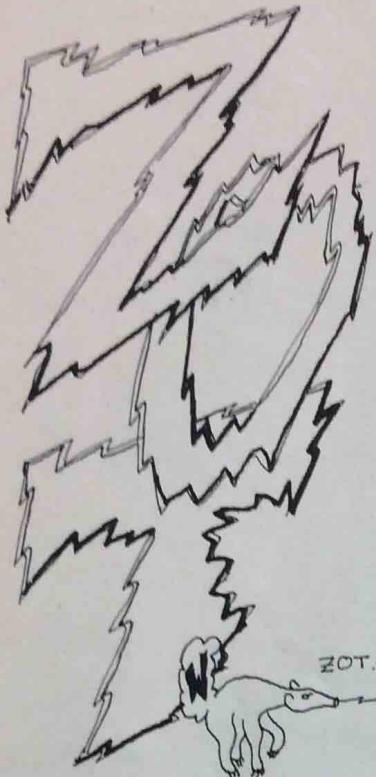
How about 3-dimensional cookies?  
(You could use a 3-D tic-tac-toe board.)



Your turn to make up some variations on *CHOMP*. Don't bite your tongue!

We made up another game for 2 or more players on a rectangular cookie — we call it *ZOT!*

Here is a  $4 \times 5$  *ZOT!* board.



**N**  
1 2 3 4 5

**W** 1 \* \* \* \*  
2 \* \* \* \* \*  
3 \* \* \* \* \*  
4 \* \* \* \* \*

**S**

The sides of the cookie are named *North*, *South*, *East*, and *West*.

A move is called a *zot*, which consists of taking all the stars in a line from a particular edge of the board to some particular star.

Here are some sample *zots*:

1 2 3 4 5  
1 \* \* \* \* \*  
2 \* \* \* \* \*  
3 \* \* \* \* \*  
4 \* \* \* \* \*

ZOT!!

W 3 4



1 2 3 4 5

1 2 3 4 5  
1 \* \* \* \* \*  
2 \* \* \* \* \*  
3 \* \* \* \* \*  
4 \* \* \* \* \*

N 3 4



You decide whether the last *zot* wins or loses.

A restriction is that all the stars you *zot* must be consecutive.

For example, if the cookie looks like this:

1 2 3 4 5

1 \* \* \* \*  
2 \* \* \* \* \*  
3 \* \* \* \*  
4 \* \* \* \* \*

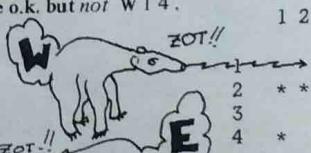
then E 3 3 and W 1 2 are o.k. but not W 1 4.

1 2 3 4 5      W 1 2

1 2 3 4 5

1 \* \* \* \*  
2 \* \* \* \* \*  
3 \* \* \* \* \*  
4 \* \* \* \* \*

E 3 3



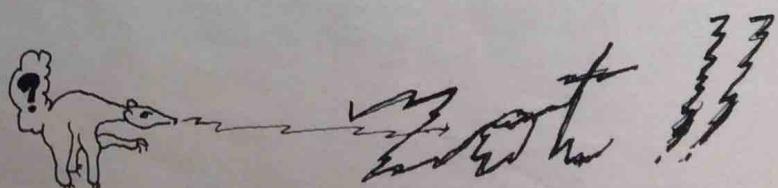
1 2 3 4 5  
1 \* \* \* \*  
2 \* \* \* \* \*  
3 \* \* \* \* \*  
4 \* \* \* \* \*

W 1 4

Holes are o.k. in front of the stars (like E 3 3) but not in-between (like W 1 4).

We don't know much about *ZOT* yet. What can you discover?

As a further variation, how about limiting the size of a player's *zotter*?



The games in this chapter are all played on grids. *Hurkle* players need no extra equipment; *Snark* and *Mugwump* players need to draw circles (a compass is handy). In all these games, the "computer" has a harder task than the players.

Grids can be on paper, a table top, the floor (make one big enough to walk on). Try a checkerboard. Use lead-up games to familiarize beginning learners with grids and the coordinate system. Some suggestions are: practice choosing an intersection and naming it (by coordinates); "Look for *all* the points North of 3,7 or South East of 6,4."; draw a circle and name all the points inside, on, and outside; find all the points that are 4 units from 3,2 and 7.8 units from 8,0.

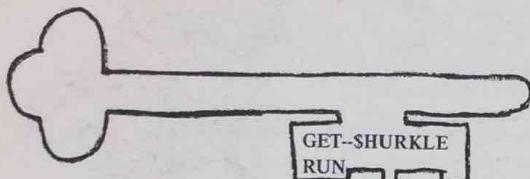
Try varying the size and shape of the grids. Invent a game that combines *Mugwump* and *Stars* — give a code related to how far your guess is from the *Mugwump*.

## HIDE & SEEK IN 2-D

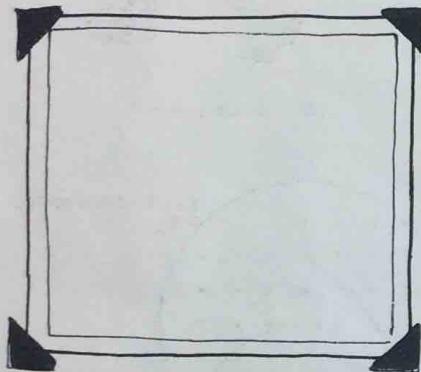
Hurkle  
Mugwump  
Snark

# THE HURKLE IS A HAPPY BEAST

Hurkle? A Hurkle is a happy beast and lives in another galaxy on a planet named Lirth that has three moons. Hurkle are favorite pets of the gwik, the dominant race of Lirth and . . . well, to find out more, read "The Hurkle is a Happy Beast" in a book called *A WAY HOME* by Theodore Sturgeon, published by Pyramid Publications, 444 Madison Avenue, New York, NY 10022. (Unless they have moved since January, 1968.)



Happy hurkles radiate.  
Scared hurkles go invisible.  
We took a snapshot of a happy  
radiating hurkle, but the click of  
the camera scared him and . . . .



THE HURKLE IS HIDING - TRY TO FIND HIM!

WHAT IS YOUR GUESS? 2,7  
GO SOUTHEAST

WHAT IS YOUR GUESS? 5,8  
GO SOUTHEAST

WHAT IS YOUR GUESS? 8,1  
GO NORTH

WHAT IS YOUR GUESS? 8,4  
GO NORTH

WHAT IS YOUR GUESS? 8,6

YOU FOUND HIM IN 5 GUESSES!!!  
LET'S PLAY AGAIN.

THE HURKLE IS HIDING - TRY TO FIND HIM!

WHAT IS YOUR GUESS? 7,5  
GO WEST

WHAT IS YOUR GUESS? 3,5  
GO WEST

WHAT IS YOUR GUESS? 1,5  
GO WEST

WHAT IS YOUR GUESS? 0,5

YOU FOUND HIM IN 4 GUESSES!!!  
LET'S PLAY AGAIN.

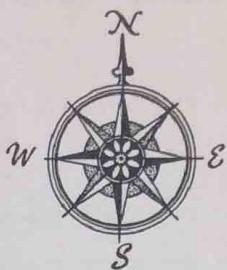
THE HURKLE IS HIDING - TRY TO FIND HIM!

WHAT IS YOUR GUESS? 9,9  
GO SOUTHWEST

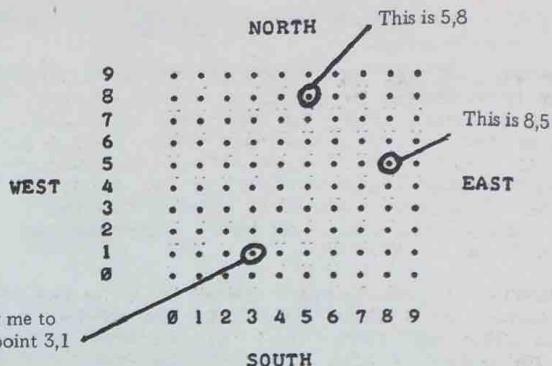
WHAT IS YOUR GUESS? 0,0  
GO NORTHEAST

WHAT IS YOUR GUESS? 5,5  
GO EAST

WHAT IS YOUR GUESS? What would you try next?

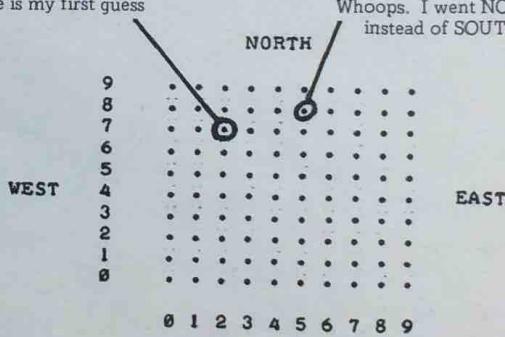


WANT THE RULES? YES  
A HURKLE IS HIDING IN A GRID, LIKE THE ONE BELOW.



TRY TO GUESS WHERE THE HURKLE IS HIDING. YOU GUESS BY TELLING ME THE GRIDPOINT WHERE YOU THINK THAT THE HURKLE IS HIDING. HOMEBASE IS POINT 0,0 IN THE SOUTHWEST CORNER. YOUR GUESS SHOULD BE A PAIR OF WHOLE NUMBERS, SEPARATED BY A COMMA. THE FIRST NUMBER TELLS HOW FAR TO THE RIGHT OF HOMEBASE AND THE SECOND NUMBER TELLS HOW FAR ABOVE HOMEBASE YOU THINK THE HURKLE IS HIDING. FOR EXAMPLE, IF YOU THINK THE HURKLE IS 7 TO THE RIGHT AND 5 ABOVE HOMEBASE, YOU ENTER 7,5 AS YOUR GUESS AND THEN PRESS THE 'RETURN' KEY. AFTER EACH GUESS, I WILL TELL YOU THE APPROXIMATE DIRECTION TO GO FOR YOUR NEXT GUESS. GOOD LUCK!

Here is my first guess



And here is my  
second guess.

Whoops. I went NORTHEAST  
instead of SOUTHEAST.

SOUTH You circle my third  
guess. Is it SOUTHEAST  
of my second guess?

What is the best first guess?

is 1,2 southwest of 5,5?

What direction is 2,6 from 8,3?

What point is due north of 7,8?

# mugwump

WANT THE RULES? YES  
A MUGWUMP IS HIDING IN A GRID, LIKE THE ONE BELOW.

9	.	.	.	.	.	.	.	.
8	.	.	.	.	.	.	.	.
7	.	.	.	.	.	.	.	.
6	.	.	.	.	.	.	.	.
5	.	.	.	.	.	.	.	.
4	.	.	.	.	.	.	.	.
3	.	.	.	.	.	.	.	.
2	.	.	.	.	.	.	.	.
1	.	.	.	.	.	.	.	.
0	.	.	.	.	.	.	.	.

0 1 2 3 4 5 6 7 8 9

MUGWUMP WILL BE HIDING AT ONE OF THE GRIDPOINTS. YOU TRY TO FIND HIM BY GUESSING HIS GRIDPOINT. HOMEBASE IS POINT  $0,0$  IN THE LOWER LEFTHAND CORNER OF THE ENTIRE GRID. YOUR GUESS SHOULD BE A PAIR OF WHOLE NUMBERS SEPARATED BY A COMMA. THE FIRST NUMBER TELLS HOW FAR TO THE RIGHT OF HOMEBASE YOU THINK MUGWUMP IS HIDING AND THE SECOND NUMBER TELLS HOW FAR ABOVE HOMEBASE YOU THINK MUGWUMP IS HIDING.

FOR EXAMPLE, IF YOU THINK MUGWUMP IS 8 TO THE RIGHT OF HOMEBASE AND 3 ABOVE HOMEBASE, YOU ENTER  $8,3$  AS YOUR GUESS AND THEN PRESS THE 'RETURN' KEY. AFTER YOU GUESS, I WILL TELL YOU HOW FAR (IN A DIRECT LINE) YOUR GUESS IS FROM WHERE MUGWUMP IS HIDING.

MUGWUMP IS HIDING...TRY TO FIND HIM!!!

WHAT IS YOUR GUESS? 6,3  
YOU ARE 3 UNITS FROM THE MUGWUMP.

MUGWUMP must be  
at 6,6 or 9,3 or 6,0  
or 3,3.

WHAT IS YOUR GUESS? 6,6  
YOU ARE 4.2 UNITS FROM THE MUGWUMP.

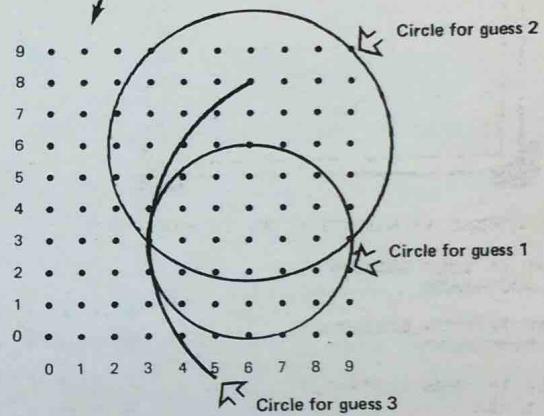
WHAT IS YOUR GUESS? 9,3  
YOU ARE 6 UNITS FROM THE MUGWUMP.

WHAT IS YOUR GUESS? 3,3  
YOU FOUND HIM IN 4 GUESSES!!!  
LET'S PLAY AGAIN.

2.2 would be a  
better second  
guess. Why?



OK - we will do one.



MUGWUMP IS HIDING...TRY TO FIND HIM!!!

WHAT IS YOUR GUESS? 5,5  
YOU ARE 5 UNITS FROM THE MUGWUMP.

Here is a handy scale to help you mark off the radii of your circles.

• • • • • • • • • • • • •  
0 1 2 3 4 5 6 7 8 9 10 11 12 13

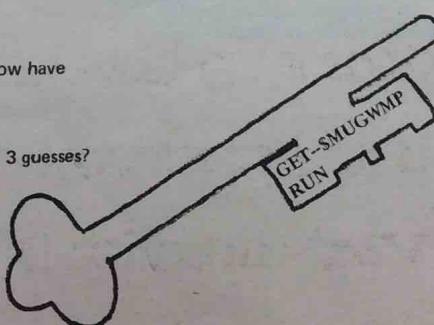
[Estimate the tenths!]

WHAT IS YOUR GUESS?



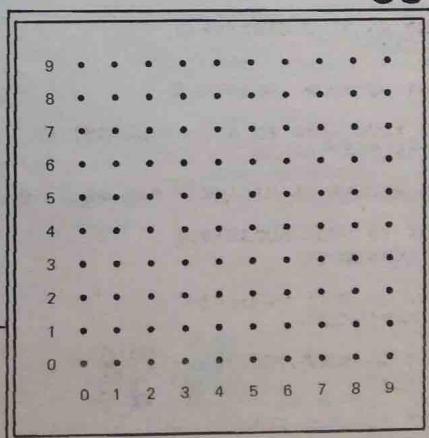
OK. Where is MUGWUMP? You now have enough information to find him!

Can you always find MUGWUMP in 3 guesses?  
(I think so.)



MUGWUMP was inspired by Project SOLO Module 0201.

Contact Project SOLO, Computer Science Department,  
University of Pittsburgh 15213



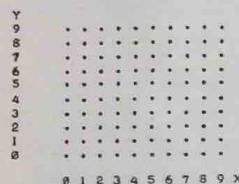
**Snark?** Inspiration from *The Hunting of the Snark* by Lewis Carroll. Want to know more? Read *The Annotated Snark* by Martin Gardner.

Annotated Snark by Martin Gardner,  
A Bramhall House book, from  
Crown Publishers, Inc. 419 Park Ave.,  
New York NY 10016



WANT THE RULES? YES

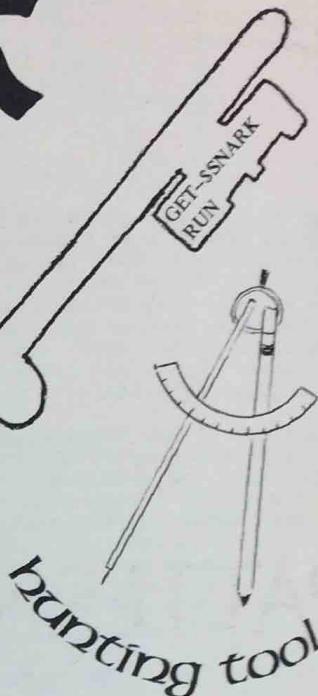
A SNARK IS HIDING IN A 10 BY 10 GRID LIKE THE ONE SHOWN BELOW:



TRY TO CATCH HIM. HERE'S HOW ... WHEN I ASK, YOU TYPE THE XY COORDINATES OF A GRIDPOINT (IF YOU DON'T KNOW WHAT THAT MEANS, ASK SOMEONE!) AND PRESS THE RETURN KEY. THEN, WHEN I ASK FOR "RADIUS", YOU TYPE THE RADIUS OF A CIRCLE CENTERED ON THE GRIDPOINT WHOSE XY COORDINATES YOU JUST ENTERED. I WILL THEN TELL YOU WHETHER THE SNARK IS 'INSIDE' YOUR CIRCLE, 'OUTSIDE' YOUR CIRCLE, OR 'ON' YOUR CIRCLE.

!!! IMPORTANT !!! IF YOU THINK YOU KNOW WHERE HE IS HIDING, ENTER 0 (ZERO) AS THE RADIUS. GOOD HUNTING.

# SNARK



"Just the place for a Snark!" I have said it twice: That alone should encourage the crew.  
Just the place for a Snark! I have said it thrice: What I tell you three times is true."

SNARK IS HIDING ... START GUESSING!

COORDINATES? 5,5  
RADIUS? 4  
SNARK IS INSIDE YOUR CIRCLE

COORDINATES? 5,5  
RADIUS? 2  
SNARK IS INSIDE YOUR CIRCLE

COORDINATES? 5,5  
RADIUS? 1  
SNARK IS ON YOUR CIRCLE

COORDINATES? 6,5  
RADIUS? 2  
SNARK IS OUTSIDE YOUR CIRCLE

COORDINATES? 5,6  
RADIUS? 2  
SNARK IS OUTSIDE YOUR CIRCLE

COORDINATES? 4,5  
RADIUS? 2  
YOU CAUGHT HIM IN 6 GUESSES!!!  
GOOD SHOW!

WANT TO PLAY AGAIN? YES

SNARK IS HIDING ... START GUESSING!

COORDINATES? 0,0  
RADIUS? 7  
SNARK IS OUTSIDE YOUR CIRCLE

COORDINATES? 0,9  
RADIUS? 7  
SNARK IS INSIDE YOUR CIRCLE

COORDINATES? 3,9  
RADIUS? 4  
SNARK IS OUTSIDE YOUR CIRCLE

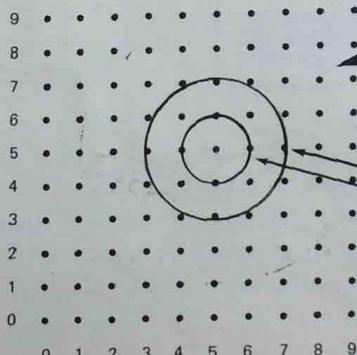
COORDINATES? 5,6  
RADIUS? 1  
SNARK IS OUTSIDE YOUR CIRCLE

COORDINATES? 3,8  
RADIUS? 1  
SNARK IS ON YOUR CIRCLE

COORDINATES? 3,9  
RADIUS? 3  
SNARK IS ON YOUR CIRCLE

COORDINATES? 6,9  
RADIUS? 0  
YOU CAUGHT HIM IN 7 GUESSES!!!  
GOOD SHOW!

WANT TO PLAY AGAIN?

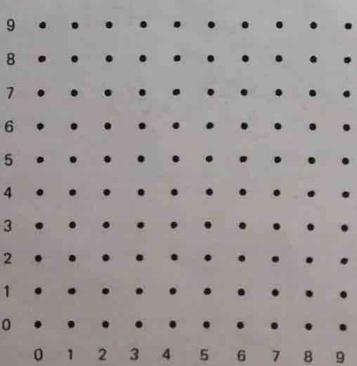


This circle has center at 5,5 and radius = 4.

SNARK is inside this circle  
inside this circle  
on this circle  
so ... SNARK must  
be at 6,5 or 5,6 or  
4,5 or 5,4.

"For the Snark's a peculiar creature, that won't be caught in a commonplace way.  
Do all that you know, and try all that you don't: Not a chance must be wasted to-day!"

Your turn — you draw the circles for the 2nd game. But perhaps you would first like to copy the grid for future SNARK hunts.



"For, although common Snarks do no manner of harm, Yet I feel it my duty to say, Some are Boojums" The Bellman broke off in alarm, For the Baker had fainted away.

These "games" are designs. You select values for the parameters — the computer draws the design. Try to discover how different values affect the designs.

# PATTERN GAMES

Dangle  
Sunsign  
Biosin  
Mandala  
Life  
Amaze

# Welcome To... Dangling String

HOW MANY STAMS DO YOU WANT? 100

HOW WILD?  
AL-VER-Y WILD  
3-RHETT-Y WILD  
2-A LITTLE WILD  
1-A TINY BIT WILD  
72

WHERE WILL THE STRING START?  
1 18 28 38  
1 1 1 1  
726

How about turning it on its side and pretending it's a mouse in a cage?

THAT'S ALL, FOLKS!  
HERE WE GO AGAIN ...  
HOW MANY STAMS DO YOU WANT? 100  
HOW WILD? 4  
WHERE WILL THE STRING START?  
and here we go.

picking up speed

smoothly done!

This one isn't wild enough to escape from the center.  $\Rightarrow$

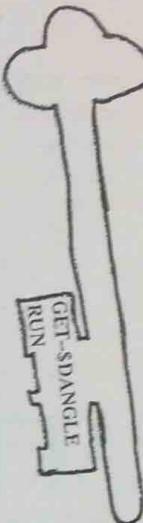
HERE'S HOW IT WORKS:

As the string grows, it "tries" to get back to the center.

All the way over to the left? It'll try very hard to go to the right.

It'll speed up, trying to get back and then start slowing down as it gets to the center.

Pretty soon it's on the other side and will start coming back.

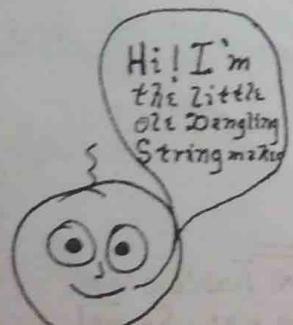


WELCOME TO ... THE DANGLING STRING

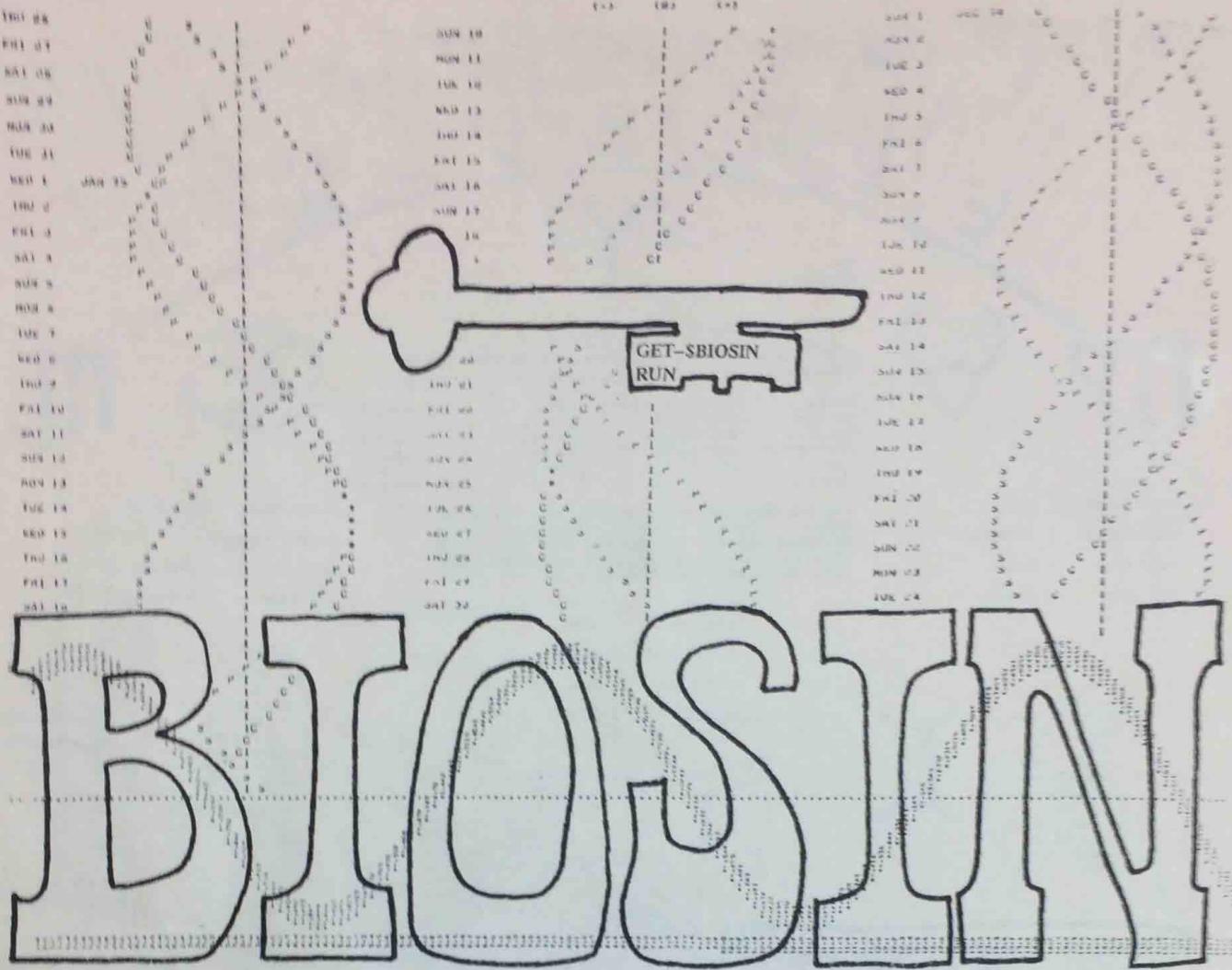
HOW MANY STAMS DO YOU WANT? 100

HOW WILD?  
AL-VER-Y WILD  
3-RHETT-Y WILD  
2-A LITTLE WILD  
1-A TINY BIT WILD  
715

WHERE WILL THE STRING START?  
1 18 28 38  
1 1 1 1  
715







A *Biorhythm* is a theoretical metabolic cycle that is constantly going on inside everyone, starting at birth [the beginning of independent life]. To date, three such cycles have been discovered:

## PHYSICAL



The physical cycle is 23 days long. It was discovered by Dr. Wilhelm Fliess, a nose and throat specialist, when he observed 23 and 28 day cycles in the recurrences of pains and swellings. This cycle is said to affect the muscle fibres, and therefore physical strength, endurance, and general physical well-being.



## SENSITIVITY

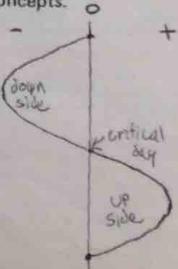
The sensitivity cycle is 28 days long. It is said to be closely related to the nervous system, affecting cooperativeness, friendliness, and optimism. On the down side of this cycle, one is most likely to be irritable, frustrated, and stubborn.



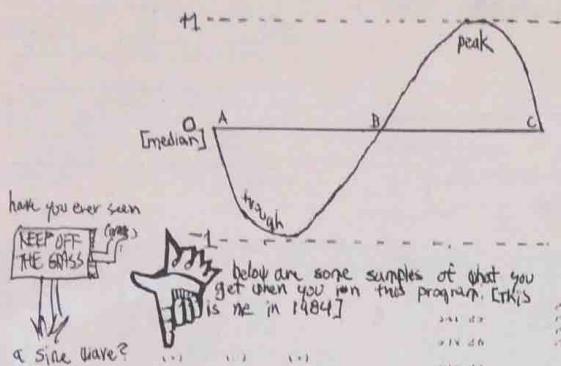
## COGNITIVE

The cognitive cycle is 33 days long. It affects the thought processes, the abilities to provide fast, accurate answers, to absorb information, and to create. The down side of this cycle is probably a good time to review old concepts.

The up side of the cycle is the *discharge period* when you are the most able in the areas that the cycle affects. The down side of the cycle is a *recuperative period*. Neither of these is necessarily good nor bad, but it is a good idea to do the most important things on the up side of the cycle and to rest on the down side.

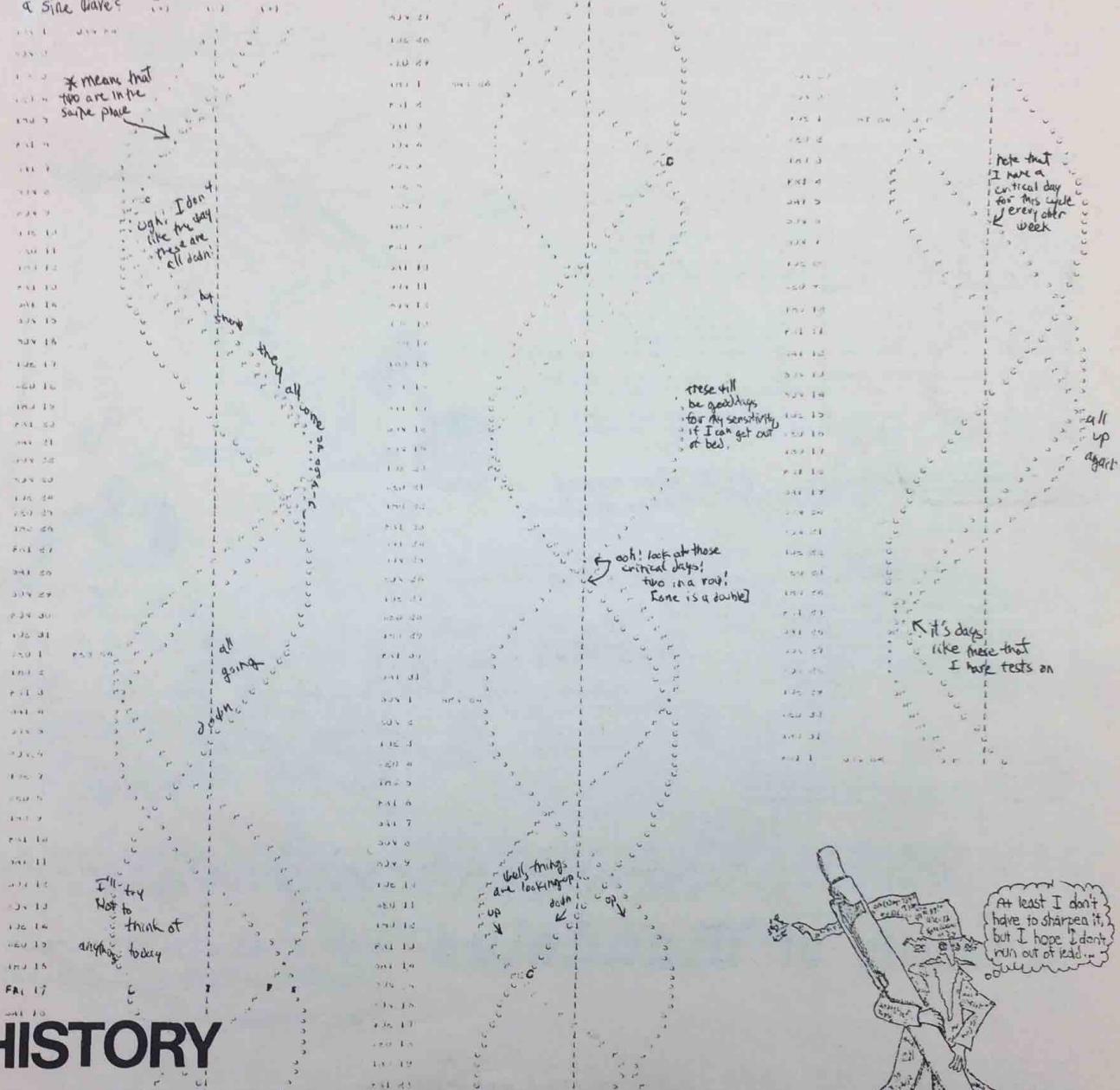


A sine wave is what you get when you graph the function  $y = \sin[x]$  . It looks like this:



Each biorhythmic cycle may be represented by a sine wave. When the wave peaks, you are on the up side of that cycle. When it troughs, you are on the down side. When the wave crosses the 0 or median line, you are having a critical day. Points A, B, and C represent critical days.

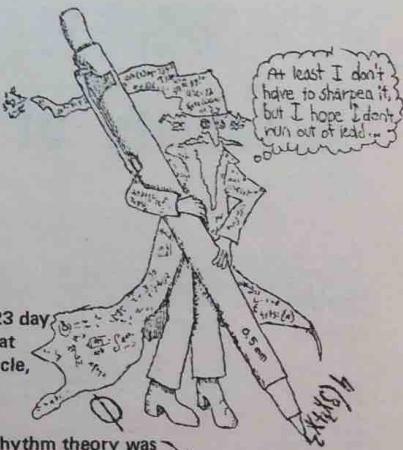
You have a triple critical day [when all 3 cycles cross the median] every 2656.5 days [that's 7 years and 101.5 days]. A good idea would be to stay in bed on such days. Every 21252 days [that's 58 years and 82 days], the cycles are in exactly the same position as when you were born.



# HISTORY

Dr. Wilhelm Fliess was the discoverer of the physical and sensitivity cycles. He theorized that the 23 day cycle was a masculine cycle and that the 28 day cycle was a feminine cycle. Some people argued that only males were affected by the 23 day cycle, and that only females were affected by the 28 day cycle, but due to contradictory evidence, it has now been accepted that each cycle affects both sexes.

Sigmund Freud, a friend of Fliess, was also very interested in biorhythms, and the biorhythm theory was of great importance in developing his concepts of psychoanalysis.



For more information, refer to *Biorhythm Theory* by Dr. R.E. Smith, published by

In the 1920's Alfred Teltscher, an engineer and teacher, observed the 33 day cognitive cycle in high school and college students at Innsbruck.

Control Data Corp  
8100 34th Ave South  
Minneapolis, Minnesota 55420

In 1939 Hans Schwing made a study of the biorhythmical aspects of 700 random accidents and 300 deaths from the records of the city of Zurich. He found that nearly 60% of the accidents happened on a critical day for the person involved — yet only one of every five days [that's 20%] is a critical day.



# Grow Your Own!

SIZE OF NANDALA IN INCHES 11.5  
DIP FREQUENCY AND IMPORTANCE 70.1  
RIPPLE FREQUENCY AND IMPORTANCE 72.5  
COMBINATION IMPORTANCE 70

NAME IS YOUR MANDALA

HERE WE GO AGAIN . . .

SIZE OF MANDALA IN INCHES 73  
DIP FREQUENCY AND IMPORTANCE 70,1  
RIPPLE FREQUENCY AND IMPORTANCE 72,5  
COMBINATION IMPORTANCE 70

HERE IS YOUR MANDALA 4

HERE WE GO AGAIN . . .

SIZE OF MANDALA IN INCHES 77  
DIP FREQUENCY AND IMPORTANCE 78±1  
RIPPLE FREQUENCY AND IMPORTANCE 72±5  
COMBINATION IMPORTANCE 79

HERE IS YOUR MANDALA #

## \* \* Some Random Notes:

\*All Mandalas have

been reduced in size so  
they'll fit on the page.

\* I like to work with  
3-inch Mandalas until I get  
one I like - then I will  
blow it up to full size, say  
7 inches.

\*Keep your numbers  
small, like  $\phi, 1, 2, 3, 4, 5$  and  
maybe 6.

So,  
make  
yours

at the  
start,  
THEN  
blow  
them up!

# another family of Mandalas

this family of  
Mandalas - related  
by COMBINATION NUMBER

SIZE OF MANDALA IN INCHES 73  
DIP FREQUENCY AND IMPORTANCE 73,1  
RIPPLE FREQUENCY AND IMPORTANCE 72,1  
COMBINATION IMPORTANCE 71

HERE IS YOUR MANDALA

SSSSSS	++	SSSS
0000\$	..	SS00
0000	..	000
00\$		SS0
SS	..	S
SS		

SIZE OF MANDALA IN INCHES ?3  
DIP FREQUENCY AND IMPORTANCE ?3,1  
RIPPLE FREQUENCY AND IMPORTANCE ?2,1  
COMBINATION IMPORTANCE ?4

HERE IS YOUR MANDALA :

SIZE OF MANDALA IN INCHES ?3  
DIP FREQUENCY AND IMPORTANCE ?3,1  
RIPPLE FREQUENCY AND IMPORTANCE ?2,1  
COMBINATION IMPORTANCE ?10

HERE IS YOUR MANDALA :

SSSSSS SSSSSS SSSSSS  
000000 SSSSSS SSS000  
000000 SSSSSS SSS000  
00 ..... 00 ..... 00  
SS \*-\*-\* . SS \*-\*-\* . SS  
..... SS .. SB .. -\*\*..



RUN LIFE  
INSTRUCTIONS? NO  
Rules are on the other page

WHICH GENERATION SHALL THE PRINTING START WITH? 1  
AND THE LAST GENERATION? 10  
ALSO, HOW MANY SHALL I SKIP? 3

ENTER PATTERN:

Cheshire Cat

DONE  
GENERATION = 0 POPULATION = 18

GEN= 1 POP= 22

GEN= 2 POP= 26

GEN= 3 POP= 18

GEN= 4 POP= 32

GEN= 6 POP= 4

GEN= 8 POP= 4

GEN= 9 POP= 4

GEN= 10 POP= 4

\*\*END OF RUN\*\*

more

next  
→  
page

# Playing LIFE

## on the Computer

Here are four LIFE patterns that we played with on our HP 2000F computer, using the program SLIFE.

The CHESHIRE CAT slowly disappears, leaving its grin behind in generation 6. It disappears completely in the next generation, leaving behind a "paw print".

The LIGHTWEIGHT SPACESHIP will travel to the right forever. Reverse it and it will go off to the left! You can also make it go up or down, and of course, fly them in squadrons or have them collide.

Its cousin, the GLIDER, moves at a 45° angle, downwards and to the right. Unless it collides somewhere (maybe with another GLIDER), it too will go on forever.

The FUSE burns from both ends until it is burnt out. What if there's an ODD number of cells? Try it and find out!

RUN LIFE  
INSTRUCTIONS? NO

WHICH GENERATION SHALL THE PRINTING START WITH? 4  
AND THE LAST GENERATION? 20  
ALSO, HOW MANY SHALL I SKIP? 3

ENTER PATTERN:

?DONE

GENERATION = 0 POPULATION = 9

?RELX

GEN= 4 POP= 9

GEN= 12 POP= 9

GEN= 16 POP= 9

GEN= 20 POP= 9

GEN= 8 POP= 9

GEN= 16 POP= 9

GEN= 20 POP= 9

GEN= 12 POP= 9

GEN= 16 POP= 9

GEN= 20 POP= 9

GEN= 16 POP= 9

GEN= 20 POP= 9

GEN= 24 POP= 9

GEN= 20 POP= 9

GEN= 24 POP= 9

GEN= 28 POP= 9

\*\*END OF RUN\*\*

NO MORE LIFE IN GENERATION 5

\*\*END OF RUN\*\*

GENERATION = 0 POPULATION = 12  
GEN= 4 POP= 13  
GEN= 8 POP= 13  
GEN= 12 POP= 13

Look  
(Don't)  
do anything  
lightweight  
Spaceship

GEN= 1 POP= 22

GEN= 2 POP= 26

GEN= 3 POP= 18

GEN= 4 POP= 32

GEN= 5 POP= 16

GEN= 6 POP= 4

\*\*END OF RUN\*\*

GENERATION = 0 POPULATION = 18

GEN= 1 POP= 22

GEN= 2 POP= 26

GEN= 3 POP= 18

GEN= 4 POP= 32

GEN= 5 POP= 16

GEN= 6 POP= 4

\*\*END OF RUN\*\*

GENERATION = 0 POPULATION = 18

GEN= 1 POP= 22

GEN= 2 POP= 26

GEN= 3 POP= 18

GEN= 4 POP= 32

GEN= 5 POP= 16

GEN= 6 POP= 4

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GEN= 5 POP= 16

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GEN= 2 POP= 26

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GEN= 4 POP= 32

GEN= 5 POP= 16

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GEN= 4 POP= 32

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GEN= 1 POP= 22

GEN= 2 POP= 26

GEN= 3 POP= 18

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GEN= 5 POP= 16

GEN= 6 POP= 4

\*\*END OF RUN\*\*

GENERATION = 0 POPULATION = 18

GEN= 1 POP= 22

GEN= 2 POP= 26

GEN= 3 POP= 18

GEN= 4 POP= 32

GEN= 5 POP= 16

GEN= 6 POP= 4

\*\*END OF RUN\*\*

GENERATION = 0 POPULATION = 18

GEN= 1 POP= 22

GEN= 2 POP= 26

GEN= 3 POP= 18

GEN= 4 POP= 32

GEN= 5 POP= 16

GEN= 6 POP= 4

\*\*END OF RUN\*\*

GENERATION = 0 POPULATION = 18

GEN= 1 POP= 22

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\*\*END OF RUN\*\*

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GEN= 1 POP= 22

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GEN= 6 POP= 4

\*\*END OF RUN\*\*

GENERATION = 0 POPULATION = 18

GEN= 1 POP= 22

GEN= 2 POP= 26

GEN= 3 POP= 18

GEN= 4 POP= 32

GEN= 5 POP= 16

GEN= 6 POP= 4

\*\*END OF RUN\*\*

GENERATION = 0

# LIFE notes

In October, 1970, SCIENTIFIC AMERICAN first published details about John Conway's game of LIFE. People all over the world have been discovering new and interesting LIFE patterns. They've been given names like GLIDER, SPACESHIP, BARBER POLE, CHESHIRE CAT, BLINKER, HARVESTER, FUSE, and BOX.

The patterns and ideas on this page are some of those. If YOU discover any new patterns, YOU'LL be able to name them!

**GETTING OFF THE GROUND**

Try some isolated triplets and see what they do. Here are a couple:

**BLINKER**

FIND SOME MORE!

How about quadruplets?

**STABLE**

**HORIZONTAL LINES**

A row of 3 CELLS is a BLINKER. What happens with longer rows?

**NEAT ODDS & ENDS**

Try these:

FIGURE 8

BEACON	CLOCK

**BEEHIVE**

**PINWHEEL**

Why are these BOXES necessary?

**Z**

46

**BIBLIOGRAPHY**

This is where you go to find out what books and magazine articles can help you further. We got all of our information from the first set of items:

1. SCIENTIFIC AMERICAN. October and November, 1970; January, February and April 1971 copies have an article called "Mathematical Games" wherein all sorts of glorious discoveries are mentioned.
2. SERIOUS GAMES: THE ART AND SCIENCE OF GAMES THAT SIMULATE LIFE. Written by Clark C. Abt and published by The Viking Press, 1970.

Remember the FUSE? It's a DIAGONAL string of CELLS that "burn" at both ends. There's an example of one last page.

To "cap" a FUSE at one end, try this:

Someone discovered this pattern and called it a HARVESTER because it climbs up the fuse and LEAVES NEAT BUNDLES!

Here are 3 kinds of fuses

**GLIDERS AND SPACESHIPS**

GLIDERS travel diagonally - if you flip them around they can travel on all 4 diagonals.

To travel horizontally or vertically, you need to use the SPACESHIPS:

LIGHTWEIGHT	MEDIUM WEIGHT	HEAVYWEIGHT

QUESTION: Are there any longer spaceships?

IDEA: Aim your SPACESHIPS and GLIDERS so they'll crash!

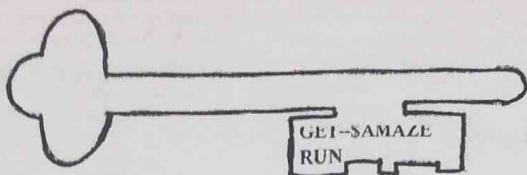
**COLLISION COURSES**

Aim a GLIDER (or SPACESHIP) at some stable figure, like a BOX.

*and before we go...*



# M A Z E



RUN  
AMAZE

DO YOU NEED INSTRUCTIONS? YES

THIS PROGRAM WILL PRINT OUT FOR YOU A MAZE!  
ALL YOU ARE REQUIRED TO DO IS INPUT THE DIMENSIONS.  
YOU MAY HAVE A MAZE UP TO 20 BY 20 UNITS. BUT NOTHING  
BEYOND THAT.

EACH MAZE IS DIFFERENT, AND HAS ONLY ONE WAY THROUGH IT.

WHAT ARE YOUR DIMENSIONS? 20, 20

There's not  
much we can say  
about this one...  
so, we'll just  
let it speak  
for itself:

WHAT ARE YOUR DIMENSIONS? 8,8

WHAT ARE YOUR DIMENSIONS? 10, 10



The games in this chapter can be played with paper and pencil. *Qubic5* and *Gomoku* – have people play against each other for awhile, then play together against the computer. A variation is to have 5 players moving in rotation, rather than two teams. Each person plays *both* sides – this method balances differing skills among the players, encourages cooperation instead of competition, and is highly instructive. There are no losers. *Teaser* is a fine game (or a pain), depending on your perspective. In *Rover*, the “computer” has to generate the original board and do the bookkeeping.

# BOARD GAMES

Qubic 5  
Gomoku  
Teaser  
Rover Robot

# QUBICS

YOUR FIRST NAME? FLASH

THIS IS THE GAME OF QUBIC, FLASH.  
DO YOU WANT INSTRUCTIONS? YES

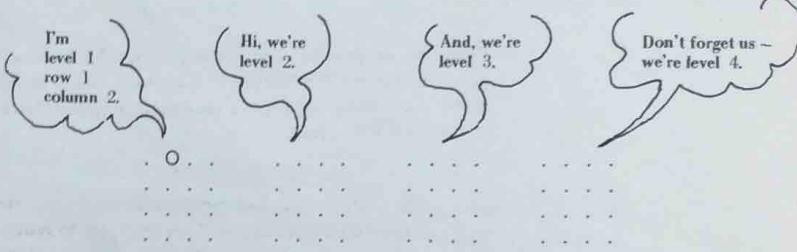
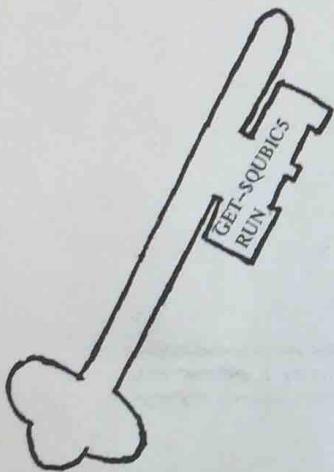
THE GAME IS TIC-TAC-TOE IN A  $4 \times 4 \times 4$  CUBE.  
YOU WIN IF YOU GET 4 IN A STRAIGHT LINE.

A MOVE IS A THREE-DIGIT NUMBER, WITH EACH DIGIT BEING EITHER 1, 2, 3, OR 4.  
THE DIGITS INDICATE THE LEVEL, ROW, AND COLUMN (IN THAT ORDER) OF YOUR MOVE.

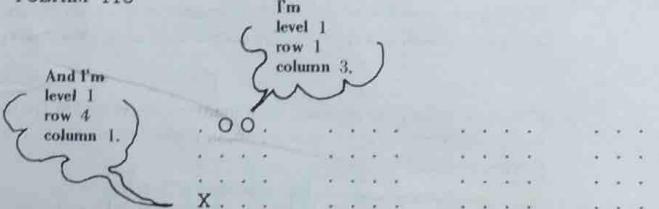
WHEN IT IS YOUR MOVE, SHOULD I PRINT OUT THE BOARD? YES  
YOUR POSITIONS ARE INDICATED BY X's AND MINE BY O's.

YOU GET TO PICK A STRATEGY LEVEL BETWEEN 1 AND 5.  
(1 IS THE EASIEST, 5 IS THE HARDEST.)  
WHAT STRATEGY LEVEL, FLASH? 4

DO YOU WANT TO GO FIRST? NO  
I CLAIM 112



YOUR MOVE, FLASH? 141  
I CLAIM 113



THE INSIDE POOP ON QUBICS

#### Level 1

*Offensive:* Pick a random row and continue to play in that row until blocked.

#### Level 2

*Offensive:* Same as level 1.

*Defensive:* If the player has a 3-in-a-row, then block it.

#### Level 3

*Offensive:* Pick two intersecting rows. Fill 2 squares in each row, then play their intersection to get 2 simultaneous 3-in-a-row's.

*Defensive:* Same as level 2.

#### Level 4

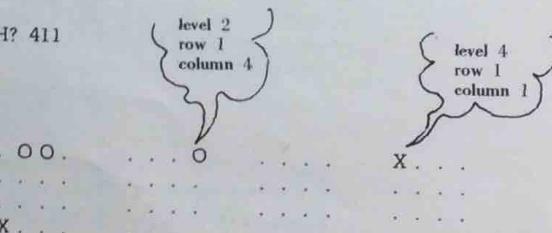
*Offensive:* Same as level 3.

*Defensive:* Check if there is a square that will give the player two simultaneous 3-in-a-row's. If so, block by moving there.

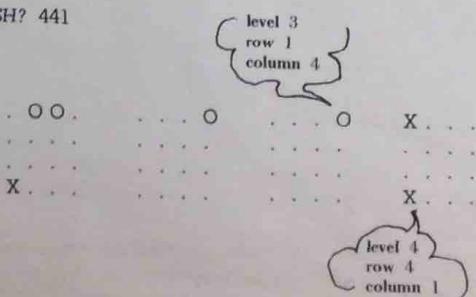
#### Level 5

QUBIC written by Hewlett-Packard.

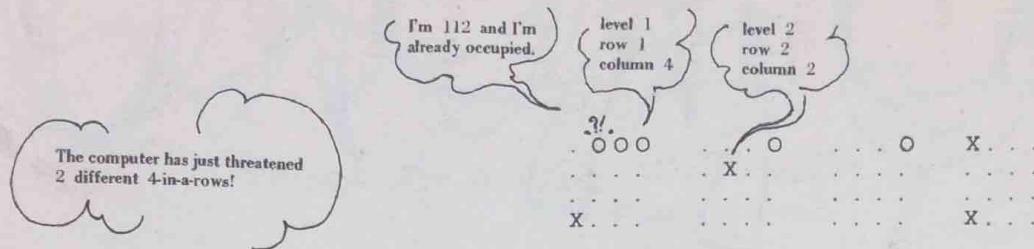
YOUR MOVE, FLASH? 411  
I CLAIM 214



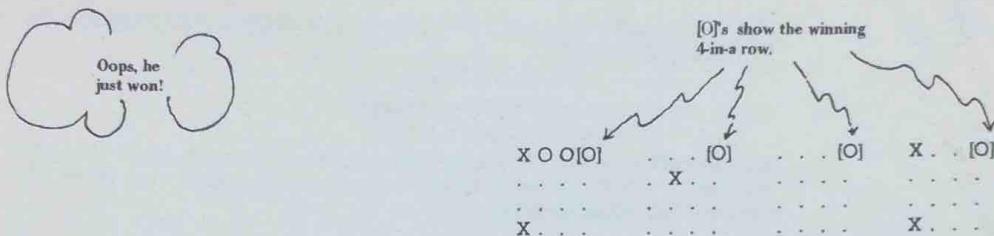
YOUR MOVE, FLASH? 441  
I CLAIM 314



YOUR MOVE, FLASH? 112  
THAT SQUARE IS USED - TRY AGAIN.  
YOUR MOVE, FLASH? 222  
FLASH, YOU BEAT ME BEFORE, BUT NO MORE! LOOK: I MOVE TO 114



FINAL POSITION:



There are 76 possible 4-in-a-rows on a  $4 \times 4 \times 4$  cube. Before each move, the program checks along all of them to see if either player is about to win or to force a win (that is, threaten 2 different wins at the same time). It's a lot of bookkeeping to keep track of, but this makes the program a challenge to most QUBIC players.

Some of the positions are more powerful than others — that is, there are more possible wins from some positions than from others. You might try to generalize the number of wins from each position on an  $n \times n \times n$  cube (a win is  $n$ -in-a-row). (*The Mathematics Teacher*, February 1971, pp. 119-122, if you get stuck.)

There is a way to defeat this QUBIC program at the most advanced strategy level (even moving second!). Its weakness is in not checking for concentrations of your moves in each of the 2-dimensional planes.

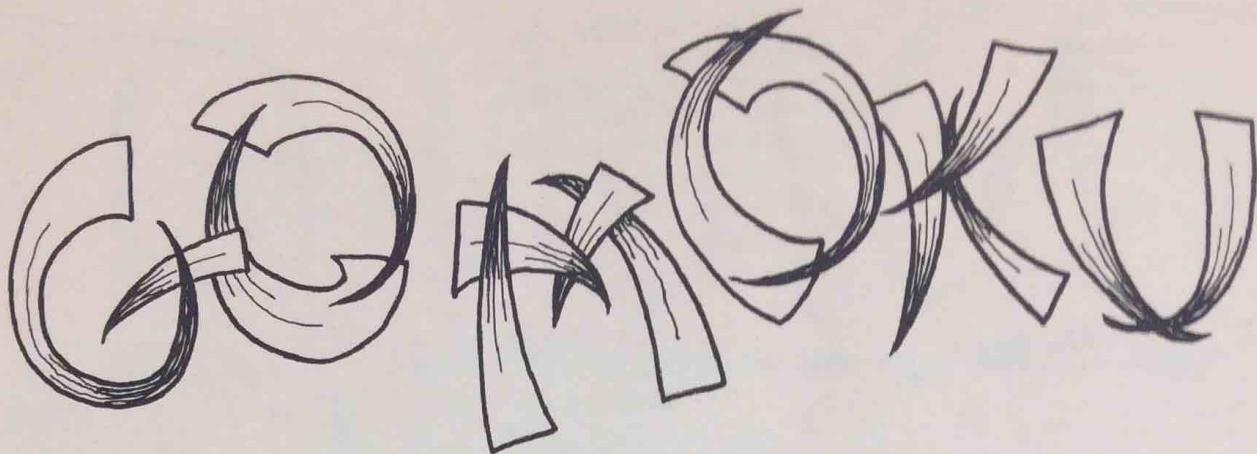
Here is something to explore: how many moves placed in the same plane does it take to force a win there (assuming 1) my opponent doesn't have any moves in that plane, and 2) he isn't about to win somewhere else)?

Suppose instead that my opponent has made a single move in some plane — how many moves do I have to make in that plane to force a win there?

We have not yet seen a QUBIC program which checks whether its opponent has enough moves in a plane to force a win there. How about trying to design one (after you figure out how many moves it takes, of course)?

A collection of variations on QUBIC are described in *The Scientific American Book of Mathematical Puzzles & Diversions*, by Martin Gardner, pp. 41-42: a square array of moves on one of the planes, forming two intersecting rows on a  $3 \times 3 \times 3$  cube (with limitations on moving in the center position), and playing on a four-dimensional hypercube.

P.S. The "wise guys" around here have gone so far as to suggest that there is an easy win for the first player but they can't prove it. What do you think?



GOMOKU IS A TRADITIONAL JAPANESE GAME PLAYED ON A  $19 \times 19$  BOARD.  
THE OBJECT IS TO OCCUPY FIVE ADJACENT POINTS IN A STRAIGHT LINE  
(HORIZONTAL, VERTICAL, OR DIAGONAL) ANYWHERE ON THE BOARD.

THIS PROGRAM PLAYS GOMOKU ON A  $9 \times 9$  BOARD. EACH MOVE IS A TWO-DIGIT NUMBER – THE FIRST DIGIT IS THE ROW AND THE SECOND IS THE COLUMN.

YOU CAN CHANGE THE CURRENT BOARD-PRINTING OPTION BY ADDING A THIRD DIGIT TO THE MOVE NUMBER:

- 0 SUPPRESS PRINTING ENTIRELY
- 1 PRINT ONLY THE OCCUPIED POINTS
- 2 PRINT THE ENTIRE BOARD

(FOR EXAMPLE, IF YOU MOVE 372 THEN YOUR MOVE IS THE POINT AT ROW 3, COLUMN 7 AND THE ENTIRE BOARD WILL BE PRINTED EACH TIME UNTIL YOU CHANGE THE PRINT OPTION.)

DO YOU WANT TO MOVE FIRST? NO

Initially, the print option is 0.

I MOVE TO 55

WHAT IS YOUR MOVE? 44  
I MOVE TO 54

WHAT IS YOUR MOVE? 352  
I MOVE TO 53

+ unoccupied  
Y your moves  
C the computer's moves

	1	2	3	4	5	6	7	8	9
1	+	+	+	+	+	+	+	+	+
2	+	+	+	+	+	+	+	+	+
3	+	+	+	+	Y	+	+	+	+
4	+	+	+	Y	+	+	+	+	+
5	+	+	C	C	C	+	+	+	+
6	+	+	+	+	+	+	+	+	+
7	+	+	+	+	+	+	+	+	+
8	+	+	+	+	+	+	+	+	+
9	+	+	+	+	+	+	+	+	+

Option 0 – no printing at all.

WHAT IS YOUR MOVE? 520  
I MOVE TO 56

Option 1 – only the occupied points are printed.

WHAT IS YOUR MOVE? 571  
I MOVE TO 46

	1	2	3	4	5	6	7	8	9
1									
2									
3									Y
4								Y	C
5							Y	C	C
6									
7									
8									
9									

Still option 1. A print option remains in effect until a new one is specified.

WHAT IS YOUR MOVE? 33  
I MOVE TO 36

1 2 3 4 5 6 7 8 9  
1  
2  
3 Y Y C  
4 Y C  
5 Y C C C C Y  
6  
7  
8  
9

WHAT IS YOUR MOVE? 260  
I MOVE TO 76

WHAT IS YOUR MOVE? 66  
I MOVE TO 65

WHAT IS YOUR MOVE? 872  
I MOVE TO 75

1 2 3 4 5 6 7 8 9  
1 + + + + + + + + +  
2 + + + + + Y + + +  
3 + + Y + Y C + + +  
4 + + + Y + C + + +  
5 + Y C C C C Y + +  
6 + + + + C Y + + +  
7 + + + + C C + + +  
8 + + + + + + Y + +  
9 + + + + + + + + +

WHAT IS YOUR MOVE? 850  
I MOVE TO 74

WHAT IS YOUR MOVE? 74  
POSITION 74 IS ALREADY OCCUPIED  
WHAT IS YOUR MOVE? 73  
I MOVE TO 83

WHAT IS YOUR MOVE? 92  
I MOVE TO 47  
I WIN THE GAME

SHOULD I PRINT THE FINAL POSITION? YES

1 2 3 4 5 6 7 8 9  
1  
2 Y  
3 Y Y C  
4 Y C C  
5 Y C C C C Y  
6 C Y  
7 Y C C C  
8 C Y Y  
9 Y

This GOMOKU program will be a challenge for most folks to beat — it is only a get-acquainted-with-the-basics-of-Gomoku, however.

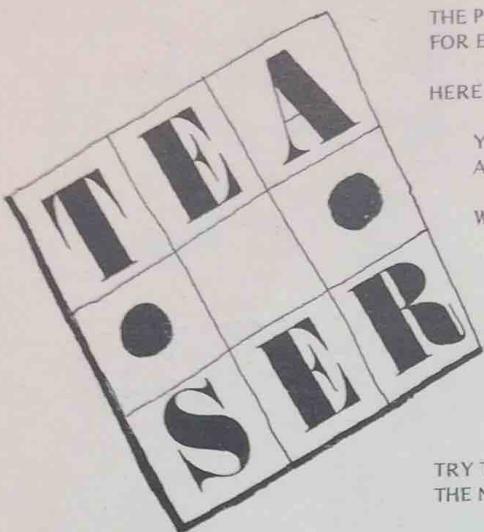
Even the original GO board was smaller than 19 x 19 — it has grown over the years.

A 9 x 9 board is too small. You get “squeezed” against a side too quickly to develop your forces. Formations on a 19 x 19 board tend to develop in rings (I “surround” you then you “surround” me and so on) and also in apparently disjoint clusters (we play a few moves in this area, then some way over there . . . ). And that’s the second problem with a 9 x 9 board — there’s no way over there. Every move is too close to each point on the board. The more complex strategies in Gomoku involve connecting these seemingly separate formations in bizarre and complicated ways.

There are two traditional rules that this program doesn’t follow. To explain these we introduce some useful terms. An *open four* is four-in-a-row with both ends open — that is, on the next turn you could move to either end. If you make an *open four*, you have a sure win (assuming the other player isn’t about to win on his next turn). An *open three* is a formation that can become an *open four* on your next move. So here’s the rule that’s different — you can’t form two open threes simultaneously unless you are forced to stop your opponent’s four-in-a-row from becoming five. Two *open threes* are a win since the one your opponent doesn’t block can become an *open four* on your next turn.

The other change is more simple to explain — a win is exactly five-in-a-row, not six or seven or . . .

This program’s major weakness is the fact that it evaluates what’s happening (threats, weaknesses, “dead” positions) at every board position (all 81 of them) after every move. A “smarter” algorithm would be one that updated information after each move, rather than recomputing everything from scratch.



IF YOU LIKE BRAIN TEASERS, THEN YOU'RE IN FOR SOME FUN!  
THE OBJECT OF THIS PUZZLE IS TO END UP WITH A  $3 \times 3$  MATRIX THAT HAS 1's  
IN ALL POSITIONS EXCEPT THE CENTER WHICH WILL BE 0.

THE POSITIONS ON THE BOARD ARE REFERRED TO AS ROW, COLUMN.  
FOR EXAMPLE, THE UPPER RIGHT HAND CORNER IS 1,3.

HERE ARE THE RULES:

YOU MAY CHANGE ANY 1 TO A 0. YOU'RE NOT ALLOWED TO CHANGE  
A 0 TO A 1.

WHEN YOU MOVE TO CHANGE A 1, THERE ARE "SIDE" EFFECTS.

MOVING IN A CORNER  
DRAW A  $2 \times 2$  BOX CONTAINING THE CORNER. THEN EACH  
POSITION IN THE BOX CHANGES STATE.

MOVING IN THE CENTER OF AN EDGE  
EACH POSITION ALONG THAT EDGE CHANGES STATE.

MOVING IN THE CENTER POSITION.  
EACH POSITION IN A '+' (PLUS SIGN) CHANGES STATE.

TRY THE GAME A FEW TIMES AND SEE WHAT HAPPENS ON THE BOARD.  
THE NEW BOARD WILL BE PRINTED AFTER EACH MOVE.

HINT (CHUCKLE): IT IS POSSIBLE TO REACH THE GOAL FROM EVERY POSITION  
(EXCEPT ALL 0's) WITHIN 11 MOVES, IF YOU CAN FIND THE RIGHT MOVES.

HERE WE GO ... THE BOARD IS

0	1	0
1	0	1
0	0	0

YOUR MOVE? 2,3

0	1	1
1	0	0
0	0	1

YOUR MOVE? 3,3

0	1	1
1	1	1
0	1	0

YOUR MOVE? 2,1

1	1	1
0	1	1
1	1	0

YOUR MOVE? 2,2

1	0	1
1	0	0
1	0	0

YOUR MOVE? 3,1

1	0	1
0	1	0
0	1	0

YOUR MOVE? 3,2

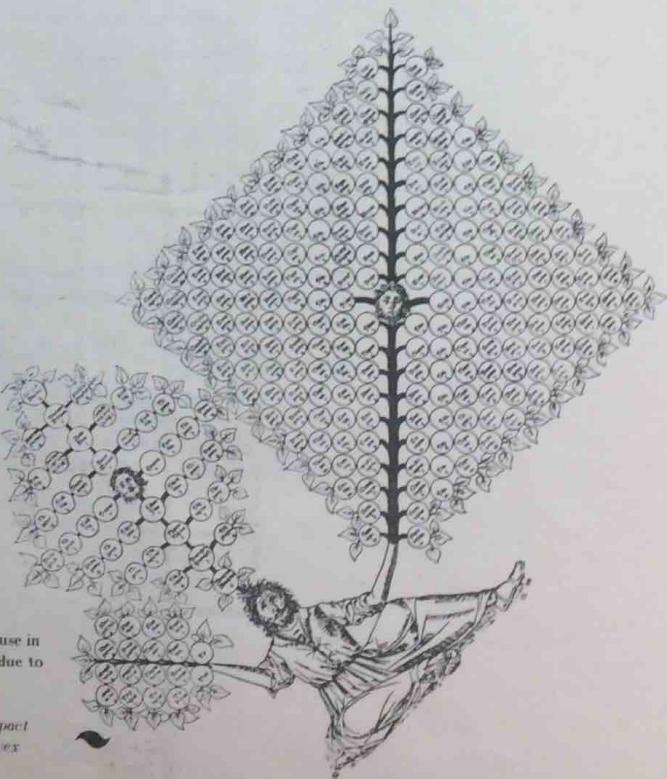
1	0	1
0	1	0
1	0	1

YOUR MOVE? 2,2

1	1	1
1	0	1
1	1	1

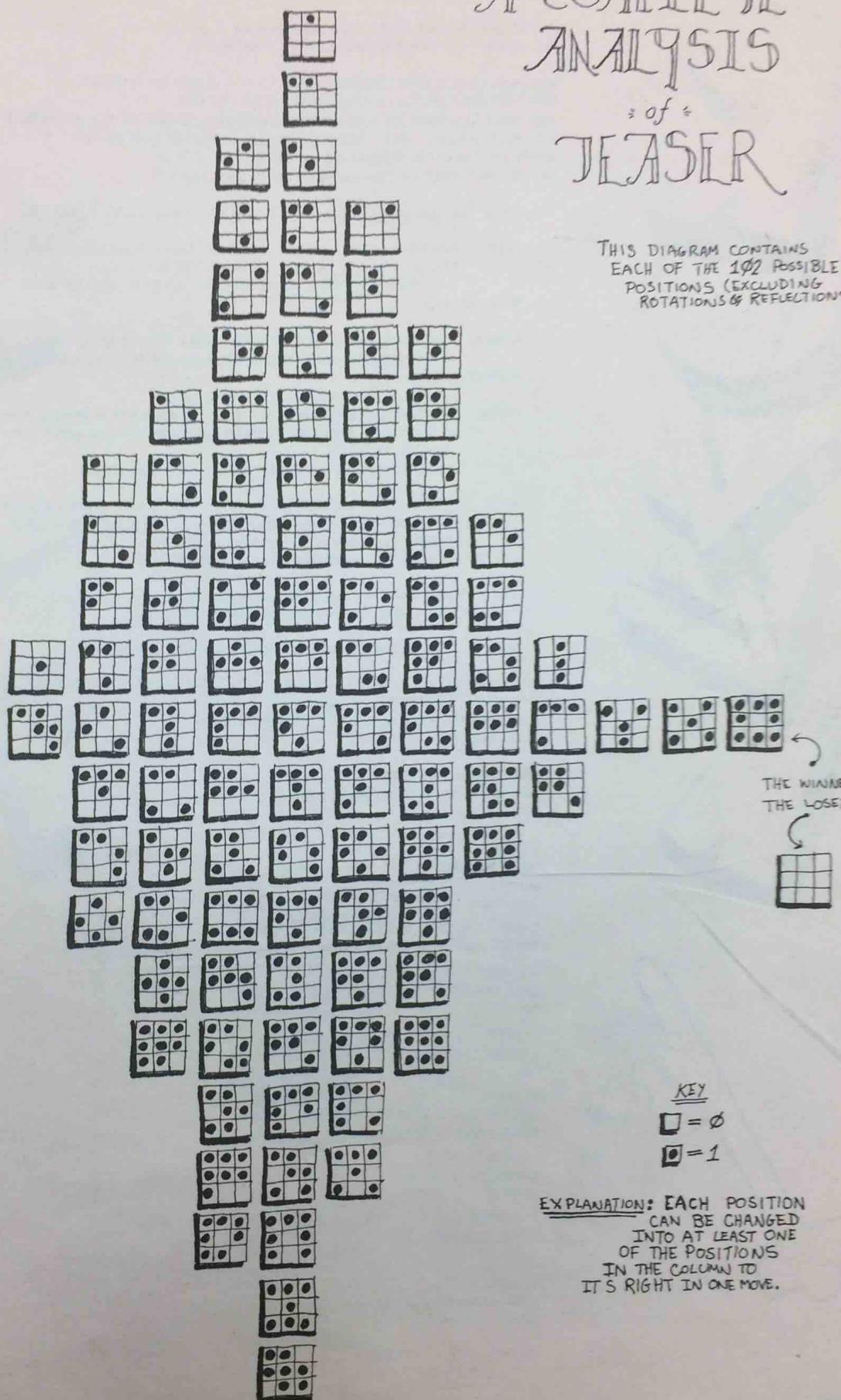
One theorem we did *NOT* use in  
analyzing TEASER is one due to  
Krein and Milman:

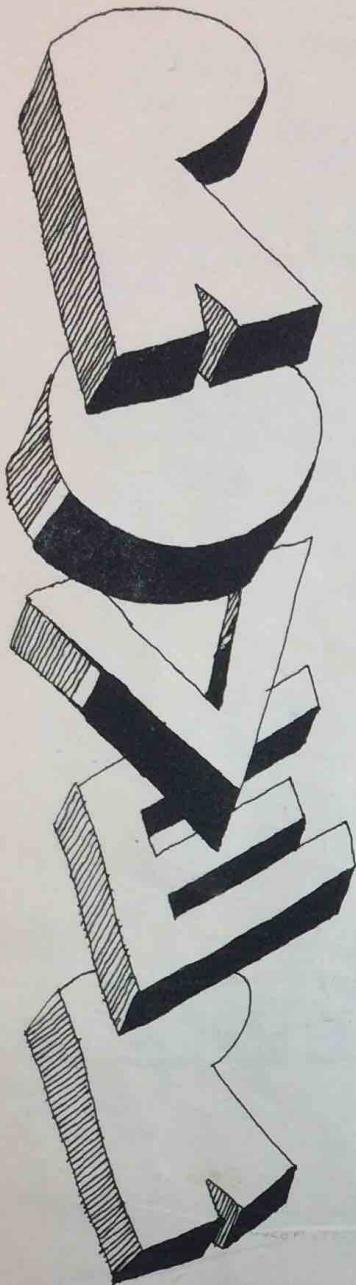
**Theorem:** Let  $K$  be a compact  
convex set in a locally convex  
topological vector space  $X$ .  
Then  $K$  is the closed convex  
hull of its extreme points.



# A COMPLETE ANALYSIS = of = TEASER

THIS DIAGRAM CONTAINS  
EACH OF THE 102 POSSIBLE  
POSITIONS (EXCLUDING  
ROTATIONS & REFLECTIONS).





ROVER ROBOT NEEDS YOUR HELP TO GET ACROSS A GRID.  
EACH SQUARE IS MARKED EITHER 'GO' OR 'STOP'.  
ROVER CAN CONTINUE MOVING AS LONG AS IT NEVER LANDS ON A 'STOP'.

ROVER MAY START AT ANY SQUARE IN ROW 1.  
THE OBJECT IS TO GET ROVER ROBOT TO ROW 9.

YOU MAY CHECK ANY SQUARE TO SEE IF IT IS A 'GO' OR A 'STOP',  
BUT YOU ONLY GET A LIMITED NUMBER OF CHECKS.  
YOU WILL ALSO HAVE A MAP OPTION SHOWING YOU WHERE ROVER ROBOT  
HAS BEEN AND ALL THE 'STOPS' UP TO THE CURRENT ROW SO THAT YOU MAY  
MOVE ROVER BACK AROUND DEAD ENDS.  
AGAIN, YOU ONLY GET A CERTAIN NUMBER OF MAPS.

HERE ARE THE COMMANDS AVAILABLE AND WHAT EACH ONE DOES:

STEP     ROVER ROBOT CAN STEP TO ANY SQUARE TOUCHING THE ONE  
IT'S ON – HORIZONTAL, VERTICAL, OR DIAGONAL  
THE COMPUTER WILL ASK FOR ROVER'S NEW SQUARE WITH  
ROW,COLUMN?

CHECK    YOU MAY CHECK ANY SQUARE TO SEE IF IT IS A 'GO' OR A 'STOP'.  
THE COMPUTER WILL ASK WHICH SQUARE TO CHECK WITH  
ROW,COLUMN?

LOOK     THE NUMBER OF 'STOPS' STRAIGHT AHEAD FROM WHERE ROVER  
IS TO ROW 9 AND THE NUMBER OF 'STOPS' IN THE NEXT ROW  
WILL BE PRINTED.  
YOU MAY 'LOOK' AS MANY TIMES AS YOU WANT TO.

MAP     DRAW A MAP FROM ROW 1 TO THE ROW THAT ROVER ROBOT  
IS CURRENTLY IN. THE MAP WILL SHOW ROVER'S PATH AND  
EVERY 'GO' AND 'STOP' IN THESE ROWS.  
YOU GET A LIMITED NUMBER OF MAPS.

INFO    WHERE ROVER ROBOT IS, THE NUMBER OF CHECKS YOU HAVE  
LEFT, AND THE NUMBER OF MAPS LEFT.

END     LEAVE ROVER ROBOT STRANDED IN THE GRID

WHICH GRID DO YOU WANT – NOVICE, REGULAR, OR EXPERT? NOVICE

WOULD YOU LIKE A CLUE (YES OR NO)? YES  
HINT: POSITION 1, 4 IS GO

THERE ARE 21 STOPS  
YOU HAVE 15 CHECKS AND 3 MAPS  
GOOD LUCK!

\*? STEP  
ROW, COLUMN? 1, 4  
GO

\*? LOOK  
THERE ARE 4 STOPS STRAIGHT AHEAD  
THERE ARE 3 STOPS IN ROW 2

\*? CHECK  
ROW, COLUMN? 2, 5  
GO

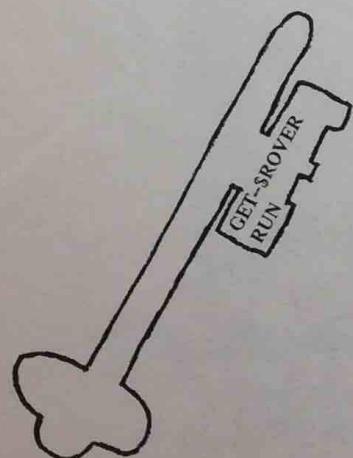
\*? STEP  
ROW, COLUMN? 2, 5  
GO

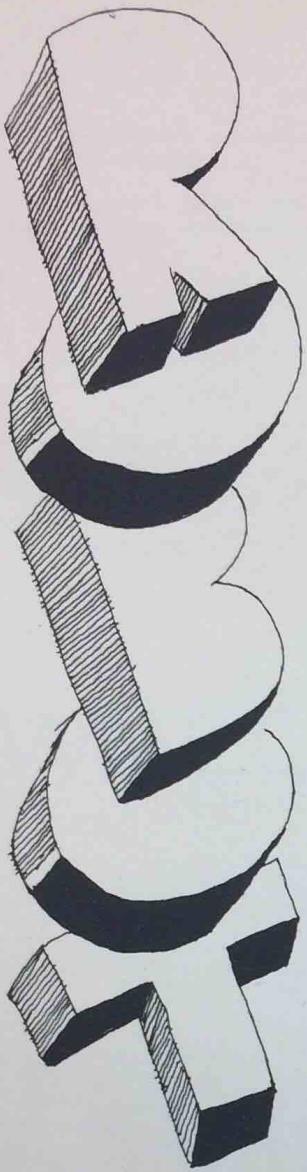
\*? LOOK  
THERE ARE 3 STOPS STRAIGHT AHEAD  
THERE ARE 3 STOPS IN ROW 3

\*? CHECK  
ROW, COLUMN? 3, 5  
STOP

\*? CHECK  
ROW, COLUMN? 3, 6  
STOP

\*? CHECK  
ROW, COLUMN? 3, 4  
STOP





\*? MAP

\*'s ARE ROVER ROBOT'S STEPS

ROWS	COLUMNS								
	1	2	3	4	5	6	7	8	9
1	STOP	GO	GO	*	GO	GO	STOP	GO	GO
2	STOP	GO	GO	STOP	*	STOP	GO	GO	GO

\*? STEP

ROW, COLUMN? 1, 6  
GO

\*? STEP

ROW, COLUMN? 2, 7  
GO

\*? LOOK

THERE ARE 2 STOPS STRAIGHT AHEAD  
THERE ARE 3 STOPS IN ROW 3

\*? STEP

ROW, COLUMN? 2, 8  
GO

\*? LOOK

THERE ARE 1 STOPS STRAIGHT AHEAD  
THERE ARE 3 STOPS IN ROW 3

\*? CHECK

ROW, COLUMN? 3, 8  
GO

\*? STEP

ROW, COLUMN? 3, 8  
GO

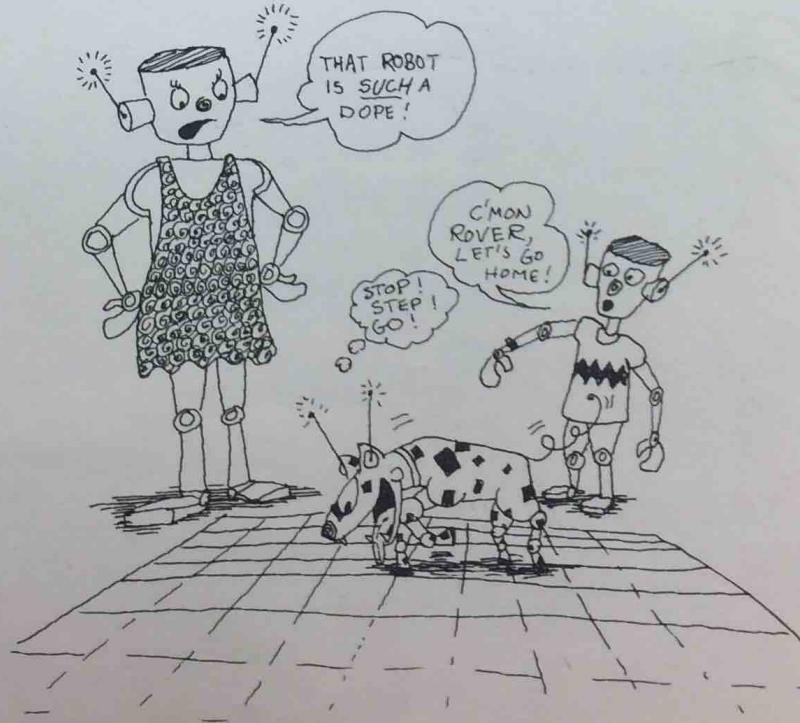
\*? INFO

ROVER ROBOT IS AT 3, 8  
YOU HAVE 10 CHECKS LEFT  
YOU HAVE 2 MAPS LEFT

\*? CHECK

ROW, COLUMN? 4, 8  
GO

... TAKE OVER, ROVER ROBOT IS COUNTING ON YOU!!

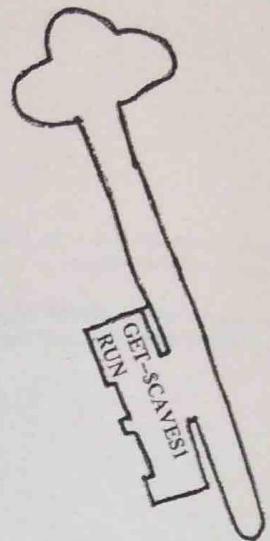


Explore tree-structures — the computer sets them up for you in *Caves1*; you design your own in *Caves2*. *Wumpus* is played on the vertices of a dodecahedron.

These games can be played without a computer, but quite a bit of preparation and bookkeeping is necessary. Discuss ways to generate the random numbers needed for the set-up and play.

# WELCOME TO THE CAVES

Caves 1  
Wumpus  
Caves 2



GET-CAVES!  
RUN  
CAVES!

You type these two lines.  
The computer types the others.

WELCOME TO THE CAVES

IS THIS YOUR FIRST VISIT (1=YES, 0=NO)?

DO YOU WANT AN INTRODUCTION (1=YES, 0=NO)?

IMAGINE YOURSELF AN EXPLORER OF THE FAMOUS DAZZLEDORF CAVES. YOU'VE BEEN UNDERGROUND FOR DAYS, TRIPPING THROUGH THE CAVERNS AND TUNNELS. UNFORTUNATELY, YOU'RE LOST, AND YOUR FOOD HAS RUN OUT.

THERE IS ONLY ONE PATH OUT. SEE IF YOU CAN FIND IT.

WHEN I TYPE A '?', YOU GIVE ME THE NUMBER OF THE CAVERN YOU WANT TO GO TO. LIKE THIS:

WHERE NEXT? 7

ADVICE: MAKE A MAP AS YOU GO - IN THE HARDER CAVES YOU SOMETIMES HAVE TO GO BACK AND TRY ANOTHER WAY. GOOD LUCK!

YOU'RE IN CAVERN # 1  
# 2 # 3 # 4 ARE WHERE YOU CAN GO  
WHERE NEXT? 2  
DEADEND This is where you take over.  
WHERE NEXT? 3

YOU'RE IN CAVERN # 3  
# 5 # 6 # 7 # 1 ARE WHERE YOU CAN GO  
WHERE NEXT? 5  
DEADEND  
WHERE NEXT? 5+6  
DEADEND  
WHERE NEXT? 7

YOU'RE IN CAVERN # 7  
# 8 # 9 # 10 # 3 ARE WHERE YOU CAN GO  
WHERE NEXT? 8

YOU'RE IN CAVERN # 8  
# 11 # 12 # 13 # 7 ARE WHERE YOU CAN GO  
WHERE NEXT? 11  
DEADEND  
WHERE NEXT? 12  
DEADEND  
WHERE NEXT? 13 is #13 always  
the way out?

!!! SUNLIGHT !!!

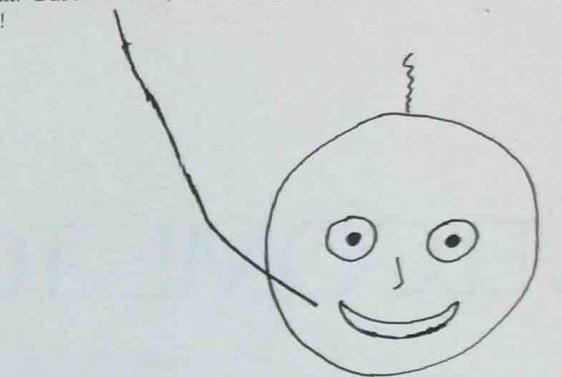
!!! FRESH AIR !!!

... REPORTERS ...

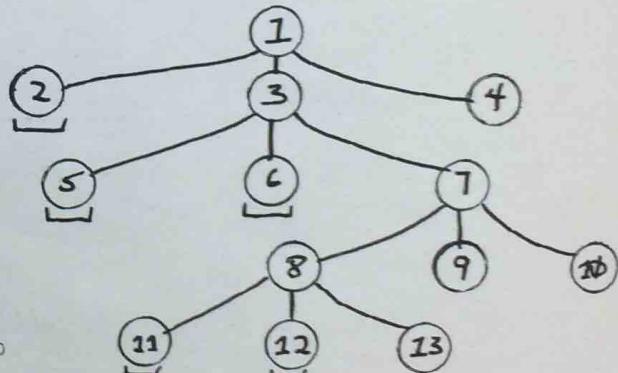
WELL, AT LEAST YOU'RE OUT

CONGRATULATIONS, INTREPID EXPLORER  
OF THE FEARSOME CAVES. IF YOU WANT TO  
EXPLORE AGAIN, YOU CAN CHOOSE A HARDER SET  
OF CAVES OR ANOTHER ONE JUST AS DIFFICULT

So you've decided to visit the CAVES, have you? Come in, come in! But remember, there's only one way out ... hope you find it!



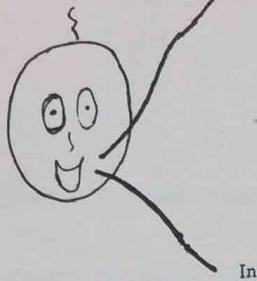
This is a map I drew when I visited the CAVES. The sideways box ↘ under a cavern tells you it's a DEADEND.



Some caverns, like #4 or #9, I never tried -- but they're probably DEADENDS 'cause there's only one way out ...



If you play CAVESI twice,  
will you get the same CAVES?

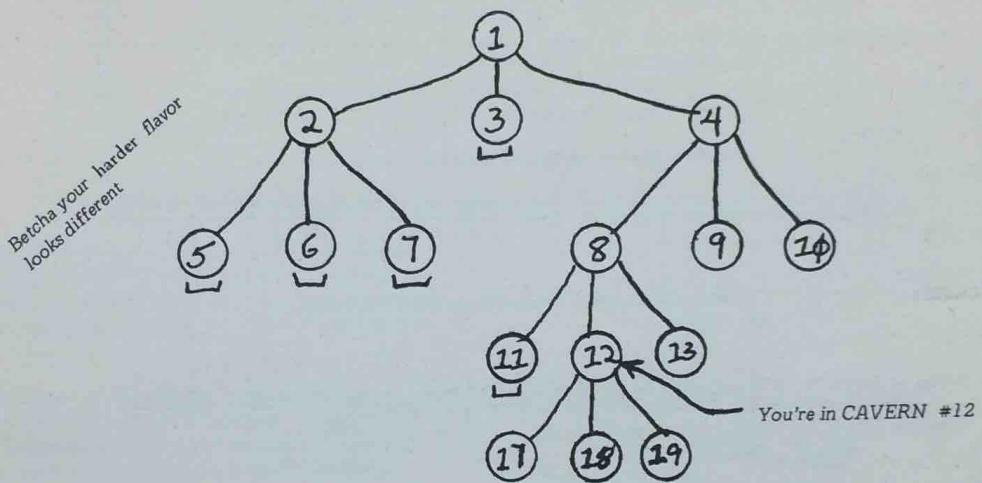


Maps are neat 'cause they show what you've found out so far. Like in the map last page, you know caverns #4, #9, and #10 were never visited.

If you were still in #8, would you go back to visit #9? Could you find your way back to #4?

In CAVES1, you get three flavors of CAVES -- each is bigger than the last. They're called usual, harder, and !!!

Here's a partial map of a harder flavor I was playing



\*\*\*\*\*  
\* How would you get back to #1?  
\*\*\*\*\*

The CAVES don't change -- earthquakes don't rumble and volcanoes don't erupt while you play. Nor are there miners around, digging them up. At least they don't on my computer...



\*\*\*\*\*  
\* Are you a SPELUNKER?  
\*\*\*\*\*

That's a word for a CAVES explorer. If you are, ask yourself,

\* Where would I hide the way out?

\* What different kinds of CAVES would I like to see?

**CAVES1** for more than 1

*Here are some ways you and a friend can enjoy playing CAVES1 together.*

\* HOT COLD

Pick a flavor with a friend. Have your friend turn away so you can make a map -- but be careful! Don't get out yet. When you're near where you think OUT is, go back to cavern # 1. Tear off the sheet and let your friend try it.

\* NEW OUT

Make a map but don't go OUT. Pick a new OUT and return to cavern # 1.

If your friend can now find your new OUT before finding the old OUT (which ends the game), he wins, and he gets to find a new OUT next game for you.

Now comes the fun. Each time your friend moves, say HOT or COLD.

\* RENUMBER

Make a table of cavern #'s, like this :

Now fill the lower boxes with numbers randomly, like this :

Diagram illustrating a linked list structure:

old #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
new #	3	2	1		5	6	4	7																							

Annotations:

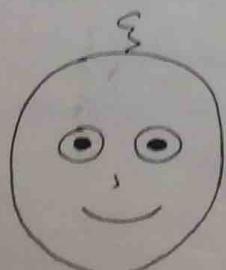
- A curved arrow labeled "start" points to node 1.
- A curved arrow labeled "where next?" points to node 8.
- A curved arrow labeled "you take over here" points to node 8.

Sit at the computer and have your friend sit away so he/she can't see. *Your friend plays the game, but YOU interpret with your table.* If your friend is in cavern # 7 and tunnels lead to # 8, # 9, and # 10 and back up to # 3, interpret the cavern # s and say

You're in cavern # 5  
# 6, # 4, # 7 and # 2 are where you can go.

If your friend chooses # 2, you still have to type in the OLD #, which is ... ?

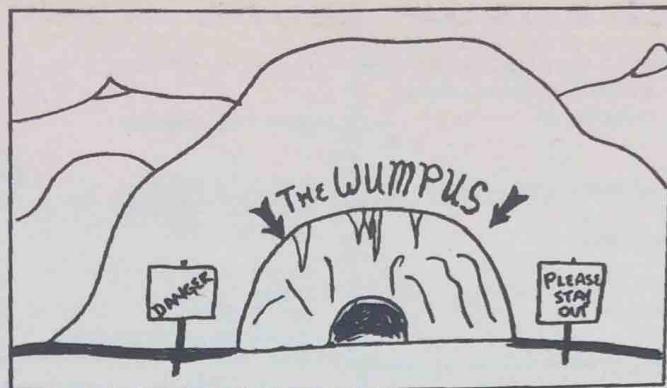
The *structure* of the CAVES doesn't change, just the *cavern #s*.



Oh -- forgot to introduce myself. I'm Dave of the CAVES and I wrote the games in the CAVES family. See you later on for CAVES2.

Bye!

# Hunt the WUMPUS



## Point

If you're planning to go in and hunt the WUMPUS, then you're in for a strange treat. You see, no one has ever seen the WUMPUS. Sure, hunters have looked for him. Some have even shot him full of arrows. And every day across the country, unfortunate hunters are eaten by the WUMPUS.

No one has ever seen the WUMPUS. If you do, please write to us and tell us of your experience. Was it frightening, pleasant, funny? Is the WUMPUS friendly, lonely, big or small?

Drawings and photographs, of course, will be appreciated.

The WUMPUS lives in a CAVE of 20 rooms (called caverns in CAVES1, remember?) and the only pleasant way out is to shoot it with one of your arrows -- you get 5 to start with. But watch out -- if you fall into a Bottomless Pit (there are two), you lose.

Two other caverns have swarms of Super Bats. If you wander there, unpredictable things will happen -- they like to fly away with people and drop them elsewhereville, like another cavern way over on the other side of the WUMPUS CAVES. Makes mapmaking difficult...



Hey! Forgot to tell you ... to be fair, you'll get warnings: if you are one cavern away from the WUMPUS, you'll read

I SMELL A WUMPUS!

and if you're one away from the Bats

BATS NEARBY!

but watch out for

I FEEL A DRAFT

'cause one false step and you've found  
a Bottomless Pit!

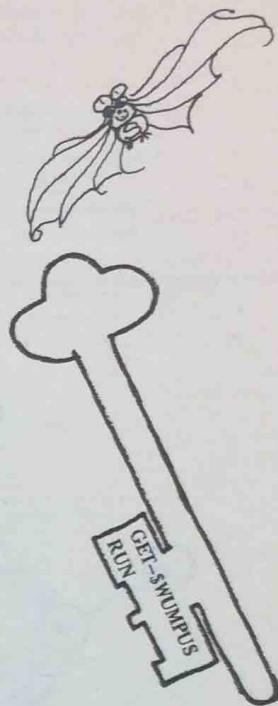
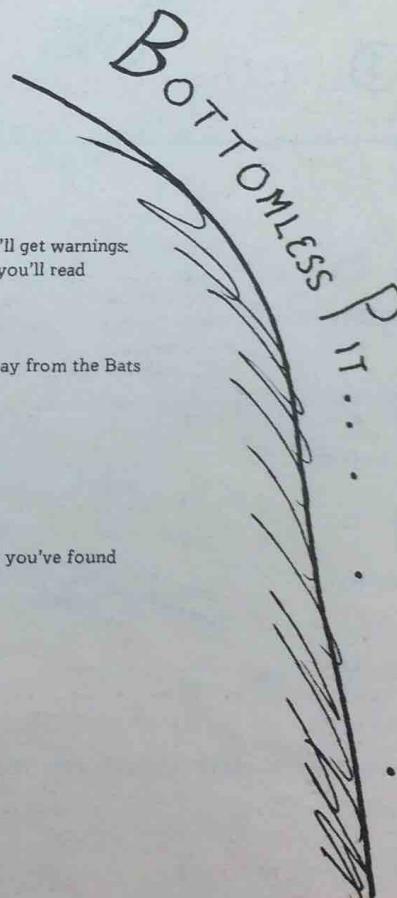
Be careful when you shoot! An arrow is good for up to 5 rooms and then you lose it. Make each shot count! Also, when you shoot, make sure the rooms you aim at are properly connected. If the next room you choose for the arrow's path isn't connected (to the last one), then the arrow goes wild.

You can get shot by your own arrows. Ouch!

Whenever you shoot an arrow, the WUMPUS wakes up!

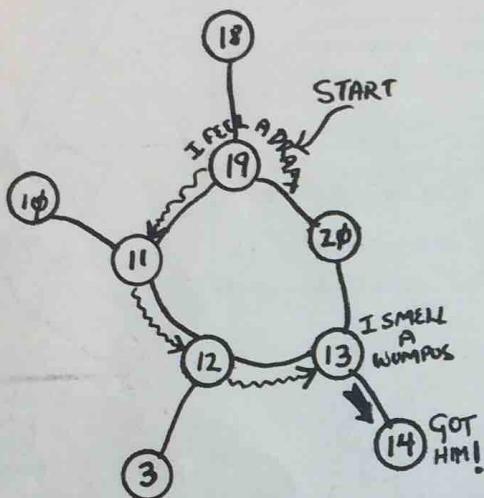
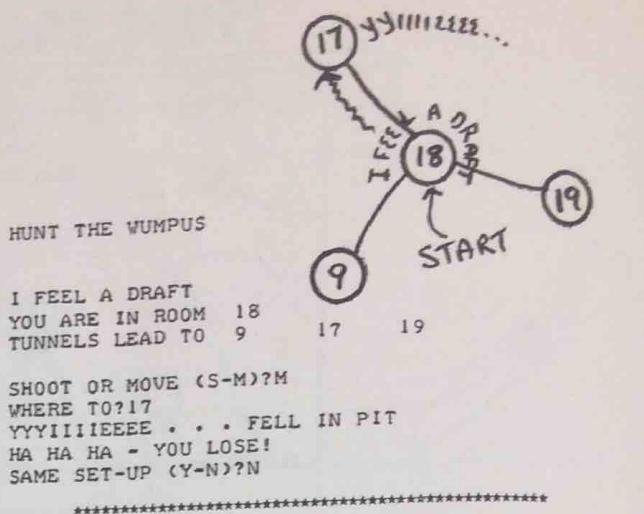
You'll also wake him up if you stumble into his room. When the WUMPUS awakens, he usually moves. And if he moves into your room, CHOMP, you get eaten.

Good luck, and keep your map up to date.



\*\*\*\*\*  
ATTENTION WUMPUS BUFFS:

- \* When the WUMPUS is one room away, don't shoot unless you're sure which room he's in. Instead, you can back up a room and then shoot. This way, if you miss, at least the WUMPUS will be two rooms away when the arrow wakes him up.
  - \* Does the WUMPUS ever hide in a Bottomless Pit?
  - \* Is he ever in a room with Superbats?
  - \* What happens if you shoot an arrow across a Bottomless Pit? Anything?
- \*\*\*\*\*



HUNT THE WUMPUS

I FEEL A DRAFT  
YOU ARE IN ROOM 4  
TUNNELS LEAD TO 3 5 14

SHOOT OR MOVE (S-M)?M  
WHERE TO?14

BATS NEARBY!  
YOU ARE IN ROOM 14  
TUNNELS LEAD TO 4 13 15

SHOOT OR MOVE (S-M)?M  
WHERE TO?15

YOU ARE IN ROOM 15  
TUNNELS LEAD TO 6 14 16

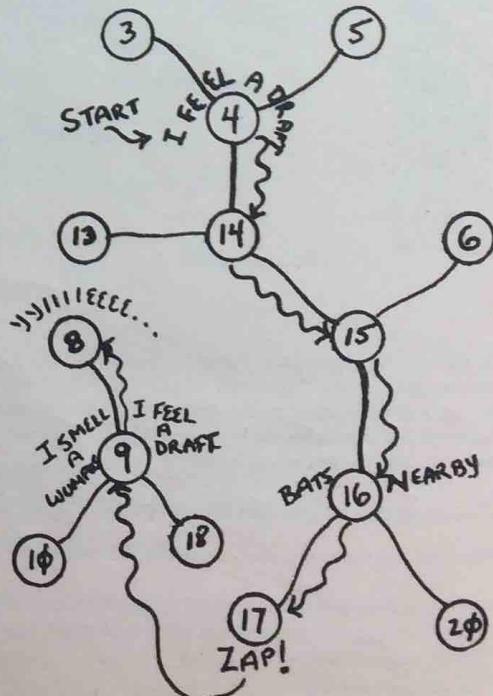
SHOOT OR MOVE (S-M)?M  
WHERE TO?16

BATS NEARBY!  
YOU ARE IN ROOM 16  
TUNNELS LEAD TO 15 17 20

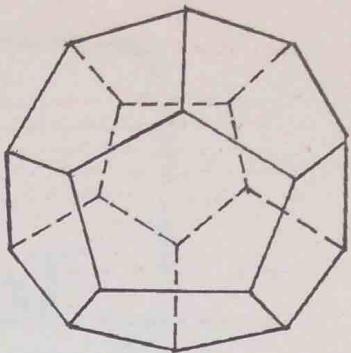
SHOOT OR MOVE (S-M)?M  
WHERE TO?17  
ZAP--SUPER BAT SNATCH! ELSEWHEREVILLE FOR YOU!

I SMELL A WUMPUS!  
I FEEL A DRAFT  
YOU ARE IN ROOM 9  
TUNNELS LEAD TO 8 10 18

SHOOT OR MOVE (S-M)?M  
WHERE TO?8  
YYYYIIIEEEEE . . . FELL IN PIT  
HA HA HA - YOU LOSE!  
SAME SET-UP (Y-N)?

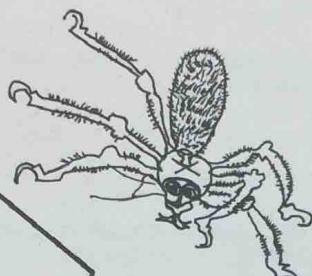


Here is what the WUMPUS CAVES look like →

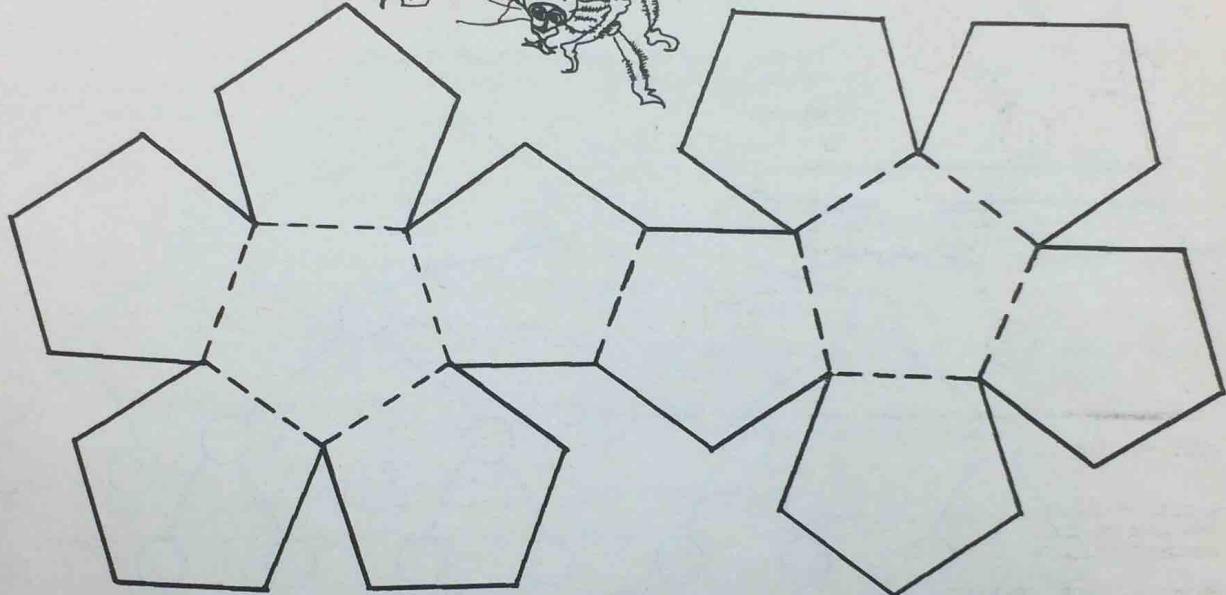


In geometry, it's called a DODECAHEDRON. That means it has 12 sides. 12 sides? But the WUMPUS CAVES has 20 rooms. Aha! Look at the vertices — where the corners meet — there are 20 of them. Now each vertex has 3 edges leading to other vertices. Begin to get the picture? Each VERTEX is a room of the CAVES and the edges connecting it to others are the TUNNELS.

To make a DODECAHEDRON, cut this figure along the solid lines. Fold along the dotted lines, and scotch tape the edges together :



+ A spider from the Bottomless Pits



## Thoughts to Think about



No matter how far you go,  
you must return to where  
you started or at least cross  
your path.



Pick a room. If I challenge you and  
name another room, could you shoot  
an arrow so it goes there? Pick a room  
and ask a friend to challenge you.

If you shoot an arrow, can you aim it  
so you hit yourself?

You can't go through  
a room with a hazard,  
right? How would you  
tell if the WUMPUS  
was sleeping soundly,  
surrounded by hazards?



From any one room, how many arrows  
do you need to reach each of the other  
rooms? Remember, an arrow can go  
through, at most, 5 rooms at a time.

# Welcome Back To The Caves

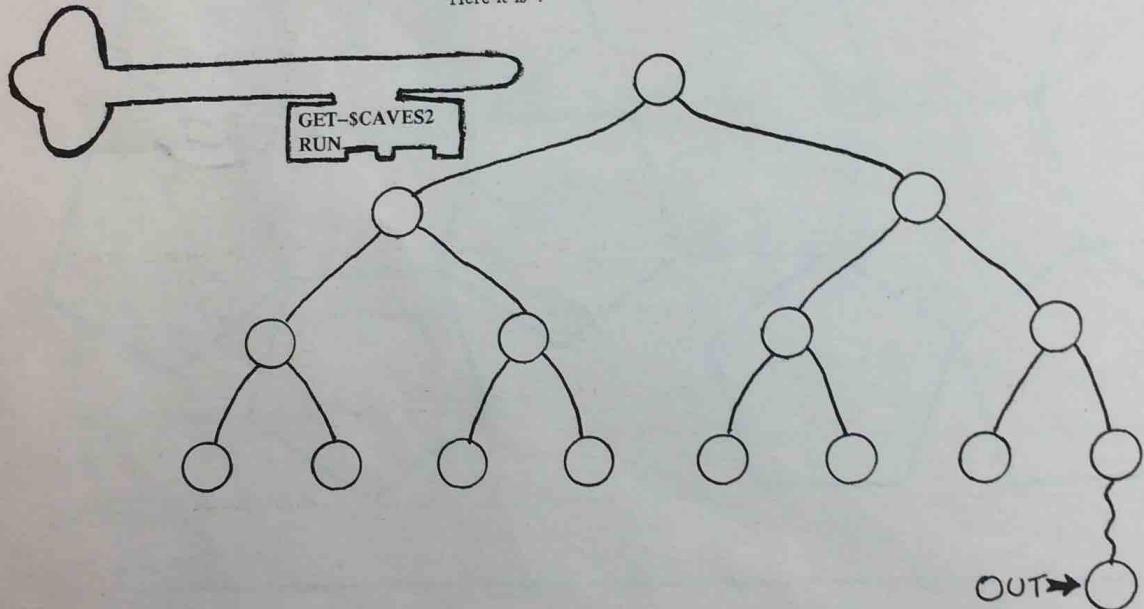


Hi! Dave of the CAVES again. I guess you've just visited the WUMPUS who also lives in CAVES. His CAVES are different 'cause they have loops in them.

You must be itching to build your own CAVES. And that's what CAVES2 is all about.

This time I'll start with a map and use CAVES2 to help me create the CAVES I want.

Here it is :



CAVES2

WELCOME TO THE CAVES

DO YOU WANT AN INTRODUCTION (1=YES, 0=NO)?1

THIS GAME IS JUST LIKE CAVES1,  
EXCEPT YOU SET UP THE CAVES

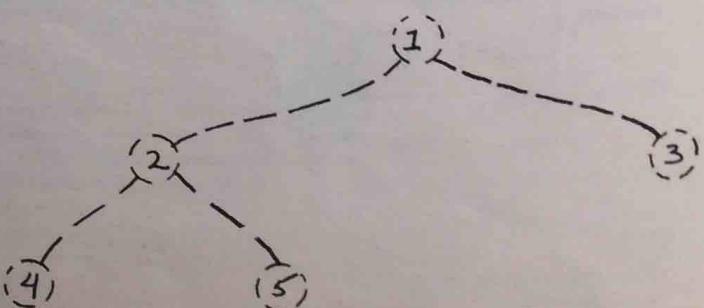
THEN, YOU CAN EXPLORE THEM,  
OR ASK A FRIEND TO FIND HIS WAY OUT

A GOOD IDEA IS TO MAKE A MAP  
AS YOU GO ALONG, SO YOU CAN SEE  
WHAT YOUR CAVES LOOK LIKE

EACH CAVERN HAS A NUMBER OF TUNNELS  
LEADING TO OTHER CAVERNS - 0 TUNNELS  
MEANS A DEADEND CAVERN. OTHERWISE,  
YOU CAN HAVE 1,2,3,4 OR 5 TUNNELS

YOU'RE IN CAVERN # 1  
HOW MANY TUNNELS?2  
THEY LEAD TO # 2 # 3

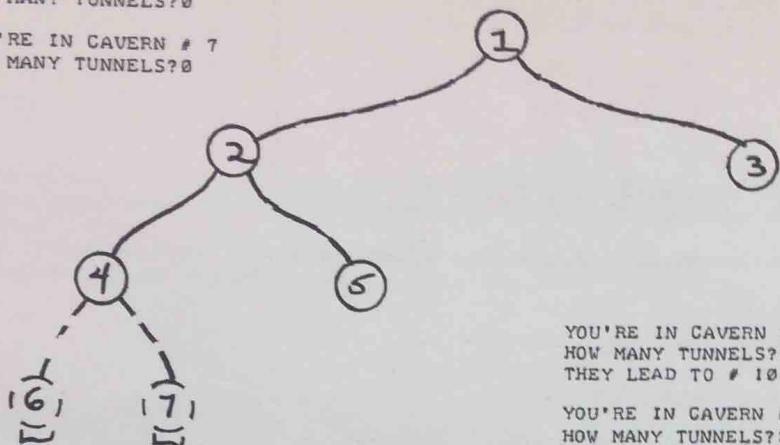
YOU'RE IN CAVERN # 2  
HOW MANY TUNNELS?2  
THEY LEAD TO # 4 # 5



YOU'RE IN CAVERN # 4  
HOW MANY TUNNELS? 2  
THEY LEAD TO # 6 # 7

YOU'RE IN CAVERN # 6  
HOW MANY TUNNELS? 0

YOU'RE IN CAVERN # 7  
HOW MANY TUNNELS? 0



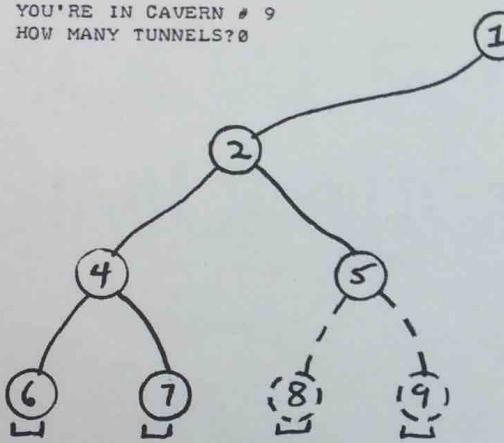
○ old cavern

○ new cavern

YOU'RE IN CAVERN # 5  
HOW MANY TUNNELS? 2  
THEY LEAD TO # 8 # 9

YOU'RE IN CAVERN # 8  
HOW MANY TUNNELS? 0

YOU'RE IN CAVERN # 9  
HOW MANY TUNNELS? 0



YOU'RE IN CAVERN # 3  
HOW MANY TUNNELS? 2  
THEY LEAD TO # 10 # 11

YOU'RE IN CAVERN # 10  
HOW MANY TUNNELS? 2  
THEY LEAD TO # 12 # 13

YOU'RE IN CAVERN # 12  
HOW MANY TUNNELS? 0

YOU'RE IN CAVERN # 13  
HOW MANY TUNNELS? 0

YOU'RE IN CAVERN # 11  
HOW MANY TUNNELS? 2  
THEY LEAD TO # 14 # 15

YOU'RE IN CAVERN # 14  
HOW MANY TUNNELS? 0

YOU'RE IN CAVERN # 15  
HOW MANY TUNNELS? 1  
THEY LEAD TO # 16

YOU'RE IN CAVERN # 16  
HOW MANY TUNNELS? 0

That's all the  
mapmaking I'm  
doing for you.  
You're on your  
own!

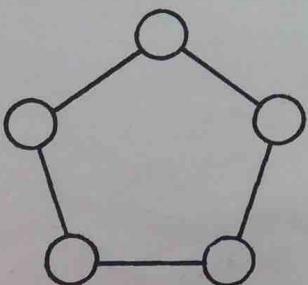


THE CAVES ARE COMPLETE EXCEPT FOR ONE SMALL THING -  
THEY NEED A ROOM THAT LEADS TO THE OUTSIDE.

WHICH ROOM # WILL THAT ONE BE? 16  
WHEN YOU'RE READY, TYPE ANY NUMBER  
?99

YOU'RE IN CAVERN # 1  
# 2 # 3 ARE WHERE YOU CAN GO  
WHERE NEXT?

If you're thinking of building a WUMPUS CAVES, let me  
warn you. CAVES2 will take up to 128 caverns (called rooms)  
in WUMPUS but they can't form loops like



the way they do in WUMPUS.

\*\*\*\*\*  
\* Here are some interesting ways to make CAVES.  
\*\*\*\*\*

\* The CAVES on the last page double on each level. How  
about tripling on each level?

\* Find a leaf and look at its veins. Remind you of CAVES?  
Make a map of the pattern and create them as CAVES  
with CAVES2.

\* Find an interesting looking river and get a map of it. See  
how all the tributaries feeding into it look like a CAVES?

\* Look at the palm of your hand. Can you see a CAVES  
structure there?

\* Get a friend to play with you. Copy your map from your  
friend's hand and make a CAVES that looks like his hand!

A simulation uses a model of a real-life situation. The computer does the complicated bookkeeping — you create the initial conditions, manipulate the parameters, and analyze the results. A simulation can be repeated or restarted as often as you want.

Most of the simulations written so far involve money, war, and politics. (*Polut* is an exception.) Hopefully, we'll be able to design non-aggressive simulations. Suggestions would be welcomed — please write.

# BUSINESS & SOCIAL SCIENCE SIMULATIONS

Hamurabi  
King  
Civil 2  
Market  
Stock  
Policy  
Polut

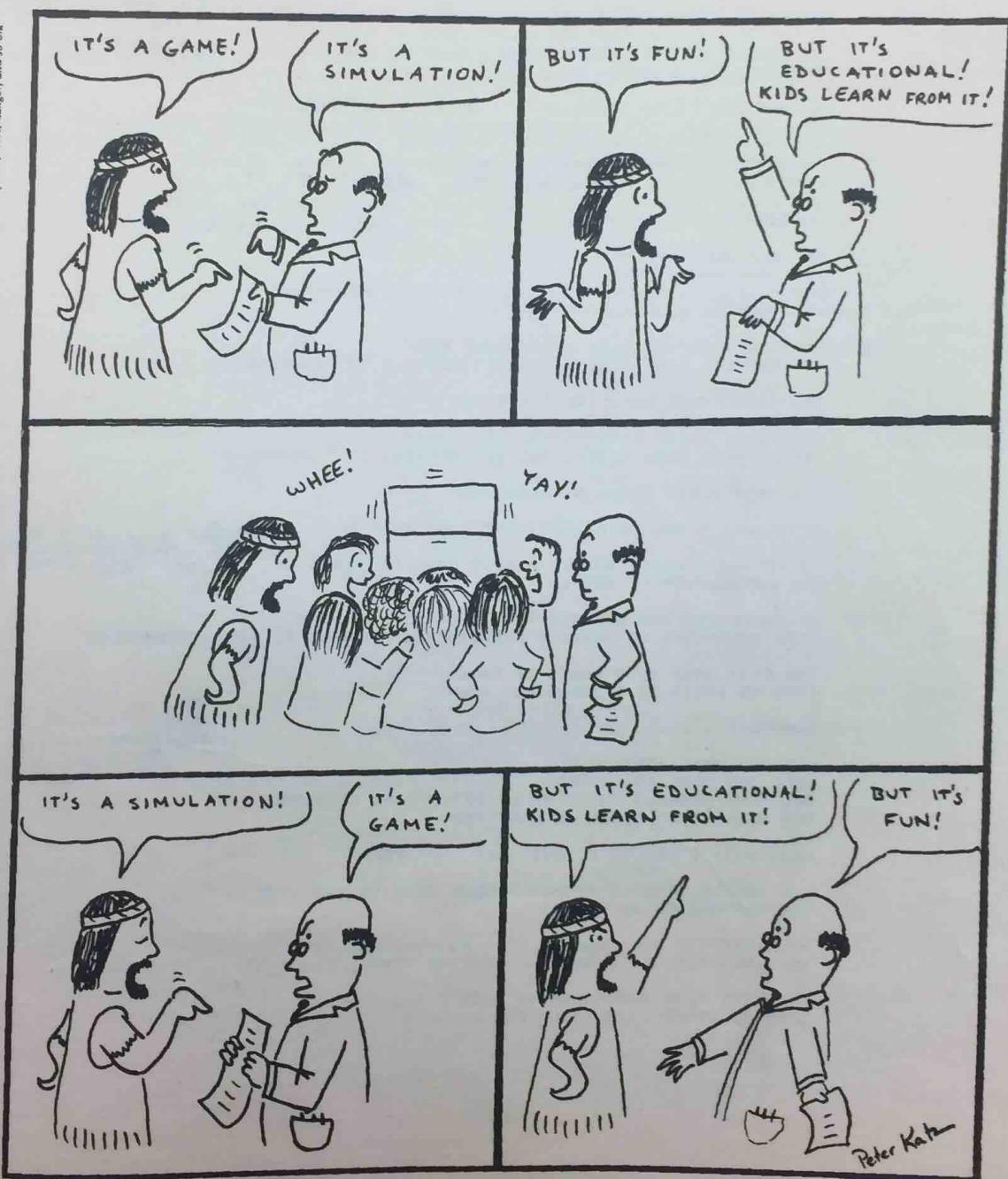
# Business & Social Science Simulations

This section contains some pure fun-type games that can also be used as serious classroom learning exercises. Three of them, CIVIL 2, HAMURABI and KING have been circulating in some form or another for years. They have been fixed, patched, and changed by hundreds of high school programmers. The versions we include here are the latest we have available.

STOCK, POLUT, MARKET and POLICY are at the other end of the spectrum. These programs were developed by the Huntington Project staff, a National Science Foundation project currently located at the State University of New York, Stony Brook. The programs represent a sample of the sophisticated simulations that are available from the project.

The Huntington programs are designed for classroom use. The Huntington project staff recommends that for use of their programs it is necessary to obtain a student workbook (\$0.30), Teachers' Guide (\$0.30) and a Resource Guide (\$0.50). These materials make it easy for a teacher with little or no computer expertise to use these programs. (Ordering information for Huntington materials is on page 91.)

Classic Definition of Classroom Computer Simulation: "Reproducing on a computer an activity or occurrence that would be impossible or impractical to do in a classroom because of cost, time, danger, and so on."

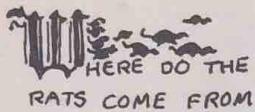


# HAMURASI

\*\* HAMURABI

HAMURABI, I BEG TO REPORT THAT LAST YEAR

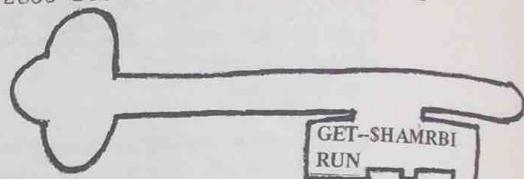
0 PEOPLE STARVED AND 5 PEOPLE CAME TO THE CITY  
THE POPULATION IS NOW 100



WE HARVESTED 3000 BUSHELS AT 3 BUSHELS PER ACRE  
RATS DESTROYED 200 BUSHELS LEAVING 2800 BUSHELS IN THE STOREHOUSES

THE CITY OWNS 1000 ACRES OF LAND  
LAND IS WORTH 18 BUSHELS PER ACRE

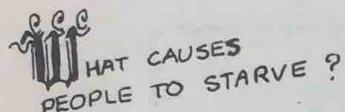
HAMURABI . . .



GET-SHAMRBI  
RUN

BUY HOW MANY ACRES?0  
SELL HOW MANY ACRES?0  
HOW MANY BUSHELS SHALL WE DISTRIBUTE AS FOOD?1000  
HOW MANY ACRES SHALL WE PLANT?500

HAMURABI, I BEG TO REPORT THAT LAST YEAR



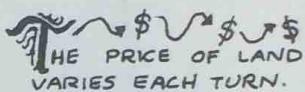
50 PEOPLE STARVED AND 6 PEOPLE CAME TO THE CITY  
THE POPULATION IS NOW 56

HY WOULD ANYONE  
COME TO THE CITY  
WHILE PEOPLE ARE  
DYING OF STARVATION?

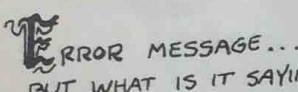
WE HARVESTED 2000 BUSHELS AT 4 BUSHELS PER ACRE  
RATS DESTROYED 167 BUSHELS LEAVING 3383 BUSHELS IN THE STOREHOUSES

THE CITY OWNS 1000 ACRES OF LAND  
LAND IS WORTH 18 BUSHELS PER ACRE

HAMURABI . . .



BUY HOW MANY ACRES?100  
SELL HOW MANY ACRES?0  
HOW MANY BUSHELS SHALL WE DISTRIBUTE AS FOOD?1400  
HOW MANY ACRES SHALL WE PLANT?900



HAMURABI! THINK AGAIN - YOU ONLY HAVE  
56 PEOPLE, 1100 ACRES, AND 183 BUSHELS IN STOREHOUSES

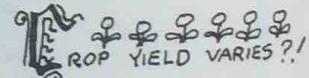
HOW MANY ACRES SHALL WE PLANT?500

HAMURABI! THINK AGAIN - YOU ONLY HAVE  
56 PEOPLE, 1100 ACRES, AND 183 BUSHELS IN STOREHOUSES

HOW MANY ACRES SHALL WE PLANT?200

HAMURABI, I BEG TO REPORT THAT LAST YEAR

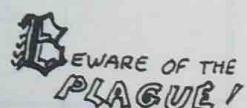
0 PEOPLE STARVED AND 10 PEOPLE CAME TO THE CITY  
THE POPULATION IS NOW 66



WE HARVESTED 600 BUSHELS AT 3 BUSHELS PER ACRE  
RATS DESTROYED 32 BUSHELS LEAVING 651 BUSHELS IN THE STOREHOUSES

THE CITY OWNS 1100 ACRES OF LAND  
LAND IS WORTH 21 BUSHELS PER ACRE

HAMURABI . . .



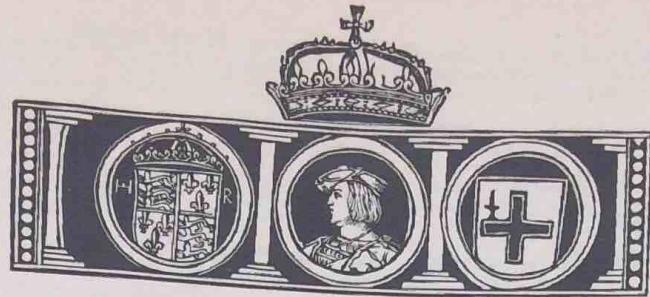
BUY HOW MANY ACRES?0  
SELL HOW MANY ACRES?200  
HOW MANY BUSHELS SHALL WE DISTRIBUTE AS FOOD?750  
HOW MANY ACRES SHALL WE PLANT?600

HAMURABI, I BEG TO REPORT THAT LAST YEAR

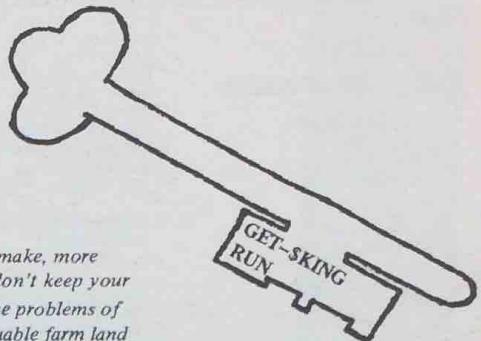
29 PEOPLE STARVED AND 28 PEOPLE CAME TO THE CITY  
THE POPULATION IS NOW 65

WE HARVESTED 600 BUSHELS AT 1 BUSHELS PER ACRE  
RATS DESTROYED 212 BUSHELS LEAVING 4189 BUSHELS IN THE STOREHOUSES

THE CITY OWNS 900 ACRES OF LAND  
LAND IS WORTH 20 BUSHELS PER ACRE



# KING



*This is a second-level economic simulation. You have more decisions to make, more resources to allocate and the fear of assassination, hanging or jail if you don't keep your people happy. You're the King again, but now you must contend with the problems of pollution and education; you must decide whether or not to sell your valuable farm land to outside industrial investors.*

*You'll like KING. It has a logical beginning and end which appeals to most people. If you survive your eight year term . . . we congratulate you. It's hard to do!*



CONGRATULATIONS! YOU'VE BEEN MADE PREMIER OF SETATS DETINU,  
A SMALL COMMUNIST ISLAND 30 BY 70 MILES LONG. YOUR JOB IS  
TO DECIDE THE COUNTRY'S FATE.

THE MONEY SYSTEM IS RALLODS. EACH COUNTRYMAN MUST HAVE AT  
LEAST 100 RALLODS/YEAR TO SURVIVE.

YOUR COUNTRY'S INCOME COMES FROM FARM PRODUCE, TOURISTS,  
AND TAXES. HALF YOUR LAND IS FARM LAND WHICH MAY BE SOLD  
TO FOREIGN INDUSTRY WHO IMPORT AND SUPPORT THEIR OWN WORKERS.

CROPS COST BETWEEN 10 AND 15 RALLODS PER SQ. MILE TO PLANT,  
AND THEY BRING IN BETWEEN 45 AND 65 RALLODS PER SQ. MILE

INDUSTRY WILL BUY LAND FROM 95 TO 105 RALLODS PER SQ. MILE.  
AND WILL PAY TAXES OF 44 RALLODS PER SQ. MILE OF LAND.  
INDUSTRY BRINGS TOURIST TRADE. IT MUST OWN AT LEAST 2 SQ.  
MILES BEFORE YOU GET ANY TOURIST TRADE, AND INCOME FROM  
YOUR TOURIST TRADE WILL INCREASE UNTIL INDUSTRY OWNS  
26 SQ. MILES OF LAND.  
INDUSTRY ALSO BRINGS POLLUTION, WHICH IS MEASURED IN UNITS.  
POLLUTION MAY BE COMBATED BY SPENDING .44 RALLODS PER UNIT  
OF POLLUTION. POLLUTION WILL DECREASE TOURIST TRADE AND  
CROP YIELD.

**Big decision. Should  
you let industry into  
your clean, peaceful  
country?**

**Pollution is double  
trouble**

YOU CAN INCREASE YOUR CROP YIELD THROUGH EDUCATION. THE  
VALUE OF CROPS IS DEPENDENT ON THE AMOUNT OF MONEY USED FOR  
EDUCATION IN THE PAST 3 YEARS. 10 RALLODS PER PERSON IS  
THE MAXIMUM USEFUL AMOUNT TO SPEND ON EDUCATION.

YOUR GOAL: TO COMPLETE YOUR 8 YEAR TERM.  
GOOD LUCK!

YOU HAVE 69672 RALLODS  
506 COUNTRYMEN, AND 2000 SQ. MILES OF LAND.  
THIS YEAR INDUSTRY WILL BUY LAND FOR 98 RALLODS/SQ. MILE  
LAND CURRENTLY COSTS 12 RALLODS/SQ. MILE TO PLANT

HOW MANY SQ. MILES TO SELL TO INDUSTRY?  
HOW MANY RALLODS TO DISTRIBUTE TO YOUR COUNTRYMEN? 50600  
HOW MANY SQ. MILES TO PLANT? 1000  
HOW MUCH TO SPEND FOR EDUCATION? 5060

1 COUNTRYMEN LEFT THE ISLAND.  
YOU HARVESTED 1000 SQ. MILES OF CROPS.  
MAKING 42000 RALLODS.  
YOU RECEIVED 0 RALLODS FROM TAXES ON INDUSTRY

YOU HAVE 44012 RALLODS  
505 COUNTRYMEN, AND 2000 SQ. MILES OF LAND.  
THIS YEAR INDUSTRY WILL BUY LAND FOR 98 RALLODS/SQ. MILE  
LAND CURRENTLY COSTS 14 RALLODS/SQ. MILE TO PLANT

HOW MANY SQ. MILES TO SELL TO INDUSTRY?  
HOW MANY RALLODS TO DISTRIBUTE TO YOUR COUNTRYMEN? 50500  
ONLY GOT 44012 RALLODS LEFT!  
HOW MANY RALLODS TO DISTRIBUTE TO YOUR COUNTRYMEN? 42000  
HOW MANY SQ. MILES TO PLANT? 1000  
ONLY GOT 2012 RALLODS LEFT!  
YOU CAN AFFORD 143 AND HAVE LABOR FOR 1010 AND HAVE 1000  
SQ.MILES  
HOW MANY SQ. MILES TO PLANT? 143  
HOW MUCH TO SPEND FOR EDUCATION? 1000  
ONLY GOT 10 RALLODS LEFT!  
HOW MUCH TO SPEND FOR EDUCATION? 1000

**Error Message**

85 COUNTRYMEN DIED OF STARVATION  
YOU WERE FORCED TO SPEND 765 RALLODS FOR FUNERAL EXPENSES  
9 COUNTRYMEN LEFT THE ISLAND.  
YOU HARVESTED 143 SQ. MILES OF CROPS.  
MAKING 7293 RALLODS.  
YOU RECEIVED 0 RALLODS FROM TAXES ON INDUSTRY

YOU HAVE 6528 RALLODS  
411 COUNTRYMEN, AND 2000 SQ. MILES OF LAND.  
THIS YEAR INDUSTRY WILL BUY LAND FOR 97 RALLODS/SQ. MILE  
LAND CURRENTLY COSTS 11 RALLODS/SQ. MILE TO PLANT

HOW MANY SQ. MILES TO SELL TO INDUSTRY? 178  
HOW MANY RALLODS TO DISTRIBUTE TO YOUR COUNTRYMEN? 41100  
ONLY GOT 23794 RALLODS LEFT!  
HOW MANY RALLODS TO DISTRIBUTE TO YOUR COUNTRYMEN? 23500  
HOW MANY SQ. MILES TO PLANT? 822  
ONLY GOT 294 RALLODS LEFT!  
YOU CAN AFFORD 26 AND HAVE LABOR FOR 822 AND HAVE 822 SQ.MILES  
HOW MANY SQ. MILES TO PLANT? 26  
HOW MUCH TO SPEND FOR EDUCATION? 1  
HOW MUCH TO SPEND TO COMBAT POLLUTION? 1000  
ONLY GOT 7 RALLODS LEFT!  
HOW MUCH TO SPEND TO COMBAT POLLUTION? 7

176 COUNTRYMEN DIED OF STARVATION  
YOU WERE FORCED TO SPEND 1584 RALLODS FOR FUNERAL EXPENSES  
OVER ONE THIRD OF THE POPULATION HAS DIED SINCE YOU  
WERE ELECTED TO OFFICE. THE PEOPLE (REMAINING)  
YOU HAVE BEEN ASSASSINATED.

**Rest in peace**

← Sound familiar?  
see Hamurabi

← A new wrinkle

← This adds  
insult to injury

← Notice how the  
prices vary



## A new start

YOU HAVE 70972. RALLODS  
 503 COUNTRYMEN, AND 2000 SQ. MILES OF LAND.  
 THIS YEAR INDUSTRY WILL BUY LAND FOR 102 RALLODS/SQ. MILE  
 LAND CURRENTLY COSTS 11 RALLODS/SQ. MILE TO PLANT

HOW MANY SQ. MILES TO SELL TO INDUSTRY? 200  
 HOW MANY RALLODS TO DISTRIBUTE TO YOUR COUNTRYMEN? 50000  
 HOW MANY SQ. MILES TO PLANT? 1500  
 EACH COUNTRYMAN CAN ONLY PLANT 2 SQ. MILES  
 YOU CAN AFFORD 3761 AND HAVE LABOR FOR 1006 AND HAVE 800  
 SQ.MILES  
 HOW MANY SQ. MILES TO PLANT? 800  
 HOW MUCH TO SPEND FOR EDUCATION? 1000  
 HOW MUCH TO SPEND TO COMBAT POLLUTION? 0

3 COUNTRYMEN DIED OF STARVATION  
 YOU WERE FORCED TO SPEND 27 RALLODS FOR FUNERAL EXPENSES  
 INSUFFICIENT RESOURCES FORCED SALE OF LAND  
 273 WORKERS CAME TO THE ISLAND AND  
 1 COUNTRYMAN LEFT THE ISLAND.  
 YOU HARVESTED 800 SQ. MILES OF CROPS.  
 MAKING 45600. RALLODS.  
 YOU RECEIVED 8800 RALLODS FROM TAXES ON INDUSTRY

YOU HAVE 45729. RALLODS  
 499 COUNTRYMEN, 273 FOREIGN WORKERS, AND 2108  
 SQ. MILES OF LAND.  
 THIS YEAR INDUSTRY WILL BUY LAND FOR 97 RALLODS/SQ. MILE  
 LAND CURRENTLY COSTS 14 RALLODS/SQ. MILE TO PLANT  
 POLLUTION LEVEL IS 11664 UNITS.

HOW MANY SQ. MILES TO SELL TO INDUSTRY? 0  
 HOW MANY RALLODS TO DISTRIBUTE TO YOUR COUNTRYMEN? 50000  
 ONLY GOT 45729. RALLODS LEFT!  
 HOW MANY RALLODS TO DISTRIBUTE TO YOUR COUNTRYMEN? 45000  
 HOW MANY SQ. MILES TO PLANT? 800  
 ONLY GOT 729 RALLODS LEFT!  
 YOU CAN AFFORD 52 AND HAVE LABOR FOR 998 AND HAVE 1108 SQ.MILES  
 HOW MANY SQ. MILES TO PLANT? 52  
 HOW MUCH TO SPEND FOR EDUCATION? 0  
 HOW MUCH TO SPEND TO COMBAT POLLUTION? 0

49 COUNTRYMEN DIED OF STARVATION  
 25 COUNTRYMEN DIED FROM EXCESS POLLUTION.  
 YOU WERE FORCED TO SPEND 666 RALLODS FOR FUNERAL EXPENSES  
 15 COUNTRYMEN LEFT THE ISLAND.  
 OF 52 SQ. MILES PLANTED, YOU HARVESTED 46 SQ. MILES OF CROPS.  
 (DUE TO POLLUTION LEVEL)  
 MAKING 1978 RALLODS.  
 YOU RECEIVED -4752 RALLODS FROM TAXES ON INDUSTRY

This time  
we'll sell to  
foreign industry

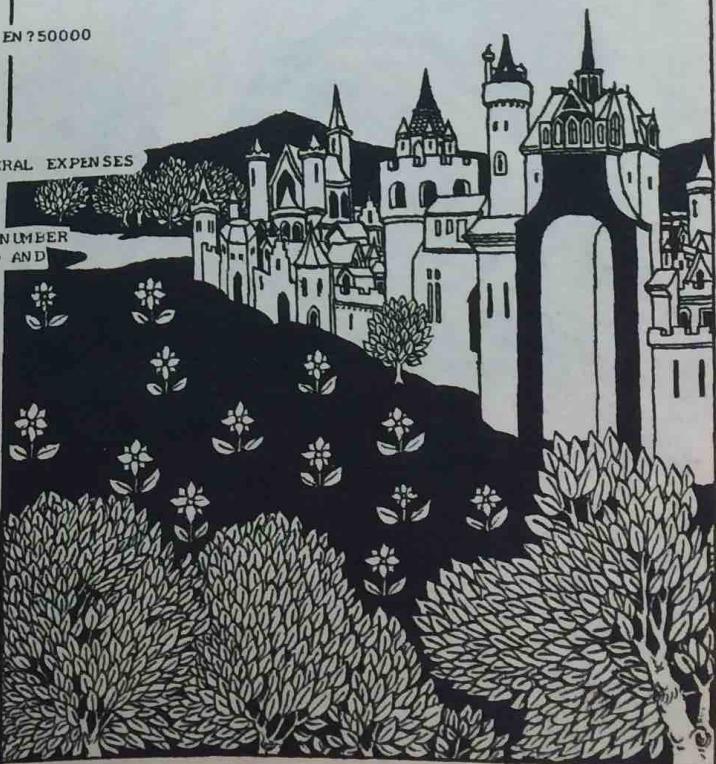
YOU HAVE 1313 RALLODS  
 410 COUNTRYMEN, 273 FOREIGN WORKERS, AND 2108  
 SQ. MILES OF LAND.  
 THIS YEAR INDUSTRY WILL BUY LAND FOR 95 RALLODS/SQ. MILE  
 LAND CURRENTLY COSTS 14 RALLODS/SQ. MILE TO PLANT  
 POLLUTION LEVEL IS 23328 UNITS.

HOW MANY SQ. MILES TO SELL TO INDUSTRY? 1200  
 THINK AGAIN, YOU'VE ONLY 1108 SQ. MILES OF FARM LAND  
 (FOREIGN INDUSTRY IS NOT INTERESTED IN FOREST LAND BECAUSE  
 OF THE GREATER DEVELOPMENT COST)  
 HOW MANY SQ. MILES TO SELL TO INDUSTRY? 700  
 HOW MANY RALLODS TO DISTRIBUTE TO YOUR COUNTRYMEN? 50000  
 HOW MANY SQ. MILES TO PLANT? 300  
 HOW MUCH TO SPEND FOR EDUCATION? 0  
 HOW MUCH TO SPEND TO COMBAT POLLUTION? 8000

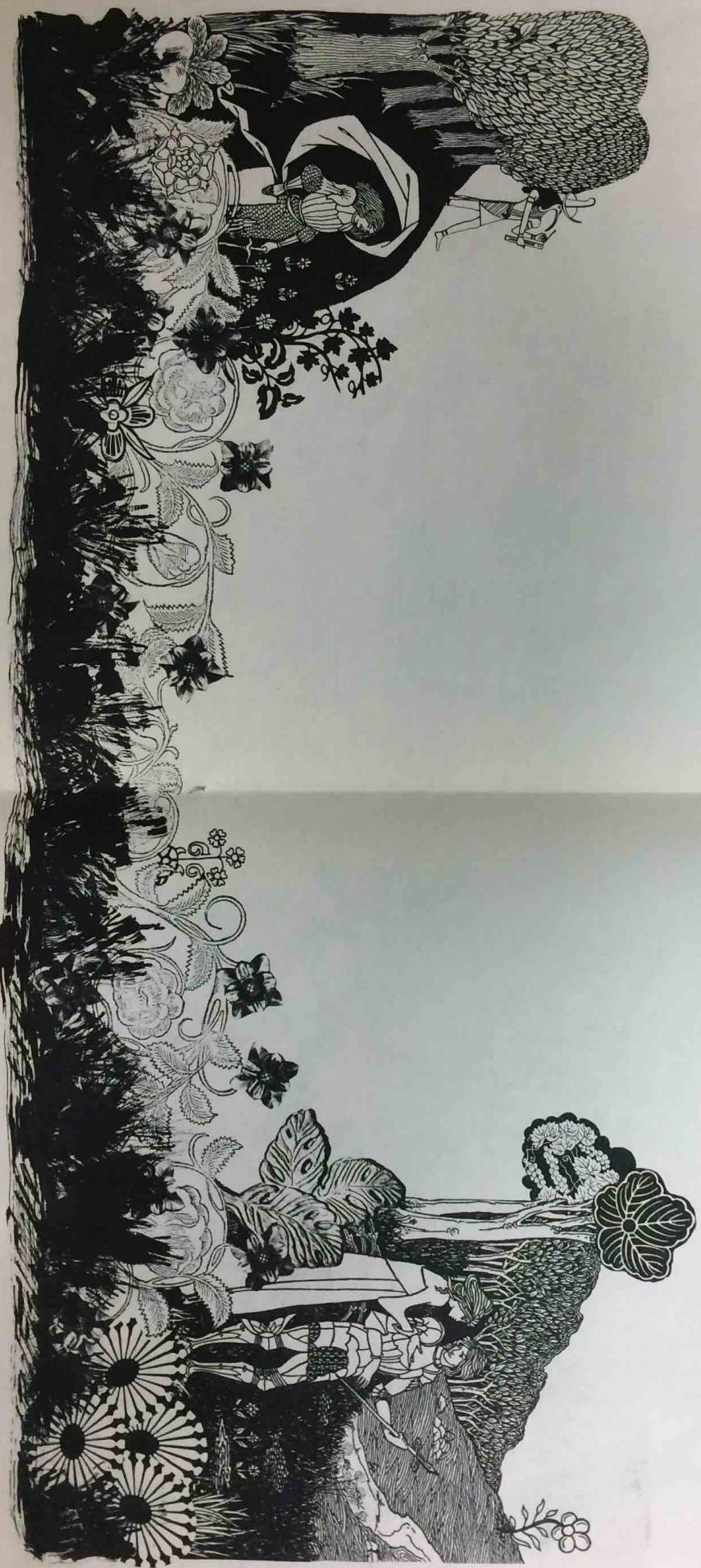
27 COUNTRYMEN DIED FROM EXCESS POLLUTION.  
 YOU WERE FORCED TO SPEND 243 RALLODS FOR FUNERAL EXPENSES  
 INSUFFICIENT RESOURCES FORCED SALE OF LAND  
 1522 WORKERS CAME TO THE ISLAND AND  
 29 COUNTRYMEN CAME TO THE ISLAND.  
 THE NUMBER OF FOREIGN WORKERS HAS EXCEEDED THE NUMBER  
 OF COUNTRYMEN. AS A MAJORITY THEY HAVE REVOLTED AND  
 TAKEN OVER THE COUNTRY.  
 YOU HAVE BEEN ASSASSINATED.

← Pollution

New beginning  
...same ending!



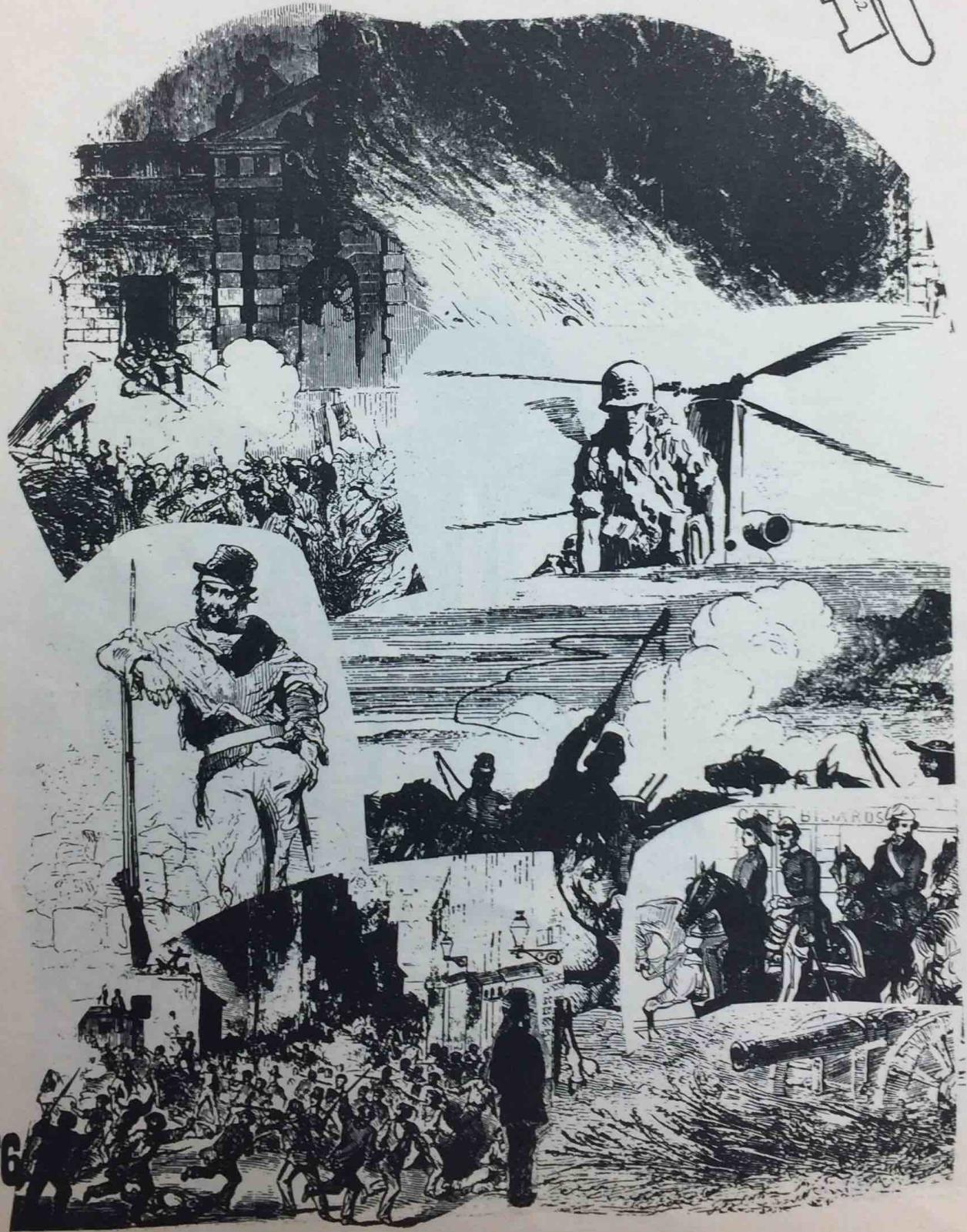
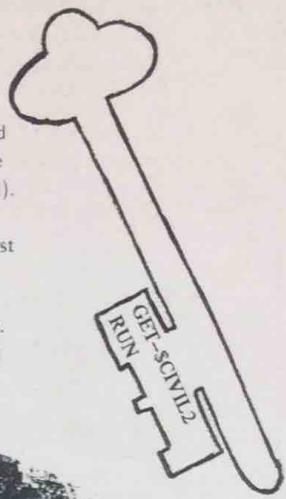
**WHAT TO DO  
AFTER YOU  
HIT RETURN :**



# CIVIL 2

A long time ago, a group of teenagers wrote a computer program that simulated 14 famous battles from the Civil War and allowed the "player" to re-fight these battles and, perhaps, change the tide of the war (yes, the Confederacy can win!). Always seeking to do better, this version of Civil War recreates the same 14 battles, but it allows two players to act as generals for each side and fight against each other.

CIVIL 2 is great fun. Whether it truly recreates the battles is for you to decide. We know for sure that it will put a little excitement into your history class and will capture the fancy of computer game enthusiasts.



This is a Civil War simulation. To play, type a response when the computer asks. Remember that all factors are interrelated and that your responses could change history. Facts and figures used are based on the actual occurrence. Most battles tend to result as they did in the Civil War, but it all depends on you! The object of the game is to win as many battles as possible.

Your choices for defensive strategy are:

- (1) Artillery attack
- (2) Fortification against frontal attack
- (3) Fortification against flanking maneuvers
- (4) Falling back

Your choices for offensive strategy are:

- (1) Artillery attack
- (2) Frontal attack
- (3) Flanking maneuvers
- (4) Encirclement

You may surrender by typing a 'S' for your strategy. Select a battle by typing a number from 1 to 14 on request. Type any other number to end the simulation. But '0' brings back exact previous battle situation allowing you to replay it. Note: A negative FOOD entry causes the program to use the entries from the previous battle. Are there two Generals present? YES

THIS IS THE BATTLE OF SECOND BULL RUN  
AUG. 29-30, 1862. THE COMBINED CONFEDERATE FORCES UNDER LEE  
AND JACKSON DROVE THE UNION FORCES BACK INTO WASHINGTON.

	CONFEDERACY	UNION
MEN	47473.	51158.
MONEY	\$ 259200.	\$ 264600.
INFLATION	19 %	16 %

CONFEDERATE GENERAL---HOW MUCH DO YOU WISH TO SPEND FOR  
- FOOD.....? 99200  
- SALARIES..? 0  
- AMMUNITION? 160000

UNION GENERAL---HOW MUCH DO YOU WISH TO SPEND FOR  
- FOOD.....? 114600  
- SALARIES..? 0  
- AMMUNITION? 150000

CONFEDERATE MORALE IS HIGH  
UNION MORALE IS HIGH  
CONFEDERATE GENERAL---BOTH SIDES ARE ON THE OFFENSIVE

CONFEDERATE STRATEGY ? 1  
UNION STRATEGY ? 2

	CONFEDERACY	UNION
CASUALTIES	14000	17115
DESERTIONS	0	10269

COMPARED TO THE ACTUAL CASUALTIES AT SECOND BULL RUN  
CONFEDERATE: 140 % OF THE ORIGINAL  
UNION: 122 % OF THE ORIGINAL

THE CONFEDERACY WINS SECOND BULL RUN

WHICH BATTLE DO YOU WISH TO SIMULATE? 5

THIS IS THE BATTLE OF GETTYSBURG  
JULY 1-3, 1863. A SOUTHERN MISTAKE BY GEN. LEE AT GETTYSBURG  
COST THEM ONE OF THE MOST CRUCIAL BATTLES OF THE WAR.

	CONFEDERACY	UNION
MEN	64860.	67442.
MONEY	\$ 391500.	\$ 295800.
INFLATION	7 %	28 %

CONFEDERATE GENERAL---HOW MUCH DO YOU WISH TO SPEND FOR  
- FOOD.....? 141500  
- SALARIES..? 0  
- AMMUNITION? 250000

UNION GENERAL---HOW MUCH DO YOU WISH TO SPEND FOR  
- FOOD.....? 145800  
- SALARIES..? 0  
- AMMUNITION? 1  
- AMMUNITION? 150000

CONFEDERATE MORALE IS HIGH  
UNION MORALE IS HIGH  
CONFEDERATE GENERAL---YOU ARE ON THE OFFENSIVE

CONFEDERATE STRATEGY ? 1  
UNION STRATEGY ? 4

	CONFEDERACY	UNION
CASUALTIES	24590	27203
DESERTIONS	8	16321

COMPARED TO THE ACTUAL CASUALTIES AT GETTYSBURG  
CONFEDERATE: 123 % OF THE ORIGINAL  
UNION: 118 % OF THE ORIGINAL

THE CONFEDERACY WINS GETTYSBURG  
WHICH BATTLE DO YOU WISH TO SIMULATE? 11

how can morale  
be high with no  
pay?

check your history  
books - who really  
won 2nd Bull Run?

a little  
economic  
understanding  
may help win the war

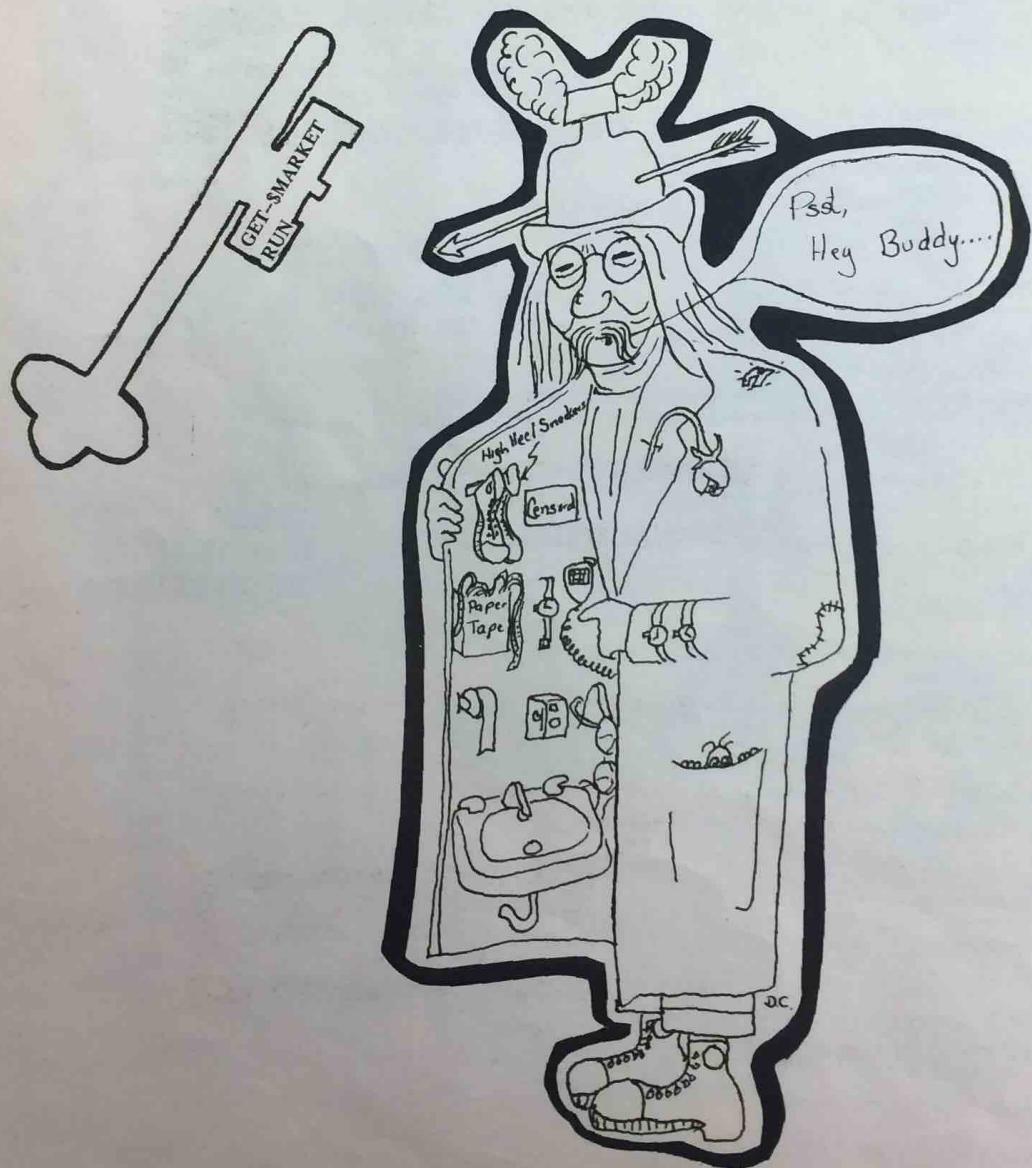
# MARKET

MARKET is a simplified version of those giant business management simulation exercises played by graduate business students and executives of large corporations. This version is exciting and simple enough to entertain 10-year olds who learn from doing it, yet difficult enough to challenge a pair of hotly competitive business managers who spent 3 hours at our computer terminal competing against each other.

MARKET sets two people (teams, classes or whatever) up in business in competition with each other. The product can be bicycles (as suggested in the supplemental materials) or any product you wish. Each business quarter, the management of each company (the players) make decisions regarding production, advertising and price, based

on the information from the previous quarter's experience. The computer then calculates each firm's sales, profits, cash position, etc. and then new decisions are made for the next quarter. The object is to run your competition into bankruptcy or reach \$12 million in assets yourself!

The market model is complete enough to include warehouse charges for carry-forward inventory and interest charges on borrowed money. It should be obvious by now, that if you plan to use MARKET as a serious learning experience you should prepare your students by providing some background information about the terms used in the simulation (see the teachers guide).



MARKET SIMULATES THE COMPETITION BETWEEN TWO COMPANIES SELLING A PRODUCT DIFFERENTIATED BY BRAND ADVERTISING. THE QUANTITY EACH COMPANY SELLS IS DEPENDENT UPON PRICE AND ADVERTISING BUDGET. THE GAME ENDS WHEN ONE COMPANY GOES BANKRUPT OR REACHES 12 MILLION IN TOTAL ASSETS.

ARE YOU BEGINNING THE GAME OR CONTINUING  
(TYPE 1 FOR BEGINNING, 2 FOR CONTINUING)?

FIXED PRODUCTION COST=\$ 250000. / QUARTER  
VARIABLE PRODUCTION COST=\$ 20 /UNIT  
WITH NO ADVERTISING AND A SELLING PRICE OF \$50/UNIT  
A COMPANY WILL SELL 25000 UNITS (PRINTED AS 25  
WAREHOUSE CHARGE FOR INVENTORY= 5 PER CENT  
INTEREST CHARGE ON BORROWED MONEY= 5 PER CENT

UNITS AND DOLLARS BELOW ARE IN THOUSANDS

NOT ALL QUARTERS ARE SHOWN

QUARTER 0

PROFIT	MARKET SHARE	CASH ON HAND	NUMBER SOLD	INVENTORY	ASSETS
0	0	5000	0	100	7000
0	0	5000	0	100	7000

COMPANY 1  
PRODUCTION LEVEL?25  
ADVERTISING BUDGET?10  
UNIT PRICE?55

ENTER YOUR PRODUCTION & ADVERTISING IN 1000'S OF UNITS

COMPANY 2  
PRODUCTION LEVEL?0  
ADVERTISING BUDGET?100  
UNIT PRICE?48

QUARTER 1

PROFIT	MARKET SHARE	CASH ON HAND	NUMBER SOLD	INVENTORY	ASSETS
371	38.18	5291	21	104	7371
536	61.81	6216	34	66	7536

COMPANY 1  
PRODUCTION LEVEL?15  
ADVERTISING BUDGET?25  
UNIT PRICE?37

PRICE CUTTER!

COMPANY 2  
PRODUCTION LEVEL?45  
ADVERTISING BUDGET?25  
UNIT PRICE?45

QUARTER 4

PROFIT	MARKET SHARE	CASH ON HAND	NUMBER SOLD	INVENTORY	ASSETS
525	59.25	8541	48	16	8861
528	40.74	8776	33	22	9216

NEW LABOR CONTRACT - VARIABLE PRODUCTION COST NOW= \$ 21 /UNIT

COMPANY 1  
PRODUCTION LEVEL?25  
ADVERTISING BUDGET?10  
UNIT PRICE?45

MARKET IS FILLED WITH RANDOM EVENTS TO FOUL YOU UP

COMPANY 2  
PRODUCTION LEVEL?45  
ADVERTISING BUDGET?40  
UNIT PRICE?42

## QUARTER 5

PROFIT	MARKET SHARE	CASH ON HAND	NUMBER SOLD	INVENTORY	ASSETS
489	44.28	9140	31	10	9350
521	55.71	9149	39	28	9737

A TRANSPORTATION STRIKE HAS OCCURED, AND YOU ARE UNABLE TO MOVE YOUR GOODS TO THE DISTRIBUTORS. NEGOTIATIONS HAVE BEGUN, BUT HOPE OF A SETTLEMENT LOOKS DIM.

**HELP!**

COMPANY 1  
PRODUCTION LEVEL?25  
ADVERTISING BUDGET?15  
UNIT PRICE?50

COMPANY 2  
PRODUCTION LEVEL?10  
ADVERTISING BUDGET?10  
UNIT PRICE?42

**NO SALES, NO PROFIT  
DURING THE STRIKE**

## QUARTER 6

PROFIT	MARKET SHARE	CASH ON HAND	NUMBER SOLD	INVENTORY	ASSETS
-302	0	8313	0	35	9048
-300	0	8639	0	38	9437

TRANSPORTATION STRIKE SETTLED. NORMAL DELIVERIES RESUMED

## QUARTER 9

PROFIT	MARKET SHARE	CASH ON HAND	NUMBER SOLD	INVENTORY	ASSETS
483	59.09	9789	52	31	10471
450	40.9	10740	36	4	10828

COMPANY 1 HAS BEEN THE VICTIM OF EMBEZZLEMENT BY THE VICE PRESIDENT OF THE COMPANY. YOUR CASH ON HAND IS NOW \$ 9589

**THAT ONE HURTS!**

COMPANY 1  
PRODUCTION LEVEL?15  
ADVERTISING BUDGET?50  
UNIT PRICE?39

COMPANY 2  
PRODUCTION LEVEL?45  
ADVERTISING BUDGET?35  
UNIT PRICE?40

## QUARTER 13

PROFIT	MARKET SHARE	CASH ON HAND	NUMBER SOLD	INVENTORY	ASSETS
365	48.78	11266	40	0	11266
425	51.21	11702	42	3	11771

THE PRESIDENT HAS JUST IMPOSED A WAGE-PRICE FREEZE ON THE ECONOMY, AND YOU MAY NOT RAISE THE PRICE OF YOUR PRODUCT OVER THE NEXT 2 QUARTERS.

**SOUND FAMILIAR?  
JUST LIKE REAL LIFE!**

COMPANY 1  
PRODUCTION LEVEL?40  
ADVERTISING BUDGET?40  
UNIT PRICE?38

COMPANY 2  
PRODUCTION LEVEL?45  
ADVERTISING BUDGET?35  
UNIT PRICE?40

## QUARTER 14

PROFIT	MARKET SHARE	CASH ON HAND	NUMBER SOLD	INVENTORY	ASSETS
310	48.19	11576	40	0	11576
440	51.8	12096	43	5	12211

\*\*\*\*\*  
COMPANY 2 YOU HAVE REACHED 12 MILLION AND WON  
\*\*\*\*\*

**THE WINNER!**

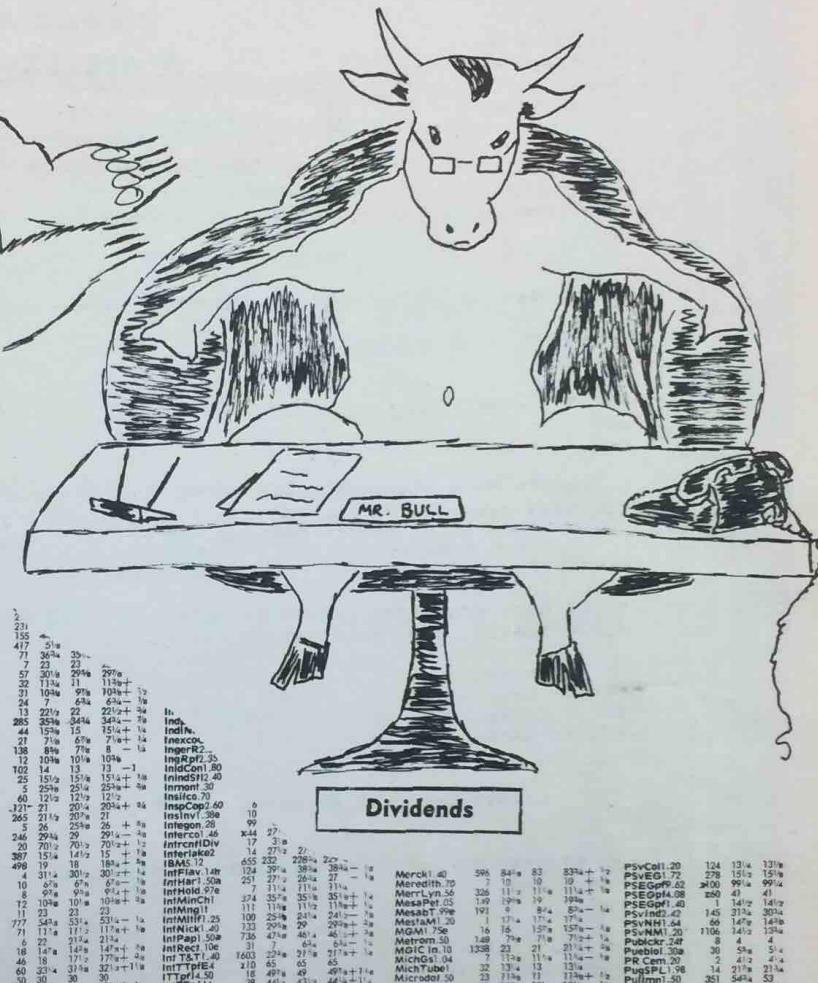
# STOCK



GET-\$STOP  
RUN

**STOCK** gives you a chance to try your hand at making money in the Stock Market without taking any risk. It was originally developed as a simulation for use in Business Education, Social Studies and Economics classes. As such, it is an excellent tool to teach students how the market works.

No knowledge of the stock market is necessary to use this program so it is also effective as a fun game. Young and old alike enjoy this game, competing to see who can make the most money.



• 0 281 24<sup>1/4</sup>  
126 23<sup>1/8</sup>  
31 8<sup>1/2</sup>

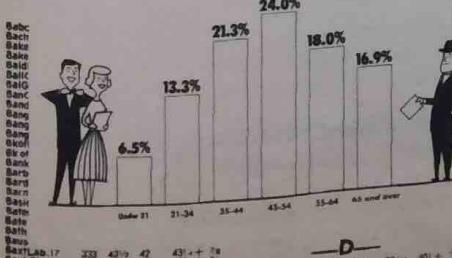
### **Dividends**

## THE STOCK MARKET

DO YOU WANT THE INSTRUCTIONS (YES-TYPE 1, NO-TYPE 0)?

THIS PROGRAM PLAYS THE STOCK MARKET. YOU WILL BE GIVEN \$10,000 AND MAY BUY OR SELL STOCKS. THE STOCK PRICES WILL BE GENERATED RANDOMLY AND THEREFORE THIS MODEL DOES NOT REPRESENT EXACTLY WHAT HAPPENS ON THE EXCHANGE. A TABLE OF AVAILABLE STOCKS, THEIR PRICES, AND THE NUMBER OF SHARES IN YOUR PORTFOLIO WILL BE PRINTED. FOLLOWING THIS, THE INITIALS OF EACH STOCK WILL BE PRINTED WITH A QUESTION MARK. HERE YOU INDICATE A TRANSACTION. TO BUY A STOCK TYPE +NNN, TO SELL A STOCK TYPE -NNN, WHERE NNN IS THE NUMBER OF SHARES. A BROKERAGE FEE OF 1% WILL BE CHARGED ON ALL TRANSACTIONS. NOTE THAT IF A STOCK'S VALUE DROPS TO ZERO IT MAY REBOUND TO A POSITIVE VALUE AGAIN. YOU HAVE \$10,000 TO INVEST. USE INTEGERS FOR ALL YOUR INPUTS. (NOTE: TO GET A 'FEEL' FOR THE MARKET RUN FOR AT LEAST 10 DAYS)

-----GOOD LUCK! -----



	Highs & Lows	
Nabisco-2	35	31
Nabisco-5	44	29
Nabisco-65	58	56
Nashville	62	37
Nashville-1	200	140
Nashville-4	100	75
NAIA-Volley	90	115
NAT Can	45	72
NAT Can-2	72	95
NAT Can-3	95	115
N. Chem	28	45
Natl City-L	90	95
Nat'l Distri	107	384
Nat'l Distri-H	90	100
Nat'l Distri-L	105	115
Nat'l Distri-S	105	115

A  
AAR Co.07a  
AAV Corp.22  
Aberdeen.50  
AcmeHilm.  
AcmePrec.  
Adams.10  
ADMIndust.  
AdobeO.09a  
AEPlastP.  
AngloAm.  
AeroFliteSe  
Aeronautic.  
Aeroseal.  
AffiliAirt.11  
Affil.Hsp.20  
AffilPub.23e  
AffilTrx.10  
AIC Photo.51  
Alkenair.  
AlkemistFrt.  
Altronic.  
Airwick.20  
AlanWest.  
AlaskaAirt.  
Alaris.12e  
AltaCorp.12e  
AlleghyAirt.12e  
Allegro.16  
AlionTr.38t  
AlliedArt.  
AllDTher.20  
Alinst.10  
Alitamic.  
AltecCorp.  
AlteCpns.  
AlteCpns.3  
AlteCpns.73200  
Almond.  
AlHessLwft.  
Alm.10  
ACenMgtWt.  
AlConfr.20b  
AlFirm.23e  
AmFlt.19  
A GarPd.24  
Am ImpPct.  
Am Int'l.  
Am MtnB.40  
Am Mt.109e  
Am Mtns.31  
AmMotors.39  
A Peint.50  
AmRlt.70r  
AmRlt.70r  
AmRecreat.137  
AmSafe.58t  
Am Tech.2  
AmTranSys.  
AMCCo.04  
AmTec.117  
Angle C.12e  
AnthonyInd.  
Aquilt Ca.30  
Argent.116  
Ariz Cl.10e  
ArmacEnf.  
Arman.11  
ArrowElect.  
Arundel.09i  
ArwestCo.  
Asamend.87  
AshOilICan.  
AskinSv.08t  
Asper.21  
AssdFstr.  
AstrexInc.  
AtlasAirt.2e  
AltoInd.  
AltoMgtWt.  
Alt Int'l.52  
Atlas Corp.  
Augatinc.13  
Auer.10  
AutoDep.  
AutmtrRad.  
AuthmSvc.20  
AuthmSvc.72  
AVCorp.  
Avondl.10e  
AVXCorp.  
Bad G.50a  
BanFd.11e  
Bank.10  
BanstrClt.  
Banner.02  
BarneyEnd.  
BarnesEng.  
BarnwellInd.  
BarryCo.40  
Barth Sp.27  
BartonsCoy.  
Barwest.25  
BasinpetCp.  
Bayrku.90e  
Bell.10  
BenzMgt.  
BennCrp.  
Berg.12e  
BergInt.2e  
BergRlwft.  
BergBrwn.  
BergSp.15  
BermZomf.  
BervenC.10  
Bever.11  
Bic Pen.28  
Big Ber.12  
Big Br.12  
Bink Mkt.09r  
BlnhySm.60  
BioDynam.  
Bissell.10  
Blount.08  
BluebirdInc.  
Budin.11  
BulfBerank.  
BowmarInr.  
Bowlall.10  
BradRagan.  
BradcomSy.  
Bram.13  
Brasca A1.  
BraunEn.52  
BremertonP.  
Brewer.09  
BrownCwt.  
BrownG.10  
BrownB.52  
BrownB.52  
BrownF.40  
BTUEm.24  
Bullseye.24  
Bundy108a  
Burgen.10  
BurnsInt.40  
ButlerAvtal.  
Butles Gmt.  
CablecomGn.  
Carles.1  
Calder.15b  
Calcemp.  
Cal Prcm.15  
CambridgeP.  
CampInc.  
CampClub.37  
CampExpo.60  
CastInt.11-16  
CentHealth.2  
CentnP.08  
CdmMarc.15  
CdmMerrill.  
CdmNatl.  
CdmSuprOil.  
Converlnt.  
Converg.10  
CapitolPd.12  
Caresca.32  
Carroll.08  
CarPpl.98t  
CarPpl.98t z10  
CarryInt.11  
CarrollDell.  
CastInt.20a  
CastInt.59b  
CastInt.60  
CastInt.61  
CastInt.62  
CavifronC.  
CelluCraft.  
CenPpl.502140  
CenPpl.502140  
CenPpl.502140  
CenSec.26b  
CentInt.17  
CentInt.18  
CertificP.37  
CervonCp.  
Chalmers.10  
Chalmers.10  
ChartMed.  
ChartMed.  
CHCCorp.  
ChiRwl.09g  
Childword.  
Chim.10  
Chim.11  
Chim.12  
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YOU MAY WANT TO CHANGE THESE NAMES TO BE MORE CONTEMPORARY.

STOCK  
INT. BALLISTIC MISSILES  
RED CROSS OF AMERICA  
LICHENSTEIN, RUMRAP & JOKE  
AMERICAN BANKRUPT CO.  
CENSORED BOOKS STORE

INITIALS  
IBM  
RCA  
LBJ  
ABC  
CBS

PRICE/SHARE  
116.75  
89.25  
155.5  
145.75  
106.25

WHAT IS YOUR TRANSACTION IN  
IBM?10

RCA?20

LBJ?20

ABC?20

CBS?20

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\*\*\*\*\* END OF DAY'S TRADING

STOCK IRM	PRICE/SHARE 109.5	HOLDINGS 0	VALUE 0	NET CHANGE 2.5
RCA	95.75	20	1915	12.75
LBJ	153	10	1530	2.75
ABC	141.25	30	4237.5	2.5
CBS	102.5	20	2050	.75

NEW YORK STOCK EXCHANGE AVERAGE: 120.4

NET CHANGE: 4.25

TOTAL STOCK ASSETS ARE \$ 9732.5  
 TOTAL CASH ASSETS ARE \$ 88.17  
 TOTAL ASSETS ARE \$ 9820.67

DO YOU WISH TO CONTINUE (YES-TYPE 1, NO-TYPE 0)?  
 WHAT IS YOUR TRANSACTION IN  
 IBM?0  
 RCA?20  
 LBJ?0  
 ABC?30  
 CBS?-20

YOU HAVE USED \$ 4096.36

MORE THAN YOU HAVE.  **YOU CAN EVEN  
GO INTO DEBT!**

\*\*\*\*\* END OF DAY'S TRADING

STOCK IBM	PRICE/SHARE 110	HOLDINGS 0	VALUE 0	NET CHANGE .5
RCA	96	40	3840	.25
LBJ	153.5	10	1535	.5
ABC	142	60	8520	.75
CBS	102	0	0	-.5

NEW YORK STOCK EXCHANGE AVERAGE: 120.7

NET CHANGE: .3

TOTAL STOCK ASSETS ARE \$ 13895  
 TOTAL CASH ASSETS ARE \$ -4096.36  
 TOTAL ASSETS ARE \$ 9798.64

DO YOU WISH TO CONTINUE (YES-TYPE 1, NO-TYPE 0)?  
 HOPE YOU HAD FUN!!

**FOR CLASSROOM USE,  
LET YOUR STUDENTS  
WORK IN TEAMS OF  
TWO OR THREE!**

We have used this program with computer students as an example of a program which can be improved (no offense to the original designers) to make it more realistic. Some of the improvements we've seen implemented include –

A stock average that is weighted to include some stocks and exclude others.

Participation by two or more players or teams.

Buy and sell pressure affects price changes. Large buy pressure on one stock may make it jump higher while the same pressure on another stock will have little or no affect. Same with selling.

Random events that affect some stocks and not others similar to the events found in MARKET.

Automatic loan provisions at present interest rates.

Here's a brief RUN of an improved version. Have your students write one.

Stock Div. (Hds)	Sales High	Low	Clos	Chng
UrishBldg	2	1,446	1,424	14%
USS Corp	132	17/8	17/8	7/8
United d. 96	9	10/8	10/8	+1/8
USAirline	32	20	19/8	-1/8
Upfront 16	16	14/8	14/8	-1/8
Upfront 22	237	46/8	45/8	-1/8
Upfront 23	45	28/8	27/8	-1/8
Upfront 24	57	24/8	23/8	-1/8
UV Impf 50	1	28	28	+1/8
UV Impf 26	1	28	28	+1/8

—V—

Varien 20

Vestco 29

VendorCo 40

Venice 20

Vessel 123

Vestcom 16

Vestcom 16

VP Corp. 76

Viacom 11

Virofex 18

Vitapowt 18

Walgreen 14

Wallbus 49

Wal-Mart 11

Wal-Mart 05

WangLabs 22

WardFood 15

Warren 20

Warren 20

Warren 20

WashGrn 34

WashNat 70

WashNat 70</

THE WALL STREET JOURNAL

REC.GAME.SOC. RECIEVES CONTRACT TO SUPPLY  
I.B.M.'S NEW EXECUTIVE RECREATIONAL AREA WITH  
RECREATIONAL FACILITIES.CONTRACT WORTH 2.4 MILLION

\*\*\*\*\* THE RANDY-SMITH INDUSTRIAL AVERAGE\*\*\*\*\*

THE AVERAGE SHARE OF STOCK GAINED \$ 2  
THE AVERAGE PRICE/SHARE IS \$ 55.75  
UP FROM THE PREVIOUS PRICE OF \$ 53.75

STOCK	LAST	CURRENT	CHANGE
PIG	44	46	2
ACE	58.5	66.5	8
HP	50.5	52.5	2
NBC	70.5	72.5	2
RGS	51	49.25	-1.75

YOUR HOLDINGS ARE:

STOCK	SHARES	COST	VALUE
PLAYER 1			
ACE	25	1462.5	1662.5
HP	250	12625	13125

YOUR TOTAL DEBT IS \$ 4087.5

DO YOU KNOW WHAT YOU'RE DOING?????

YOUR DEBT IS \$ 4087.5 BELOW THE LEGAL LIMIT!!!!  
SINCE YOU CANNOT COVER YOUR PURCHASES, YOU WILL RECEIVE  
A LOAN OF \$5000. YOU HAVE 10 TURNS TO PAY THIS OFF

YOUR TOTAL CASH IS \$ 912.5

912.5 HAS BEEN SUBTRACTED FROM YOUR CASH.

YOU STILL OWE \$ 4087.5

AT INTEREST RATE 10 %

YOUR TOTAL ASSETS ARE NOW \$ 14787.5

PLAYER 2

ACE	250	14625	16625
YOUR TOTAL DEBT IS \$ 4625			

DO YOU KNOW WHAT YOU'RE DOING?????

YOUR DEBT IS \$ 4625 BELOW THE LEGAL LIMIT!!!!  
SINCE YOU CANNOT COVER YOUR PURCHASES, YOU WILL RECEIVE  
A LOAN OF \$5000. YOU HAVE 10 TURNS TO PAY THIS OFF

YOUR TOTAL CASH IS \$ 375

# POLICY

## a simulation of the

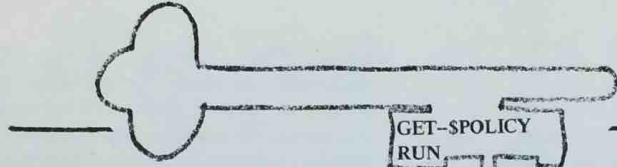
How would you and your students like to take a crack at managing the American Economy? Think you could do a better job than the administration in Washington at combatting inflation?; lowering unemployment?; stabilizing the Consumer Price Index?; or decreasing the National Crime rate? POLICY gives the chance to try your hand at economic management. At the same time it will teach your students some fundamental economics, let them evaluate economic policies and involve them in an exciting role-playing activity. POLICY also concerns itself with socio-economic problems such as the high school drop-out rate, air pollution, and poverty. It is a good socio-economic model of the United States, apparently designed and programmed with plenty of thought and skill.

We will not attempt to tell you everything about this simulation. You really need the supplemental materials mentioned in the introduction to this chapter. These pages will give you a good idea of what POLICY is all about.



## U.S. economy

### how to play



Take a group, a class and divide them into six groups. We found in a class of 30 it was best to run two complete simulations at once! Each group can contain 2-3, though it can be done with groups of 5 or 6 as well. How the group divides is up to you. We mixed our groups as much as possible. Assign each group one of these roles: BUSINESS, LABOR, CIVIL RIGHTS, THE MILITARY, INTERNATIONALIST, NATIONALISTS. We randomly assigned roles so that students would be encouraged to play a role they were not familiar with. The first assignment should be for each group to describe itself, the feelings of the group (role) and a general class discussion about how each group should "behave." The general topic of interest groups and pressure groups and their role in our government is a good topic to conclude this part of the activity.

Depending on the economic literacy of your groups, you will find it necessary to discuss the 18 Socio-economic indicators used in the model, these indicators are:

Gross National Product  
U.S. Federal Budget  
U.S. Military Budget  
U.S. Birthrate  
Foreign Aid  
Business Profits before taxes  
Business expenditure for new plant and equipment  
Annual Productivity Increase  
Average Weekly Earnings (Industrial Workers)  
Unemployment Rate (White)  
High School Dropout Rate  
Unemployment Rate (Black)  
Persons below the poverty level (Black) (%)  
Consumer Price Index  
Annual Emissions of five major air pollutants  
National Crime Rate (offenses per 100,000 pop.)  
National Infant Mortality Rate (deaths per 1000/births)  
U.S. Military Strength compared to the U.S.S.R.

(Complete explanation of each comes in the student workbook.)

The Beauty of this simulation is that the computer is in the background. The excitement is in what happens as the students interact in their roles.

Your discussion might include how each role group will be concerned about each of the indicators.

Once the groups are familiar with the 18 Socio-economic indicators, they need to be introduced to the 14 socioeconomic policies they will be asked to "vote on." These 14 policies are the real guts of this simulation. We can't list them all but as you read these few, think how each group will respond to them. Here are 5 of the 14 policies.

\*\*\* The maximum corporate income tax rate should be reduced from 48% to 40%. This tax reduction would result in a dramatic increase in corporate profits. In addition to benefiting the stockholders, this would increase business investment in plant and equipment, promote productivity and generally expand the economy.

\*\*\* The federal government should provide clinics throughout the United States to give free birth control information. This proposal is made with the expectation that over the short run it would lower the infant mortality rate and the birth rate and, over the long run, lessen poverty and pollution.

\*\*\* The United States should increase its spending on space programs by \$2 billion. While designed to speed up our exploration of space, this proposal would be especially beneficial to the Aerospace industry and would receive the wholehearted support of the military. Unless accompanied by a decrease in some other area of the federal budget, it would tend to increase employment opportunities and stimulate the economy.

Policy allows you to punch a DATA tape so you can restart the simulation the next day from where you left off.

\*\*\* The federal government should increase the appropriations for the FBI by 50%. In an effort to combat the growing crime rate, many have advocated an expansion of the Federal Bureau of Investigation.

\*\*\* The federal government should spend \$11 billion to eliminate extreme poverty through direct subsidies to the poor. This would provide a most direct and immediate attack on poverty. It should significantly improve living conditions for the poor in a number of different ways. It should also stimulate the economy and, perhaps be somewhat inflationary.

The first computer RUN starts you off with the beginning figures for each socioeconomic indicator (shown below).

### HAND-MADE FORM

Computer Printout

### INITIAL AMOUNTS:

#### SOCIOECONOMIC INDICATORS

- 101 Gross National Product
- 102 U.S. Federal Budget
- 103 U.S. Military Budget
- 104 U.S. Birthrate
- 105 Foreign Aid
- 106 Business Profits before taxes
- 107 Business expenditure for new plant and equipment
- 108 Annual Productivity Increase
- 109 Average Weekly Earnings (Industrial Workers)
- 110 Unemployment Rate (White)
- 111 High School Dropout Rate
- 112 Unemployment Rate (Black)
- 113 Persons below the poverty level (Black) (%)
- 114 Consumer Price Index
- 115 Annual Emissions of five major air pollutants
- 116 National Crime Rate (offenses per 100,000 pop.)
- 117 National Infant Mortality Rate (deaths per 1000 live births)
- 118 U.S. Military Strength compared to the U.S.S.R.

INDICATOR	CURRENTLY
101	976.5
102	197
103	80
104	18.2
105	3
106	82
107	54
108	3
109	140
110	4.5
111	25
112	8.2
113	30
114	116.3
115	142
116	5568
117	20
118	0

These are the beginning amounts.

Now you know the ground rules and your students have sufficient background to play. Each team is given 100 points (*you can vary this*) and is told to vote points on those policies it wants passed. It takes more than 100 points (*you can vary this*) to pass a policy which makes it essential for different groups to interact . . . "you put 20 points on number 4 and we'll put 30 points on number 6." The team interplay is exciting to witness. *You will find it necessary to remind your groups to stay in their "role."*

Each team submits their "votes" to the instructor or computer operator. The data is entered and the computer tells you which policies passed and prints new figures for each of the 18 indicators (assume a time period of one year). Each team should review what happened to the policies it was concerned with and evaluate the status of indicators that they wanted to see changed. Then each team gets 100 more points and the process is repeated as many times as you would like.

POLICY NO. 8 PASSED!

PASSED : 8

END OF PERIOD 1

#### SOCIOECONOMIC INDICATORS

- 101 Gross National Product
- 102 U.S. Federal Budget
- 103 U.S. Military Budget
- 104 U.S. Birthrate
- 105 Foreign Aid
- 106 Business Profits before taxes
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INDICATOR	CURRENTLY	INCREASE	PCT. INC.
101	1000.5	24	2.45
102	208	11	5.58
103	79.2	-.81	-1.02
104	18.5	.29	1.59
105	2.7	-.31	-10.34
106	85	3	3.65
107	54	0	0
108	3.03	.03	1
109	140	0	0
110	4.5	0	0
111	24.95	-.05	-.2
112	8.2	0	0
113	29.9	-.1	-.34
114	120.95	4.65	3.99
115	156.19	14.19	9.99
116	5068	-500	-8.98
117	18	-2	-10
118	0	0	-10

New Figures

Some changes are built into the model regardless of which policies pass.

SOME SUGGESTIONS BASED ON MY OWN EXPERIENCE  
PLUS CONTRIBUTIONS FROM OTHERS —

1. EACH PLAYER SHOULD BE GIVEN A COPY OF THE POLICIES TO STUDY.
2. MAKE UP A FORM LIKE THE ONE SHOWN, SO THE COMPUTER OUTPUT MAKES SENSE TO THE PLAYERS. DISTRIBUTE IT TO EACH TEAM AFTER EACH ROUND OF PLAY.
3. WE FOUND 100 POINTS TO BE TOO MUCH. CHANGE THE PROGRAM (INSTRUCTIONS IN THE TEACHERS' GUIDE) TO 30, 80 OR 90 POINTS.



4. SMALL GROUPS ARE MORE FUN TO WORK WITH.
5. DON'T MENTION CHEATING... BUT WATCH IT HAPPEN.
6. THE ENTIRE SIMULATION CAN BE DONE IN 5 OR 6 CLASS PERIODS.
7. ONE YEAR MY STUDENTS WERE BORED AFTER 3 ROUNDS OF PLAY. WE CHANGED ROLES TO THIS NEW LIST — COLLEGE RADICALS, WOMEN'S LIBERATION, SOUTHERN DEMOCRATS, REAGAN REPUBLICANS, VETERANS OF FOREIGN WARS, EDUCATION/SCIENTIST. CHOOSE YOUR OWN ROLES, IT WAS FUN!

# POLUT

POLUT is a water pollution simulation that can be used in Science, Environmental Studies or Social Studies classes. It is sufficiently self-explanatory to be used with a minimum of background information. To optimize learning, you should have students read the Resource Handbook, which can act as a textbook on the subject of water pollution. We regularly use this program to show "tourists" to our center how a computer simulation can be used in a classroom (everyone is interested in water pollution, aren't they?).



## WATER POLLUTION STUDY

INSTRUCTIONS (1=YES, 0=NO)?

IN THIS STUDY YOU CAN SPECIFY THE FOLLOWING CHARACTERISTICS:

- FOLLOWING CHARACTERISTICS: AN  
PR

  - A. THE KIND OF BODY OF WATER:
    - 1. LARGE POND
    - 2. LARGE LAKE
    - 3. SLOW-MOVING RIVER
    - 4. FAST-MOVING RIVER
  - B. THE WATER TEMPERATURE IN DEGREES FAHRENHEIT:
  - C. THE KIND OF WASTE DUMPED INTO THE WATER:
    - 1. INDUSTRIAL
    - 2. SEWAGE
  - D. THE RATE OF DUMPING OF WASTE, IN PARTS PER MILLION (PPM)/DAY.
  - E. THE TYPE OF TREATMENT OF THE WASTE:
    - 0. NONE
    - 1. PRIMARY (SEDIMENTATION OR PASSAGE THROUGH FINE SCREENS TO REMOVE GROSS SOLIDS)
    - 2. SECONDARY (SAND FILTERS OR THE ACTIVATED SLUDGE METHOD TO REMOVE DISSOLVED AND COLLOIDAL ORGANIC MATTER)

 SING THE RESOURCE  
HANDBOOK AND STUDENT  
GUIDE YOU CAN ASSIGN  
POLYU TO A STUDENT AS  
AN INDEPENDENT STUDY  
PROJECT.

### BODY OF WATER? 3

WATER TEMPERATURE 33°

YOUR BODY OF WATER IS A BLOCK OF ICE, AND CAN'T  
ACCEPT ANY WASTE. TRY A NEW TEMPERATURE.

WATER TEMPERATURE 23.5

#### **KIND OF WASTE?**

DUMPING RATE? 18

NEW YORK CITY ONLY POLLUTES ITS WATER AT THE RATE OF  
12 PPM/DAY. MAKE YOUR RATE BETWEEN 0 AND 14.

DUMPING RATE? 8

**TYPE OF TREATMENT**

**E**RROR MESSAGES...  
TO THWART THE CLOWN  
IN THE GROUP (OR TO  
CATCH UNWITTING GOOPS.)



\*\*\*\*\*

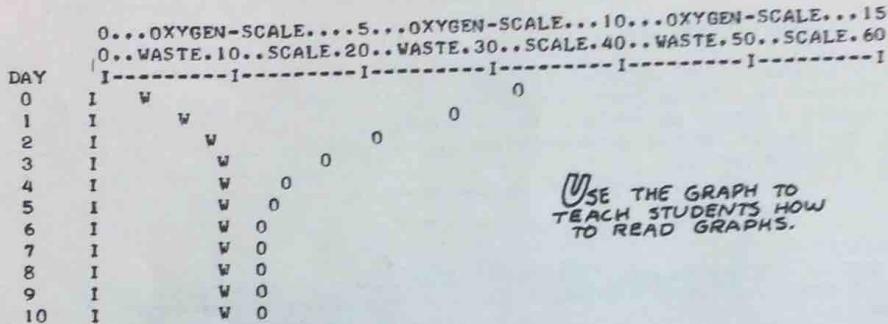
BODY OF WATER?2  
WATER TEMPERATURE?60  
KIND OF WASTE?2  
DUMPING RATE?10  
TYPE OF TREATMENT?1

CREATE A BAD  
ENVIRONMENT  
AND TRY TO  
CLEAN IT UP!

DO YOU WANT: A GRAPH(1), A TABLE(2), OR BOTH(3)?1

AFTER DAY 2 THE FISH BEGIN TO DIE, BECAUSE  
THE OXYGEN CONTENT OF THE WATER DROPPED BELOW 5 PPM.

FISH NEED OXYGEN  
TO LIVE.



USE THE GRAPH TO  
TEACH STUDENTS HOW  
TO READ GRAPHS.

THE WASTE CONTENT AND OXYGEN CONTENT WILL REMAIN AT  
THESE LEVELS UNTIL ONE OF THE VARIABLES CHANGES.

ANOTHER RUN (1=YES, 0=NO)?1

\*\*\*\*\*

BODY OF WATER?2  
WATER TEMPERATURE?60  
KIND OF WASTE?2  
DUMPING RATE?10  
TYPE OF TREATMENT?2

SAME SITUATION AS BEFORE  
WITH SECONDARY INSTEAD  
OF PRIMARY TREATMENT.  
DOES IT HELP ??

DO YOU WANT: A GRAPH(1), A TABLE(2), OR BOTH(3)?2

TIME DAYS	OXY. CONTENT PPM	WASTE CONTENT PPM
0	7.89	2.67
1	7.68	3.39
2	7.37	3.72
3	7.15	3.87
4	7.02	3.94
5	6.95	3.97
6	6.92	3.99
7	6.9	3.99
8	6.9	4
9	6.89	4
10	6.89	4
11	6.89	4
12	6.89	4
13	6.89	4
14	6.89	4
15	6.89	4
16	6.89	4
17	6.89	4
18	6.89	4
19	6.89	4
20	6.89	4
21	6.89	4
22	6.89	4
23	6.89	4
24	6.89	4
25	6.89	4
26	6.89	4
27	6.89	4
28	6.89	4
29	6.89	4
30	6.89	4

OUR STUDENTS FOUND  
THE TABLE DIFFICULT  
TO INTERPRET.  
HOW ABOUT YOU?



# *Other simulations from Huntington II*

## **ELECT 1,2**

Studies the campaign strategy in 14 past American Presidential elections.

## **ELECT 3**

A role playing game to be used in the classroom. ELECT 3 simulates a real life political campaign with students planning campaign strategies and simulating a real election.

## **POLSYS**

A role playing classroom simulation where students try to influence the decisions of a local governmental body (played by the computer). Does a good job of showing students how to effectively use the means at their disposal to affect the governmental processes in their community.

## **USPOP**

A population model of the United States that allows students to study the effects of fertility, mother's age, sex ratio of offspring and mortality on future population size and composition.

## **SAP**

A complete statistical analysis package for doing surveys. Shows how to set up a survey and then analyze it according to the user's needs.

HUNTINGTON MATERIALS ARE AVAILABLE FROM:

DIGITAL EQUIPMENT CORPORATION  
SOFTWARE DISTRIBUTION CENTER  
146 MAIN STREET  
MAYNARD, MA 01754

Intergalactic mercantilism and intergalactic war. *Star Trek* is a complex, interactive game — can't the *structure* be preserved in a way that doesn't encourage killing by the all-powerful good guys? We would appreciate some suggestions and alternative models. Write to us.

# SCIENCE FICTION GAMES

Trader  
Star Trek

# \*\*\*\*\* Star Trader \*\*\*\*\*

THE DATE IS JAN 1, 2070 AND INTERSTELLAR FLIGHT HAS EXISTED FOR 70 YEARS. THERE ARE SEVERAL STAR SYSTEMS THAT HAVE BEEN COLONIZED. SOME ARE ONLY FRONTIER SYSTEMS, OTHERS ARE OLDER AND MORE DEVELOPED.

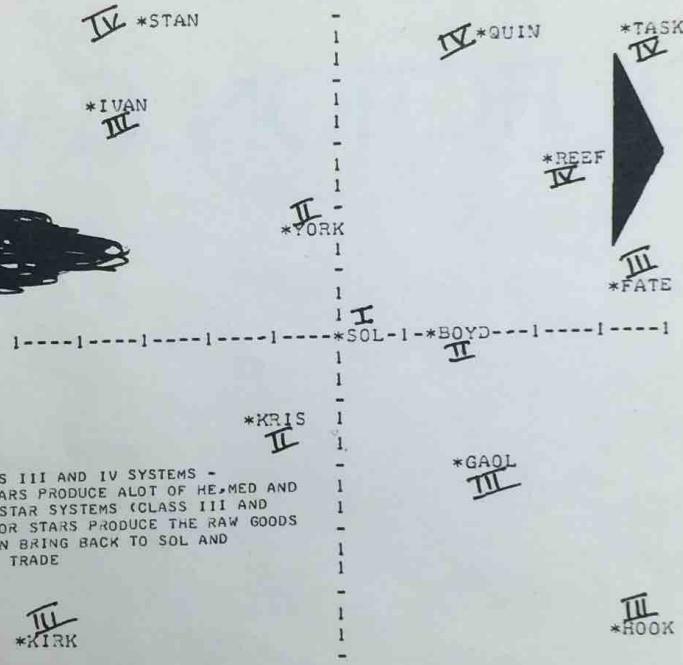
EACH OF YOU IS THE CAPTAIN OF TWO INTERSTELLAR TRADING SHIPS. YOU WILL TRAVEL FROM STAR SYSTEM TO STAR SYSTEM, BUYING AND SELLING MERCHANDISE. IF YOU DRIVE A GOOD BARGAIN YOU CAN MAKE LARGE PROFITS.

AS TIME GOES ON, EACH STAR SYSTEM WILL SLOWLY GROW, AND ITS NEEDS WILL CHANGE. A STAR SYSTEM THAT NOW IS SELLING MUCH URANIUM AND RAW METALS CHEAPLY MAY NOT HAVE ENOUGH FOR EXPORT IN A FEW YEARS.

YOUR SHIPS CAN TRAVEL ABOUT TWO LIGHTYEARS IN A WEEK AND CAN CARRY UP TO 30 TONS OF CARGO. ONLY CLASS I AND CLASS II STAR SYSTEMS HAVE BANKS ON THEM. THEY PAY 5% INTEREST AND ANY MONEY YOU DEPOSIT ON ONE PLANET IS AVAILABLE ON ANOTHER - PROVIDED THERE'S A LOCAL BANK.

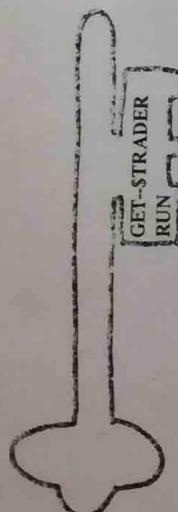


STAR MAP  
\*\*\*\*\*



ALL SHIPS START AT SOL  
ADVICE: VISIT THE CLASS III AND IV SYSTEMS -  
SOL AND THE CLASS II STARS PRODUCE A LOT OF HE-MED AND  
SOFT, WHICH THE POORER STAR SYSTEMS (CLASS III AND  
IV) NEED. ALSO, THE POOR STARS PRODUCE THE RAW GOODS  
UR, MET, GEMS THAT YOU CAN BRING BACK TO SOL AND  
THE CLASS II SYSTEMS IN TRADE

THE MAP IS 100 LIGHT-YEARS BY 100 LIGHT-YEARS,  
SO THE CROSS-LINES MARK 10 LIGHT-YEAR DISTANCES



IT IS THE FUTURE: Interstellar space ships link the small community of newly discovered worlds. YOU captain two merchant ships with the future of the young, emergent worlds depending upon you and your fellow skippers.

You land and you liftoff, you buy local merchandise and sell what you have on board. You trade with the merchants and haggle over prices. Bid too high? Try a little lower. Bid too low? Try again next time!

You buy your raw materials (like Uranium or Metals) on the less developed, newer star systems. With a full ship, you lift off and return to Class I or Class II star systems. There you sell out and load up on goods such as Heavy Equipment, or Medicine. Then out to the periphery for another haul.

But that's not all! As the years progress, the star systems will slowly develop, and those on the brisker trading routes will grow faster.

Here is the start.  
Follow black arrows

This material was from a 4-person game -- the map  
on the cross page was from this game.

LUMMOX lands on QUIN.  
What happens next? The  
captain moves to the chair at  
the terminal and bargains with  
the local merchants --

\* JUL 13 , 2070  
\* LUMMOX HAS LANDED ON QUIN  
2 WEEKS LATE - 'WE GOT LOST. SORRY'

\$ ON BOARD UR MET HE MED SOFT GEMS NET WT  
5 000 0 0 15 10 10 0 25

WE ARE BUYING:  
HE WE NEED 8 UNITS. HOW MANY ARE YOU SELLING? 8  
WE OFFER 36000. WHAT DO YOU BID? 36000  
WE'LL BUY!  
MED WE NEED 5 UNITS. HOW MANY ARE YOU SELLING? 5  
WE OFFER 25700. WHAT DO YOU BID? 25700  
WE OFFER 25900. WHAT DO YOU BID? 25900  
WE'LL BUY!  
SOFT WE NEED 10 UNITS. HOW MANY ARE YOU SELLING? 10  
WE OFFER 34200. WHAT DO YOU BID? 37500  
WE'LL BUY!

They go up \$200!  
WE ARE SELLING:  
UR UP TO 9 UNITS. HOW MANY ARE YOU BUYING? 10  
WE ONLY HAVE 9 UNITS  
HOW MANY ARE YOU BUYING? 9  
WE WANT ABOUT 36600. YOUR OFFER? 35000  
SOLD!  
MET UP TO 7 UNITS. HOW MANY ARE YOU BUYING? 7  
WE WANT ABOUT 22000. YOUR OFFER? 15000  
WE WANT ABOUT 19300. YOUR OFFER? 17500  
OUR FINAL OFFER: 19320 YOUR OFFER? 18500  
SOLD!  
GEMS UP TO 4 UNITS. HOW MANY ARE YOU BUYING? 4  
WE WANT ABOUT 9700. YOUR OFFER? 9000  
SOLD!  
WHAT IS YOUR NEXT PORT OF CALL? SOL  
THE ETA AT SOL IS JAN 11 , 2071

STUDY THE MAP AND CURRENT PRICE CHARTS CAREFULLY -  
CLASS I AND II STARS MAKE EXCELLENT TRADING PARTNERS  
WITH CLASS III OR IV STARS.

PLAYER 1 , WHICH STAR WILL LUMMOX TRAVEL TO? QUIN  
THE ETA AT QUIN IS JUN 29 , 2070

PLAYER 2 , WHICH STAR WILL JOHN TRAVEL TO? KIRK  
THE ETA AT KIRK IS SEP 3 , 2070

PLAYER 3 , WHICH STAR WILL INDRA TRAVEL TO? HOOK  
THE ETA AT HOOK IS AUG 16 , 2070

PLAYER 4 , WHICH STAR WILL X15 TRAVEL TO? IVAN  
THE ETA AT IVAN IS JUN 29 , 2070

PLAYER 1 , WHICH STAR WILL LITTLETRAVEL TO? IVAN  
THE ETA AT IVAN IS JUN 29 , 2070

PLAYER 2 , WHICH STAR WILL HARDY TRAVEL TO? FATE  
THE ETA AT FATE IS MAY 29 , 2070

PLAYER 3 , WHICH STAR WILL SHIVA TRAVEL TO? GAOL  
THE ETA AT GAOL IS APR 10 , 2070

PLAYER 4 , WHICH STAR WILL APOLLO TRAVEL TO? STAN  
THE ETA AT STAN IS JUL 14 , 2070

Several months later, LUMMOX  
returns to SOL

\* FEB 2 , 2071  
\* LUMMOX HAS LANDED ON SOL  
3 WEEKS LATE - PIRATES ATTACKED MIDVOYAGE

\$ ON BOARD UR MET HE MED SOFT GEMS NET WT  
46 000 9 7 7 5 0 4 28

WE ARE BUYING:  
UR WE NEED 24 UNITS. HOW MANY ARE YOU SELLING? 9  
WE OFFER 54300. WHAT DO YOU BID? 62000  
WE'LL BUY!  
MET WE NEED 18 UNITS. HOW MANY ARE YOU SELLING? 18  
WE OFFER 29600. WHAT DO YOU BID? 35000  
WE OFFER 30000. WHAT DO YOU BID? 33500  
OUR FINAL OFFER: 30000 WHAT DO YOU BID? 32500  
WE'LL BUY!  
GEMS WE NEED 12 UNITS. HOW MANY ARE YOU SELLING? 12  
WE OFFER 14400. WHAT DO YOU BID? 16500  
WE OFFER 14900. WHAT DO YOU BID? 16750  
OUR FINAL OFFER: 14900 WHAT DO YOU BID? 16000  
WE'LL BUY!

WE ARE SELLING:  
HE UP TO 18 UNITS. HOW MANY ARE YOU BUYING? 18  
WE WANT ABOUT 23800. YOUR OFFER? 26000  
WE WANT ABOUT 23400. YOUR OFFER? 21000  
OUR FINAL OFFER: 23300. YOUR OFFER? 21500  
SOLD!  
MED UP TO 12 UNITS. HOW MANY ARE YOU BUYING? 12  
WE WANT ABOUT 33000. YOUR OFFER? 25000  
WE WANT ABOUT 31900. YOUR OFFER? 27500  
OUR FINAL OFFER: 31600. YOUR OFFER? 29000  
SOLD!  
SOFT UP TO 24 UNITS. HOW MANY ARE YOU BUYING? 15  
WE WANT ABOUT 33000. YOUR OFFER? 25000  
WE WANT ABOUT 31900. YOUR OFFER? 28500  
OUR FINAL OFFER: 31800. YOUR OFFER? 29200  
SOLD!

DO YOU WISH TO VISIT THE LOCAL BANK? YES  
YOU HAVE 0 DOLLARS IN THE BANK  
HOW MUCH DO YOU WISH TO DEPOSIT? 99999999  
YOU HAVE \$ 75000. ON YOUR SHIP  
HOW MUCH DO YOU WISH TO DEPOSIT? 65000

WHAT IS YOUR NEXT PORT OF CALL? QUIN  
CREWMEN DEMAND A VACATION - 2 WEEK DELAY.  
THE ETA AT QUIN IS AUG 14 , 2071

And LUMMOX goes back to QUIN.  
Five months have gone by -- here's  
what the local merchants want to  
trade

\* AUG 21 , 2071  
\* LUMMOX HAS LANDED ON QUIN  
1 WEEK LATE - 'OUR COMPUTER MADE A MISTAKE.'

\$ ON BOARD UR NET HE MED SOFT GEMS NET WT  
10 000 0 0 15 15 0 30

WE ARE BUYING:  
HE WE NEED 10 UNITS. HOW MANY ARE YOU SELLING? 10  
WE OFFER 47700. WHAT DO YOU BID? 60000  
WE OFFER 49000. WHAT DO YOU BID? 55000  
OUR FINAL OFFER: 49100. WHAT DO YOU BID? 52500  
WE'LL BUY!  
MED WE NEED 9 UNITS. HOW MANY ARE YOU SELLING? 10  
WE OFFER 54000. WHAT DO YOU BID? 60000  
WE'LL BUY!  
SOFT WE NEED 12 UNITS. HOW MANY ARE YOU SELLING? 15  
WE OFFER 54000. WHAT DO YOU BID? 65000  
WE OFFER 54900. WHAT DO YOU BID? 62500  
OUR FINAL OFFER: 55200. WHAT DO YOU BID? 68000  
WE'LL BUY!

WE ARE SELLING:  
UR UP TO 11 UNITS. HOW MANY ARE YOU BUYING? 11  
WE WANT ABOUT 39900. YOUR OFFER? 38000  
WE WANT ABOUT 38500. YOUR OFFER? 35000  
OUR FINAL OFFER: 38500. YOUR OFFER? 36000  
SOLD!

NET UP TO 9 UNITS. HOW MANY ARE YOU BUYING? 9  
WE WANT ABOUT 22800. YOUR OFFER? 22500  
WE WANT ABOUT 22700. YOUR OFFER? 21000  
SOLD!  
GEMS UP TO 8 UNITS. HOW MANY ARE YOU BUYING? 8  
WE WANT ABOUT 17600. YOUR OFFER? 16000  
SOLD!  
WHAT IS YOUR NEXT PORT OF CALL? TASK  
THE ETA AT TASK IS NOV 8 , 2071

It's been over a year since QUIN's  
been visited... the other star ships  
have been busy elsewhere.

Now for a short hop over to TASK  
and then, maybe, back to SOL



# Two Pages of Ideas for Star Trader

## SO YOU'RE NEW?

Just try to get the feel of the game. Find a friend and play for an hour or two. Spend a few days thinking about the game. Now get a few friends and play another short game for an hour or two.

Do you like the game? GREAT! Now read the box called ARE YOU GETTING INTO IT?

## STARDUST SPINOFFS

\* What does it feel like to fly a spaceship?

\* How many crew members do you need? Are they men or women or mixed? What size is the ship?

\* Sketch or paint a model of the ship.

\* Is your food and water stored on board? Do you recycle it? Are there hydroponic gardens in your ship?

\* What do you use for fuel? How often do you need to refuel?

\* Do you own the ship or do all the crewmembers have joint ownership?

\* Why are there pirate ships? Can you become one? Where would you refuel?

\* Does your ship land on a planet or do space tugs ferry the merchandise up and down? How much does it cost? Are there space long-shoremen strikes?

\* What about taxes?

\* Do you have stowaways? What does spacelaw tell you to do with them if they are discovered between stars?

## SO YOU'RE FINALLY AN OLDTIMER . . .

You've played a dozen games with many variations. You're probably playing a long-range game (50 years? 100 years?) with friends once or twice a week. Congratulations!

A few suggestions, some of which you've probably thought of -

\* Play a *tight* game. 2 ships per player, 1 star system per ship, 25 light year minimum interstellar distance, and push the profit margin to 5. Drop max tonnage to 25 (or even 20), allow only 2 bids per round, and Good Luck - hope you make some money!

\* Play an *easy* game. 2 players, 1 ship each, 13 stars, 15 lightyear interstellar distance, and drop the profit margin number to 1. Max tonnage make 60, allow 9 bids per round, you should make millions.

\* Study the program.

\* Change the macro-economic model (explanation of how to on next page).

## ARE YOU GETTING INTO IT?

I'll make two suggestions:

\* Get two or three friends who've also gotten their feet wet. If necessary, talk them into it. Start a 50 year game. If you and your friends play once a week in two hour chunks, (Friday? During the week after school?) the game will easily last a whole school year.

Don't forget - each time you stop, type SAVE as your next port of call and keep the paper tape.

\* Set up your own game and try different situations. You can

- † Play with up to 12 players
- † Choose ships per player so total number of ships is less than or equal to 12.
- † Ask for 4 to 13 star systems to start.
- † Pick any length game (a million years?)
- † Change the cargo tonnage limits of a ship.
- † Fiddle with the minimum interstellar distance.
- † Fix the maximum number of bids per round ("OUR FINAL BID . . .")
- † Set the profit margin.

## START A CLUB

\* Find some friends and tell them about *your* strategies.

\* Talk about *their* strategies.

\* Design a new, *better* Star Traders game.

\* There are lots of good science fiction stories. How many are about interstellar merchants? What merchandise do they sell or trade?

## HERE ARE SOME IDEAS

### FOR A BETTER GAME

Here are some ideas for a better game -

\* Change the way the stars are set up.

\* Make more than one Class I star to start with so there will be competing trade centers.

\* Allow a player to go pirate for awhile. But if he's caught, he ----- (you fill in).

\* If a level III is growing too quickly, put an interstellar embargo on selling Uranium there. Otherwise, the locals would have a nuclear war.

\* Make up better merchandise.

\* How about ship-to-ship trading at certain open ports.

\* If ships could pick their interstellar speed, how would you design the game to make very high speeds costly? Maybe at high speeds, the chances go up that the ship will fall apart, or maybe each step in speed squares the fuel cost, or maybe . . .

Here is a discussion of three interesting parts of STAR TRADER. Be you curious about the ideas, or are plowing right into the program, puzzling it out, read on ...

### HOW THE STAR MAP IS MADE

Ever notice how the stars are distributed? At the beginning of each game, the Frontier Class (Class IV) stars are on the outskirts, the Developed Class (Class II) near the center, and the Underdeveloped Class (Class III) stars are scattered.

Here's how this is done (If you speak BASIC, look at lines 1900 through 2390 in the TRADER program).

SOL is our sun, and is the only Class I star on the starting map. It's always in the center.

All the other stars are generated randomly. Class IIs appear inside the box (50 lightyears on a side) while Class IVs (the Frontier systems) are generated outside the box. The Class IIIIs are sprinkled throughout.

To make the star map more even, as each star is placed, only half the map is considered. The first star appears somewhere in the top half,  $Y \geq 0$ . The next star is placed on the right halfboard (think of it as East of SOL) where  $X \geq 0$ . Then the bottom halfboard, then the left and around again until all stars are placed.

After placing SOL, the program next places two Frontier stars, then one Underdeveloped. After these initial 4, STAR TRADER places a Frontier, an Underdeveloped, a Developed. Then back to Frontier for another cycle until all stars are placed.

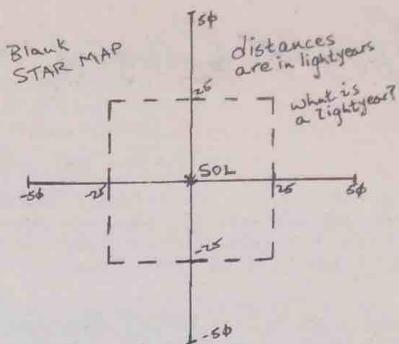
Want to generate your own Star Map? Easy — Start with a large, blank Star Map. Now mark down SOL.

Use another sheet of paper to cover all but the top halfmap. Make a random toss (use a thumbtack or a wadded ball of paper) on the halfmap showing: if it lands inside the box, toss again. Mark and name the new star.

Rotate the covering sheet to expose the second halfmap. Toss again for a Frontier star. Mark and name.

Rotate again for each star remaining. Toss each time until the star is legal (on the map, inside/outside the box if Developed/Frontier).

One more thing — the *minimum distance* between stars is usually 15 light-years. If a new star is closer to any other star, toss again.



### HOW LOCAL MERCHANTS BARGAIN

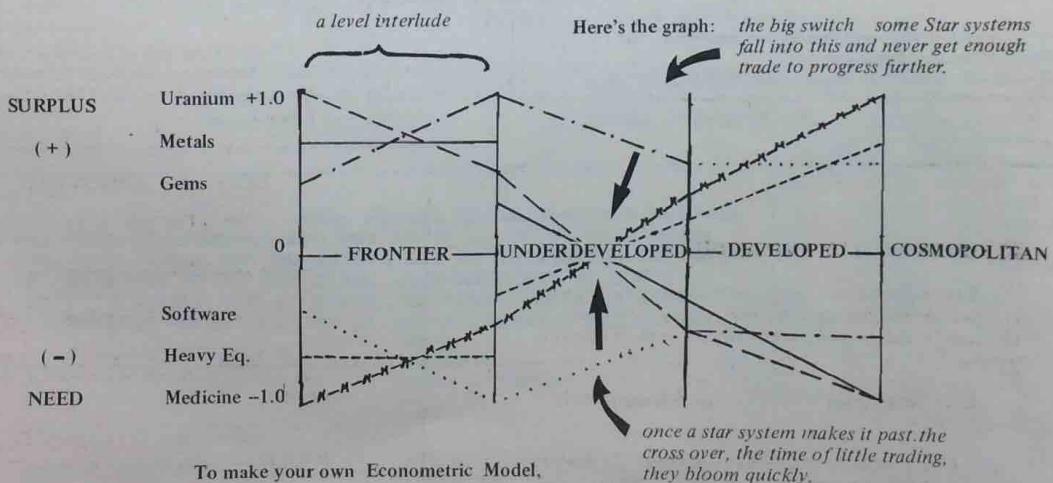
When your counter offer to their bid is too far away, the merchants will tell you, THAT'S TOO LOW or WE'LL PASS THIS ONE. But if you're within their Price Window, they will adjust and continue bargaining! Usually, they move a little towards your last offer. Beware — the Price Window gets narrower each round of bidding. If you stick to the same bid, they'll probably reject it.

The Price Window is widest when the number of units you're bargaining for satisfies the local merchants. If they want 6 units, you'll get your best prices by offering 6 (or more). Unless you want to save some for a later star stop, it's best to buy — or sell — what the merchants ask for.

### THE ECONOMETRIC MODEL

Each Star System (including SOL) is constantly changing its developmental level. And so the balance of products and needs shifts as well.

Young Star Systems have surpluses of Uranium, Raw Metals and Gems but need a lot of Heavy Equipment, Medicine and Computer Software. Cosmopolitan (and Developed) Star Systems are reversed — and this is why they make such good trading partners.



To make your own Econometric Model,

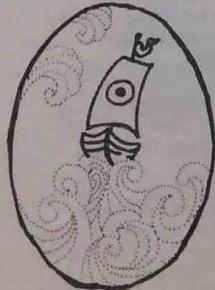
\* Plot your new graph for all six types of merchandise. Graph paper helps and so do colored pencils. Less confusion.

\* Each segment (there are 18 — 3 for each of 6 types; the graph past Cosmopolitan is a continuation of the lines during Developed) is the straight-line history of a type of merchandise during a *level interlude*, between Frontier and Underdeveloped, say, or between Developed and Cosmopolitan.

\* For each segment, find its slope and Y-intercept (in the  $Y = mx + b$  formula, m is the slope and b the Y-intercept).

\* Replace lines 100 and 110 in TRADE\* with your new numbers. Line 100 is the slope information. The first 3 numbers are the three slopes for Uranium. The next 3 for Metals and so on. Line 110 are the Y-intercept numbers and also come 3 at a time.

When you find some new Models that work well, let us know!



A Game Based on... STAR TREK®

AS CAPTAIN OF THE ENTERPRISE, YOUR MISSION IS TO FIND AND DESTROY ALL UNITS OF THE KLINGON INVASION FORCE WITHIN 30 STARDATES. IF YOU FAIL, THE FEDERATION WILL BE CONQUERED.

Your ship, the *ENTERPRISE*, is much more powerful than the Klingon battle cruisers. But beware! Space battle drains your ship of energy and it is not easy to find the Starbases. If the Klingons catch you with your shields down, you'll probably get crisped!

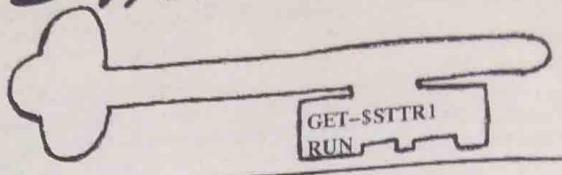
Think of Starbases as interstellar pit stops, where the ENTERPRISE refuels (energy goes back to 3000), damages are repaired, and your photon torpedoes are reloaded (back to 10).

Because the Klingon ships are scattered throughout the galaxy, you'll be navigating the *ENTERPRISE* all over the place.

The galaxy is divided into quadrants - there are 64 of them, and they make a checkerboard. Give COMMAND 7, then COMPUTER COMMAND 0 and you'll get a galactic map printed - up to date, of course - it shows those parts of the galaxy you've already explored.

Each quadrant is divided into 64 sectors. You guessed it - they're arranged 8-by-8. Each time you move, you get a short-range sensor scan printed - that's a map of the quadrant you're in. If you want to see what's in your neighboring quadrants, either go there, or get a long range sensor scan.

Oh yes - it takes 1 stardate to move to a new quadrant, and you must defeat the Klingons in 30 stardates or less.



HERE ARE YOUR CONTROL COMMANDS

COMMAND 0	= WARP ENGINE CONTROL
COMMAND 1	= SHORT RANGE SENSOR SCAN
COMMAND 2	= LONG RANGE SENSOR SCAN
COMMAND 3	= PHASER CONTROL
COMMAND 4	= PHOTON TORPEDO CONTROL
COMMAND 5	= SHIELD CONTROL
COMMAND 6	= DAMAGE CONTROL REPORT
COMMAND 7	= LIBRARY COMPUTER

SHORT-RANGE SENSORS <\*> = ENTERPRISE  
SHOW THESE SYMBOLS +++ = KLINGON  
                          >I< = STARBASE  
                          \* = STAR

ON THE NEXT FOUR PAGES, I'LL SHOW YOU A GAME I PLAYED RECENTLY -

~~YOU MUST DESTROY 16 KLINGONS IN 30 STARDATES WITH 4~~

## STARBASES

*This'll be an easy game - only 16 klingons - and I've lots of Starbases to refuel at.*

STARDATE	3000
CONDITION	GREEN
QUADRANT	8,1
SECTOR	7,7
ENERGY	3000
PHOTON TORPEDOES	10
SHIELDS	0

COMMAND: ?2  
LONG RANGE SENSOR SCAN FOR QUADRANT 8,1

: 0 : 11 : 2 : aha! Klingons due East

101

COMMAND: ?  
COURSE (1-9): ?  
WARP FACTOR (0-8): ?  
COMBAT AREA CONDITION RED  
SHIELDS DANGEROUSLY LOW

*I arrive in a combat quadrant with no energy  
in my shields*

COMMAND 2 = LONG RANGE SENSOR SCAN  
SHOWS CONDITIONS IN SPACE FOR ONE QUADRANT ON EACH SIDE  
OF THE ENTERPRISE IN THE MIDDLE OF THE SCAN. THE SCAN  
IS CODED IN THE FORM XXX, WHERE THE UNITS DIGIT IS THE  
NUMBER OF STARS, THE TENS DIGIT IS THE NUMBER OF STAR-  
BASES, THE HUNDREDS DIGIT IS THE NUMBER OF KLINGONS.

10

582

STARDATE	3001
CONDITION	RED
QUADRANT	8,2
SECTOR	7,7
ENERGY	2997
PHOTON TORPEDOES	10
SHIELDS	0



98

90

*Don't fire before putting up your shields*

NUMBER OF UNITS TO SHIELDS: 31822

COMMAND 5 = SHIELD CONTROL  
DEFINES NUMBER OF ENERGY UNITS TO BE ASSIGNED TO SHIELDS  
ENERGY IS TAKEN FROM TOTAL SHIP'S ENERGY.

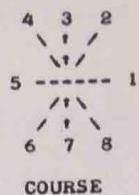
When you navigate, you choose a direction (COURSE) and then decide how far you want to go (WARP FACTOR) - that's two decisions, so here are two paragraphs :

**COURSE :** East is 1, North 3 and you can figure the rest yourself from the diagram. Of course, NorthWest (between 3 and 5) is 4. You can get finer directions by using decimal fractions - between South (7) and SouthEast(8) are 7.1, 7.2, 7.3, ..., 7.8, 7.9 I rarely use finer COURSE settings, such as 7.125 ... Between 8 and 1, use 8.1, 8.2, ..., 8.9

**WARP FACTOR :** If you set your warp factor to 1, you move 1 full quadrant and end up the next one over. 2 skips you over the neighboring quadrant and you'll stop in the one past it. \*\*\* WARNING \*\*\* If you go out of the known galaxy, you will find no stars (0) and may have trouble getting back. To maneuver within a quadrant, use numbers less than 1; .5 will move you half a quadrant, or 4 sectors. Since there are 8 sectors across a quadrant, each 1/8 warp factor (or .125 in decimal) moves you 1 sector.

COMMAND 0 = WARP ENGINE CONTROL  
"COURSE IS IN A CIRCULAR NUMERICAL VECTOR ARRANGEMENT AS SHOWN.  
INTERGER AND REAL VALUES MAY BE USED. THEREFORE COURSE 1.5 IS HALF WAY BETWEEN 1 AND 2.

A VECTOR OF 9 IS UNDEFINED, BUT VALUES MAY APPROACH 9.



ONE 'WARP FACTOR' IS THE SIZE OF ONE QUADRANT. THEREFORE TO GET FROM QUADRANT 6,5 TO 5,5 YOU WOULD USE COURSE 3, WARP FACTOR 1

*Warp Engine Control is a fancy name for NAVIGATION.*

COMMAND: ?3

PHASERS LOCKED ON TARGET. ENERGY AVAILABLE= 1997

NUMBER OF UNITS TO FIRE: ?600

81 UNIT HIT ON ENTERPRISE AT SECTOR 3,5 ( 919 LEFT)

31 UNIT HIT ON KLINGON AT SECTOR 3,5 (169 LEFT)

COMMAND: ?3

PHASERS LOCKED ON TARGET. ENERGY AVAILABLE= 1397

NUMBER OF UNITS TO FIRE: ?600

49 UNIT HIT ON ENTERPRISE AT SECTOR 3,5 ( 870 LEFT)

214 UNIT HIT ON KLINGON AT SECTOR 3,5 (-45 LEFT)

KLINGON AT SECTOR 3,5 DESTROYED \*\*\*\*

Hits reduce the shield levels until ... there's nothing left ...

COMMAND 3 = PHASER CONTROL  
ALLOWS YOU TO DESTROY THE KLINGONS BY HITTING HIM WITH SUITABLY LARGE NUMBERS OF ENERGY UNITS TO DEPLET HIS SHIELD POWER. KEEP IN MIND THAT WHEN YOU SHOOT AT HIM, HE GONNA DO IT TO YOU TOO.

COMMAND: ?2

LONG RANGE SENSOR SCAN FOR QUADRANT 8,2

```
: 11 : 2 : 3 :  
-----  
: 7 : 1 : 8 :  
-----  
: 0 : 0 : 0 :  
-----
```

I'm looking around for some more Klingons. I figure I have enough energy and torpedoes left for 4 or 5 more before I'll have to find a Starbase.

COMMAND: ?0

COURSE (1-9): ?2

WARP FACTOR (0-8): 3

\*\*>

STARDATE	3002
CONDITION	GREEN
QUADRANT	5,5
SECTOR	7,7
ENERGY	778
PHOTON TORPEDOES	10
SHIELDS	870



COMMAND: ?2

LONG RANGE SENSOR SCAN FOR QUADRANT 5,5

```
: 7 : 1 : 1 :  
-----  
: 2 : 1 : 101 :  
-----  
: 2 : 5 : 1 :  
-----
```

none here ...

... but my sensors spot one due East

COMMAND: ?0

COURSE (1-9): ?1

WARP FACTOR (0-8): ?1

\* +\*

\*\*>

STARDATE	3003
CONDITION	RED
QUADRANT	5,6
SECTOR	7,7
ENERGY	775
PHOTON TORPEDOES	10
SHIELDS	870

COMMAND: ?4

TORPEDO COURSE (1-9):?3  
TORPEDO TRACK:

6,7  
5,7  
4,7  
3,7

This was an easy shot -  
the Klingon was due North

\*\*\* KLINGON DESTROYED \*\*\*

COMMAND 4 = PHOTON TORPEDO CONTROL  
COURSE IS THE SAME AS USED IN WARP ENGINE CONTROL  
IF YOU HIT THE KLINGON, HE IS DESTROYED AND CANNOT FIRE  
BACK AT YOU. IF YOU MISS, HE WILL SHOOT HIS PHASERS AT  
YOU.

NOTE: THE LIBRARY COMPUTER (COMMAND 7) HAS AN OPTION  
TO COMPUTE TORPEDO TRAJECTORY FOR YOU (OPTION 2).

COMMAND: ?2

LONG RANGE SENSOR SCAN FOR QUADRANT 5,6

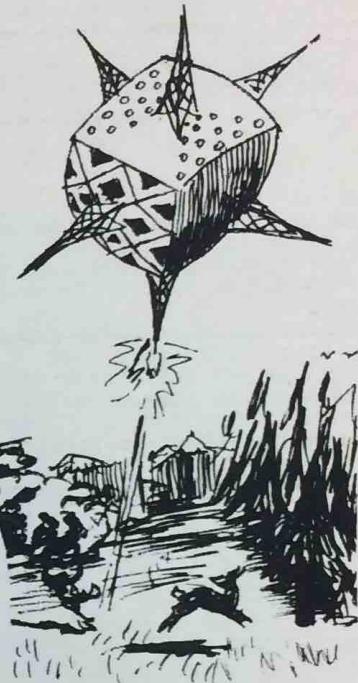
: 1 : 1 : 4 :  
-----  
: 1 : 1 : 6 :  
-----  
: 5 : 1 : 105 :  
-----

Back to looking around - I have to go  
SouthEast to reach the next one.

COMMAND: ?0

COURSE (1-9):?8  
WARP FACTOR (0-8):?1

+++ \* STARDATE 3004  
\* CONDITION RED  
\* QUADRANT 6,7  
\* SECTOR 7,7  
\* ENERGY 772  
\* PHOTON TORPEDOES 9  
\* SHIELDS 870  
-----



COMMAND: ?4

TORPEDO COURSE (1-9):?3.2  
TORPEDO TRACK:

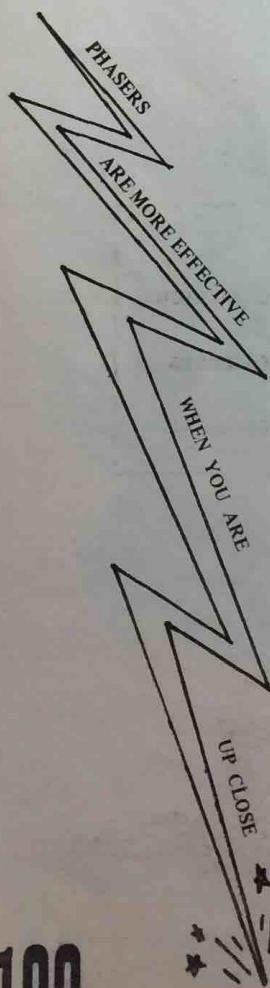
6,7  
5,7  
4,6  
3,6  
2,6

\*\*\* KLINGON DESTROYED \*\*\*

COMMAND: ?2  
LONG RANGE SENSOR SCAN FOR QUADRANT 6,7

: 1 : 6 : 5 :  
-----  
: 1 : 5 : 6 :  
-----  
: 6 : 104 : 5 :  
-----

by the way - the Enterprise's computer  
banks are storing all the Long Range Sensor  
scans I've taken.



COMMAND: ?0  
COURSE (1-9):?7  
WARP FACTOR (0-8):?1

+++ \* STARDATE 3005  
\* CONDITION RED  
\* QUADRANT 7,7  
\* SECTOR 7,7  
\* ENERGY 769  
\* PHOTON TORPEDOES 8  
\* SHIELDS 870  
-----

COMMAND: ?0  
COURSE (1-9):?4  
WARP FACTOR (0-8):?5

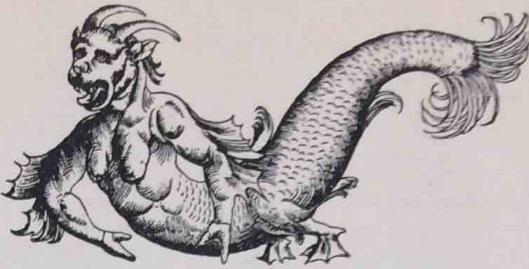
32 UNIT HIT ON ENTERPRISE AT SECTOR 1,1 ( 839 LEFT)  
WARP ENGINES SHUTDOWN AT SECTOR 1,1 DUE TO BAD NAVIGATION

+++ \* STARDATE 3005  
\* CONDITION RED  
\* QUADRANT 7,7  
\* SECTOR 2,2  
\* ENERGY 768  
\* PHOTON TORPEDOES 8  
\* SHIELDS 839  
-----

COMMAND: ?3  
PHASERS LOCKED ON TARGET. ENERGY AVAILABLE= 768  
NUMBER OF UNITS TO FIRE:?200  
79 UNIT HIT ON ENTERPRISE AT SECTOR 1,1 ( 759 LEFT)  
167 UNIT HIT ON KLINGON AT SECTOR 1,1 ( 33 LEFT)  
COMMAND: ?3  
PHASERS LOCKED ON TARGET. ENERGY AVAILABLE= 568  
NUMBER OF UNITS TO FIRE:?150  
46 UNIT HIT ON ENTERPRISE AT SECTOR 1,1 ( 714 LEFT)  
52 UNIT HIT ON KLINGON AT SECTOR 1,1 (-19 LEFT)  
KLINGON AT SECTOR 1,1 DESTROYED \*\*\*\*

COMMAND: ?2  
LONG RANGE SENSOR SCAN FOR QUADRANT 7,7

: 1 : 5 : 6 :  
: 6 : 4 : 5 :  
: 15 : 4 : 7 : hey! a Starbase! there it is



COMMAND: ?0  
COURSE (1-9):?6  
WARP FACTOR (0-8):?1

<> \* >!<

STARDATE	3006
CONDITION	GREEN
QUADRANT	8,6
SECTOR	2,2
ENERGY	515
PHOTON TORPEDOES	8
SHIELDS	714

COMMAND: ?0  
COURSE (1-9):?8  
WARP FACTOR (0-8):?2.25

first I navigate UNDER the two stars in my way.  
now I can warp straight in and dock

\* >!<

STARDATE	3006
CONDITION	GREEN
QUADRANT	8,6
SECTOR	4,4
ENERGY	518
PHOTON TORPEDOES	8
SHIELDS	714

COMMAND: ?0  
COURSE (1-9):?2  
WARP FACTOR (0-8):?0.35

DAMAGE CONTROL REPORT: COMPUTER STATE OF REPAIR IMPROVED

SHIELDS DROPPED FOR DOCKING PURPOSES

\* >!<

STARDATE	3006
CONDITION	DOCKED
QUADRANT	8,6
SECTOR	2,6
ENERGY	3000
PHOTON TORPEDOES	10
SHIELDS	0

COMMAND: ??  
COMPUTER ACTIVE AND AWAITING COMMAND?

STATUS REPORT

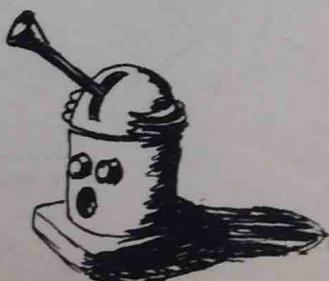
NUMBER OF KLINGONS LEFT = 12  
NUMBER OF STARDATES LEFT = 24  
NUMBER OF STARBASES LEFT = 4

DEVICE	STATE OF REPAIR
WARP ENGINES	0
S.R. SENSORS	0
L.R. SENSORS	0
PHASER CNTRL	0
PHOTON TUBES	0
DAMAGE CNTRL	0
SHIELD CNTRL	0
COMPUTER	5.22258

COMMAND 7 = LIBRARY COMPUTER  
THE LIBRARY COMPUTER CONTAINS THREE OPTIONS:  
OPTION 0 = CUMULATIVE GALACTIC RECORD  
SHOWS COMPUTER MEMORY OF THE RESULTS OF ALL PREVIOUS  
LONG RANGE SENSOR SCANS  
OPTION 1 = STATUS REPORT  
SHOWS NUMBER OF KLINGONS, STARDATES AND STARBASES  
LEFT.  
OPTION 2 = PHOTON TORPEDO DATA  
GIVES TRAJECTORY AND DISTANCE BETWEEN THE ENTERPRISE  
AND ALL KLINGONS IN YOUR QUADRANT

COMMAND: ??  
COMPUTER ACTIVE AND AWAITING COMMAND?  
COMPUTER RECORD OF GALAXY FOR QUADRANT 8,6

	1	2	3	4	5	6	7	8
1	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0
4	0	0	0	7	1	1	4	0
5	0	0	0	2	1	1	6	5
6	0	0	0	2	5	1	5	6
7	11	2	3	0	0	6	4	5
8	7	1	8	0	0	15	4	7



COMMAND: ?

A collection of odds and ends. *Crash* and the more complicated *Lunar* simulate landing a spaceship. *Reverse*, *Zeros*, and *Taxman* are open-ended games — they can be played and appreciated at many different levels of sophistication.

# LAST CHAPTER

Crash  
Lunar Lander  
Reverse  
Zeros  
Taxman



CONGRATULATIONS! YOU ARE AT THE CONTROLS OF A SPACE MODULE.  
THE OBJECT IS TO LAND ON THE SURFACE WITH AS SMALL A VELOCITY AS POSSIBLE.

YOU START AT A GIVEN HEIGHT ABOVE THE SURFACE WITH YOUR MODULE MOVING  
TOWARD THE SURFACE.

YOU CHOOSE THE AMOUNT OF FUEL TO BE BURNED DURING THE NEXT ONE SECOND.

- IF YOU BURN ZERO, YOUR SPEED INCREASES DUE TO GRAVITY.
- IF YOU BURN EXACTLY THE AMOUNT REQUIRED TO OVERCOME GRAVITY, YOUR  
VELOCITY REMAINS CONSTANT.
- IF YOU BURN MORE, YOUR SPEED DECREASES BUT BURNING TOO MUCH MAY BEGIN  
TO MOVE YOU UPWARD (YOUR VELOCITY BECOMES POSITIVE).

THERE IS MORE THAN ENOUGH FUEL, BUT BE CAREFUL NOT TO WASTE IT!

YOU MAY TRY TO LAND ON THE MOON, ON THE EARTH, OR ON PERSEPHONE.

LANDING ON THE MOON IS THE EASIEST, SO TRY THAT FIRST.  
PERSEPHONE IS AN UNKNOWN PLANET SO YOU WILL HAVE TO SPECIFY ALL THE INITIAL  
CONDITIONS (HEIGHT, VELOCITY, FUEL, MAXIMUM BURN, AND BURN TO CANCEL GRAVITY).

GOOD LUCK AND HAPPY LANDINGS!

LOCATION: MOON, EARTH, OR PERSEPHONE? MOON

INITIAL CONDITIONS: STANDARD OR RANDOM? STANDARD

INITIAL HEIGHT: 500 FEET

INITIAL VELOCITY: -50 FEET/SEC

TOTAL FUEL SUPPLY: 120 UNITS

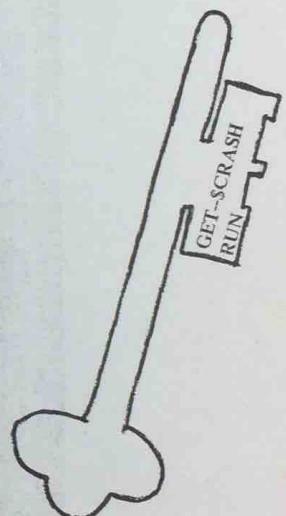
MAXIMUM BURN: 30 UNITS/SEC

AMOUNT OF BURN TO CANCEL GRAVITY: 5 UNITS/SEC

*The magnitude (absolute value)  
of the velocity is the speed.*

*The sign of the velocity is the  
direction. A positive (+) velocity  
means you are moving away  
(upward) from the surface.  
A negative (-) velocity means  
you are falling toward the surface.*

TIME	HEIGHT	VELOCITY	FUEL	BURN
0	500	-50	120	? 0
1	447.5	-55	120	? 0
2	390	-60	120	? 0
3	327.5	-65	120	? 10
4	265	-60	110	? 5
5	205	-60	105	? 0
6	142.5	-65	105	? 20
7	85	-50	85	? 24
8	44.5	-31	61	? 27
9	24.5	-9	34	? 20
10	23	6	14	? 0
11	26.5	1	14	? 0
12	25	-4	14	? 0
13	18.5	-9	14	? 10
14	12	-4	4	? 4
15	OUT OF FUEL			
15	7.5	-5		
16	0	-10	0	



*Hint: If you slow down too soon,  
you may not have enough fuel  
when you really need it.*

YOU GOT DOWN, BUT YOU WILL NEVER BE AN ASTRONAUT!

LOCATION: MOON, EARTH, OR PERSEPHONE? EARTH

INITIAL CONDITIONS: STANDARD OR RANDOM? STANDARD

INITIAL HEIGHT: 2000 FEET

INITIAL VELOCITY: -150 FEET/SEC

TOTAL FUEL SUPPLY: 630 UNITS

MAXIMUM BURN: 90 UNITS/SEC

AMOUNT OF BURN TO CANCEL GRAVITY: 32 UNITS/SEC

TIME	HEIGHT	VELOCITY	FUEL	BURN
0	2000	-150	630	?

Your turn ...

Choosing PERSEPHONE as the location allows you to set up *all* the initial conditions. Here are some of the ways you can "use" PERSEPHONE:

- In the sample landing on the MOON, we burned 20 units of fuel at TIME = 9. This thrust sent the module upward (velocity became positive). We could "start over" at this point by specifying PERSEPHONE as our location. Here's how:

LOCATION: MOON, EARTH, OR PERSEPHONE? PERSEPHONE

INITIAL HEIGHT (FEET)? 24.5

INITIAL VELOCITY (FEET/SEC) (USUALLY NEGATIVE)? -9

TOTAL FUEL SUPPLY (UNITS)? 34

MAXIMUM BURN (UNITS/SEC)? 30

AMOUNT OF BURN TO CANCEL GRAVITY (UNITS/SEC)? 5

TIME	HEIGHT	VELOCITY	FUEL	BURN
0	24.5	-9	34	?

- We could try another planet to land on. The AMOUNT OF BURN TO CANCEL GRAVITY is the same as the *gravity* of the planet you are landing on.

Here are some values for the gravities in our solar system:

LOCATION	GRAVITY (FT/SEC <sup>2</sup> )
Mercury	12
Venus	29
Earth	32
Moon	5
Mars	12
Jupiter	85
Saturn	37
Uranus	34
Neptune	43
Sun	898
Asteroid	?
Neutron Star	?

So, if you wanted to try to land on SATURN, you would name PERSEPHONE as your location and 37 as the AMOUNT OF BURN TO CANCEL GRAVITY.

- You can try problems like the following:

Given an initial height of 1000, an initial velocity of -50, a maximum burn of 60, and a gravity of 12, what is the *minimum* amount of fuel needed to land with a velocity of less than -5?

Or how about this one – You are giving one of the natives a tour of your module while it is resting on the surface of the moon. It stumbles into the control panel and suddenly you have lifted off the surface with an initial burn of 50 units. How many seconds will it take to get the moon-being safely home (velocity less than -5 at touchdown)?



The physical model for this simulation assumes uniformly accelerated motion (ignoring mass).  
Here are the equations it uses:

Notation:	$t$	time
	$x$	distance
	$v_0$	initial velocity
	$v$	final velocity
	$v$	average velocity
	$a$	acceleration (which in this case is the gravity of the planet)

We start with two equations:

$$(1) \quad x = vt \quad (\text{distance} = \text{velocity} \times \text{time})$$

(2)  $a = (v - v_0) / t$  (acceleration is equal to the change in velocity divided by the elapsed time)

Rearranging (2), we get

$$(3) \quad v = v_0 + at$$

The average velocity,  $v$ , is

$$(4) \quad v = (v_0 + v) / 2 \quad (\text{since the acceleration is constant})$$

The distance,  $x$ , covered in time  $t$  is

$$(5) \quad x = l(v_0 + v) / 2 / t \quad (\text{by substituting into (1)})$$

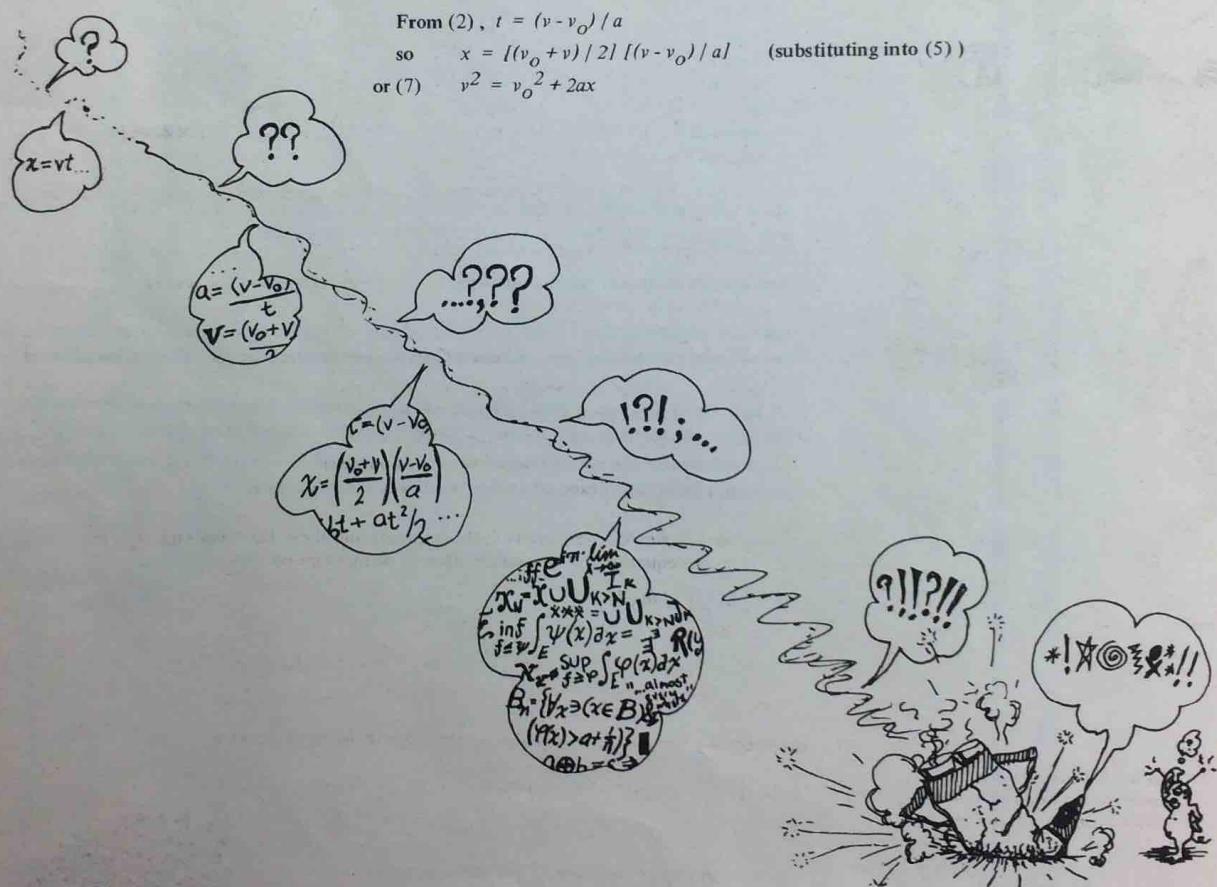
$$x = l(v_0 + v_0 + at) / 2 / t \quad (\text{from (3)})$$

or (6)  $x = v_0 t + \frac{1}{2} at^2$

From (2),  $t = (v - v_0) / a$

$$\text{so } x = l(v_0 + v) / 2 / [(v - v_0) / a] \quad (\text{substituting into (5)})$$

or (7)  $v^2 = v_0^2 + 2ax$



Instead of inputting BURN every second, input BURN RATE, DURATION, where the BURN RATE is the amount of fuel burned per second and the DURATION is the number of seconds to burn at that rate.

Recently, ITCHY'S RESTAURANT opened a franchise on the moon. Your goal is to land as close to ITCHY'S as possible with as small a velocity as you can (both horizontal and vertical).

Input BURN and ANGLE OF DESCENT at each turn. This will produce both a HORIZONTAL and a VERTICAL component of the velocity. Don't forget to give the HORIZONTAL DISTANCE from ITCHY'S, as well as the (vertical) HEIGHT above the surface.

GROUND CONTROL CALLING LUNAR LANDER.  
ON-BOARD AND GROUND COMPUTERS KAPUT.  
TAKE OVER!!

CAPSULE WEIGHT 33000 LBS – AVAILABLE FUEL 16500 LBS  
ESTIMATED FREE FALL IMPACT TIME IS 120 SECONDS

SET RETRO ROCKET BURN RATE TO ANY VALUE FROM 0 LBS/SEC (FREE FALL)  
TO 300 LBS/SEC, TYPE A COMMA AND THEN GIVE THE BURN TIME LENGTH.  
[THE BURN RATE IS THE AMOUNT OF FUEL THAT YOUR RETRO ROCKETS WILL  
BURN EACH SECOND. THE BURN TIME LENGTH IS THE NUMBER OF SECONDS  
YOU WANT YOUR RETRO ROCKETS TO BURN AT THIS BURN RATE.]

GOOD LUCK!

SEC	MI	FT	MPH	LB FUEL	BURN RATE, TIME
0	120	0	3600	16500	? 0, 75
75	42	990	3870	16500	? 300, 10
85	32	1223	3288.39	13500	? 250, 20
105	16	4988	2178.97	8500	? 200, 15
120	9	2334	1404.62	5500	? 150, 10
130	6	625	983.016	4000	? 100, 10
140	3	4141	694.948	3000	? 90, 5
145	2	4811	561.658	2550	? 80, 5
150	2	1128	442.146	2150	? 70, 10
160	1	1466	230.247	1450	? 60, 5
165	1	111	139.031	1150	? 50, 4
169	0	4749	79.5837	950	? 40, 2
171	0	4549	57.0077	870	? 10, 10
181	0	3723	55.5942	770	? 10, 20
201	0	2141	52.1128	570	? 12, 10
211	0	1447	42.3984	450	? 10, 20
231	0	247	37.4835	250	? 15, 1
232	0	220	35.2779	235	? 13, 2
234	0	121	32.4026	209	? 12, 3

ON MOON AT 236.672 SEC – IMPACT VELOCITY 29.5746 MPH  
CRAFT DAMAGE. YOU ARE STRANDED UNTIL A RESCUE MISSION ARRIVES.  
HOPE YOUR OXYGEN HOLDS OUT.

There are two factors that *CRASH* ignores (its model is based on *uniformly accelerated motion*) which *LUNAR* includes:

- the mass of the rocket is being reduced as fuel is burned
- the exhaust velocity of the gas has a direct effect on the velocity of the rocket (*conservation of momentum*)

For the mathematically-insane, here's a sketch of *how* these factors sneak in. First, some notation:

$v_o$  initial velocity (at the beginning of the time interval)

$v$  final velocity (at the end of the time interval)

$v_e$  exhaust velocity of the gas (relative to the rocket)

$m_o$  initial mass of the rocket (*before* the fuel is burned)

$m_r$  final mass of the rocket (*after* the fuel is burned)

Now, assume that during the time interval, the burn rate and the exhaust velocity,  $v_e$ , are constant. Then the equation for the conservation of momentum becomes:

$$\begin{aligned} v - v_o &= v_e \ln [m_r/m_o] \\ &= v_e \ln [1 - (m_o - m_r)/m_o] \\ &= -v_e [(m_o - m_r)/m_o + ((m_o - m_r)/m_o)^2/2 + ((m_o - m_r)/m_o)^3/3 \\ &\quad + ((m_o - m_r)/m_o)^4/4 + ((m_o - m_r)/m_o)^5/5 + \dots] \end{aligned}$$

The corresponding formula for computing  $v$  that appears in the program is

$$J = V + G*S - Z*Q*(1 + Q*(.5 + Q*(1/3 + Q*(.25 + Q/5))))$$

where  $J = v$

$V = v_o$

$G =$  gravity of the moon (.001 miles/sec/sec)

$S =$  time interval

$Z = v_e$

$Q = (m_o - m_r)/m_o$

The next formula

$$I = A - G*S*S/2 - V*S + Z*S*Q*(.5 + Q*(1/6 + Q*(1/12 + Q/20)))$$

is used to determine the new altitude above the surface ( $A$  is the altitude at the beginning of the time interval). It is simply the integral with respect to time of the last equation.

For those truly fiendish-at-heart, try altering the variable  $Z$  (which is set to 1.8). This is  $v_e$ , the exhaust velocity of the gas, and altering it corresponds (physically) to changing the type of fuel (and possibly the engine design).

# REVERSE

THIS IS THE GAME OF 'REVERSE'. TO WIN, ALL YOU HAVE TO DO IS ARRANGE THE LIST OF NUMBERS (1 THROUGH 9) IN NUMERICAL ORDER FROM LEFT TO RIGHT.

TO MOVE, YOU TELL ME HOW MANY NUMBERS TO REVERSE.  
FOR EXAMPLE, IF THE CURRENT LIST IS:

2 3 4 5 1 6 7 8 9

AND YOU REVERSE 4, THE RESULT WILL BE:

5 4 3 2 1 6 7 8 9

NOW, IF YOU REVERSE 5, YOU WIN!

1 2 3 4 5 6 7 8 9

NO DOUBT YOU WILL LIKE THIS GAME OF SKILL, BUT IF YOU WANT TO QUIT,  
REVERSE 0 (ZERO).

HERE WE GO . . . THE LIST IS:

3 6 8 2 4 9 1 7 5

REVERSE? 3

8 6 3 2 4 9 1 7 5

REVERSE? 5

4 2 3 6 8 9 1 7 5

REVERSE? 8

7 1 9 8 6 3 2 4 5

REVERSE? 4

8 9 1 7 6 3 2 4 5

REVERSE? 3

1 9 8 7 6 3 2 4 5

REVERSE? 9

5 4 2 3 6 7 8 9 1

REVERSE? 4

3 2 4 5 6 7 8 9 1

REVERSE? 2

2 3 4 5 6 7 8 9 1

REVERSE? 8

9 8 7 6 5 4 3 2 1

REVERSE? 9

1 2 3 4 5 6 7 8 9

YOU WON IN 10 MOVES

There are various strategies for playing *REVERSE* of both algorithmic and heuristic types. This gives the player a chance to explore these concepts in a practical (rather than theoretical) context.

An *algorithmic* method is a pre-defined, step-by-step process (first do this, move that, then compute this, and so on . . . ) that terminates within a predictable number of moves (given the number of items in the list). One of our first questions about *REVERSE* was whether or not it was *always* possible to order *any* list. This was answered by producing an algorithm that *always* did it in at most  $2n - 3$  steps (where  $n$  is the number of integers in the list).

Here's how it works: Find where the *largest* number is, say in position  $k$ . *REVERSE?*  $k$  puts the *largest* number first then *REVERSE?*  $n$  moves it to the end of the list. This took 2 reverses — it is now in its correct place and it won't move again. Do the same with the next largest number — move it to the front then *REVERSE?*  $n-1$ . Two more reverses. This process will put the largest  $n-2$  integers in their proper positions in  $2*(n-2)$  or  $2n - 4$  reverses. We're left with only 1 and 2 — if they are not in order yet, then one more move — *REVERSE?* 2 — puts the entire list in order. Our algorithm took  $2n - 3$  reverses.

It's true that after moving a number to its correct position, the next smallest integer may have been first (you'd save one move) or even in its correct position (then you'd save two moves!). In the worst case, however, you'll always be "unlucky" and you'll need each of the  $2n - 3$  reverses.

The  $2n - 3$  algorithm for  $n = 5$   
THE LIST IS:

```

    4   1   5   2   3
REVERSE? 3
    5   1   4   2   3
REVERSE? 5
    3   2   4   1   5
REVERSE? 3
    4   2   3   1   5
REVERSE? 4
    1   3   2   4   5
REVERSE? 2
    3   1   2   4   5
REVERSE? 3
    2   1   3   4   5
REVERSE? 2
    1   2   3   4   5
YOU WON IN 7 MOVES
  
```

A shorter way to order this list

```

    4   1   5   2   3
REVERSE? 2
    1   4   5   2   3
REVERSE? 3
    5   4   1   2   3
REVERSE? 5
    3   2   1   4   5
REVERSE? 3
    1   2   3   4   5
YOU WON IN 4 MOVES
  
```

In addition to proving that every list can be ordered, we have constructed an *upper bound* on the number of reverses, namely  $2n - 3$ , for an  $n$ -element list. Can we *always* do better?

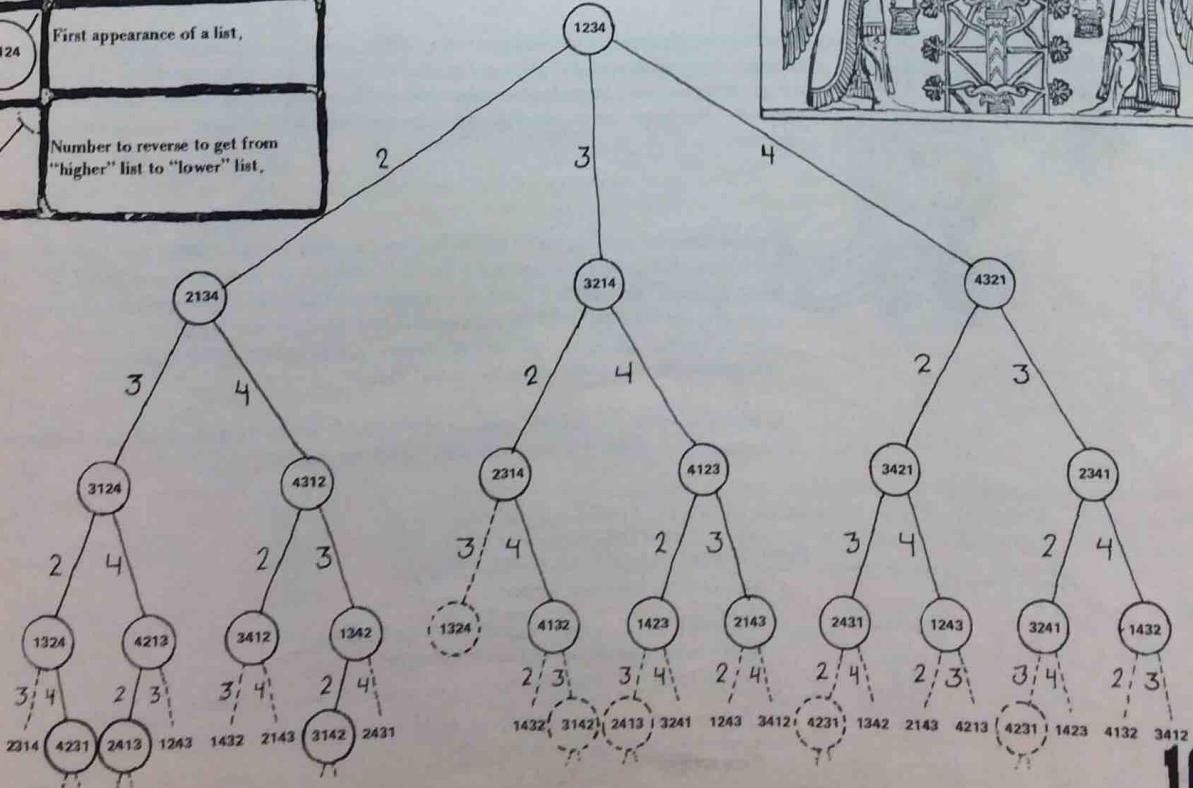
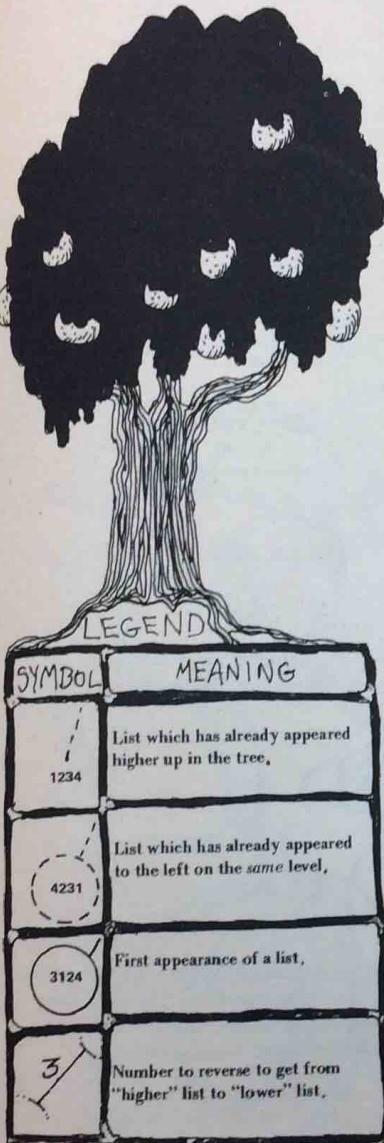
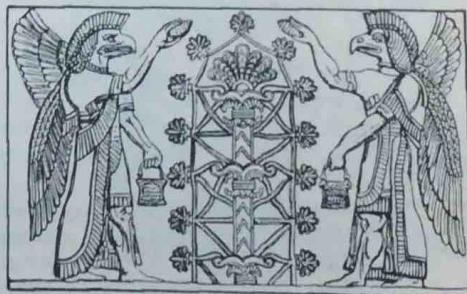
To ask whether we can do better than  $2n - 3$  can be confusing. Suppose the initial list were:

5 4 3 2 1 6 7 8 9

REVERSE? 5 would order it in only 1 move! So we ask whether we can *always* do better.

We've tried essentially two different approaches to solving this: 1) *exhaustive* methods and 2) methods involving *partial orderings*. To date, we've been unsuccessful with both approaches!

An exhaustive method we tried involved working backwards. Starting with the list in order, we attempted to construct a tree as follows: the ordered list at the root;  $n - 1$  branches corresponding to the lists you get from moving REVERSE? 2, 3, ...,  $n$  (REVERSE? 1 is the identity); then from each of these (and subsequent nodes),  $n - 2$  branches (excluding REVERSE? 1 and reversing the same number that just got you to this node — i.e. if you just reversed 5 to get to this node, then reversing 5 again would give the same list as you had *two* nodes ago). Each path through the tree corresponds to a sequence of reverses. What is the least number of levels in the tree that you need to produce *each* of the  $n!$  possible lists (the number of levels will then be the maximum number of reverses you will ever have to do)?



Blech!  $n = 5$  is already too big to draw. Worse yet — how do you *prune* duplicates? Shudder at these pairs of reverse sequences for awhile:

[ 3 4 2 ] , [ 2 3 4 2 3 ]  
or [ 2 4 3 5 3 ] , [ 5 3 4 2 3 ]

You guessed it — the sequences in each pair produce identical lists! Would you really have guessed it? We sure don't see a pattern. Maybe you can find one.

The heuristics we have explored make use of "partial orderings". By "partial ordering" we mean that one or more parts of the list are in ascending or descending order. The idea is to try to move each of these parts as a unit.

Here's an example:

THE LIST IS:

6 2 8 9 1 5 4 3 7

REVERSE? 5

1 9 8 2 6 5 4 3 7

REVERSE? 3

8 9 1 2 6 5 4 3 7

REVERSE? 8

3 4 5 6 2 1 9 8 7

REVERSE? 4

6 5 4 3 2 1 9 8 7

REVERSE? 6

1 2 3 4 5 6 9 8 7

REVERSE? 9

7 8 9 6 5 4 3 2 1

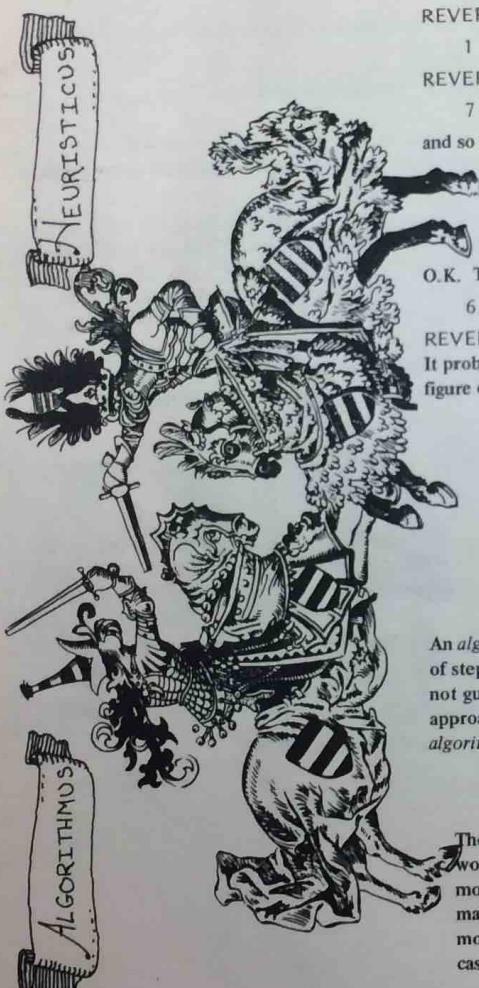
and so on ...

This move extends the ordered sequence 5 4 3 to 6 5 4 3. Now 6 5 4 3 can be treated as a unit so that (eventually) when 6 is put in place, 3, 4, and 5 will also end-up in place on the same move.

Joins two sub-orderings

The 3 4 5 6 group and the 2 1 group are in the "right" order to be joined with one reverse. If the list had been 3 4 5 6 1 2 9 8 7 then they couldn't be linked in one move.

The 9 8 7 is in the "wrong" order — we'll have to move them up front, "fix" the order, and then put them back.



O.K. The list is:

6 8 3 5 2 4 7 9 1

REVERSE? 3 (to put the 6 and 5 together) or REVERSE? 6 (to join the 6 and 7). It probably *will* matter later in this game which way you do it, but we don't know how to figure out which choice is better at *this* point.

!?

multireverse

!?

sitairueH

An *algorithm* guarantees a solution in a deterministic (pre-defined) manner within a known number of steps. A *heuristic* is used to get you closer to a solution. Unlike an algorithm, a heuristic does not guarantee success. Instead, a heuristic seeks to "improve" things locally. Using a *heuristic* approach often helps you to gain a good enough understanding of the problem to create an *algorithm*.

The fundamental problem we've had with analyzing these partial-ordering heuristics is: What is the worst case, that is, which scrambling is the *most* unordered? How "ordered" is list A? Is list A more "ordered" than list B? Until we can apply our heuristics to the worst case, we can't say how many reverses it'll take. And we can't do this until we determine what the worst case is! There's more bad news. The worst case for one partial-ordering heuristic may be *different* than the worst case for another one — there's no *worst* list! Help . . .

In practice, we used a "mixed" strategy of the  $2n - 3$  algorithm and partial-ordering heuristics. We consistently seemed to do better than  $2n - 3$  reverses but . . .

REVERTERI  
VARI

Some variations of REVERSE to play with:

- Reverse from *either* end of the list
- REVERSE? I, J — starting at the I-th element, reverse J ( $I = 1$  is the case we've been talking about)
- REVERSE in 2-D — Reverse any row or column of an  $n \times n$  grid
- P.S. We won't mention REVERSE on an arbitrary topological network (or even try to define the operation)



WE START WITH A BOARD LIKE THIS:

1	2	3	4	5	6	7
0	0	0	0	0	0	0

YOU AND I TAKE TURNS. WE CHOOSE ONE OF THE NUMBERS AND I DRAW A BRIDGE BETWEEN THE TWO 0's BELOW THAT NUMBER. ONCE AN 0 HAS BEEN USED FOR A BRIDGE, IT CAN'T BE USED AGAIN.

FOR INSTANCE, IF YOU CHOOSE THE NUMBER 3,

1	2	3	4	5	6	7
? 3	0	0	0—0	0	0	0

THEN I CAN'T CHOOSE THE NUMBERS 2 OR 4.

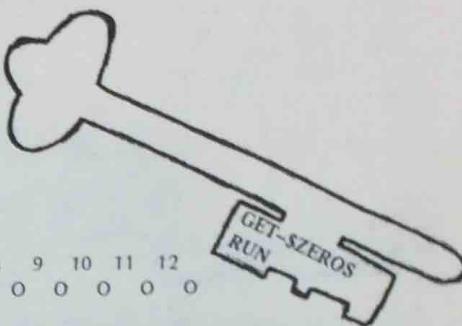
THE WINNER IS THE LAST PLAYER WHO CAN DRAW A BRIDGE.

P.S. IF YOU WANT ME TO MOVE FIRST, PRESS THE 'RETURN' KEY FOR YOUR FIRST MOVE.

HERE WE GO ...

1	2	3	4	5	6	7
? 3	0	0	0—0	0***0	0	0
? 7	0***0	0—0	0***0	0—0		

I WIN



HOW MANY NUMBERS THIS TIME? 12

1	2	3	4	5	6	7	8	9	10	11	12
? 0	0	0	0	0	0	0	0	0	0	0	0

ZEROS is a *partitioning* game. Each move *partitions* one group of numbers into two distinct groups (sometimes, one (or even both) of these groups may be empty).

Look at the sample game played. Initially there was 1 partition of 7 numbers. After moving 3 (which eliminated 2, 3, and 4), there were two partitions — [1] and [5, 6, 7]. Moving 5 partitioned [5, 6, 7] into the empty partition [ ] and [7], a one-element partition. (If we started with 17 numbers, then moving 9 would create two partitions, each containing 7 numbers.)

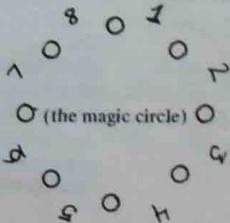
Your strategy will depend upon the number of non-empty partitions and their sizes. If one of the partitions were

1	2	3	4	5
0	0	0	0	0

then moving 3 would leave 2 moves (1 and 5) but moving 2 would leave only 1 move (either 4 or 5 but not both). If this were the only partition, you would choose 3. However, if there were just one other partition containing a single number, you could move 2 to win.

This version of ZEROS goes up to 18 numbers, which should be enough to get you "started". See what you can discover about the general case of  $p$  partitions, where the  $i$ -th partition,  $p_i$ , contains  $n_i$  elements.

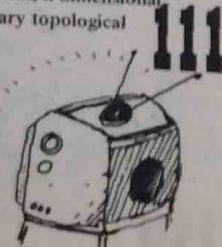
As a "slight" variation, suppose the zeros were arranged in a circle like this:

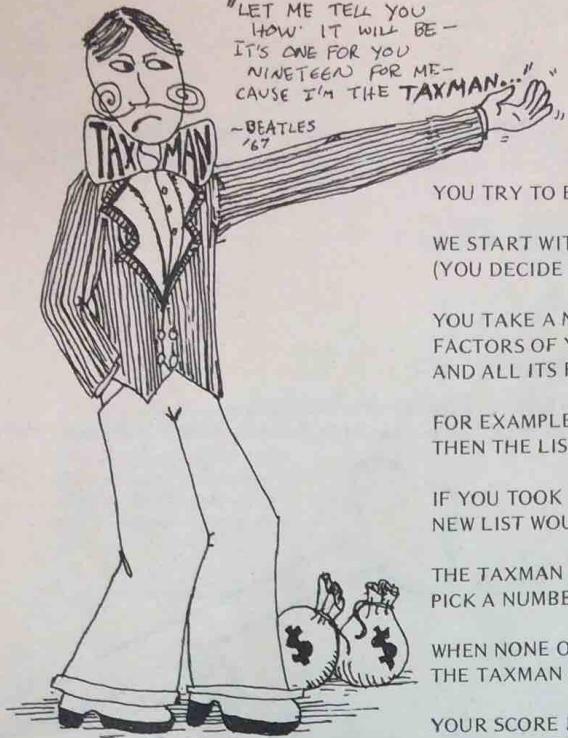


How does your analysis change?

How about ZEROS on a two-dimensional grid where a move eliminates all numbers in the same row and column (or should it be only those numbers that are in the partition you've just moved in)? We won't even suggest ZEROS on a cube with planar partitions (in general, n-dimensional space with hyperplane partitions), nor will we even hint at playing on arbitrary topological networks.

TAKE MY WORD  
FER IT, DESE  
COMPUDE  
GAMES DONT  
AMMOUNT TA'  
NUTTIN'!!





# TAXMAN

YOU TRY TO BEAT THE TAXMAN.

WE START WITH A LIST OF WHOLE NUMBERS IN NUMERICAL ORDER  
(YOU DECIDE HOW MANY).

YOU TAKE A NUMBER FROM THE LIST — THE TAXMAN GETS ALL THE  
FACTORS OF YOUR NUMBER THAT ARE STILL LEFT. YOUR NUMBER  
AND ALL ITS FACTORS ARE THEN DELETED FROM THE LIST.

FOR EXAMPLE, SUPPOSE YOU WANT 10 NUMBERS TO BE IN THE LIST  
THEN THE LIST WOULD BE: 1 2 3 4 5 6 7 8 9 10

IF YOU TOOK 8, THE TAXMAN WOULD GET 1, 2, AND 4 AND THE  
NEW LIST WOULD BE: 3 5 6 7 9 10

THE TAXMAN MUST GET SOMETHING EVERY TIME SO YOU CAN ONLY  
PICK A NUMBER THAT HAS FACTORS LEFT.

WHEN NONE OF THE REMAINING NUMBERS HAS ANY FACTORS,  
THE TAXMAN GETS THEM!!

YOUR SCORE IS THE SUM OF THE NUMBERS YOU TAKE.  
IF YOU WANT TO GIVE UP, TAKE 0.

GOOD LUCK!

HOW MANY NUMBERS DO YOU WANT IN THE LIST? 10

THE LIST IS: 1 2 3 4 5 6 7 8 9 10

YOU TAKE? 8  
YOUR TOTAL IS 8  
I GET 1 2 4  
MY TOTAL IS 7

NEW LIST: 3 5 6 7 9 10

YOU TAKE? 9  
YOUR TOTAL IS 17  
I GET 3  
MY TOTAL IS 10

NEW LIST: 5 6 7 10

YOU TAKE? 6  
THERE ARE NO FACTORS OF 6 FOR ME.  
ARE YOU TRYING TO SHORT-CHANGE THE TAXMAN?

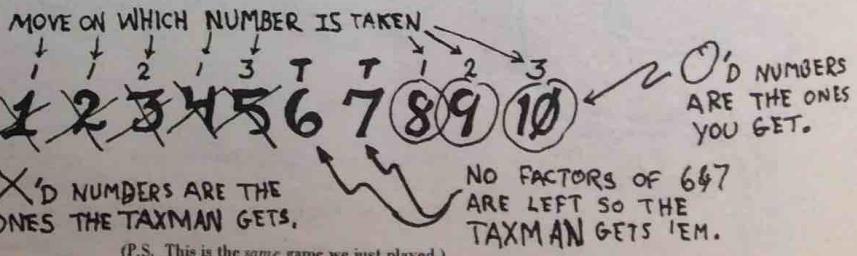
YOU TAKE? 8  
8 IS NOT IN THE LIST — TRY AGAIN.

YOU TAKE? 10  
YOUR TOTAL IS 27  
I GET 5  
MY TOTAL IS 15

NEW LIST: 6 7  
I GET 6 7 BECAUSE NO FACTORS OF ANY NUMBER ARE LEFT.  
MY TOTAL IS 28

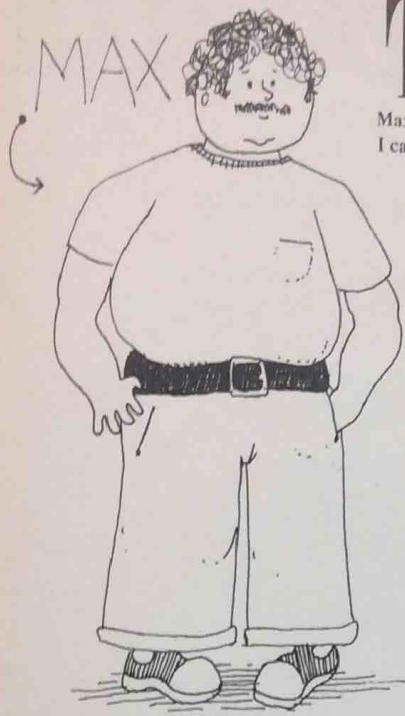
TAXMAN 28      YOU 27      THE TAXMAN WINS.

For playing *TAXMAN* at picnics, at piano recitals, at perennial places, or wherever the urge is overwhelming, as an added attraction we are introducing



(P.S. This is the same game we just played.)

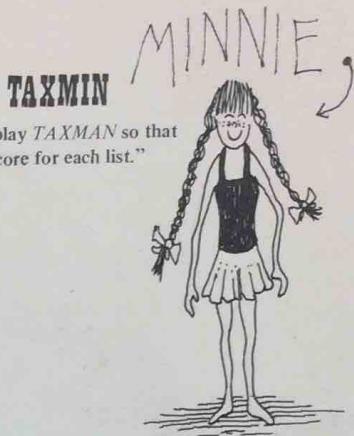
AND INTRODUCING...



# TAXMAX

Max says, "I want to play TAXMAN so that I can get the *maximum* score for each list."

... AND LAST BUT LEAST ...



Minnie says, "I want to play TAXMAN so that I can get the *minimum* score for each list."

Some suggestions  
for playing  
**TAXMAX**

One way of playing TAXMAX and TAXMIN would be to try *all* possible combinations of moves and to compare scores – also known as the *exhaustive search*. This sort of mentality has resulted historically in computer manufacturers building bigger and faster (and of course, more costly) computers, rather than programmers writing more efficient programs.

Try to compute an *upper bound* on the *number of turns* you will have. The Taxman must get *at least one factor* every time you get a number so you can get *at most* half the numbers in the list.

In most lists, you can't even do that well. You can get at most one prime number (the Taxman gets the rest). The smaller primes can be used as factors for getting larger numbers in the list. But the larger primes (those that aren't *proper* factors of any number in the list) go to the Taxman without you getting anything in return. It's as if the Taxman got them before you even started. See if you can figure out how these "larger" primes affect your upper bound.

After you have determined an upper bound,  $U$ :

If you can get  $U$  numbers and they are the *largest* you could get (except for those impossible primes), then you have a *maximum*. (The fun starts in those lists where it is impossible to get  $U$  numbers, or where you "lose" some of the larger numbers you thought you should have gotten but couldn't.)

Try to make the "best" use of each factor. The best use for the factor 1 is to take the largest prime number on your first turn – the largest prime is in the "group of largest numbers" and it is the largest number remaining that has only one factor left.

Write down the factors for each number in the list. Whenever a number is chosen, cross off all occurrences of its remaining factors (and the number itself) for the other numbers left in the list. On each turn the best use to make of the remaining factors is to select a member of the "group of largest numbers" that has only one factor left. (Figuring out what this group is can be quite an exertion – the idea is that you won't get a *maximum* if you pick numbers that are "too" small!)

Meeting *both* these conditions is not always possible. When it isn't, either your upper bound will change or your "group of largest numbers" will be modified (or even both!).

WARNING – THE TAXMAN HAS DETERMINED THAT TAXMAX  
MAY BE HAZARDOUS TO YOUR HEALTH!!



A TAXMIN hint:

Surprisingly, TAXMIN follows "easily" from a simplified version of TAXMAX. TAXMIN on a list of  $2n$  numbers is "similar" to TAXMAX on a list of  $n$  numbers, with a "little extra" thrown in. Experiment and then see if you can derive the relationship.

# SELECTED LISTINGS

## Number Guessing Games

Number . . . . .	116
Abase . . . . .	117
Trap . . . . .	116
Stars . . . . .	116
Clocks . . . . .	118
Bagels . . . . .	117
Quadgt . . . . .	119
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# Number Guessing Games

## NUMBER

```

100 REM *** NUMBER *** A NUMBER GUESSING GAME ***
110 REM *** COPYRIGHT PEOPLE'S COMPUTER COMPANY
120 REM *** P. O. BOX 310, MENLO PARK CA 94025
130 REM *** PRINT INSTRUCTIONS ON HOW TO PLAY
140 PRINT "I WILL THINK OF A WHOLE NUMBER FROM 1 TO 100."
150 PRINT "TRY TO GUESS MY NUMBER. AFTER EACH GUESS, I WILL"
160 PRINT "TELL YOU IF YOU HAVE GUESSED MY NUMBER OR IF YOUR"
170 PRINT "GUESS IS TOO SMALL OR TOO BIG."
180 REM *** COMPUTER 'THINKS' OF A NUMBER - CALL IT X
190 LET X=INT(100*RND(0))+1
200 PRINT
210 PRINT "OK, I HAVE A NUMBER. START GUESSING."
220 REM *** HUMAN STARTS GUESSING
230 PRINT
240 PRINT "WHAT IS YOUR GUESS?"
250 INPUT G
260 IF G<X THEN 510
270 IF G>X THEN 480
280 PRINT "TOO SMALL. TRY A LARGER NUMBER."
290 GOTO 410
300 PRINT "TOO BIG. TRY A SMALLER NUMBER."
310 GOTO 410
320 REM *** HUMAN HAS GUESSED THE COMPUTER'S NUMBER
330 PRINT
340 PRINT "YOU GUessed IT!!!! LET'S PLAY AGAIN."
350 PRINT
360 GOTO 310
370 END

```

## STARS

```

100 REM *** STARS *** STARS *** STARS *** STARS *** STARS ***
110 REM *** COPYRIGHT 1974 BY PCC, P.O. BOX 310, MENLO PARK CA
120 PRINT "WELCOME TO MY GALAXY. I'M IN CHARGE OF THE STARS HERE."
130 PRINT "PLAY MY GAME *STARS* AND GET SOME STARS FOR YOURSELF!"
140 PRINT
150 PRINT "WANT TO KNOW HOW TO PLAY?"
160 INPUT Z$[1,1]
170 IF Z$=>"Y" THEN 280
180 REM *** HERE IS HOW TO PLAY
190 PRINT
200 PRINT "I WILL THINK OF A WHOLE NUMBER FROM 1 TO 100."
210 PRINT "TRY TO GUESS MY NUMBER. AFTER YOU GUESS, I"
220 PRINT "WILL TYPE ONE OR MORE STARS (*), THE CLOSER"
230 PRINT "YOU ARE TO MY NUMBER, THE MORE STARS I TYPE."
240 PRINT "ONE STAR (*) MEANS YOU ARE FAR AWAY FROM MY"
250 PRINT "NUMBER. SEVEN STARS (******) MEANS YOU ARE VERY."
260 PRINT "VERY, VERY CLOSE TO MY NUMBER!!!"
270 REM *** COMPUTER 'THINKS' OF A NUMBER FROM 1 TO 100
280 LET X=INT(100*RND(0))+1
290 PRINT
300 PRINT "OK, STARSEEKER, I AM THINKING OF A NUMBER. START GUESSING."
310 REM *** GUESSING BEGINS
320 LET N=1
330 PRINT
340 PRINT "WHAT IS YOUR GUESS?"
350 INPUT G
360 IF G<X THEN 550
370 LET D=ABS(G-X)
380 IF D >= 64 THEN 500
390 IF D >= 32 THEN 490
400 IF D >= 16 THEN 480
410 IF D >= 8 THEN 470
420 IF D >= 4 THEN 460
430 IF D >= 2 THEN 450
440 PRINT " *"
450 PRINT " *"
460 PRINT " *"
470 PRINT " *"
480 PRINT " *"
490 PRINT " *"
500 PRINT " *"
510 PRINT
520 LET N=N+1
530 GOTO 330
540 REM *** PLAYER HAS GUESSED THE GALACTIC NUMBER
550 FOR K=1 TO 18
560 PRINT " *"
570 NEXT K
580 PRINT "!!!!"
590 PRINT "THAT'S IT!!! YOU GUessed MY COSMIC NUMBER IN" ; N ; "GUESSES."
600 PRINT
610 PRINT "WANT TO PLAY AGAIN?"
620 INPUT Z$[1,1]
630 IF Z$=>"Y" THEN 280
640 PRINT "OK, GOODBYE FOR NOW. PLAY WITH ME AGAIN SOMEHEN."
650 END

```

## TRAP

```

100 REMARK *** TRAP *** TRAP *** TRAP *** TRAP *** TRAP ***
110 REMARK *** COPYRIGHT 1974 BY PEOPLE'S COMPUTER COMPANY
120 PRINT "DO YOU WANT INSTRUCTIONS"
130 INPUT Z$[1,1]
140 IF Z$=>"Y" THEN 290
150 PRINT "I WILL THINK OF A NUMBER FROM 1 TO 100."
160 PRINT "TRY TO GUESS MY NUMBER. ENTER TWO NUMBERS. TRYING"
170 PRINT "TO TRAP MY NUMBER BY YOUR TWO THOSE NUMBERS. I'll"
180 PRINT "TELL YOU IF YOU HAVE TRAPPED MY NUMBER OR IF MY"
190 PRINT "NUMBER IS SMALLER THAN YOUR TWO TRAP NUMBERS OR"
200 PRINT "IF MY NUMBER IS LARGER THAN YOUR TWO TRAP NUMBERS."
210 PRINT "IF MY NUMBER IS LARGER THAN YOUR TWO TRAP NUMBERS, I'll"
220 PRINT "TELL YOU THAT YOU HAVE TRAPPED MY NUMBER. I'll"
230 PRINT "TELL YOU THAT MY NUMBER IS BETWEEN* YOUR TRAP NUMBERS"
240 PRINT "OR - PERHAPS MY NUMBER IS THE SAME AS ONE OF YOUR"
250 PRINT "TRAP NUMBERS."
260 PRINT "MY NUMBER IS LARGER THAN YOUR TWO TRAP NUMBERS."
270 PRINT "IT'S IMPORTANT!! IF YOU THINK YOU KNOW MY NUMBER, THEN"
280 PRINT "ENTER YOUR GUESS FOR *BOTH* TRAP NUMBERS."
290 PRINT

```

```

300 LET X=INT(100*RND(0))+1
310 PRINT "I'M THINKING...I HAVE A NUMBER!"
320 LET K=1
330 PRINT "FIRST TRAP NUMBER"
340 INPUT A
350 PRINT "SECOND TRAP NUMBER"
360 INPUT B
370 PRINT "INPUT A"
380 LET T=SIGN(X-A)*SIGN(X-B)
390 GOTO 1-3 OF 410, 410, 400, 410, 450
400 IF A=B THEN 490
410 PRINT "MY NUMBER IS TRAPPED BY YOUR NUMBERS."
420 GOTO 460
430 PRINT "MY NUMBER IS SMALLER THAN YOUR TRAP NUMBERS."
440 GOTO 460
450 PRINT "MY NUMBER IS LARGER THAN YOUR TRAP NUMBERS."
460 LET K=K+1
470 GOTO 330
480 PRINT "YOU GOT IT IN" ; K ; "GUESSES...LET'S PLAY AGAIN, LUCKY."
490 GOTO 290
500 END

```

# ABASE

```

10 REM-ABASE-A NUMBER GUESSING GAME USING DIFFERENT BASES
10 REM-PETER KATZ, 10/5/73, RAVENSWOOD
10 DIR AS(151,35151)
10 L=8
10 REM THE NUMBER OF GUESSES CAN BE CHANGED BY CHANGING 'L' IN LINE 40
10 PRINT "THIS IS A NUMBER GUESSING GAME USING DIFFERENT BASES"
10 PRINT "YOU TELL THE COMPUTER WHAT BASE YOU WISH TO PLAY IN."
10 PRINT "THE COMPUTER WILL SELECT A NUMBER IN YOUR BASE."
10 PRINT "AND YOU TRY TO GUESS THE NUMBER."
10 PRINT "THE COMPUTER WILL TELL YOU IF YOUR GUESS IS TOO HIGH."
10 PRINT "TOO LOW, OR IN THE WRONG BASE."
10 PRINT "YOU WILL HAVE 'L' TRIES TO GUESS THE NUMBER."
10 PRINT "WHAT BASE DO YOU WISH TO PLAY IN?"
10 INPUT Z
10 IF Z<11 AND Z>1 THEN 200
10 PRINT "PLEASE TRY A BASE BETWEEN 2 AND 10."
10 GOTO 140
10 REM THE COMPUTER PICKS THE NUMBER
10 P=INT(100*RD(0))+1
10 X=0
10 A=1
10 IF P<1+A THEN 260
10 A=A+1
10 GOTO 230
10 A=A-1
10 IF A=0 THEN 390
10 B=1
10 J=B+Z+A
10 IF J>P THEN 330
10 B=B+1
10 GOTO 290
10 B=B-1
10 J=B*Z+A
10 Y=B*101A
10 X=X+Y
10 P=P-J
10 GOTO 260
10 EXIT+P
10 Z1=Z-1
10 RESTORE
10 FOR C=1 TO Z1
10 READ D
10 NEXT C
10 G1
10 F=D
10 GOSUB 990
10 PRINT "O.K. I HAVE A NUMBER IN MIND BETWEEN 1 AND "B$" BASE "Z$
10 PRINT TAB(10);"- GUESS #";G;
10 INPUT Y
10 IF Y>D OR Y<1 THEN 800
10 H=0
10 Q=Y
10 GOSUB 840
10 IF R=1 THEN 780
10 IF Y=E THEN 650
10 G=G+1
10 IF G=L+1 THEN 740
10 REM THE COMPUTER FINDS OUT IF YOUR NUMBER IS TOO HIGH OR TOO LOW
10 IF Y>E THEN 630
10 PRINT TAB(5);"TOO LOW. GUESS #";G;
10 GOTO 500
10 PRINT TAB(5);"TOO HIGH. GUESS #";G;
10 GOTO 502
10 IF G=1 THEN 720
10 PRINT "WIGH!! IT TOOK YOU "G" GUESSES."
10 PRINT "DO YOU WANT TO PLAY AGAIN?"
10 INPUT R$1,13
10 IF R$1,13="N" THEN 1180
10 PAINT
10 GOTO 143
10 PRINT "WOW!! YOU GOT IT IN 1 GUESS!!"
10 GOTO 670
10 F=E
10 GOSUB 990
10 PRINT "YOU LOSE, BUCKWHEAT! THE NUMBER IN BASE "Z" WAS "S$
10 GOTO 670
10 PRINT "THERE IS NO SUCH NUMBER IN BASE "Z". TRY AGAIN."
10 GOTO 490
10 PRINT "I SAID A NUMBER BETWEEN 1 AND "B$". TRY AGAIN."
10 GOTO 490
10 REM THIS SUBROUTINE FINDS OUT IF THE NUMBER IS ACCEPTABLE
10 REM IN THE GIVEN BASE
10 A=1
10 IF Q<101A THEN 880
10 A=A+1
10 GOTO 850
10 A=A-1
10 IF A=0 THEN 940
10 K=INT(.1*A*Q+.00005)
10 IF W >= Z THEN 960
10 Q=Q-101A*X
10 GOTO 880
10 IF Q >= Z THEN 960
10 GOTO 970
10 H=1
10 RETURN
10 REM THIS SUBROUTINE CHANGES THE NUMBER INTO A STRING
10 S$="123456789"
1000 BS=""
1010 S=1
1020 K=6
1030 IF F >= 101K THEN 1070
1040 K=K-1
1050 GOTO 1030
1060 K=K-1
1070 T=INT(.1*K*F+.00005)
1080 F=F-101K*T
1090 IF T>0 THEN 1140
1100 BS$(S$)=AS(1,T)
1110 IF K=0 THEN 1160
1120 S=S+1
1130 GOTO 1060
1140 BS$(S$)=AS(10,101)
1150 GOTO 1110
1160 RETURN
1170 DATA 1,10012*36,10231,1210,433,244,202,144,121,103
1180 END

```

# BAGELS

```

10 REM *** HP TIME-SHARED BASIC PROGRAM LIBRARY ****
10 REM BAGELS: 3 DIGIT NUMBER GUESsing
10 REM 36360 (AS01) REV A -- 11/71
10 REM ***** CONTRIBUTING PROGRAM *****

10 REM *** PICOC-FERMI-BAGELS NUMBER GUESs GAME*** D. RESEK, P. ROME
1000 REM COPYRIGHT 1971 BY THE REGENTS OF THE UNIV. OF CALIF.
1020 REM PRODUCED AT THE LAWRENCE HALL OF SCIENCE, BERKELEY
1030 DIM AS(10),BS(10),AC(3),BC(3)
1040 N$="123456789"
1050 Y=0
1060 T=255
1070 PRINT "DO YOU LIKE THE RULES?"
1080 INPUT AS
1090 IF ASCII(1)='N' THEN 1150
1100 PRINT "I AM THINKING OF A THREE DIGIT NUMBER. YOU CAN GUESS WHAT"
1110 PRINT "NUMBER I HAVE IN MIND AND I WILL TELL YOU."
1120 PRINT "PICOC - ONE DIGIT IS IN THE 'WRONG PLACE' "
1130 PRINT "FERMI - ONE DIGIT IS IN THE CORRECT PLACE"
1140 PRINT "BAGELS - NO DIGIT IS CORRECT"
1150 FOR I=1 TO 3
1160 A$=INT(18*RND(0))
1170 FOR J=1 TO T-1
1180 IF AC(J)=AS(J) THEN 1160
1190 NEXT J
1200 NEXT I
1210 IF A(J)<#BC(J) THEN 1460
1220 FOR J=1 TO 3
1230 IF A(J)<#BL(J) THEN 1490
1240 FOR J=1 TO 3
1250 IF A(J)<#BC(J) THEN 1460
1260 FOR J=1 TO 3
1270 IF AC(J)<#BL(J) THEN 1490
1280 FOR J=1 TO 3
1290 IF AC(J)<#BC(J) THEN 1460
1300 PRINT TAB(22);"WHAT?",J
1310 GOTO 1230
1320 BL(J)=C-1
1330 NEXT J
1340 IF BC(1)<#BL(2) OR BC(2)<#BL(3) OR BC(3)<#BL(1) THEN 1650
1350 C=D=0
1360 FOR J=1 TO 2
1370 IF AC(J)<#BL(J+1) THEN 1390
1380 C=C-1
1390 IF AC(J)<#BL(J) THEN 1410
1400 C=C-1
1410 IF AC(J)<#BL(3) THEN 1440
1420 C=C-1
1430 IF AC(3)<#BL(1) THEN 1460
1440 C=C+1
1450 FOR J=1 TO 3
1460 IF A(J)<#BL(J) THEN 1490
1470 IF A(J)<#BL(J) THEN 1490
1480 D=D+1
1490 NEXT J
1500 PRINT "OH WELL"
1510 GO TO 1700
1520 FOR J=1 TO C
1530 PRINT "...PICO .."
1540 NEXT J
1550 FOR J=1 TO D
1560 PRINT "...FERMI .."
1570 NEXT J
1580 PRINT "...BAGELS.."
1590 PRINT "OH WELL"
1600 NEXT I
1610 PRINT "TRY GUESsing A THREE DIGIT NUMBER."
1620 GO TO 1700
1630 PRINT "OH. I FORGOT TO TELL YOU THAT THE NUMBER I HAVE IN MIND."
1640 GO TO 1230
1650 PRINT "OH. I FORGOT TO TELL YOU THAT THE NUMBER I HAVE IN MIND."
1660 PRINT "HAS NO TWO DIGITS THE SAME."
1670 GO TO 1230
1680 PRINT "YOU GOT IT."
1690 YAY+1
1700 PRINT "AGAIN"
1710 INPUT AS
1720 IF AS(1,1)='Y' THEN 1150
1730 IF Y=0 THEN 1750
1740 PRINT "A 'Y'- POINT BAGELS BUFF."
1750 END

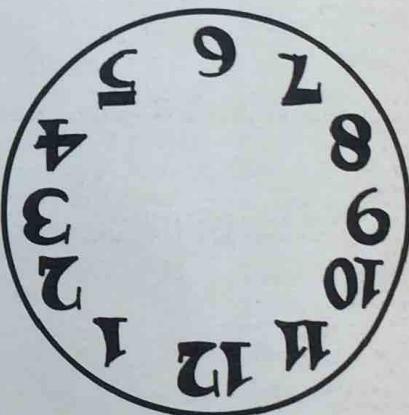
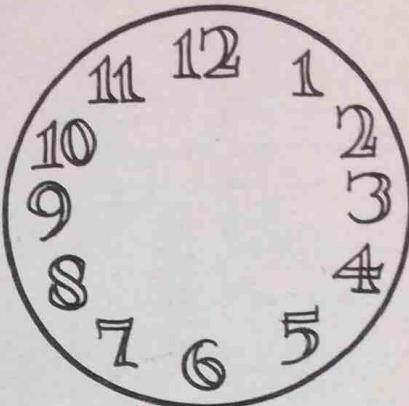
```

# CLOCKS

```

1000 REM - CLOCKS
1020 REM - PEOPLES COMPUTER CENTER , MENLO PARK , CA.
1040 REM - CONCEPT : BOB ALRECHT
1060 REM - PROGRAMER : RAY COOP
1080 REM - THANKS TO PETE SESSIONS AND GREG YOB
1100 REM - **** 3/5/73 ****
1120 PRINT "DO YOU WANT INSTRUCTIONS?"
1140 INPUT QS[1,1]
1160 IF QS="N" THEN 1620
1180 REM *****INTRO*****
1200 PRINT ""
1220 PRINT "I'M THINKING OF A TIME BETWEEN 0:01 (1 MIN.AFTER MIDNIGHT)"
1240 PRINT "AND 12:00 NOON. YOUR JOB IS TO TRY TO GUESS THE TIME I'M"
1260 PRINT "THINKING OF ."
1280 PRINT
1300 PRINT "AFTER YOU ENTER YOUR GUESS ,A SET OF CODE WORDS WILL"
1320 PRINT "TELL YOU HOW FAR YOUR GUESS IS FROM MY TIME."
1340 PRINT
1360 PRINT "CODE WORDS :"
1380 PRINT " MEGA - HOURS CORRECT."
1400 PRINT " KILO - MINUTES CORRECT."
1420 PRINT " HECTO - HOURS OFF BY AT MOST + OR - 2."
1440 PRINT " DECA - MIN. OFF BY AT MOST + OR - 2."
1460 PRINT " DECI - HOURS OFF BY AT MOST + OR - 5."
1480 PRINT " CENTI - MIN. OFF BY AT MOST + OR - 5."
1500 PRINT " MILLI - MIN. OFF BY AT MOST + OR - 10."
1520 PRINT " MICRO - MIN. OFF BY AT MOST + OR - 20."
1540 PRINT " BLA - COMPLETELY OFF IN HOURS OR MIN."
1560 PRINT
1580 PRINT " FORMAT = HH:MM OR H:MM ONLY."
1600 PRINT ""
1620 D=INT(RND(0)*720)+1
1640 D=INT(D/60)
1660 E=D1-D*60
1680 IF D=12 AND E=1 THEN 1620
1700 PRINT "O.K. I HAVE THOUGHT OF A TIME."
1720 DIM A[4]
1740 MAT A=ZER
1760 DIM TS[10]
1780 R=M=0
1800 DIM CS[72]
1820 DIM QS[1]
1840 TS="0123456789"
1860 DIM DS[10]
1880 REM ****INPUT*****
1900 IF M>0 THEN 1960
1920 T=13
1940 GOTO 1980
1960 T=0
1980 PRINT TAB(T)" YOUR GUESS":'
2000 INPUT CS
2020 R=R+1
2040 M=M+1
2060 REM ****PARSER*****
2080 LET I=1
2100 LET J=1
2120 DS=""
2140 IF I>LEN(CS) THEN 2280
2160 IF CS[I,1]="" THEN 2240
2180 IF CS[I,1]="" THEN 2240
2200 DS[J,J]=CS[I,I]
2220 J=J+1
2240 I=I+1
2260 GOTO 2140
2280 IF LEN(DS)=4 THEN 2360
2300 CS[1,1]="""
2320 CS[2]=DS
2340 DS=CS
2360 FOR I=1 TO 4
2380 QS=DS[I,I]
2400 FOR J=1 TO 10
2420 IF QS=TS[J,J] THEN 2460
2440 A[I]=J-1
2460 NEXT J
2480 NEXT I
2500 REM ****CONVERTED INPUT TIME*****
2520 A5=10*A[1]+A[2]
2540 A6=10*A[3]+A[4]
2560 REM ****CODE WORDS*****
2580 REM ****HOURS*****
2600 IF A5=D AND A6=E THEN 3240
2620 IF A5=D THEN 2820
2640 F=ABS(A5-D)
2660 IF F<3 THEN 2780
2680 IF F<6 THEN 2740
2700 PRINT "BLA "
2720 GOTO 2860
2740 PRINT "DEC1 "
2760 GOTO 2860
2780 PRINT "HECTO"
2800 GOTO 2860
2820 PRINT "MEGA "
2840 REM ****MINUTES*****
2860 IF A6=E THEN 3180
2880 G=ABS(A6-E)
2900 IF G<3 THEN 3140
2920 IF G<6 THEN 3100
2940 IF G<11 THEN 3060
2960 IF G<21 THEN 3020
2980 PRINT " BLA "
3000 GOTO 1880
3020 PRINT " MICRO"
3040 GOTO 1880
3060 PRINT " MILLI"
3080 GOTO 1880
3100 PRINT " CENTI"
3120 GOTO 1880
3140 PRINT " DECA"
3160 GOTO 1880
3180 PRINT " KILO "
3200 GOTO 1880
3220 REM ****HUMAN ELEMENT*****
3240 PRINT "***** YOU GOT IT!!!!!!"

```



```

3260 IF R=1 THEN 3460
3280 IF R<5 THEN 3400
3300 IF R<10 THEN 3360
3320 PRINT "FINALLY, AFTER"JR;" GUESSES YOU GOT IT!"
3340 GOTO 3420
3360 PRINT " "R;"GUESSES THAT'S ABOUT PAR FOR THE COURSE."
3380 GOTO 3420
3400 PRINT R;"GUESSES: AREN'T WE GETTING GOOD!?"
3420 PRINT "TRY TO BETTER YOUR SCORE NEXT TIME .."
3440 GOTO 3600
3460 PRINT "INCREDIBLE , YOU GOT IT IN ONE GUESS , THAT'S A"
3480 PRINT "PERFECT SCORE."
3500 PRINT "WE WOULD LIKE TO TELL YOU THAT: "
3520 PRINT " THE WORLD IS PROUD OF YOU."
3540 PRINT " YOUR COUNTRY IS PROUD OF YOU."
3560 PRINT " DYMIX IS PROUD OF YOU."
3580 PRINT " AND MOST OF ALL I'M PROUD OF YOU."
3600 PRINT ""
3620 PRINT "ONE MORE TIME"
3640 INPUT QS
3660 IF QS="Y" THEN 1620
3680 PRINT ""
3700 PRINT "SEE YOU LATER"
3720 END

```

# QUADGT

```

10 DIM A$(5),D$(10)
20 D$="0123456789"
30 DEF FNA(X)=INT(10*RND(1))
40 PRINT "DO YOU WANT TO SEE THE INSTRUCTIONS?"
50 INPUT AS
60 IF AS[1,1]!="Y" THEN 100
70 IF AS[1,1]!="N" THEN 280
80 PRINT "I SAID, !"
90 GOTO 40
100 PRINT "THIS GAME IS PLAYED AS FOLLOWS:"
110 PRINT
120 PRINT "I WILL CHOOSE A 4 DIGIT NUMBER. NO TWO DIGITS WILL BE THE SAME."
130 PRINT "YOUR JOB WILL BE TO FIGURE OUT WHAT DIGITS I PICKED."
140 PRINT
150 PRINT "MAKE YOUR GUESS BY ENTERING A 4 DIGIT NUMBER. I WILL"
160 PRINT "RESPOND WITH A 2 DIGIT NUMBER. MY RESPONSE INDICATES TWO"
170 PRINT "THINGS. FIRST, I TELL YOU HOW MANY DIGITS YOU GUessed ARE"
180 PRINT "IN THE NUMBER I CHOSE. SECOND, I TELL YOU HOW MANY DIGITS"
190 PRINT "ARE PLACED IN THE CORRECT POSITION WITHIN THE CHOSEN"
200 PRINT "NUMBER."
210 PRINT
220 PRINT "FOR EXAMPLE, IF YOU GUESS 1463 AND I RESPOND WITH"
230 PRINT "31 THEN YOU GOT 3 OF THE DIGITS WHICH APPEAR IN THE"
240 PRINT "ANSWER BUT ONLY ONE DIGIT IS IN THE CORRECT POSITION."
250 PRINT "THUS, THE NUMBER I CHOSE COULD POSSIBLY BE 0364."
260 PRINT
270 PRINT "THE EXPERIENCED PLAYER WILL AVERAGE 5 OR 6 GUESSES PER GAME."
280 PRINT "ENTER YOUR FIRST 4 DIGIT GUESS."
290 A[1]=FNA(1)
300 FOR I=2 TO 4
310 A[I]=FNA(1)
320 FOR J=1 TO I-1
330 IF A[I]=A[J] THEN 310
340 NEXT J
350 NEXT I
360 L=0
370 ENTER 255,I,A$
380 IF I#256 THEN 410
390 PRINT LIN(1),"THINK A LITTLE FASTER, PLEASE."
400 GOTO 370
410 IF LEN(A$)=4 THEN 440
420 PRINT LIN(1),"ENTER EXACTLY 4 DIGITS"
430 GOTO 370
440 FOR I=1 TO 4
450 FOR J=0 TO 9
460 IF A$[I,I]#D$(J+1,J+1) THEN 490
470 N[I]=J
480 GOTO 530
490 NEXT J
500 PRINT USING 510;LIN(1),A$(I,I)
510 IMAGEA,X,"IS AN ILLEGAL CHARACTER. TRY AGAIN"
520 GOTO 370
530 NEXT I
540 FOR I=1 TO 3
550 FOR J=I+1 TO 4
560 IF A$[I,I]#A$[J,J] THEN 600
570 PRINT USING 580;LIN(1),A$(I,I)
580 IMAGEA,X,"APPEARS MORE THAN ONCE. TRY AGAIN"
590 GOTO 370
600 NEXT J
610 NEXT I
620 M1=M2=0
630 FOR I=1 TO 4
640 FOR J=1 TO 4
650 IF N[I]#A[J] THEN 700
660 M1=M1+1
670 IF I#J THEN 710
680 M2=M2+1
690 GOTO 710
700 NEXT J
710 NEXT I
720 PRINT USING "D,D";SPA(5),M1,M2
730 L=L+1
740 IF M2#4 THEN 800
750 PRINT USING 760;L
760 IMAGE #, "YOU GOT IT IN ", 2D, " GUESSES. PLAY ANOTHER GAME"
770 INPUT AS
780 IF AS[1,1]!="Y" THEN 280
790 STOP
800 IF L=19 THEN 1000
810 IF L#12 AND L#15 AND L#18 THEN 370
820 ENTER 3-I,A$
830 IF I=256 THEN 410
840 PRINT
850 IF L=15 THEN 910
860 IF L=18 THEN 950
870 PRINT "YOU ARE OBVIOUSLY A BEGINNER. HERE'S A HINT."
880 PRINT USING 890;A[1]
890 IMAGE "THE FIRST DIGIT IS A "D
900 GOTO 370
910 PRINT "I'M BEGINNING TO LOSE MY PATIENCE."
920 PRINT USING 930;A[1],A[2]
930 IMAGE "THE FIRST TWO DIGITS ARE ",D,D,"IF YOU CAN'T GET IT NOW, GIVE IT UP."
940 GOTO 370
950 PRINT "HERE'S AN IDEA. I'LL PRINT IT OUT."
960 PRINT "SEE IF YOU CAN TYPE IT BACK IN: "
970 PRINT USING 980;A[1],A[2],A[3],A[4]
980 IMAGE D,D,D,D
990 GOTO 370
1000 PRINT "I QUIT. GO PLAY SOME OTHER GAME. BETTER YET, LOG OFF."
1010 STOP
1020 END

```

8925

3946

2057

9368

7958

4803

1847

6789

119

# BUTTON

```
10 REM *** BUTTON, BUTTON, WHO'S GOT THE BUTTON ? ***
20 REM *** WRITTEN BY DAVE KAUFMAN * AUGUST 1973 ***
30 REM *** PEOPLE'S COMPUTER COMPANY ***
40 REM *** 1919 NEHALTO AVENUE, MENLO PARK, CA. 94025 ***
50 REM FN(X)=X MODULO 7
60 REM FN(X)=(X=0)*7+(X>0 AND X<6)*X+(X=8)*1
70 DEF FN(X)=FN((X+SGN(RND(0))-5))
80 PRINT "WANT THE RULES ? (1 MEANS YES, 0 NO) ?";
90 INPUT X
100 IF X=0 THEN 200
110 GOSUB 1000
120 REM *** GAME STARTS HERE ***
130 REM B IS THE ONE WITH THE BUTTON
140 B=INT(RND(0)*7)+1
150 PRINT
160 PRINT
170 REM *** GUESSING STARTS HERE ***
180 REM G IS PLAYER'S GUESS
190 PRINT "WHO DO YOU GUESS HAS IT?";
200 INPUT G
210 IF G=0 THEN 9999
220 IF G=8 THEN 500
230 IF G=FN(B+1) OR G=FN(B-1) THEN 450
240 IF G>0 AND G<8 THEN 400
250 PRINT "SILLY - THERE'S NO ONE HERE BY THAT NUMBER"
260 PRINT "TRY AGAIN ... "
270 GOTO 320
280 REM *** PLAYER'S GUESS HASN'T GOT IT NOR DOES HIS NEIGHBOR ***
290 PRINT G;" : 'WHO, ME?''"
300 PRINT
310 PRINT "WHOEVER HAS IT, KEEPS IT"
320 GOTO 300
330 REM *** PLAYER'S GUESS DOESN'T HAVE IT, BUT HIS NEIGHBOR DOES ***
340 PRINT G;" : 'MY NEIGHBOR HAS IT'''"
350 PRINT
360 PRINT
370 PRINT "... BUT WHOEVER HAS IT, PASSES IT"
380 B=FN(B)
390 GOTO 300
400 REM *** A WINNER !
410 PRINT G;" : 'RIGHT YOU ARE - LUCKY !!!'"
420 PRINT
430 PRINT
440 PRINT "DO YOU WANT TO PLAY AGAIN ? (1 MEANS YES, 0 NO) ?";
450 INPUT X
460 IF X=1 THEN 200
470 STOP
480 REM *** THE INTRO ***
490 PRINT
500 PRINT "BUTTON, BUTTON, WHO'S GOT THE BUTTON?"
510 PRINT
520 PRINT "SEVEN FRIENDS ARE SITTING IN A CIRCLE"
530 PRINT
540 PRINT "AND YOU'RE IN THE CENTER"
550 PRINT
560 PRINT
570 PRINT
580 PRINT
590 PRINT
600 PRINT "    1"
610 PRINT "    2"
620 PRINT "    3"
630 PRINT "    4"
640 PRINT "    5"
650 PRINT "    6"
660 PRINT "    7"
670 PRINT
680 PRINT
690 PRINT
700 PRINT "SOMEONE HAS THE BUTTON AND YOU HAVE TO GUESS WHO"
710 PRINT
720 PRINT "AFTER YOU GUESS, HE CAN PASS THE BUTTON (IF HE WANTS TOO)"
730 PRINT "BUT ONLY TO SOMEONE NEXT TO HIM IN THE CIRCLE"
740 PRINT
750 PRINT "IF YOU WANT TO STOP, TYPE 0 (ZERO)"
760 PRINT
770 PRINT "GOOD LUCK!!!"
780 RETURN
9999 END
```

# LETTER

# Word Games

```

100 REM *** LETTER - A LETTER GUESSING GAME ***
110 REM *** COPYRIGHT PEOPLE'S COMPUTER COMPANY ***
120 REM *** P.O. BOX 310, MENLO PARK CA 94025
130 DIM AS[26], GS[26], LS[1]
140 LET AS="ABCDEFGHIJKLMNPQRSTUVWXYZ"
150 REM *** PRINT INSTRUCTIONS ON HOW TO PLAY
160 PRINT "I WILL THINK OF A LETTER FROM A TO Z."
170 PRINT "TRY TO GUESS MY LETTER. AFTER EACH GUESS, I WILL"
180 PRINT "TELL YOU IF YOU GUessed MY LETTER OR IF YOUR GUESS"
190 PRINT "IS TOO HIGH OR TOO LOW. THE LOWEST LETTER IS 'A'"
200 PRINT "AND THE HIGHEST LETTER IS 'Z'."
210 PRINT
220 PRINT "IF YOU WISH, THINK OF THE LETTERS FROM 'A' TO 'Z' ARRANGED IN A TOTEM POLE WITH 'A' ON THE BOTTOM AND 'Z' ON THE TOP. IF I TELL YOU TO TRY A HIGHER LETTER, TRY ONE CLOSER TO THE TOP OF THE TOTEM POLE. IF I TELL YOU TO TRY A LOWER LETTER, TRY ONE CLOSER TO THE BOTTOM OF THE TOTEM POLE. ENJOY!!!"
230 LET X=INT(26*RND(0))+1
240 LET LS=AS(X,X)
250 PRINT "OK, I HAVE A LETTER. START GUESsing."
260 REM *** ASK FOR A GUESS
270 INPUT GS
280 REM *** IF GUESS IS NOT A LETTER, TRY AGAIN
290 FOR K=1 TO 26
300 IF GS<>AS(K,K) THEN 440
310 NEXT K
320 PRINT "HEY!!! THAT'S NOT A SINGLE LETTER. PLAY FAIR, NOW!!"
330 GOTO 340
340 REM *** COMPARE GUESS WITH COMPUTER'S LETTER
350 IF GS=LS THEN 510
360 IF GS>LS THEN 480
370 PRINT "TOO LOW. TRY A HIGHER LETTER."
380 GOTO 340
390 PRINT "TOO HIGH. TRY A LOWER LETTER."
400 GOTO 340
410 REM *** HUMAN HAS GUessed THE COMPUTER'S LETTER
420 PRINT "YOU GOT IT!!! LET'S PLAY AGAIN."
430 GOTO 290
440 END

```

## ABAGEL

```

100 REM GUESS A THREE LETTER WORD
110 DIM WS[10], GS[10]
120 REM PRINT INSTRUCTIONS
130 PRINT "ALL THE WORDS I KNOW HAVE THREE LETTERS IN THEM.."
140 PRINT "I WILL THINK OF A WORD, AND YOU TRY TO GUESS IT."
150 PRINT "EACH TIME, JUST TYPE A THREE LETTER WORD (OF YOUR OWN)."
160 PRINT "AND SEE WHAT I SAY."
170 PRINT
180 PRINT "'BAGELS' MEANS NONE OF YOUR LETTERS ARE IN MY WORD."
190 PRINT "BUT FOR EACH LETTER THAT IS IN MY WORD TOO, I WILL SAY,"'
200 PRINT "'FERMI' IF IT'S IN THE RIGHT POSITION, OR 'PICO'."'
210 PRINT "IF IT'S IN A DIFFERENT POSITION."
220 PRINT
230 PRINT "BUT I WON'T TELL YOU WHICH LETTERS I MEAN - YOU HAVE TO."
240 PRINT "USE YOUR HEAD TO FIGURE THAT OUT !"
250 REM READ THE WORD TO BE GUESSED
260 READ N
270 RESTORE
280 READ R
290 LET R=INT(N*RND(0))+1
300 FOR K=1 TO R
310 READ WS
320 NEXT K
330 READ WS
340 IF WS[1,1]=WS[2,2] THEN 380
350 IF WS[1,1]=WS[3,3] THEN 380
360 PRINT
370 PRINT "O-K. I HAVE A WORD."
380 PRINT
390 REM INPUT A GUESS
400 INPUT GS
410 PRINT "WHAT IS YOUR GUESS?"
420 INPUT GS
430 IF LEN(GS)=3 THEN 470
440 PRINT "MY WORD HAS THREE LETTERS."
450 GOTO 410
460 IF GS[1,1]=GS[2,2] THEN 510
470 IF GS[1,1]=GS[3,3] THEN 510
480 IF GS[2,2]=GS[3,3] THEN 510
490 GOTO 600
500 PRINT "NO TWO LETTERS ARE THE SAME."
510 GOTO 410
520 REM COMPARE GUESS WITH COMPUTER'S WORD
530 LET F=0
540 LET P=0
550 FOR J=1 TO 3
560 FOR K=1 TO 3
570 IF GS[J,J]<>WS[K,K] THEN 720
580 IF JK THEN 700
590 PRINT "PICO "
600 LET P=P+1
610 GOTO 720
620 PRINT "FERMI "
630 LET F=F+1
640 NEXT K
650 NEXT J
660 IF F>P THEN 770
670 PRINT "BAGELS "
680 PRINT
690 GOTO 400
700 IF F=3 THEN 800
710 PRINT
720 GOTO 400
730 REM HUMAN HAS GUessed THE WORD
740 PRINT
750 PRINT "YOU GOT IT! MY WORD IS : WS"
760 PRINT
770 GOTO 300
780 REM HERE ARE THE WORDS
790 DATA 47
800 DATA "POT", "APT", "WIN", "RUN", "LIP", "PET", "ART", "CUP"
810 DATA "PUN", "CAT", "MAP", "LAP", "OUT", "DOT", "ARE", "FOR"
820 DATA "AND", "BUT", "TUR", "CRY", "LET", "WED", "LED", "IRK"
830 DATA "SKY", "CUE", "TEN", "NET", "SAW", "WAS", "CUT", "THE"
840 DATA "FAR", "YOU", "HIM", "HER", "ERG", "ALP", "INK", "PEN"
850 DATA "PIN", "DIG", "DEW", "AMP", "WHY", "SUN", "SON", "OPT"
860 END

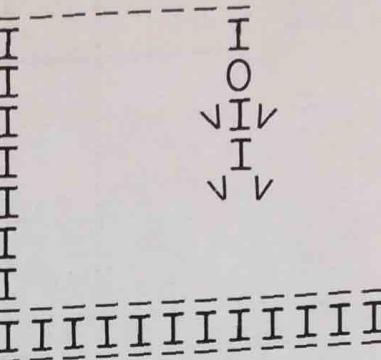
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# HANGMAN

```

10 REM **HANGMN** MULTI-LANGUAGE HANGMAN GAME
20 REM AUTHOR: LOWELL VON EGGER 02/16/73
30 FILES *
40 DIM BS[27],WS[14],PS[14],US[27],WL[100],GS[4]
50 Z=D=0
60 PRINT "DO YOU WANT INSTRUCTIONS (YES OR NO)?"
70 INPUT BS
80 IF BS$="NO" THEN 220
80 IF BS$="YES" THEN 60
100 PRINT " THIS IS THE GAME OF HANGMAN. YOU CHOSE THE"
110 PRINT "LANGUAGE THAT YOU WANT TO PLAY IN, AND I THINK"
120 PRINT "OF A WORD IN THAT LANGUAGE. YOU TRY TO GUESS, LETTER"
130 PRINT "BY LETTER, WHAT THE WORD IS. SIMPLE HUH?"
140 PRINT " WHEN I THINK OF A WORD, I WILL PRINT A LINE OF"
150 PRINT "DASHES WHICH CORRESPONDS TO THE NUMBER OF LETTERS IN"
160 PRINT "THE WORD."
170 PRINT " IF YOU GIVE UP, TYPE 'GIVE'. IF YOU WANT TO QUIT,"
180 PRINT "SIMPLY TYPE 'QUIT'."'
190 PRINT " A FEW SPECIAL INSTRUCTIONS:"
200 PRINT "SPANISH - THE ' IS COUNTED AS ONE LETTER, AND THE"
210 PRINT "-CH- IS COUNTED AS TWO."
220 PRINT "IN WHAT LANGUAGE WOULD YOU LIKE TO PLAY?"
230 PRINT "(ENGLISH, FRENCH, SPANISH, OR GERMAN)"
240 BS="""
250 INPUT BS
260 ASSIGN BS[1,6],1,A
270 IF A#3 THEN 300
280 PRINT "THE "JS[2]" LANGUAGE IS NOT AVAILABLE. TRY AGAIN."
290 GOTO 230
300 PRINT "HAVE FUN!!"
310 READ #1,IM1
320 Z=Z+1
330 IF Z>M1 THEN 1340
340 W=INT(M1*RND(1)+1)
350 FOR A=1 TO Z-1
360 IF WA=A THEN 340
370 NEXT A
380 WZ=Z
390 PS=0
400 READ #1,IM1
410 FOR A=1 TO W
420 READ #1,WS
430 NEXT A
440 PS="""
450 FOR A=1 TO LEN(WS)
460 PS[A,A]="-"
470 NEXT A
480 PRINT "THE WORD IS "JS
490 BS$="ABCDEFIGHJKLMNOPQRSTUVWXYZ"
500 US="""
510 PRINT "YOUR GUESS??""
520 R=0
530 ENTER 30,A,GS
540 PRINT
550 IF GS$="GIVE" THEN 1100
560 IF GS$="QUIT" THEN 1310
570 GS=G$[1,1]
580 IF AA=256 THEN 610
590 PRINT "HURRY UP!"
600 GOTO 510
610 FOR A=1 TO 27
620 IF GS$=BS[A,A] THEN 660
630 NEXT A
640 PRINT "THAT IS NOT A VALID CHARACTER."
650 GOTO 510
660 C=A
670 FOR A=1 TO LEN(US)
680 IF GS$=US[A,A] THEN 710
690 NEXT A
700 GOTO 730
710 PRINT "YOU HAVE ALREADY USED THAT LETTER. GUESS AGAIN."
720 GOTO 510
730 US[A,A]=GS
740 FOR A=1 TO LEN(WS)
750 IF GS$=WS[A,A] THEN 1120
760 NEXT A
770 IF R#0 THEN 1170
780 PRINT "WRONG."
790 M=M+1
800 PRINT "-----I"
810 PRINT "I 0"
820 GOTO M OF 1030,840,860,880,900
830 GOTO 920
840 PRINT "I "
850 GOTO 930
860 PRINT "I /"
870 GOTO 930
880 PRINT "I /I"
890 GOTO 930
900 PRINT "I \I"
910 GOTO 930
920 PRINT "I \I\"
930 IF M>7 THEN 1030
940 PRINT "I "
950 GOTO M-6 OF 1030,960,980,1000,1020
960 PRINT "I /"
970 GOTO 1030
980 PRINT "I / \"
990 GOTO 1030
1000 PRINT "I \ \"
1010 GOTO 1030
1020 PRINT "I \ \ \"
1030 FOR A=1 TO 5-P
1040 PRINT "I "
1050 NEXT A
1060 PRINT "-----IIIIIIIIII-----"
1070 IF M#1 AND M#6 AND M#7 THEN 1090
1080 P=P+1
1090 IF M<11 THEN 1240
1100 PRINT "YOU HAVE JUST BEEN HUNG."
1110 GOTO 1220
1120 IF R=1 THEN 1140
1130 PRINT "RIGHT!""
1140 PS[A,A]=GS

```



## File

```

10 REM *** HANGFL *** THIS PROGRAM SETS UP FILES FOR * HANGMN *
20 REM *** FIRST, OPEN THE FILES YOU NEED. ***
30 REM *** A 2-RECORD FILE CAN HOLD ABOUT 80 10-LETTER WORDS, ***
40 REM *** OR 50 15-LETTER WORDS ***
50 REM *** HANGMN EXPECTS THESE FILES: ENGLIS, FRENCH, SPANIS, GERMAN
1000 DIM AS[72],FS[26]
1010 FILES *
1100 PRINT "WHICH HANGMAN FILE ?"
1110 INPUT FS
1120 ASSIGN FS[1,6],1,A
1130 IF A#3 THEN 1200
1140 PRINT FS;" DOESN'T EXIST; WHEN THE PROGRAM ENDS, TYPE"
1150 PRINT
1160 PRINT "OPEN-";FS[1,6];",2"
1170 STOP
1200 PRINT
1210 PRINT "HOW MANY WORDS ?"
1220 INPUT W9
1230 PRINT #1,1,W9
1240 FOR W0=1 TO W9
1250 PRINT "WORD #";W0,
1260 INPUT AS
1270 PRINT #1,AS
1280 NEXT W0
1300 PRINT
1310 PRINT "THAT'S IT FOR "JS
1320 PRINT "ANOTHER HANGMAN FILE ?"
1330 INPUT AS
1340 IF AS[1,1]="Y" THEN 1100
9999 END

1150 R=1
1160 GOTO 760
1170 FOR A=1 TO LEN(PS)
1180 IF PS[A,A]="-" THEN 1240
1190 NEXT A
1200 PRINT "YOU GOT IT!!!"
1210 D=D+1
1220 PRINT "THE WORD WAS "JS
1230 GOTO 1270
1240 PRINT "THE WORD IS "JS
1250 PRINT "YOU HAVE USED ";US
1260 GOTO 510
1270 PRINT "WOULD YOU LIKE TO PLAY AGAIN (YES OR NO)?"
1280 INPUT BS
1290 IF BS$="YES" THEN 320
1300 IF BS$="NO" THEN 1270
1310 PRINT "YOU TOOK ";LEN(US); "GUESSES."
1320 PRINT "YOU WERE HUNG";Z-D;"TIME(S)."
1330 GOTO 1370
1340 PRINT "SORRY, BUT I'M OUT OF WORDS. IF YOU WANT TO START"
1350 PRINT "OVER, RERUN THE PROGRAM. THE WORDS WILL BE THE SAME."
1360 PRINT "BUT THEY WILL BE IN A DIFFERENT ORDER."
1370 PRINT "COME AGAIN SOON... IT WAS FUN!"
1380 END

```

```

10 REM *** MADLIBS *** WRITTEN BY DAVE KAUFMAN, AUGUST '74
20 REM *** COPYRIGHT, PEOPLE'S COMPUTER CO. ***
30 REM *** 1919 MENALTO AVE, MENLO PARK, CA 94025 ***
40 REM
100 REM * DECLARE STRING VARIABLES
110 REM * AS TO OS ARE USED BY THE STORIES FOR PLAYER INPUT
112 REM * XS AND YS ARE USED BY THE MAIN PROGRAM
120 DIM AS[30],BS[30],CS[30],DS[30],ES[30],FS[30],GS[30],HS[30],IS[30]
130 DIM JS[30],KS[30],LS[30],MS[30],NS[30],OS[30]
140 DIM XS[72],YS[72]
150 REM * Q HOLDS A QUEUE OF STORIES, WAITING TO BE USED.
152 REM   Q(1,1)    Q(1,2)
154 REM   Q(2,1)    Q(2,2)
156 REM   Q(3,1)    Q(3,2)
158 REM   Q(4,1)    Q(4,2)
160 REM
162 REM * THE FIRST COLUMN HOLDS THE STORY #S IN THE 'READY' QUEUE
164 REM * (THE NEXT RANDOM STORY GETS CHOSEN FROM THIS QUEUE)
166 REM * AND THE SECOND COLUMN HOLDS THE 'WAIT' QUEUE
168 REM * (WHEN A STORY IS CHOSEN FROM THE 'READY' QUEUE, IT GETS
170 REM * PUT INTO THE 'WAIT' QUEUE NEXT, AND WAITS ITS TURN. THE
172 REM * 'WAIT' QUEUE MOVES UP IN ORDER, THE TOP ONE GOING INTO
174 REM * THE 'READY' QUEUE)
180 DIM Q(4,2)
190 GOSUB 600
200 REM * TALK TO PERSON AND FIND OUT WHICH STORY TO USE
210 PRINT "HELLO. THIS IS THE MADLIB PROGRAM TYPING."
220 PRINT
230 PRINT "THERE ARE SEVERAL STORIES IN THIS PROGRAM. YOU CAN"
240 PRINT "GET ONE PICKED AT RANDOM, OR CHOOSE ONE YOURSELF."
250 PRINT
260 PRINT "WHICH DO YOU WANT - CHOOSE OR RANDOM"
270 INPUT XS
280 IF XS$(1,1)="C" THEN 400
290 IF XS$(1,1)="R" THEN 300
292 PRINT "'CHOOSE' MEANS YOU PICK A STORY (YOU CAN ASK FOR A MENU)"
294 PRINT "'RANDOM' MEANS YOU WON'T KNOW WHAT YOU'RE GETTING"
296 GOTO 260
300 REM * THIS SECTION PICKS A RANDOM STORY FROM THE 'READY' QUEUE
302 REM * BEFORE RUNNING THE STORY, IT UPDATES THE 'WAIT' QUEUE
304 REM * SO THIS STORY WON'T BE CHOSEN AGAIN FOR AWHILE
310 Q0=INT(4*RND(0))+1
320 S=Q(0,1)
330 GOSUB 800
340 GOSUB 900
350 GOTO 250
400 REM * THIS SECTION ASKS THE PERSON TO CHOOSE A STORY
410 PRINT
412 PRINT "WHICH STORY NUMBER (TYPE A 0 TO GET A MENU)"
414 INPUT S
416 IF S#0 THEN 420
418 GOSUB 700
419 GOTO 410
420 IF S <= S9 AND S >= 1 AND INT(S)=S THEN 438
422 PRINT "SORRY, BUT THAT AIN'T A STORY NUMBER"
424 PRINT "(HINT: TYPE A 0 TO GET THE FULL LIST)"
426 GOTO 412
430 REM & NOW, FIX THE 'READY' AND 'WAIT' QUEUES
432 REM FIRST, SEE IF IT'S IN THE 'READY' QUEUE
440 FOR Q0=1 TO 4
442 IF Q(0,1)=S THEN 470
444 IF Q(0,0,1)=S THEN 470
446 NEXT Q0
450 REM STORY NUMBER ISN'T THERE, SO CHECK THE 'WAIT' QUEUE
452 FOR Q0=1 TO 4
454 IF Q(0,2)=S THEN 460
456 NEXT Q0
460 FOR Q1=0 TO 3
462 Q(0,2)=Q(0,1)+1,2]
464 IF Q(0,2)=0 THEN 468
466 NEXT Q1
468 Q(0,2)=S
469 GOTO 480
470 REM FOUND STORY # IN 'READY' QUEUE, SO CALL THE REGULAR SUBROUTINE!
472 GOSUB 800
480 REM NOW THAT THE QUEUES HAVE BEEN UPDATED, RUN STORY, THEN LOOP BAB
490 GOSUB 900
492 GOTO 250
500 REM *** SUBROUTINES START HERE ***
510 REM * THIS SUBROUTINE RESTORES THE DATA POINTER TO A PARTICULAR STB
520 REM S IS THE # OF THE STORY TO READ FROM
530 GOTO S OF 540,544,548,552,556,560,564,566
540 RESTORE 1000
542 RETURN
544 RESTORE 2000
546 RETURN
548 RESTORE 3000
550 RETURN
552 RESTORE 4000
554 RETURN
556 RESTORE 5000
558 RETURN
560 RESTORE 6000
562 RETURN
564 RESTORE 7000
566 RETURN
568 RESTORE 8000
570 RETURN
580 REM * THIS SUBROUTINE READS THE STORY NUMBERS INTO MAT 0
590 REM * AND FINDS THE TOTAL # OF STORIES
610 REM S9 IS THE TOTAL # OF STORIES
620 MAT Q=ZER
622 FOR S=1 TO 8
624 GOSUB 500
626 READ YS
628 IF YS="#" THEN 640
630 Q(S-4*INT(S/5),1+INT(S/5))=S
632 NEXT S
640 S9=S-1
650 IF S9<5 THEN 670
660 RETURN
670 PRINT "THERE MUST BE AT LEAST 5 STORIES IN THIS PROGRAM."
680 PRINT "ALL THERE ARE IS"IS9"STORIES. BYE !"
690 STOP
700 REM * THIS SUBROUTINE PRINTS ALL STORY TITLES

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```

710 PRINT
712 PRINT "HERE'S THE MENU :"
714 PRINT
720 FOR S=1 TO S9
722 GOSUB 500
724 READ Y$ 
726 PRINT S;Y$ 
728 NEXT S
730 RETURN
800 REM * THIS SUBROUTINE PUTS THE NUMBER OF THE CURRENT STORY ON THE
802 REM * BOTTOM OF THE 'WAIT' QUEUE. IT THEN MOVES THE STORY ON TOP
804 REM * OF THE 'WAIT' QUEUE INTO THE 'READY' QUEUE.
810 REM S IS THE NUMBER OF THE CURRENT STORY
812 REM Q0 IS ITS POSITION IN THE 'READY' QUEUE
820 Q(0,1)=Q(1,2)
830 FOR Q1=1 TO 3
832 Q(Q1,2)=Q(Q1+1,2)
834 IF Q(1,2)=0 THEN 840
836 NEXT Q1
840 Q(Q1,2)=S
850 RETURN
900 REM * THIS SUBROUTINE RUNS THE SELECTED STORY
910 GOSUB 500
911 I=0
912 REM SKIP TO QUERIES BY READING TITLE
914 READ Y$ 
920 REM FIRST, GET ALL QUERIES FOR INPUT
922 READ Y$ 
924 IF Y$="**" THEN 991
926 PRINT Y$;
928 I=I+1
930 GOTO I OF 932,936,940,944,948,952,956,960,964,968,972,976,980,984,9
932 INPUT A$
934 GOTO 990
936 INPUT B$
938 GOTO 990
940 INPUT C$
942 GOTO 990
944 INPUT D$
946 GOTO 990
948 INPUT E$
950 GOTO 990
952 INPUT F$
954 GOTO 990
956 INPUT G$
958 GOTO 990
960 INPUT H$
962 GOTO 990
964 INPUT I$
966 GOTO 990
968 INPUT J$
970 GOTO 990
972 INPUT K$
974 GOTO 990
976 INPUT L$
978 GOTO 990
980 INPUT M$
982 GOTO 990
984 INPUT N$
986 GOTO 990
988 INPUT O$
990 GOTO 920
991 REM NOW, PRINT TITLE & GOSUB THE STORY - LET IT RUN ITSELF !
992 GOSUB 500
993 READ Y$ 
994 PRINT LINE(-5);TAB((45-LEN(Y$))/2)Y$ 
995 PRINT LINE(-3)
996 GOSUB S OF 1000,2000,3000,4000,5000,6000,7000,8000
999 RETURN
1000 REM *** WEATHER ***
1002 REM * FIRST, THE TITLE
1010 DATA "WEATHER REPORT"
1020 REM * SECOND, THE QUERIES FOR INPUT
1030 DATA "GIVE ME A PLACE"
1040 DATA "GIVE ME A TEMPERATURE"
1050 DATA "NOW I NEED A VERB"
1060 DATA "WHAT IS YOUR NAME"
1099 DATA "**"
1500 REM * AND THIRD, THE STORY GETS PRINTED OUT
1502 PRINT " GOOD EVENING, TV VIEWERS. THIS IS THE EVENING"
1510 PRINT "WEATHER REPORT FOR ";A$;" AND VICINITY."
1512 PRINT
1520 PRINT "THE ";B$;" WILL BE WARM, AND THE HUMIDITY IN THE LOW"
1530 PRINT "30'S. THERE WILL BE A SLIGHT RAIN THAT WILL ";C$;
1540 PRINT "AND THAT IS ALL."
1550 PRINT
1560 PRINT " SIGNING OFF FOR KLMN-TV, THIS IS ";D$;
1999 RETURN
2000 REM *** STAR TREK ***
2002 REM * FIRST, THE TITLE
2010 DATA "STAR TREK INTRODUCTION"
2020 REM * SECOND, THE QUERIES FOR INPUT
2030 DATA "I NEED A FAMOUS NAME"
2040 DATA "WHAT WOULD YOU LIKE TO DO MOST OF ALL "
2050 DATA "LEAST OF ALL "
2060 DATA "GIVE ME A NAME"
2070 DATA "AND A DATE"
2080 DATA "A NAME OF A DISTANT PLACE"
2090 DATA "THE NAME OF YOUR BEST FRIEND"
2499 DATA "**"
2500 REM * AND THIRD, THE STORY GETS PRINTED OUT
2502 PRINT "SPACE, THE FINAL FRONTIER"
2510 PRINT "THESE ARE THE VOYAGES OF THE STARSHIP ";A$;
2520 PRINT "ITS FIVE-YEAR MISSION : ";B$;
2530 PRINT "TO SEEK OUT NEW LIFE AND NEW CIVILIZATIONS."
2540 PRINT "TO ";C$"; . . . "
2542 PRINT "TO BOLDLY GO WHERE NO MAN HAS GONE BEFORE . . . "
2550 PRINT
2560 PRINT TAB(15)";S T A R T R E K "
2570 PRINT
2580 PRINT "CAPTAIN ";D$"; CAPTAIN'S LOG, STARDATE ";E$;
2590 PRINT
2600 PRINT " WE ARE RESPONDING TO A DISTRESS CALL FROM THE"
2610 PRINT "SCIENTIFIC EXPEDITION TO ";F$;
2620 PRINT
2630 PRINT "CAPTAIN ";D$"; LIEUTENANT ";G$";, PLEASE TAKE OVER"

```

# madlib

```

2640 PRINT " THE RELN WHILE MR. SPOCK AND I BEAM DOWN"
2650 PRINT " TO INVESTIGATE."
2660 PRINT TAB(1)*" COMMERCIAL BREAK "
2670 RETURN
2680 REM *** COMPUTER TALK ***
2690 REM * FIRST, THE TITLE
2700 DATA "COMPUTER TALK"
2710 REM * SECOND, THE QUERIES FOR INPUT
2720 DATA "I NEED A WORD FOR SOMETHING BIG"
2730 DATA "GIVE ME A SHORT, SECRET MESSAGE"
2740 DATA "WHAT'S ANOTHER WORD FOR 'PREPARE' "
2750 DATA "WHO WOULD PREPARE IT"
2760 DATA "ANOTHER WORD FOR MESSAGE"
2770 DATA "A PERSON IN CHARGE IS CALLED A . . . "
2780 DATA "GIVE ME A NUMBER"
2790 DATA "ANOTHER NUMBER"
2800 DATA "SOMETHING VERY IMPORTANT"
2810 DATA "I NEED AN ACTION WORD"
2820 REM * AND THIRD, THE STORY GETS PRINTED OUT
2830 PRINT " THE 3-BIT "JBS$" GENERATES THE CONTROL SIGNALS"
2840 PRINT "FOR THE "JBS$" BY A DECODING OF THE "JCS$"."
2850 PRINT "IT IS LOADED AND "JBS$" BY A "JES$" AND THEREFORE"
2860 PRINT "THE TIMING OF I/O "JFS$" IS UNDER "JGS$"."
2870 PRINT
2880 PRINT " THERE ARE "MS$" OUTPUT MODES AND "MIS$" INPUT MODES."
2890 PRINT "THE HIGH ORDER "IS$" OF THE REGISTER IS THE INPUT FLAG."
2900 PRINT "WHEN THIS "JBS$" IS A 1-BIT, THE "JFS$" IS"
2910 PRINT "SUBSTITUTED FOR THE "JAS$", THUS PROVIDING A SOURCE"
2920 PRINT "OF DATA WHEN "JBS$" AND EXTERNAL I/O "JFS$"."
2930 RETURN
2940 REM *** HOW TO <BLANK> YOUR FIRST <BLANK> PROGRAM ***
2950 REM * FIRST, THE TITLE
2960 DATA "HOW TO <BLANK> YOUR FIRST <BLANK> PROGRAM"
2970 REM * SECOND, THE QUERIES FOR INPUT
2980 DATA "GIVE ME A VERB RELATED TO MOTION"
2990 DATA "GIVE ME A WORD WHICH MEANS APPROVAL"
3000 DATA "NOW A WORD FOR A HEAVY MACHINE"
3010 DATA "NOW ABOUT SOMETHING LIGHT"
3020 DATA "NOW A WORD FOR MECHANICAL CONNECTIONS OR FORCES"
3030 DATA "SOMETHING YOU LIKE ALOT"
3040 DATA "AND SOMETHING YOU HATE"
3050 DATA "*"
3060 REM * AND THIRD, THE STORY GETS PRINTED OUT
3070 PRINT " FIRST, YOU HAVE TO LOGON THE "JCS$". ONCE YOU"
3080 PRINT "HAVE "JES$" THE "JGS$" WORD, THEN "AS$" THE"
3090 PRINT "NOUN."
3100 PRINT
3110 PRINT " NEXT, SCRATCH THE "JCS$" AND ENTER YOUR "JDS$"."
3120 PRINT "ONCE ENOUGH "JDS$" ARE ENTERED, IT'S TIME TO"
3130 PRINT AS$" YOUR "JCS$" UNTIL YOU LOOP THE "JFS$" OR"
3140 PRINT ES$" ED YOUR "JBS$" PROGRAM."
3150 RETURN
3160 REM *** HOW TO WIN FRIENDS AND INFLUENCE PEOPLE ***
3170 REM * FIRST, THE TITLE
3180 DATA "HOW TO WIN FRIENDS AND INFLUENCE PEOPLE"
3190 REM * SECOND, THE QUERIES FOR INPUT
3200 DATA "NAME SOMETHING YOU'VE ALWAYS WANTED TO DO"
3210 DATA "NOW A PART OF A PERSON"
3220 DATA "ANOTHER PART OF A PERSON"
3230 DATA "GIVE ME A 1-WORD EXCLAMATION"
3240 DATA "WHAT'S THE BEST WORD FOR A BAD DAY"
3250 DATA "A TYPE OF PERSON"
3260 DATA "AN ACTION WORD"
3270 DATA "I NEED EVEN ANOTHER PART OF A PERSON"
3280 DATA "A DESCRIPTIVE WORD"
3290 DATA "NAME SOMETHING"
3300 DATA "WHAT DO PEOPLE DO"
3310 DATA "SOMETHING THAT PEOPLE NOTICE"
3320 DATA "SOMETHING YOU LIKE TO DO"
3330 DATA "ANOTHER THING YOU DON'T LIKE TO DO"
3340 DATA "*"
3350 REM * AND THIRD, THE STORY GETS PRINTED OUT
3360 PRINT " TO CHANGE PEOPLE YOU MUST "JAS$" WITH THEM."
3370 PRINT "THERE ARE A NUMBER OF WAYS TO GO ABOUT CHANGING"
3380 PRINT "A PERSON'S "JBS$". WALK UP TO THEM ON THE STREET."
3390 PRINT "GRAB THEM BY THE "JCS$" AND YELL "JDS$"!!!!, YOU"
3400 PRINT "E$!" "JFS$"! OR CATCH THEM ASLEEP AND WHISPER,"
3410 PRINT "JGS$", "JGS$", "JGS$" IN THEIR "JBS$".
3420 PRINT "OR SET YOURSELF UP AS A "JES$" "JJS$" AND"
3430 PRINT "PRETTY SOON PEOPLE WILL START TO "JFS$"."
3440 PRINT "TO WORK THIS ALTERNATIVE, THOUGH, YOU MUST EITHER"
3450 PRINT "HAVE A "JLS$" YOU CAN CHANGE SOCIETY WITH, OR"
3460 PRINT "DO A "IMS$" OR A "JNS$". BUT ONLY IF YOU AREN'T"
3470 PRINT "MISTAKEN FOR A "JES$" "JFS$"."
3480 RETURN
3490 REM *** ATOP THE NARGOIDS ***
3500 REM * FIRST, THE TITLE
3510 DATA "ATOP THE NARGOIDS"
3520 REM * SECOND, THE QUERIES FOR INPUT
3530 DATA "*"
3540 REM * AND THIRD, THE STORY GETS PRINTED OUT
3550 RETURN
3560 REM *** EMPTY STORY ***
3570 DATA "*"
3580 REM *** EMPTY STORY ***
3590 DATA "*"
3600 END

```

```

18 REM PROGRAM BY: CRAIG JENSEN
19 PRINT TAB(1)*"A WORD GAME"
20 QW=0:0:BS$(72),CS$(72),AI(28)
21 RESTORE
22 A$= ""
23 B$= ""
24 CS="""
25 MAT A$=ZER
26 A=INV(42*END(1)+1)
27 FOR B$=1 TO A
28 READ AS
29 NEXT B
30 C=LEN(A$)
31 FOR E$=1 TO C
32 D=INT(CRN(1)+1)
33 IF A$D$1 THEN 160
34 B$EE=A$CD,D
35 AI$1=A$CD,D
36 NEXT E
37 IF A$=B$ THEN 150
38 PRINT "HOW MANY SECONDS DO YOU NEED TO ANSWER?"
39 PRINT "ANOTHER"
40 INPUT CS
41 R=R+
42 PRINT "TOTALS CORRECT?" "WRONG?" "OVERTIME?" Q
43 PRINT "ANOTHER"
44 INPUT CS

```

# "Nim-Like" Games

## BATNUM

```

10 REM *** BATNUM
12 REM *** FIRST VERSION BY JOHN KEMENY, DARTMOUTH COLLEGE
14 REM *** MODIFIED BY PEOPLE'S COMPUTER COMPANY, MENLO PARK, CA
90 DIM AS[72]
100 REM *** INSTRUCTIONS?
110 PRINT "DO YOU NEED INSTRUCTIONS (YES OR NO)?"
120 INPUT A$ 
130 IF AS[1,1] = "Y" THEN 1000
200 REM *** SET UP PILE, MIN & MAX, WIN OR LOSE TAKING LAST
210 PRINT
220 PRINT "HOW MANY OBJECTS IN THE PILE?"
230 INPUT P
240 P=INT(P)
250 IF P <= 0 THEN 1999
260 PRINT "WHAT IS THE MINIMUM YOU CAN TAKE?"
270 INPUT A
280 A=INT(A)
290 IF A>P THEN 320
300 PRINT "YOU HAVE TO TAKE AT LEAST 1 EACH TIME"
310 GOTO 260
320 PRINT "WHAT IS THE MAXIMUM YOU CAN TAKE?"
330 INPUT B
340 B=INT(B)
350 IF B >= A THEN 380
360 PRINT "THE MINIMUM CAN'T BE LARGER THAN THE MAXIMUM"
370 GOTO 260
380 PRINT
390 PRINT "DO YOU WIN OR LOSE BY TAKING THE LAST OBJECT (WIN OR LOSE)?"
400 INPUT AS
410 REM *** TAKING-THE-LAST-OBJECT OPTION
420 REM *** WIN: L=0 LOSE: L=A
430 L=0
440 IF AS[1,1] = "W" THEN 500
450 L=A
460 IF AS[1,1] = "L" THEN 500
470 GOTO 390
500 REM *** SET UP STRATEGY
510 REM *** A IS THE MINIMUM, B IS THE MAXIMUM, L IS THE 'LAST' OPTION
520 REM *** COMPUTER TRIES TO LEAVE (A+B)K + L AFTER MOVING
530 T=A+B
550 REM *** WHO GOES FIRST?
560 PRINT "DO YOU WANT TO GO FIRST (YES OR NO)?"
570 INPUT AS
580 IF AS[1,1] = "Y" THEN 800
600 REM *** THE COMPUTER MOVES
602 REM *** CHECK IF END OF GAME
604 IF P>B THEN 610
606 IF (P <= A) OR (L=0) THEN 720
610 R=P-T*INT(P/T)
615 REM *** TAKE CARE OF THE CASE 0 < R < A
620 IF (R >= A) OR (R=B) THEN 630
625 R=A
630 REM *** IF R=L THEN THERE IS NO 'GOOD' MOVE
635 IF R=L THEN 680
640 C=R-L
650 IF C>0 THEN 700
660 C=C+B
670 GOTO 700
680 REM *** MAKE A RANDOM MOVE
690 C=INT((B-A+1)*RND(0))+A
700 PRINT "I TAKE";C;
705 P=P-C
710 GOTO 800
720 REM *** THE GAME IS OVER
730 IF L=0 THEN 760
740 PRINT "I TAKE";P;"AND LOSE (LUCKY)"
750 GOTO 1900
760 PRINT "I TAKE";P;"AND WIN!"
770 GOTO 1900
800 REM *** THE HUMAN MOVES
810 PRINT
820 PRINT "THERE ARE";P;"OBJECTS IN THE PILE."
830 PRINT "HOW MANY DO YOU TAKE?"
840 INPUT H
850 H=INT(H)
860 IF (H >= A) AND (H <= B) THEN 910
870 REM *** CHECK IF END OF GAME
880 IF (H=P) AND (P<A) THEN 930
890 PRINT "YOU MAY TAKE FROM";A;"TO";B
900 GOTO 830
910 P=P-H
920 IF P>0 THEN 600
930 REM *** THE GAME IS OVER
940 IF L=0 THEN 970
950 PRINT "OH WELL, YOU LOSE"
960 GOTO 1900
970 PRINT "CONGRATULATIONS, YOU WIN!"
980 GOTO 1900
1000 PRINT
1010 PRINT "WE BEGIN WITH A PILE OF OBJECTS (YOU DECIDE HOW MANY)."
1020 PRINT
1030 PRINT "WE TAKE TURNS REMOVING OBJECTS FROM THE PILE."
1040 PRINT "YOU DECIDE WHAT THE MINIMUM (LEAST) AND THE MAXIMUM (MOST)."
1050 PRINT "ARE THAT WE CAN TAKE ON EACH TURN. FOR EXAMPLE, IF 2 IS"
1060 PRINT "THE MINIMUM AND 5 IS THE MAXIMUM, THEN ON EACH TURN"
1070 PRINT "WE MUST TAKE 2, 3, 4, OR 5 OBJECTS."
1080 PRINT
1090 PRINT "TWO MORE THINGS TO DECIDE. IS TAKING THE LAST OBJECT"
1100 PRINT "WINNING OR LOSING? AND, DO YOU WANT TO GO FIRST?"
1110 PRINT
1120 GOTO 200
1900 REM *** PLAY AGAIN?
1910 PRINT
1920 PRINT "DO YOU WANT TO PLAY AGAIN (YES OR NO)?"
1930 INPUT AS
1940 IF AS[1,1] = "Y" THEN 200
1999 END

```

## 23 MATCHES

```

10 REM *** 23 MATCHES
12 REM *** PEOPLE'S COMPUTER COMPANY, MENLO PARK, CA
90 DIM AS[72]
100 REM *** PRINT THE INSTRUCTIONS
110 PRINT
120 PRINT "WE START WITH A PILE OF 23 MATCHES."
130 PRINT
140 PRINT "WE TAKE TURNS. ON EACH TURN WE CAN REMOVE"
150 PRINT "1, 2, OR 3 MATCHES FROM THE PILE."
160 PRINT "THE ONE WHO HAS TO TAKE THE LAST MATCH LOSES."
170 PRINT
180 PRINT "YOU GO FIRST. . ."
190 PRINT "MAY THE BEST COMPUTER (HA HA) WIN."
200 REM *** INITIALIZE THE NUMBER OF MATCHES
210 M=23
220 PRINT
230 PRINT "THERE ARE NOW 23 MATCHES."
240 REM *** THE HUMAN MOVES
250 PRINT "HOW MANY DO YOU TAKE?"
260 INPUT H
270 REM *** CHECK IF H = 1, 2, OR 3
280 H=INT(H)
290 IF (H<1) OR (H>3) THEN 800
300 REM *** ADJUST # MATCHES LEFT
310 M=M-H
320 REM *** CHECK IF THE HUMAN LOST
330 IF M <= 0 THEN 850
340 REM *** THE COMPUTER MOVES
350 IF M=1 THEN 880
360 REM *** TRY TO LEAVE 4K + 1 MATCHES
370 R=M-4*INT(M/4)
380 REM *** IF R=1 THEN THERE IS NO 'GOOD' MOVE
390 IF R=1 THEN 598
400 REM *** THE WINNING MOVE IS (R+3) MOD 4
410 C=(R+3)-4*INT((R+3)/4)
420 GOTO 610
430 REM *** MAKE A RANDOM MOVE
440 C=INT(3*RND(0))+1
450 REM *** THE COMPUTER MOVES
460 PRINT "I TOOK";C;
470 REM *** ADJUST # MATCHES LEFT AND PRINT IT
480 M=M-C
490 PRINT ". . . THERE ARE NOW";M;"MATCHES."
500 PRINT
510 GOTO 300
520 REM *** THE HUMAN CHEATED
530 PRINT "YOU CHEATED, BUT I'LL GIVE YOU ANOTHER CHANCE."
540 GOTO 300
550 REM *** THE COMPUTER WON
560 PRINT "I WON! BETTER LUCK NEXT TIME."
570 GOTO 980
580 REM *** THE HUMAN WON
590 PRINT "O.K. SO YOU WON (LUCKY) . . ."
600 REM *** PLAY AGAIN?
610 PRINT "DO YOU WANT TO PLAY AGAIN (YES OR NO)?"
620 INPUT AS
630 IF AS[1,1] = "Y" THEN 200
999 END

```

```

10 REM *** NIM
12 REM *** PEOPLE'S COMPUTER COMPANY, MENLO PARK, CA
15 REM
16 REM N => NUMBER OF FILES
17 REM P(I) => NUMBER OF OBJECTS IN FILE I
18 REM B(I,J) => P(I) IN BASE 2
19 REM D(J) => B(I,J) + ... + B(N,J) IN BASE 2
20 REM M => MAXIMUM NUMBER OF FILES
21 REM THE MAXIMUM FILE SIZE IS 31
22 REM
23 LET M=10
24 DIM P[10],B[10,5],D[5]
25 DIM AS[72]
26 PRINT "DO YOU NEED INSTRUCTIONS (YES OR NO)?"
27 INPUT AS
28 PRINT
29 IF AS[1,1]!="N" THEN 880
30 PRINT "NIM IS PLAYED WITH FILES OF STARS (YOU DECIDE)"
31 PRINT
32 PRINT "WHEN IT IS YOUR TURN, YOU MAY TAKE AS MANY *'S"
33 PRINT "AS YOU LIKE, BUT FROM ONE FILE ONLY."
34 PRINT "THE PLAYER WHO TAKES THE LAST '*' WINS."
35 PRINT "FOR EXAMPLE, SUPPOSE THE FILES ARE:"
36 PRINT TAB(5);"FILE 1: * *"
37 PRINT TAB(5);"FILE 2: * * *"
38 PRINT TAB(5);"FILE 3: * *"
39 PRINT
40 PRINT "TO TAKE THREE *'S FROM FILE 2, YOU MOVE 3,2. THAT LEAVES"
41 PRINT TAB(5);"FILE 1: * *"
42 PRINT TAB(5);"FILE 2: *"
43 PRINT TAB(5);"FILE 3: * *"
44 PRINT "NOW IF I MOVE 2,3 (TAKING 2 *'S FROM FILE 3)"
45 PRINT "YOU WIN BY MOVING 2,1 (2 *'S FROM FILE 1)!!"
46 PRINT
47 PRINT "HERE WE GO . . ."
48 PRINT
49 PRINT
50 REM FOR A NEW PLAYER SET N=3 AND P(1)=3,P(2)=5,P(3)=7"
51 REM
52 LET N=3
53 LET P[1]=3
54 LET P[2]=5
55 LET P[3]=7
56 REM WHO MOVES FIRST?
57 PRINT "DO YOU WANT TO GO FIRST (YES OR NO)?"
58 INPUT AS
59 IF AS[1,1]!="Y" THEN 202
60 REM PRINT THE FILES
61 GOSUB 960
62 GOTO 214
63 REM
64 REM MAIN BODY
65 REM
66 REM PRINT THE FILES
67 GOSUB 960
68 REM THE HUMAN MOVES
69 GOSUB 880
70 REM CHECK WHETHER THE HUMAN WON
71 GOSUB 830
72 IF T=0 THEN 850
73 REM THE COMPUTER MOVES
74 GOSUB 680
75 REM CHECK WHETHER THE COMPUTER WON
76 GOSUB 830
77 IF T=0 THEN 860
78 GOTO 202
79 REM
80 REM THE COMPUTER MOVES
81 REM
82 REM INITIALIZE
83 FOR J=1 TO 5
84 LET D[J]=0
85 NEXT J
86 REM ADD P(1) + ... + P(N) IN BASE 2
87 FOR I=1 TO N
88 LET T=P[I]
89 FOR J=5 TO I STEP -1
90 LET B[I,J]=INT(T/2^(J-1))
91 LET D[J]=ABS(DE[J]-B[I,J])
92 LET T=T-B[I,J]*2^(J-1)
93 NEXT J
94 NEXT I
95 REM FIND THE LARGEST I SUCH THAT D(I)=1
96 LET T=0
97 FOR I=5 TO 1 STEP -1
98 LET T=T+I*D[I]*(-1-SGN(T))
99 NEXT I
100 REM IF T>0 THEN THE WINNING MOVE IS
101 REM D(T)*2^(T-1) + D(T-1)*2^(T-2)*SGN(B(S,T-1))-5 + ...
102 REM + D(I)*SGN(B(S,I)-5)
103 REM FROM ANY FILE I SUCH THAT B(I,T)=1
104 REM IF T=0 THEN REMOVE I FROM ANY NON-EMPTY FILE
105 IF T>0 THEN 662
106 LET S=INT(N*RND(9))+1
107 IF P[S]=0 THEN 650
108 LET T=1
109 GOTO 684
110 REM FIND I SO THAT B(I,J)=1
111 LET S=0
112 FOR I=1 TO N
113 LET S=S+[B[I,T]*(-1-SGN(S))]
114 NEXT I
115 IF T=1 THEN 684
116 LET M=8
117 FOR J=T-1 TO 1 STEP -1
118 LET W=W+D[J]*2^(J-1)*SGN(B(S,J))-5
119 NEXT J
120 LET T=2^(T-1)+W
121 REM THE COMPUTER MOVES
122 PRINT "I MOVE";T;""
123 PRINT
124 LET P[S]=P(S)-T
125 RETURN
126 REM THE HUMAN MOVES
127 INPUT T,S
128 IF S=SGN(N+1-S)+SGN(S)+INT(S-1) THEN 810
129 PRINT "WHICH FILE DO YOU WANT?"
130 INPUT S
131 GOTO 804
132 IF INT(T)*P[S]>0 THEN 816
133 PRINT "SORRY, BUT YOU CAN'T TAKE ";T;" '*'S FROM FILE ";
134 GOTO 800
135 REM VALID INPUT
136 LET P[S]=(P(S)-INT(T))*SGN(1+SGN(P[S])-INT(T))
137 RETURN
138 REM
139 REM CHECK FOR A WINNER
140 REM
141 LET T=0
142 FOR I=1 TO N
143 LET T=T+P[I]
144 NEXT I
145 RETURN
146 REM THE HUMAN WON
147 PRINT
148 PRINT "CONGRATULATIONS!! YOU WON . . ."
149 GOTO 868
150 REM THE COMPUTER WON
151 PRINT
152 PRINT "I WON. BETTER LUCK NEXT TIME."
153 REM ANOTHER GAME?
154 PRINT "DO YOU WANT TO PLAY AGAIN (YES OR NO)?"
155 INPUT AS
156 IF AS[1,1]!="N" THEN 999
157 PRINT
158 REM SET UP THE FILES
159 REM
160 GOSUB 988
161 GOTO 182
162 REM
163 REM INPUT THE NUMBER OF FILES AND THE SIZE OF EACH FILE
164 REM
165 PRINT "HOW MANY FILES DO YOU WANT?"
166 INPUT N
167 PRINT
168 LET N=INT(N)
169 IF N <= 0 THEN 999
170 IF N <= M THEN 918
171 PRINT "I CAN PLAY WITH AT MOST ";M;" FILES."
172 PRINT
173 GOTO 988
174 FOR I=1 TO N
175 PRINT "HOW MANY '*'S IN FILE ";I
176 INPUT P[I]
177 LET P[I]=INT(P[I])+SGN(1+INT(P[I]))
178 IF P[I] <= 31 THEN 932
179 PRINT "I CAN PLAY WITH AT MOST 31 '*'S IN EACH FILE."
180 GOTO 928
181 NEXT I
182 REM CHECK THAT NOT ALL THE FILES ARE EMPTY
183 GOSUB 830
184 IF T>0 THEN 946
185 PRINT "HOW CAN WE PLAY IF ALL THE FILES ARE EMPTY?"
186 GOTO 988
187 PRINT
188 PRINT
189 REM PRINT THE FILES
190 REM
191 FOR I=1 TO N
192 PRINT TAB(5);"FILE ";I;"": "
193 IF P[I]=0 THEN 972
194 FOR J=1 TO P[I]
195 PRINT "* "
196 NEXT J
197 PRINT
198 NEXT I
199 PRINT
200 RETURN
201 END

```

# CHOMP

```

100 REM *** THE GAME OF CHOMP *** COPYRIGHT PCC 1973 ***
110 PRINT
120 PRINT "THIS IS THE GAME OF CHOMP (SCIENTIFIC AMERICAN, JAN 1973)"
130 PRINT "WANT THE RULES (1=YES, 0=NO!)"
140 INPUT R
150 IF R=0 THEN 340
160 F=1
170 R=5
180 C=7
190 PRINT "CHOMP IS FOR 1 OR MORE PLAYERS (HUMANS ONLY)."
200 PRINT
210 PRINT "HERE'S HOW A BOARD LOOKS (THIS ONE IS 5 BY 7):"
220 GOSUB 540
230 PRINT
240 PRINT "THE BOARD IS A BIG COOKIE - R ROWS HIGH AND C COLUMNS"
250 PRINT "WIDE. YOU INPUT R AND C AT THE START. IN THE UPPER LEFT"
260 PRINT "CORNER OF THE COOKIE IS A POISON SQUARE (P). THE ONE WHO"
270 PRINT "CHOMPS THE POISON SQUARE LOSES. TO TAKE A CHOMP, TYPE THE"
280 PRINT "ROW AND COLUMN OF ONE OF THE SQUARES ON THE COOKIE."
290 PRINT "ALL OF THE SQUARES BELOW AND TO THE RIGHT OF THAT SQUARE"
300 PRINT "(INCLUDING THAT SQUARE, TOO) DISAPPEAR -- CHOMP!!"
310 PRINT "NO FAIR CHOMPING SQUARES THAT HAVE ALREADY BEEN CHOMPED."
320 PRINT "OR THAT ARE OUTSIDE THE ORIGINAL DIMENSIONS OF THE COOKIE."
330 PRINT
340 PRINT "HERE WE GO..."
350 DIM A[10,10]
360 F=0
370 FOR I=1 TO 10
372 FOR J=1 TO 10
375 LET A[I,J]=0
377 NEXT J
379 NEXT I
380 PRINT
390 PRINT "HOW MANY PLAYERS?"
400 INPUT P
410 II=0
420 PRINT "HOW MANY ROWS?"
430 INPUT R
440 IF R <= 9 THEN 470
450 PRINT "TOO MANY ROWS (9 IS MAXIMUM). NOW, "
460 GOTO 420
470 PRINT "HOW MANY COLUMNS?"
480 INPUT C
490 IF C <= 9 THEN 530
500 PRINT "TOO MANY COLUMNS (9 IS MAXIMUM). NOW, "
510 GOTO 470
520 PRINT
530 FOR I=1 TO R
540 FOR J=1 TO C
568 A[I,J]=1
570 NEXT J
580 NEXT I
590 A[1,1]=-1
600 REM PRINT THE BOARD
610 PRINT
620 PRINT TAB(7); "1 2 3 4 5 6 7 8 9"
630 FOR I=1 TO R
640 PRINT I; TAB(7)
650 FOR J=1 TO C
660 IF A[I,J]=-1 THEN 700
670 IF A[I,J]=0 THEN 720
680 PRINT "+";
690 GOTO 710
700 PRINT "P ";
710 NEXT J
720 PRINT
730 NEXT I
740 PRINT
750 IF F=0 THEN 770
760 RETURN
770 REM GET CHOMPS FOR EACH PLAYER IN TURN
780 LET II=II+1
790 LET PI=II-INT(II/P)*P
800 IF PI <> 0 THEN 820
810 PI=P
820 PRINT "PLAYER ",PI
830 PRINT "COORDINATES OF CHOMP (ROW,COLUMN)";
840 INPUT RI,CI
850 IF RI<1 THEN 920
860 IF RI>R THEN 920
870 IF CI<1 THEN 920
880 IF CI>C THEN 920
890 IF A(RI,CI)=0 THEN 920
900 IF A(RI,CI)=-1 THEN 1010
910 GOTO 940
920 PRINT "NO FAIR. YOU'RE TRYING TO CHOMP ON EMPTY SPACE!"
930 GOTO 820
940 FOR I=RI TO R
950 FOR J=CI TO C
960 A[I,J]=0
970 NEXT J
980 NEXT I
990 GOTO 610
1000 REM END OF GAME DETECTED IN LINE 900
1010 PRINT "YOU LOSE, PLAYER ",PI
1020 PRINT
1030 PRINT "AGAIN (1=YES) 0=NO!)"
1040 INPUT R
1050 IF R=1 THEN 340
1060 END

```

# ZOT

```

1 REM *** THE GAME OF ZOT
2 REM *** PEOPLE'S COMPUTER COMPANY : AUGUST 9, 1974 (ABDICTION DAY)
3 REM *** PROGRAMMED BY : MARC LE BRUN
100 REM *** PROGRAM STRUCTURE
110 REM ***
120 REM *** AT THE START OF THE RUN THE BOARD (B) AND STRINGS FOR
130 REM *** THE SIDE TO MOVE FROM (S$) THE NAMES OF THE COMPASS
140 REM *** DIRECTIONS (D$) AND ARBITRARY ANSWERS (A$) ARE
150 REM *** DIMENSIONED AT LINE 700. INSTRUCTIONS ARE PRINTED
160 REM *** BY THE BLOCK OF LINES BEGINNING AT LINE 500.
200 REM *** THE GAME PROPER BEGINS AT LINE 1000 WHERE THE NUMBER OF
210 REM *** ROWS AND COLUMNS (R&C) ARE INPUT. THE BOARD B IS
220 REM *** FILLED WITH STARS (=1), THE AUXILIARY VALUES RI AND CI
230 REM *** (USED IN VARIOUS CONDITIONALS) ARE INITIALIZED, AS ARE
240 REM *** THE TOTAL NUMBER OF STARS IN THE BOARD (N) AND THE PLAYER
250 REM *** WHOSE TURN IT IS (P).
260 REM *** THE LOOP TRAVERSED FOR EACH MOVE BEGINS AT LINE 2000.
270 REM *** FIRST THE BOARD IS PRINTED. THEN THE SECTION FOR FETCH-
280 REM *** ING THE ACTUAL MOVE IS ENTERED (AT LINE 3000). THE SIDE
290 REM *** OF THE BOARD (S$) IS INPUT, CHECKED, AND CONVERTED TO A
300 REM *** NUMERICAL INDEX (D). THEN THE MOVE ROW & COLUMN (I0,J0)
310 REM *** ARE FETCHED AND CHECKED. A SOMEWHAT COMPLICATED SECTION
320 REM *** FOR CHECKING AND EXECUTING THE ZOT IS BEGUN AT 4000.
330 REM *** THE BASIC PROCEDURE IS TO BEGIN AT THE SPECIFIED ROW &
340 REM *** COLUMN AND SCAN OUTWARD (WITH CO-ORDINATE INDICES I & J)
350 REM *** TO THE SIDE OF THE BOARD SPECIFIED BY D. THIS IS ACCOM-
360 REM *** PLISHED BY USING TWO INCREMENTS II & JI. ONE OF THESE IS
370 REM *** ZERO AND THE OTHER +0 - 1, DEPENDING ON THE DIRECTION
380 REM *** OF THE ZOT. II & JI ARE DERIVED BY BLACK MAGIC FROM D
390 REM *** VIA THE TEMPORARY VARIABLES D0 AND S, WHICH PLAY NO FUR-
400 REM *** THER ROLE IN THE ALGORITHM.
410 REM *** IN THE INITIAL SCAN A SWITCH (S0) =1 INDICATES
420 REM *** SCANNING OVER STARS, =0 SCANNING OVER SPACE. THE TRANSI-
430 REM *** TION (OF S0) I->0 IS LEGAL (TO ALLOW ZOTTING OVER LEADING
440 REM *** SPACES). A 0->1 TRANSITION INDICATES THAT THE STARS ARE
450 REM *** NOT CONSECUTIVE. A COUNTER (C0) OF THE NUMBER OF STARS
460 REM *** SCANNED IS KEPT TO #1 SIMPLIFY THEIR REMOVAL IF THE
470 REM *** ZOT IS LEGAL AND #2 TO DETECT A ZOT CONTAINING NO STARS
480 REM *** (WHICH CONDITION IS NOT CAUGHT BY THE S0 'TRANSITIONS')
490 REM *** IF THE MOVE PASSES ALL THESE TESTS THE INITIAL C0 POSI-
500 REM *** TIONS ARE RESCANNED (WITH THE HELP OF A DUMMY INDEX K)
510 REM *** AND SET TO ZERO. THEN N IS UPDATED. IF IT'S ZERO THE LAST
520 REM *** STAR HAS BEEN ZOTTED AND WE ENTER A TERMINAL DIALOG. IF
530 REM *** THE GAME'S STILL AFOOT WE SETUP FOR THE NEXT PLAYER AND
540 REM *** RE-ENTER THE LOOP FROM THE TOP (I.E. LINE 2000).
550 REM ***
560 REM *** AT LINE 5000 A SUBROUTINE THAT INSISTS ON A YES OR NO
570 REM *** REPLY BEGINS. A IS SET TO 1 FOR 'YES', 0 FOR 'NO'.
580 REM ***
590 REM *** THESE REMARKS SHOULD SIMPLIFY UNTANGLING THE CODE.
600 REM *** HOWEVER, BASICK IS HARDLY A TRANSPARENT LANGUAGE.
610 REM *** THIS CODE IS DESIGNED TO BE SIMPLE AND COMPREHENSIBLE.
620 REM *** NOT 'EFFICIENT' (WHATEVER THAT MEANS) !!
630 REM ***
640 REM *** ONCE ONLY INITIALIZATIONS
700 DIM B[10,10],S$(1),D$(4),A$(72)

```

```

120 DS="NSEW"
130 PRINT
140 PRINT "**** THE GAME OF ZOT ****"
150 PRINT
160 PRINT "DO YOU WANT INSTRUCTIONS ?"
170 GOSUB 5000
180 PRINT
190 IF A=0 THEN 1000
200 REM *** INSTRUCTIONS
210 PRINT "IN THE GAME OF ZOT THE TWO (HUMAN) PLAYERS COMPETE TO GET"
220 PRINT "THE LAST BITE OF A RECTANGULAR COOKIE. A MOVE, CALLED A"
230 PRINT "ZOT, CONSISTS OF TAKING ALL THE STARS IN A LINE BETWEEN"
240 PRINT "A GIVEN SIDE OF THE BOARD AND A PARTICULAR STAR. THE SIDES"
250 PRINT "OF THE BOARD ARE NAMED N,E,S & W (FOR NORTH, EAST ETC.)"
260 PRINT "LIKE ON A MAP. THE POSITION OF THE STAR IS GIVEN BY THE"
270 PRINT "ROW AND COLUMN IT'S IN. FOR EXAMPLE, IF THE FIRST MOVE"
280 PRINT "ON A 4 BY 5 (ROWS BY COLUMNS) BOARD WERE ' E,3,2 ' THE RE-"
290 PRINT " * * * * "
300 PRINT " * * * * "           (ZOTTING FROM THE EAST OVER TO 3,2)
310 PRINT " * * * * "           (*'S DENOTE ZOTTED UP STARS)"
320 PRINT "THE STARS IN THE ZOT MUST BE CONSECUTIVE. YOU MAY NOT ZOT"
330 PRINT "EMPTY SPACE UNLESS IT IS BETWEEN THE EDGE OF THE BOARD"
340 PRINT "(IN THE GAME ABOVE THE LINE OF STARS YOU ARE ZOTTING"
350 PRINT "BECAUSE 2,3 IS EMPTY, BUT ' E,3,1 ' IS LEGAL)."
360 PRINT
370 PRINT "HERE WE GO ..."
380 REM *** START THE GAME
390 PRINT
400 PRINT "HOW MANY ROWS AND COLUMNS IN THE COOKIE ?"
410 INPUT R,C
420 REM *** CHECK IF SIZE IS WITHIN LIMITS
430 REM *** (NOTE RESEMBLANCE TO LINES 3100 & 4250)
440 IF R*(C1-C)<=0 THEN 1080
450 IF C*(C1-C)>0 THEN 1100
460 PRINT "ALLOWED COOKIE DIMENSIONS RANGE FROM 1 TO 10."
470 GOTO 1000
480 REM *** CHECK FOR INTEGRAL COOKIE
490 REM *** (NOTE RESEMBLANCE TO LINE 3160)
500 IF R-INT(R)+C-INT(C)=0 THEN 1150
510 PRINT "COOKIE MUST HAVE INTEGER DIMENSIONS."
520 GOTO 1000
530 REM *** INITIALIZE BOARD AND AUXILLIARY VARIABLES
540 FOR I=1 TO R
550 FOR J=1 TO C
560 B(I,J)=0
570 NEXT J
580 NEXT I
590 R1=R+1
600 C1=C+1
610 N=R*C
620 P=1
630 REM *** MAIN MOVE LOOP
640 REM *** PRINT THE BOARD
650 PRINT
660 FOR I=1 TO R
670 FOR J=1 TO C
680 IF B(I,J)=1 THEN 2080
690 PRINT ".";
700 GOTO 2090
710 PRINT "+"
720 NEXT J
730 PRINT
740 NEXT I
750 PRINT
760 REM *** FETCH A MOVE
770 REM *** FETCH BOARD SIDE
780 PRINT "YOUR MOVE PLAYER ";P"; :"
790 PRINT "SIDE TO ZOT FROM ";
800 INPUT S
810 REM *** DETERMINE SPECIFIED SIDE OF BOARD
820 D=1
830 IF S$[1,1]=DS[D,D] THEN 3092
840 D=D+1
850 IF D<5 THEN 3050
860 PRINT "THE SIDES OF THE BOARD ARE NAMED N,E,S & W."
870 GOTO 3090
880 REM *** FETCH CO-ORDINATES
890 PRINT "ROW, COLUMN TO ZOT TO ";
900 INPUT I0,J0
910 REM *** CHECK IF MOVE IS ON BOARD
920 REM *** (NOTE RESEMBLANCE TO LINES 1040 & 4250)
930 IF I0*(C1-I0)<=0 THEN 3140
940 IF J0*(C1-J0)>0 THEN 3160
950 PRINT "ROWS ARE NUMBERED 1 THRU ";I0"; ; COLUMNS 1 THRU ";C1"; ."
960 GOTO 3092
970 REM *** CHECK THAT MOVES ARE INTEGERS
980 REM *** (NOTE RESEMBLANCE TO LINE 1100)
990 IF I0-INT(I0)+J0-INT(J0)=0 THEN 4000
1000 PRINT "MOVES MUST REFER TO WHOLE NUMBERED ROWS AND COLUMNS."
1010 GOTO 3092
1020 REM *** SCAN ALONG LINE OF ZOT, VERIFY MOVE AND UPDATE BOARD
1030 REM *** SET UP MACHINERY FOR SCANNING
1040 D0=INT((D-1)/2)
1050 S=2*(D-2*D0)-3
1060 II=S*(I-D0)
1070 JI=S*D0
1080 I=I0
1090 J=J0
1100 REM *** INITIALIZE SEARCH SWITCH AND STAR COUNTER
1110 S0=1
1120 C0=0
1130 REM *** SCAN OUTWARD FROM MOVE TO EDGE OF BOARD
1140 REM *** TEST FOR STAR
1150 IF B(I0,J0)=1 THEN 4170
1160 REM *** FOUND A SPACE : SET SWITCH AND CONTINUE SCAN
1170 S0=0
1180 GOTO 4220
1190 REM *** FOUND A STAR
1200 REM *** (IF WE WERE SCANNING SPACE THIS IS AN ILLEGAL ZOT)
1210 IF S0=0 THEN 4300
1220 REM *** OTHERWISE WE INCREASE THE STAR COUNT
1230 C0=C0+1
1240 REM *** ADVANCE SCAN CO-ORDINATES TO NEXT POSITION

```

# Hide & Seek in 2D

# HURKLE

# MUGWUMP

```

110 REM *** PEOPLE'S COMPUTER COMPANY, MENLO PARK CA
120 PRINT "WANT THE RULES?"
130 INPUT Z$(1))
140 IF Z$ <> "Y" THEN 400
150 REM *** HERE ARE THE RULES
160 PRINT "A MUGWUMP IS HIDING IN A GRID, LIKE THE ONE BELOW."
170 PRINT
180 FOR K=9 TO 0 STEP -1
190 PRINT TAB(14)$(X$(TAB(20));". . . . . . . . . .")
200 NEXT K
210 PRINT
220 PRINT TAB(20);"(0 1 2 3 4 5 6 7 8 9"
230 PRINT
240 PRINT "MUGWUMP WILL BE HIDING AT ONE OF THE GRIDPOINTS."
250 PRINT "YOU TRY TO FIND HIM BY GUESSING HIS GRIDPOINT."
260 PRINT "HOMEASE IS POINT 0,0 IN THE LOWER LEFTHAND"
270 PRINT "CORNER OF THE ENTIRE GRID. YOUR GUESS SHOULD BE"
280 PRINT "A PAIR OF WHOLE NUMBERS SEPARATED BY A COMMA."
290 PRINT "THE FIRST NUMBER TELLS HOW FAR TO THE RIGHT OF"
300 PRINT "HOMEASE YOU THINK MUGWUMP IS HIDING AND THE"
310 PRINT "SECOND NUMBER TELLS HOW FAR ABOVE HOMEASE YOU"
320 PRINT "THINK MUGWUMP IS HIDING."
330 PRINT
340 PRINT "FOR EXAMPLE, IF YOU THINK MUGWUMP IS 8 TO THE RIGHT"
350 PRINT "OF HOMEASE AND 3 ABOVE HOMEASE, YOU ENTER 8,3"
360 PRINT "AS YOUR GUESS AND THEN PRESS THE 'RETURN' KEY."
370 PRINT "AFTER YOU GUESS, I WILL TELL YOU HOW FAR (IN A DIRECT"
380 PRINT "LINE) YOUR GUESS IS FROM WHERE MUGWUMP IS HIDING."
390 REM *** HIDE MUGWUMP AT RANDOM GRIDPOINT A,B
400 LET A=INT(10*RND(0))
410 LET B=INT(10*RND(0))
420 PRINT
430 PRINT "MUGWUMP IS HIDING...TRY TO FIND HIM!!!!"
440 LET T=1
450 PRINT
460 PRINT "WHAT IS YOUR GUESS?"
470 INPUT X,Y
480 REM *** IF MUGWUMP NOT FOUND GO TO LINE 500
490 IF X <> A THEN 560
500 IF Y <> B THEN 560
510 PRINT "YOU FOUND HIM IN";T;"GUESSES!!!!"
520 PRINT "LET'S PLAY AGAIN."
530 PRINT
540 GOTO 400
550 REM *** D=Straightline distance to MUGWUMP
560 LET D=SQR((X-A)^2+(Y-B)^2)
570 REM *** THEN WE ROUND D TO ONE DECIMAL PLACE
580 LET D=INT(10*D)/10
590 PRINT "YOU ARE";D;"UNITS FROM THE MUGWUMP."
600 LET T=T+1
610 GOTO 450
620 END

```

# SNARK

```

100 REM *** SNARK ... CATCH HIM WITH A WELL PLACED CIRCLE
110 REM *** PEOPLE'S COMPUTER COMPANY, MENLO PARK CA
120 PRINT "WANT THE RULES?"
130 INPUT Z$(1,1)
140 IF Z$ <> "?" THEN 390
150 REM *** HERE ARE THE RULES
160 PRINT
170 PRINT "A SNARK IS HIDING IN A 10 BY 10 GRID LIKE THE ONE"
180 PRINT "SHOWN BELOW:"
190 PRINT
200 PRINT "Y"
210 FOR Y=9 TO 0 STEP -1
220 PRINT Y;" . . . . . "
230 NEXT Y
240 PRINT
250 PRINT TAB(6); " 0 1 2 3 4 5 6 7 8 9 X"
260 PRINT
270 PRINT "TRY TO CATCH HIM. HERE'S HOW ... WHEN I ASK, YOU TYPE"
280 PRINT "THE X,Y COORDINATES OF A GRIDPOINT (IF YOU DON'T KNOW"
290 PRINT "WHAT THAT MEANS, ASK SOMEONE!) AND PRESS THE RETURN"
300 PRINT "KEY. THEN, WHEN I ASK FOR 'RADIUS', YOU TYPE THE RADIUS"
310 PRINT "OF A CIRCLE CENTERED ON THE GRIDPOINT WHOSE X,Y"
320 PRINT "COORDINATES YOU JUST ENTERED. I WILL THEN TELL YOU"
330 PRINT "WHETHER THE SNARK IS 'INSIDE' YOUR CIRCLE, 'OUTSIDE'"
340 PRINT "YOUR CIRCLE, OR 'ON' YOUR CIRCLE."
350 PRINT
360 PRINT "!!! IMPORTANT !!! IF YOU THINK YOU KNOW WHERE HE IS"
370 PRINT "HIDING, ENTER 0 (ZERO) AS THE RADIUS. GOOD HUNTING."
380 REM *** HIDE THE SNARK
390 LET X=INT(10*RND(0))
400 LET Y=INT(10*RND(0))
410 PRINT
420 PRINT "SNARK IS HIDING ... START GUESsing!"
430 REM *** GUESsing BEGINS
440 K=1
450 PRINT
460 PRINT "COORDINATES";
470 INPUT A,B
480 IF A=INT(A) AND B=INT(B) THEN 510
490 PRINT "FORGOT TO TELL YOU - COORDINATES MUST BE INTEGERS!"
500 GOTO 450
510 LET D2=(X-A)*(X-A)+(Y-B)*(Y-B)
520 PRINT "RADIUS";
530 INPUT R
540 IF R=INT(R) AND R >= 0 THEN 580
550 PRINT "WHOOPS! THE RADIUS MUST BE A WHOLE NUMBER."
560 PRINT
570 GOTO 520
580 IF R <> 0 THEN 600
590 IF D2=0 THEN 710
600 IF D2<R*R THEN 630
610 IF D2>R*R THEN 650
620 IF D2=R*R THEN 670
630 PRINT "SNARK IS INSIDE YOUR CIRCLE"
640 GOTO 680
650 PRINT "SNARK IS OUTSIDE YOUR CIRCLE"
660 GOTO 680
670 PRINT "SNARK IS ON YOUR CIRCLE"
680 K=K+1
690 GOTO 450
700 REM *** WE GOT A WINNER
710 PRINT
720 PRINT "YOU CAUGHT HIM IN" ;?;"GUESSES!!!"
730 PRINT "GOOD SHOW!"
740 PRINT
750 PRINT "WANT TO PLAY AGAIN?"
760 INPUT Z$(1,1)
770 IF Z$="Y" THEN 390
780 END

```

# G a m Pattern s

## DANGLE

```

10 REM *** THE DANGLING STRING ***
20 REM *** WRITTEN BY DAVE KAUFMAN, AUGUST 1973 ***
30 REM *** COPYRIGHT, PEOPLE'S COMPUTER CENTER ***
40 REM *** 1921 MENALTO AVE., MENLO PARK, CA. ***
50 REM G IS THE # OF THIS GAME
60 G=1
70 PRINT "WELCOME TO ... THE DANGLING STRING"
80 PRINT
90 PRINT "HOW MANY STARS DO YOU WANT?"
100 INPUT S
110 S=ABS(INT(S) MAX 1)
120 PRINT
130 PRINT "HOW WILD"
140 IF G>1 THEN 200
150 PRINT "?"
160 PRINT " 4=VERY WILD"
170 PRINT " 3=PRETTY WILD"
180 PRINT " 2=A LITTLE WILD"
190 PRINT " 1=A TINY BIT WILD"
200 INPUT W
210 W=ABS(INT(W))
220 IF W>0 THEN 250
230 W=1
240 GOTO 270
250 IF W <= 4 THEN 270
260 W=4
270 REM GET FIRST POSITION
280 PRINT
290 PRINT "WHERE WILL THE STRING START?"
300 IF G>1 THEN 350
310 PRINT "?"
320 PRINT "I      10      20      30"
330 PRINT "I      I      I      I"
340 PRINT
350 INPUT X
360 X=ABS(INT(X))
370 X=((X-1) MAX 0) MIN 32
380 PRINT TAB(X); "*"
390 REM FIND THE FIRST DISPLACEMENT
400 D=SGN(32*RND(0)-X+1)
410 REM NOW LOOP FOR EACH STAR
420 FOR I=2 TO S
430 D=D+SGN(32*RND(0)-X+1)
440 IF W >= ABS(D) THEN 460
450 D=W*SGN(D)
460 REM FIND NEXT POINT
470 X=X+D
480 IF X>0 THEN 500
490 X=1
500 PRINT TAB(X); "*"
510 NEXT I
520 PRINT
530 PRINT "THAT'S ALL, FOLKS!"
540 PRINT
550 G=G+1
560 PRINT "HERE WE GO AGAIN ..."
570 GOTO 80
580 END

```

# SUNSIGN

```

1 REM *** SUN SIGN DESIGN - PEOPLE'S COMPUTER CENTER ***
2 REM *** BOX 310 MENLO PARK CALIFORNIA 94025 ***
3 REM *** PROGRAMMER : JANE WOOD ***
4 REM
10 DIM A$(72),B$(26)
20 B$="ABCDEFGHIJKLMNPQRSTUVWXYZ"
30 REM
100 REM *** INSTRUCTIONS ***
105 PRINT
110 PRINT "DO YOU NEED INSTRUCTIONS ?"
115 GOSUB 4000
120 PRINT
125 IF X=0 THEN 200
130 PRINT "THIS PROGRAM PRINTS DESIGNS BASED ON A PERSON'S"
132 PRINT "NAME AND SUN SIGN. HERE IS A TABLE OF SUN SIGNS :"
134 PRINT
136 PRINT "ARIES MAR 21-APR 20 LIBRA SEP 24-OCT 23"
138 PRINT "TAURUS APR 21-MAY 21 SCORPIO OCT 24-NOV 22"
140 PRINT "GEMINI MAY 22-JUN 21 SAGITTARIUS NOV 23-DEC 21"
142 PRINT "CANCER JUN 22-JUL 23 CAPRICORN DEC 22-JAN 20"
144 PRINT "LEO JUL 24-AUG 23 AQUARIUS JAN 21-FEB 19"
146 PRINT "VIRGO AUG 24-SEP 23 PISCES FEB 20-MAR 20"
148 PRINT
150 PRINT "THE PROGRAM ASKS FOR A FIRST, MIDDLE AND LAST"
152 PRINT "NAME. IF YOU DON'T HAVE A MIDDLE NAME TYPE A"
154 PRINT "CARRIAGE RETURN. THE PROGRAM ONLY PAYS ATTEN-"
156 PRINT "TION TO LETTERS, AND IGNORES ALL OTHER TELE-"
158 PRINT "TYPE CHARACTERS. HERE WE GO . . . . ."
160 PRINT
200 REM *** GET STRING PARAMETERS ***
205 PRINT
210 PRINT
215 PRINT "FIRST NAME   ";
220 GOSUB 3000
225 GOSUB 1000
230 V0=X
235 PRINT
240 PRINT "MIDDLE NAME ";
245 GOSUB 3000
250 GOSUB 1000
255 V2=X
260 PRINT
265 PRINT "LAST NAME  ";
270 GOSUB 3000
275 GOSUB 1000
280 V4=X
285 PRINT
290 PRINT "SUN SIGN   ";
295 GOSUB 3000
300 GOSUB 1000
305 V6=X
310 PRINT
315 PRINT
320 PRINT
325 REM
400 REM *** COMPUTE NUMERIC PARAMETERS ***
405 V=0
410 Q=9
415 GOSUB 2000
420 V1=M
425 V=V2
430 GOSUB 2000
435 V3=M
440 V=V4
445 Q=7
450 GOSUB 2000
455 V5=M
460 V=V6
465 Q=5
470 GOSUB 2000
475 V9=M
480 C=0
485 REM
500 REM *** PICTURE PRINTING LOOP ***
505 FOR J=-(V9+3) TO V9+2
510 AS=""
515 V0=V0-J
520 V2=V2-J
525 K0=2*V5+2
530 REM
535 REM *** COMPUTE ROW ***
540 FOR K=-K0 TO K0
545 K1=K0+K+18
550 V0=V0-K*V5
555 V=V0
560 Q=9
565 GOSUB 2000
570 V7=M
575 V2=V2-K*V3
580 V=V2
585 Q=7
590 GOSUB 2000
595 V8=M
600 IF K <> K0 THEN 610
605 V8=-1
610 GOTO SGN(V8-V7)+2 OF 625,615,635
615 AS[K1,K1]=""0"
620 GOTO 640
625 AS[K1,R1]="" "
630 GOTO 645
635 AS[K1,K1]=""*"
640 C=C+1
645 NEXT K
650 REM
655 REM *** PRINT ROW ***
660 K=1
665 IF C=0 THEN 695
670 PRINT AS[K,K]
675 IF AS[K,K]="" " THEN 685
680 C=C-1
685 K=K+1
690 IF K <= LEN(AS) THEN 665
695 PRINT
700 NEXT J
800 REM *** ASK FOR ENCORE ***
805 PRINT
810 PRINT
815 PRINT
820 PRINT
825 PRINT "WOULD YOU LIKE TO DO ANOTHER ONE ?"
830 GOSUB 4000
835 IF X=1 THEN 200
840 STOP
845 REM
1000 REM *** CONVERT INPUT STRING TO NUMBER ***
1010 X=0
1020 J=1
1030 IF J>LEN(A$) THEN 1120
1040 K=1
1050 IF K>26 THEN 1100
1060 IF A$[J,J]=B$[K,K] THEN 1090
1070 K=K+1
1080 GOTO 1050
1090 X=X+K+192
1100 J=J+1
1110 GOTO 1030
1120 RETURN
1130 REM
2000 REM *** MODULOUS FUNCTION ***
2010 M=V-INT(V/Q)*Q+1
2020 RETURN
2030 REM
3000 REM *** FETCH STRING ***
3010 PRINT "? ";
3020 ENTER 255,T,A$
3030 IF T=-256 THEN 3020
3040 PRINT
3050 RETURN
3060 REM
4000 REM *** YES OR NO FETCH ***
4010 X=0
4020 INPUT AS
4030 IF AS="NO" THEN 4090
4040 X=1
4050 IF AS="YES" THEN 4090
4060 PRINT "PLEASE ANSWER YES OR NO . . . . ."
4070 PRINT "ANSWER ";
4080 GOTO 4010
4090 RETURN
4100 REM
9999 END

```

# MANDAL

```

2 REM *** NEW MANDALA WITH MODIFIED I/O ***
3 REM *** PEOPLE'S COMPUTER CENTER : 6/12/74 ***
4 REM *** PROGRAMMER : MARC LE BRUIN ***
5 REM *** INTRO & INITIAL DIALOG : DAVE KAUFMAN ***
6 REM *** ORIGINAL PROGRAM BY GREG YOB ***
10 DIM CS(6),AS(3)
12 CS="*", $B"
14 PI=3.14159
16 PRINT "INTRODUCTION (YES OR NO? )"
18 INPUT AS
19 IF AS(1,1)="N" THEN 100
20 PRINT
24 PRINT " * YOU * DESIGN A MANDALA BY TYPING IN SOME NUMBERS."
28 PRINT " MANDALAS ARE SQUARE PATTERNS. THINK OF A LINE THAT STARTS
30 PRINT "AT THE MANDALA'S CENTER AND EXTENDS STRAIGHT OUT. IMAGINE"
32 PRINT "SWINGING IT AS IF IT WERE A PIECE OF ROPE, WITH A WEIGHT ON ITS"
34 PRINT "END TO KEEP IT STRAIGHT. WHEN THE LINE DIPS AND CLIMBS, YOU'LL"
36 PRINT "MAKE AN INTERESTING SURFACE."
38 PRINT
40 PRINT " IF THE LINE ITSELF RIPPLES WHILE YOU SWING IT, YOUR SURFACE"
42 PRINT "WILL BE EVEN MORE INTERESTING."
44 PRINT
46 PRINT " THIS IS WHAT MAKING MANDALAS IS ALL ABOUT - * YOU * CONTROL"
48 PRINT "THE RIPPLE, AND * YOU * CONTROL THE DIPPING."
50 PRINT
52 PRINT " HOW MANY RIPPLES FROM YOUR HAND TO THE END? THAT'S CALLED"
54 PRINT "THE RIPPLE FREQUENCY, AND HOW MANY DIPS IN A COMPLETE SWING?"
56 PRINT "THAT'S A FREQUENCY TOO."
58 PRINT
60 PRINT " WHEN * YOUR * MANDALA IS MADE, THE RIPPLE AND DIP"
62 PRINT "EFFECTS ARE ADDED - IF ONE IS POSITIVE AND THE OTHER NEGATIVE."
64 PRINT "YOU'LL TEND TO GET A BLANK AREA. BUT IF BOTH ARE POSITIVE,"
66 PRINT "YOU'LL HAVE LOTS OF + AND - PRINTED - NEGATIVE SURFACES"
68 PRINT "ARE SHOWN WITH + AND - SYMBOLS."
70 PRINT
72 PRINT " ONE MORE THING - YOU CAN MAKE THE RIPPLES AND DIPS HAVE"
74 PRINT "DIFFERENT IMPORTANCE. WHEN YOU GIVE YOUR RIPPLE (OR DIP)"
76 PRINT "FREQUENCY, TYPE A COMMA, AND THEN AN IMPORTANCE NUMBER."
78 PRINT "WHICHEVER HAS THE LARGER IMPORTANCE NUMBER WILL BE THE STRONGER."
80 PRINT
82 PRINT " YOUR MANDALAS HAVE A THIRD EFFECT, A COMBINATION OF DIPS AND"
84 PRINT "RIPPLES. ALL THREE EFFECTS ARE ADDED TO GET THE SURFACE."
86 PRINT
88 PRINT " ADVICE : UNTIL YOU HAVE A GOOD FEEL FOR DIPS AND RIPPLES"
90 PRINT "USE ZERO (0) FOR YOUR COMBINATION NUMBER. ALSO, USE SMALL"
92 PRINT "INTEGERS, LIKE 1 OR 5 OR 4."
100 REM *** INITIAL DIALOG ***
110 PRINT
120 PRINT "SIZE OF MANDALA IN INCHES"
130 INPUT S
140 IF S >= 1 AND S <= 7 THEN 180
150 PRINT "MANDALAS CAN BE BETWEEN 1 AND 7 INCHES."
160 PRINT "SIZE"
170 GOTO 130
180 S=INT(2.5*S+.5)
190 PRINT "DIP FREQUENCY AND IMPORTANCE"
200 INPUT FI,CI
210 PRINT "RIPPLE FREQUENCY AND IMPORTANCE"
220 INPUT F2,C2
230 PRINT "COMBINATION IMPORTANCE"
240 INPUT C3
250 PRINT
260 PRINT "HERE IS YOUR MANDALA !"
270 PRINT
280 REM *** PARAMETER NORMALIZATION ***
290 FI=INT(FI+.5)
300 F2=INT(F2+.5)
310 CI=ABS(C1)
320 C2=ABS(C2)
330 C3=ABS(C3)
340 C=C1+C2+C3
350 C1=3*C1/C
360 C2=3*C2/C
370 C3=3*C3/C
380 PRINT
1000 REM *** PRINTING LOOP ***
1010 FOR Y=S TO -S STEP -1
1020 Y2=Y*
1030 REM FIND EDGE
1040 XI=S
1050 X2=-S
1060 X3=-1
1070 FOR X=X1 TO X2 STEP X3
1080 R=SQR((XX+Y2)/S)
1090 IF X <> 0 THEN 1120
1100 A=PI*SGN(Y)/2
1110 GOTO 1150
1120 A=ATN(Y/X)
1130 IF X>0 THEN 1150
1140 A=A+PI
1150 G1=SIN(FI*A)
1160 G2=SIN(F2*R*PI)
1170 Q=INT(C1*G1+C2*G2+C3*G1*G2+.3)+1
1180 IF X3=1 THEN 1250
1190 IF Q=3 OR Q=4 THEN 1260
1200 REM FOUND EDGE
1210 XI=-S
1220 X2=X
1230 X3=1
1240 GOTO 1070
1250 PRINT CS(Q,Q)/CS(0,Q)
1260 NEXT X
1270 PRINT
1280 NEXT Y
1290 PRINT
1300 PRINT "HERE WE GO AGAIN ..."
1310 GOTO 100
999 END

```

# LIFE

```

10 REM-LIFE DEVELOPED FOR 2000F
20 DIM S(29,29)
30 DIM MS(72)
40 Y=A$=0
50 MAT S=ZER
60 PRINT "INSTRUCTIONS"
70 INPUT JS(1,1)
80 IF JS(1,1)="N" THEN 340
90 PRINT "THIS IS JOHN CONWAY'S GAME OF LIFE. ARTICLES FURTHER DESCRIBING"
100 PRINT "THIS GAME MAY BE FOUND IN THE MATHEMATICAL GAMES SECTION OF"
110 PRINT "SCIENTIFIC AMERICAN ISSUES: OCTOBER '70, NOVEMBER '70, FEBRUARY '71."
120 PRINT
130 PRINT "THE GAME INVOLVES CELLULAR GENERATION GROWTH. EACH CELL IS"
140 PRINT "ONE PRINTED CHARACTER, A CELL IS SURROUNDED BY EIGHT OTHER"
150 PRINT "CELLS, IN THREE DIRECTIONS: DIAGONALLY, HORIZONTALLY, VERTICALLY."
160 PRINT "IN EACH GENERATION CELLS DIE AND GROW SIMULTANEOUSLY."
170 PRINT
180 PRINT "A CELL DIES FROM OVERPOPULATION IF IT IS SURROUNDED BY MORE"
190 PRINT "THAT THREE LIVING CELLS. IT WILL ALSO DIE OF ISOLATION IF IT HAS"
200 PRINT "LESS THAN TWO CELLS SURROUNDING IT. NEW CELLS CAN BE FORMED IN"
210 PRINT "EMPTY POSITIONS ONLY; IF AND ONLY IF IT HAS THREE CELLS AROUND IT."
220 PRINT
230 PRINT "YOU WILL BE ASKED TO ENTER THE FIRST, LAST, AND THE INTERVAL"
240 PRINT "BETWEEN THE GENERATIONS TO BE PRINTED."
250 PRINT
260 PRINT "ENTER YOUR PATTERN IN QUOTES -- A LINE AT A TIME -- A '+' WHERE"
270 PRINT "YOU WANT A LIVE CELL AND A '-' (SPACE) FOR AN EMPTY ONE."
280 PRINT "MAX BOARD SIZE IS 28 BY 28."
290 PRINT
300 PRINT "WHEN YOU'RE FINISHED, TYPE THE WORD 'DONE' AS YOUR LAST LINE."
310 PRINT "BE SURE EACH LINE YOU ENTER IS IN QUOTES."
320 PRINT
330 PRINT "NOTE: IF THE LIMITS OF THIS PROGRAM ARE REACHED, IT WILL TERMINATE."
340 PRINT
350 PRINT "WHICH GENERATION SHALL THE PRINTING START WITH?"
360 INPUT T
370 PRINT "AND THE LAST GENERATION?"
380 INPUT RI
390 PRINT "ALSO, HOW MANY SHALL I SKIP?"
400 INPUT D
410 O=+1
420 PRINT "ENTER PATTERN"
430 FOR M=1 TO 28
440 INPUT MS
450 IF MS="DONE" THEN 570
460 IF LEN(MS)<29 THEN 490
470 PRINT "NO MORE THAN 28 CELLS PER LINE"
480 GOTO 440
490 FOR R=1 TO LEN(MS)
500 IF MS(R,R)="/" THEN 550
510 IF MS(R,R)="#" THEN 580
520 SCM,R)=1
530 A=A+1
540 S=S MAX R
550 NEXT R
560 NEXT M

```

```

570 GOTO 600
580 PRINT "'''IMSCR,RJ''' IS NEITHER A BLANK NOR A '*' - TYPE THE LINE AGAIN"
590 GOTO 440
600 DIM X(29,29)
610 IF NOT Y THEN 630
620 GOTO 20
630 MAT X=ZER
640 V=0
650 Y=N=M-1
660 PRINT "GENERATION = 0 POPULATION = "IA
670 GOSUB 1100
680 G=G+1
690 A=V=0
700 MAT S=ZER
710 FOR M=1 TO NI
720 FOR R=1 TO S
730 J=0
740 IF M>28 OR R>28 THEN 1200
750 IF NOT X(M,R+1) OR R=S THEN 770
760 J=J+1
770 IF NOT X(M+1,R+1) OR M=NI OR R=S THEN 790
780 J=J+1
790 IF NOT X(M+1,R) OR M=NI THEN 810
800 J=J+1
810 IF M=NI OR R=1 THEN 840
820 IF NOT X(M+1,R-1) THEN 840
830 J=J+1
840 IF R=1 THEN 870
850 IF NOT X(M,R-1) THEN 870
860 J=J+1
870 IF M=1 OR R=1 THEN 900
880 IF NOT X(M-1,R-1) THEN 900
890 J=J+1
900 IF M=1 THEN 930
910 IF NOT X(M-1,R) THEN 930
920 J=J+1
930 IF M=1 OR R=S THEN 960
940 IF NOT X(M-1,R+1) THEN 960
950 J=J+1
960 IF J=3 THEN 980
970 IF J#2 OR NOT X(M,R) THEN 1000
980 S(M,R)=1
990 A=A+1
1000 NEXT R
1010 NEXT M
1020 IF A=0 THEN 1390
1030 IF G=R1 THEN 1050
1040 IF G<T OR (G-T)/0#INT((G-T)/0) THEN 1070
1050 PRINT "GEN="G;TAB(2*R-1)"POP="A
1060 GOTO 1080
1070 V=9
1080 GOSUB 1100
1090 GOTO 680
1100 J=A=50
1110 C=D=0
1120 FOR M=1 TO NI
1130 FOR R=1 TO S
1140 IF NOT S(M,R) THEN 1210
1150 J=J M1 M
1160 A=A MIN R
1170 C=C MAX M
1180 D=D MAX R
1190 IF V=9 THEN 1210
1200 PRINT TAB(2*R-2)*";
1210 NEXT R
1220 IF V=9 THEN 1240
1230 PRINT
1240 NEXT M
1250 IF G=R1 THEN 1400
1260 C=C-J+3
1270 D=D-A+3
1280 MAT X=ZER
1290 FOR M=1 TO NI
1300 FOR R=1 TO S
1310 IF NOT S(M,R) THEN 1330
1320 X(M-J+2,R-A+2)=1
1330 NEXT R
1340 NEXT M
1350 MAT S=ZER
1360 N1=C
1370 S=D
1380 RETURN
1390 PRINT "NO MORE LIFE IN GENERATION"IG
1400 PRINT "**END OF RUN**"
1410 GOTO 1430
1420 PRINT "CELL HAS REACHED LIMITS OF PROGRAM. PROGRAM MUST TERMINATE."
1430 PRINT
1440 PRINT "ANOTHER RUN "
1450 INPUT JS(1,1)
1455 Y=A=S=0
1457 MAT S=ZER
1460 IF JS(1,1)="Y" THEN 340
1470 END

```

## AMAZE

```

1000 DIM W(20,78),V(20,78),AS(10)
1010 PRINT "DO YOU NEED INSTRUCTIONS"
1020 INPUT AS(1,1)
1030 IF AS="Y" THEN 1070
1040 IF AS="N" THEN 1130
1050 PRINT "PLEASE TYPE YES OR NO"
1060 GOTO 1020
1070 PRINT "THIS PROGRAM WILL PRINT OUT FOR YOU A MAZE!"
1080 PRINT "ALL YOU ARE REQUIRED TO DO IS INPUT THE DIMENSIONS."
1090 PRINT "YOU MAY HAVE A MAZE UP TO 20 BY 20 UNITS. BUT NOTHING"
1100 PRINT "BEYOND THAT ."
1110 PRINT "EACH MAZE IS DIFFERENT, AND HAS ONLY ONE WAY THROUGH"
1120 PRINT "IT."
1130 MAT W=ZER
1140 MAT V=ZER
1150 PRINT "WHAT ARE YOUR DIMENSIONS"
1160 INPUT H,V
1170 IF H <= 20 AND H=INT(H) AND V <= 20 AND V=INT(V) THEN 1200
1180 PRINT "SORRY--TRY AGAIN"
1190 GOTO 1160
1200 PRINT
1210 IF H#1 AND V#1 THEN 1240
1220 PRINT "MEANINGLESS DIMENSIONS, TRY AGAIN"
1230 GOTO 1160
1240 PRINT ""
1250 Q=Z=0
1260 X=INT(RND(0)*H+1)
1270 FOR I=1 TO H
1280 IF I=X THEN 1310
1290 PRINT "I--"
1300 GOTO 1320
1310 PRINT "I: "
1320 NEXT I
1330 PRINT "I"
1340 C=1
1350 W(I,1)=C
1360 C=C+1
1370 R=X
1380 S=1
1390 GOTO 1490
1400 IF R#H THEN 1470
1410 IF S#V THEN 1440
1420 R=S=1
1430 GOTO 1480
1440 R=1
1450 S=S+1
1460 GOTO 1480
1470 R=R+1
1480 IF W(R,S)=0 THEN 1400
1490 IF R#=0 THEN 1850
1500 IF W(R-1,S) THEN 1850
1510 IF S#=0 THEN 1660
1520 IF W(R,S-1)=0 THEN 1660
1530 IF R=H THEN 1570
1540 IF W(R+1,S) THEN 1570
1550 X=INT(RND(0)*3+1)
1560 GOTO X OF 2230,2300,2370
1570 IF S#V THEN 1610
1580 IF Z=1 THEN 1640
1590 Q=1
1600 GOTO 1620
1610 IF W(R,S+1) THEN 1640
1620 X=INT(RND(0)*3+1)
1630 GOTO X OF 2230,2300,2470
1640 X=INT(RND(0)*2+1)
1650 GOTO X OF 2230,2300
1660 IF R=H THEN 1770
1670 IF W(R+1,S) THEN 1770
1680 IF S#V THEN 1720
1690 IF Z=1 THEN 1750

```

# Board Games

## ROVER

```

1700 Q=1
1710 GOTO 1730
1720 IF W[R,S+1] THEN 1750
1730 X=INT(RND(0)*3+1)
1740 GOTO X OF 2230,2370,2470
1750 X=INT(RND(0)*2+1)
1760 GOTO X OF 2230,2370
1770 IF S#V THEN 1810
1780 IF Z=1 THEN 1840
1790 Q=1
1800 GOTO 1820
1810 IF W[R,S+1] THEN 1840
1820 X=INT(RND(0)*2+1)
1830 GOTO X OF 2230,2470
1840 GOTO 2230
1850 IF S=0 THEN 2060
1860 IF W[R,S-1] THEN 2060
1870 IF R=H THEN 1980
1880 IF W[R+1,S] THEN 1980
1890 IF S#V THEN 1930
1900 IF Z=1 THEN 1960
1910 Q=1
1920 GOTO 1940
1930 IF W[R,S+1] THEN 1960
1940 X=INT(RND(0)*3+1)
1950 GOTO X OF 2300,2370,2470
1960 X=INT(RND(0)*2+1)
1970 GOTO X OF 2300,2370
1980 IF S#V THEN 2020
1990 IF Z=1 THEN 2050
2000 Q=1
2010 GOTO 2030
2020 IF W[R,S+1] THEN 2050
2030 X=INT(RND(0)*2+1)
2040 GOTO X OF 2300,2470
2050 GOTO 2300
2060 IF R=H THEN 2160
2070 IF W[R+1,S] THEN 2160
2080 IF S#V THEN 2120
2090 IF Z=1 THEN 2150
2100 Q=1
2110 GOTO 2130
2120 IF W[R,S+1] THEN 2150
2130 X=INT(RND(0)*2+1)
2140 GOTO X OF 2370,2470
2150 GOTO 2370
2160 IF S#V THEN 2200
2170 IF Z=1 THEN 2220
2180 Q=1
2190 GOTO 2210
2200 IF W[R,S+1] THEN 2220
2210 GOTO 2470
2220 GOTO 2660
2230 W[R-1,S]=C
2240 C=C+1
2250 V[R-1,S]=2
2260 R=R-1
2270 IF C=H*V+1 THEN 2670
2280 Q=0
2290 GOTO 1490
2300 W[R,S-1]=C
2310 C=C+1
2320 V[R,S-1]=1
2330 S=S-1
2340 IF C=H*V+1 THEN 2670
2350 Q=0
2360 GOTO 1490
2370 W[R+1,S]=C
2380 C=C+1
2390 IF V[R,S]=0 THEN 2420
2400 V[R,S]=3
2410 GOTO 2430
2420 V[R,S]=2
2430 R=R+1
2440 IF C=H*V+1 THEN 2670
2450 Q=0
2460 GOTO 1850
2470 IF Q=1 THEN 2570
2480 W[R,S+1]=C
2490 C=C+1
2500 IF V[R,S]=0 THEN 2530
2510 V[R,S]=3
2520 GOTO 2540
2530 V[R,S]=1
2540 S=S-1
2550 IF C=H*V+1 THEN 2670
2560 GOTO 1490
2570 Z=1
2580 IF V[R,S]=0 THEN 2620
2590 V[R,S]=3
2600 Q=0
2610 GOTO 2660
2620 V[R,S]=1
2630 Q=0
2640 R=S=1
2650 GOTO 1480
2660 GOTO 1400
2670 FOR J=1 TO V
2680 PRINT "I"
2690 FOR I=1 TO H
2700 IF V[I,J]<2 THEN 2730
2710 PRINT " "
2720 GOTO 2740
2730 PRINT "I"
2740 NEXT I
2750 PRINT
2760 FOR I=1 TO H
2770 IF V[I,J]=0 THEN 2810
2780 IF V[I,J]=2 THEN 2810
2790 PRINT " ";
2800 GOTO 2820
2810 PRINT ":-)"
2820 NEXT I
2830 PRINT ":"
2840 NEXT J
2850 PRINT "DO YOU WANT ANOTHER MAZE?"
2860 INPUT AS[1,1]
2870 IF AS="Y" THEN 1130
2880 IF AS="N" THEN 2910
2890 PRINT "A YES OR NO WILL DO JUST FINE"
2900 GOTO 2860
2910 END

```

```

1 REM *** PEOPLE'S COMPUTER COMPANY
2 REM *** 1919 MENALTO AVENUE MENLO PARK, CA
3 REM *** 7-74
4 REM *** BASED ON AN IDEA BY JEFF SUMBERG, RIDGEWOOD, NEW JERSEY
5 REM *** WITH HELP FROM JOHN ROBERTSON
60 REM *** VARIABLE CONVENTIONS
52 REM MS => INPUT MESSAGES
54 REM DS => STRING FOR DECODING COMMAND
56 REM ES => NUMBER OF ROWS IN GRID
60 REM RI => CURRENT ROW YOU ARE IN
62 REM R9 => PASSING ROW BETWEEN ROUTINES
64 REM C => NUMBER OF COLUMNS IN GRID
66 REM CI => CURRENT COLUMN YOU ARE IN
68 REM C9 => PASSING COLUMN BETWEEN ROUTINES
70 REM K1 => NUMBER OF CHECKS YOU HAVE LEFT
72 REM M1 => NUMBER OF MAPS YOU HAVE LEFT
74 REM S => NUMERICAL REPRESENTATION OF A GO
76 REM P => NUMERICAL REPRESENTATION OF A STOP
77 REM PI => NUMBER OF STOPS IN THE GRID
78 REM Y => NUMERICAL REPRESENTATION OF A POSITION ROVER'S BEEN
80 REM X => NUMERICAL REPRESENTATION OF WHERE ROVER STOPPED
82 REM Z1 => TEMPORARY
84 REM Z9 => RETURN CODE: 0 CONTINUE GAME; 1 STOP
100 REM *** DIMENSIONS AND GLOBAL VARIABLES
104 DIM MS[72],DS[6],ES[3]
108 R=9
112 C=9
116 DIM F[9,9]
120 DS="SCLMIE"
124 ES="NRE"
128 P=0
132 S=1
136 Y=2
140 X=3
190 REM *** INSTRUCTIONS?
192 PRINT "DO YOU WANT INSTRUCTIONS (YES OR NO)?"
194 INPUT MS
196 IF MS[1,1] <> "Y" THEN 200
198 GOSUB 2800
200 REM *** INITIALIZE GRID, CHECKS, MAPS
204 GOSUB 2000
208 REM *** FIND A GO STARTING POSITION AND GIVE INFO
212 GOSUB 900
216 REM *** THE GAME PROCEEDS
220 GOSUB 1000
224 REM *** ANOTHER GAME?
228 PRINT
232 PRINT "DO YOU WANT TO TRY ANOTHER GRID (YES OR NO)?"
236 INPUT MS
240 IF MS[1,1] <> "Y" THEN 200
244 REM *** BYE
248 GOTO 2999
900 REM *** GO STARTING POSITION AND # STOPS, # CHECKS, # MAPS
904 RI=0
908 CI=0
912 PRINT
916 PRINT "WOULD YOU LIKE A CLUE (YES OR NO)?"
920 INPUT MS
924 IF MS[1,1] <> "Y" THEN 960
928 Z1=INT(C/2-1+2*RND(0))
932 IF F[1,Z1]=5 THEN 944
936 F[1,Z1]=5
940 PI=PI-1
944 PRINT "HINT: POSITION 1,";Z1;" IS GO"
960 PRINT
964 PRINT "THERE ARE";PI;"STOPS"
968 PRINT "YOU HAVE";K1;"CHECKS AND";M1;"MAPS"
972 PRINT "GOOD LUCK!"
976 PRINT
980 RETURN
1000 REM *** COMMAND DECODER
1004 REM *** THE FIRST LETTER OF EACH COMMAND IS UNIQUE
1008 PRINT
1012 PRINT "+";
1016 INPUT MS
1020 FOR I=1 TO 6
1024 IF MS[1,I]=DS[1,I] THEN 1040
1028 NEXT I
1032 PRINT "I CAN'T FIGURE OUT WHAT YOU MEAN - TELL ME AGAIN"
1036 GOTO 1008
1040 GOSUB I OF 1100,1200,1300,1400,1500,1600
1044 REM *** CHECK RETURN CODE TO SEE IF GAME IS OVER
1048 IF Z=90 THEN 1008
1052 RETURN
1100 REM *** STEP COMMAND
1102 GOSUB 2100
1104 IF (ABS(RI-R9) <= 1) AND (ABS(CI-C9) <= 1) THEN 1120
1105 REM *** CHECK IF THIS IS THE FIRST MOVE
1106 IF (R9=1) AND (CI=0) THEN 1120
1107 IF RI>0 THEN 1112
1108 PRINT "YOU CAN START ANYWHERE IN ROW 1"
1110 GOTO 1102
1112 PRINT "YOU CAN'T STEP FROM";RI;"";CI;" TO ";R9;"";C9;" - TRY AGAIN"
1116 GOTO 1102
1120 RI=R9
1124 CI=C9
1128 REM *** CHECK IF IT IS A STOP
1132 IF F[RI,CI]=P THEN 2600
1136 REM *** MARK THAT YOU HAVE BEEN THERE
1140 FIRI,CI=Y
1144 REM *** CHECK IF YOU HAVE MADE IT TO THE LAST ROW
1148 IF RI=R THEN 2500
1152 PRINT "GO"
1156 RETURN
1200 REM *** CHECK COMMAND
1204 REM *** SEE IF THERE ARE ANY CHECKS LEFT
1208 IF K1 >= 1 THEN 1220
1212 PRINT "SORRY, BUT YOU'VE ALREADY USED ALL YOUR CHECKS"
1216 RETURN
1220 K1=K1-1
1224 GOSUB 2100
1228 Z1=F[R9,C9]
1232 IF Z1=P THEN 1246

```

# rover

```

1236 PRINT "GO"
1240 RETURN
1246 PRINT "STOP"
1250 RETURN
1300 REM *** LOOK COMMAND
1304 Z1=0
1308 FOR I=R1+1 TO R
1312 IF F(I,J1) <> P THEN 1320
1316 Z1=Z1+1
1320 NEXT I
1324 PRINT "THERE ARE";Z1;"STOPS STRAIGHT AHEAD"
1328 Z1=0
1332 FOR I=1 TO C
1336 IF F(R1+I,J1) <> P THEN 1344
1340 Z1=Z1+1
1344 NEXT I
1348 PRINT "THERE ARE";Z1;"STOPS IN ROW";R1+1
1352 RETURN
1400 REM *** MAP COMMAND
1404 REM *** SEE IF THERE ARE ANY MAPS LEFT
1408 IF M1 > 1 THEN 1420
1412 PRINT "SORRY, BUT YOU'VE ALREADY USED ALL YOUR MAPS"
1416 RETURN
1420 M1=M1-1
1424 REM *** THE MAP IS PRINTED FROM ROW 1 TO ROW R9
1428 R9=R1
1432 GOSUB 2200
1436 RETURN
1500 REM *** INFO COMMAND
1504 PRINT "ROVER ROBOT IS AT";R1;"";J1
1508 PRINT "YOU HAVE";X1;"CHECKS LEFT"
1512 PRINT "YOU HAVE";M1;"MAPS LEFT"
1516 RETURN
1600 REM *** END COMMAND
1604 REM *** SET END-OF-GAME RETURN CODE
1608 Z9=1
1612 PRINT "YOU'VE LEFT ROVER ROBOT STRANDED - HOW SELFISH"
1616 GOTO 2616
2000 REM *** INITIALIZE GRID, # OF CHECKS, # OF MAPS
2004 PRINT
2008 PRINT
2012 PRINT "WHICH GRID DO YOU WANT - NOVICE, REGULAR, OR EXPERT?"
2016 INPUT MS
2020 FOR L1=1 TO 3
2024 IF M$1,L1)=E$(L1,L1) THEN 2036
2028 NEXT L1
2032 GOTO 2012
2036 Z1=.8-L1/10
2040 PI=0
2044 FOR I=1 TO R
2048 FOR J=1 TO C
2052 F(I,J)=INT(RND(0)+Z1)
2056 IF F(I,J)=1 THEN 2064
2060 PI=PI+1
2064 NEXT J
2068 NEXT I
2070 REM *** GUARANTEE ONE STOP IN EACH COLUMN AMONG THE LAST 3 ROWS
2072 FOR I=1 TO C
2074 IF (F(I-2,J)=P) OR (F(I-1,J)=P) OR (F(I,R)=P) THEN 2062
2076 REM *** PLACE A STOP IN THIS COLUMN IN ONE OF THE LAST THREE ROWS
2078 F(I-2+INT(3*RND(0)),J)=P
2080 PI=PI+1
2082 NEXT I
2090 K1=INT(R+R*RND(0))
2092 M1=4-L1
2094 Z9=0
2096 RETURN
2100 REM *** ROW,COLUMN SUBROUTINE
2104 REM *** RETURN A VALID POSITION IN R9,C9
2108 PRINT "ROW,COLUMN";
2112 INPUT R9,C9
2116 R9=INT(R9)
2120 C9=INT(C9)
2124 IF (R9<1) OR (R9>R) OR (C9<1) OR (C9>C) THEN 2132
2126 RETURN
2132 PRINT "THAT POSITION IS NOT IN THE GRID - TRY AGAIN"
2136 GOTO 2108
2200 REM *** PRINT A MAP
2204 REM *** ROW 1 TO ROW R9 WILL BE PRINTED
2212 PRINT TAB(S);";"S ARE ROVER ROBOT'S STEPS"
2220 PRINT
2224 PRINT TAB(25);"C O L U M N S"
2226 PRINT
2227 PRINT " R O W S "
2228 FOR I=1 TO C
2232 PRINT TAB(6*(I+1));I;
2236 NEXT I
2240 PRINT
2244 PRINT
2248 FOR I=1 TO R9
2252 PRINT TAB(5);I;TAB(9);
2256 FOR J=1 TO C
2260 Z1=[I,J]
2264 IF Z1 <> S THEN 2276
2268 PRINT " GO ";
2272 GOTO 2304
2276 IF Z1 <> P THEN 2288
2280 PRINT " STOP ";
2284 GOTO 2304
2288 IF Z1 <> Y THEN 2300
2292 PRINT " * ";
2296 GOTO 2304
2300 PRINT " XXXX ";
2304 NEXT J
2308 PRINT
2312 PRINT
2316 NEXT I
2320 PRINT
2324 PRINT
2328 RETURN
2500 REM *** MADE IT TO THE LAST ROW
2504 REM *** SET END-OF-GAME RETURN CODE
2508 Z9=1
2512 PRINT "HOOORAY! ROVER ROBOT MADE IT TO ROW";R
2514 PRINT
2516 PRINT "FINAL MAP (YES OR NO)"
```

```

2520 INPUT MS
2524 IF M$1,1)="Y" THEN 2532
2526 RETURN
2530 R=R
2536 GOSUB 2200
2540 RETURN
2544 REM *** ROVER STOPPED, ROVER ROBOT, YOU'VE LANDED ON A STOP"
2548 PRINT "YOU BAD, ROVER ROBOT, YOU'VE LANDED ON A STOP"
2552 RETURN
2556 REM *** SET END-OF-GAME RETURN CODE
2560 R=R
2564 IF R1,C1=0 THEN 2568
2568 F(R1,C1)=X
2572 PRINT TAB(5);THE "XXXX" IS WHERE ROVER ROBOT STOPPED"
2576 PRINT "FINAL MAP (YES OR NO)";
2580 INPUT MS
2584 IF M$1,1)="Y" THEN 2636
2588 RETURN
2600 REM *** INSTRUCTIONS
2604 PRINT "ROVER ROBOT NEEDS YOUR HELP TO GET ACROSS A GRID."
2608 PRINT "EACH SQUARE IS MARKED EITHER 'GO' OR 'STOP'."
2612 PRINT "ROVER CAN CONTINUE MOVING AS LONG AS IT NEVER LANDS ON A 'STOP'."
2616 PRINT "ROVER MAY START AT ANY SQUARE IN ROW 1."
2620 PRINT "ROVER MAY TRYING TO REACH POSITION"
2624 PRINT "YOU MAY CHECK ANY SQUARE TO SEE IF IT IS A 'GO' OR A 'STOP'."
2628 PRINT "YOU WILL ALSO HAVE A MAP-OPTION SHOWING YOU WHERE ROVER IS LOCATED."
2632 PRINT "HAS BEEN AND ALL THE 'STOP'S UP TO THE CURRENT ROW."
2636 PRINT "LEAVE ROVER ROBOT STRANDED IN THE GRID."
2640 PRINT "INFO"
2644 PRINT "MAP"
2648 PRINT "INFORMATION"
2652 PRINT "RETURN"
2656 PRINT "END"
2660 PRINT "END"
2664 PRINT "END"
2668 PRINT "END"
2672 PRINT "END"
2676 PRINT "END"
2680 PRINT "END"
2684 PRINT "END"
2688 PRINT "END"
2692 PRINT "END"
2696 PRINT "END"
2700 PRINT "END"
2704 PRINT "END"
2708 PRINT "END"
2712 PRINT "END"
2716 PRINT "END"
2720 PRINT "END"
2724 PRINT "END"
2728 PRINT "END"
2732 PRINT "END"
2736 PRINT "END"
2740 PRINT "END"
2744 PRINT "END"
2748 PRINT "END"
2752 PRINT "END"
2756 PRINT "END"
2760 PRINT "END"
2764 PRINT "END"
2768 PRINT "END"
2772 PRINT "END"
2776 PRINT "END"
2780 PRINT "END"
2784 PRINT "END"
2788 PRINT "END"
2792 PRINT "END"
2796 PRINT "END"
2800 PRINT "END"
2804 PRINT "END"
2808 PRINT "END"
2812 PRINT "END"
2816 PRINT "END"
2820 PRINT "END"
2824 PRINT "END"
2828 PRINT "END"
2832 PRINT "END"
2836 PRINT "END"
2840 PRINT "END"
2844 PRINT "END"
2848 PRINT "END"
2852 PRINT "END"
2856 PRINT "END"
2860 PRINT "END"
2864 PRINT "END"
2868 PRINT "END"
2872 PRINT "END"
2876 PRINT "END"
2880 PRINT "END"
2884 PRINT "END"
2888 PRINT "END"
2892 PRINT "END"
2896 PRINT "END"
2900 PRINT "END"
2904 PRINT "END"
2908 PRINT "END"
2912 PRINT "END"
2916 PRINT "END"
2920 PRINT "END"
2924 PRINT "END"
2928 PRINT "END"
2932 PRINT "END"
2936 PRINT "END"
2940 PRINT "END"
2944 PRINT "END"
2948 PRINT "END"
2952 PRINT "END"
2956 PRINT "END"
2960 PRINT "END"
2964 PRINT "END"
2968 PRINT "END"
2972 PRINT "END"
2976 PRINT "END"
2980 PRINT "END"
2984 PRINT "END"
2988 PRINT "END"
2992 PRINT "END"
2996 PRINT "END"
2998 PRINT "END"
2999 PRINT "END"
```

# TEASER

```

10 DIM A$[3]
20 PRINT "DO YOU WANT INSTRUCTIONS?"
30 INPUT A$
40 IF A$="YES" THEN 75
50 IF A$="NO" THEN 280
60 PRINT "PLEASE GIVE ME YES OR NO ANSWER."
70 GOTO 30
75 PRINT
80 PRINT "IF YOU LIKE BRAIN TEASER, THEN YOU'RE IN FOR SOME FUN!!"
90 PRINT "THE OBJECT OF THIS PUZZLE IS TO SOLVE A 3 X 3 MATRIX SUCH THAT"
100 PRINT "1'S APPEAR IN ALL POSITIONS EXCEPT IN THE CENTER WHICH WILL REMAIN"
110 PRINT "0. THE POSITIONS ON THE MATRIX BOARD ARE REFERRED TO BY ROWS!!"
120 PRINT "THEN COLUMNS. FOR EXAMPLE, THE UPPER RIGHT HAND POSITION WOULD"
130 PRINT "BE REFERRED TO 1,3. HERE ARE THE RULES AND CONDITIONS!!"
140 PRINT
150 PRINT "YOU ARE NOT ALLOWED TO CHANGE A 0 TO A 1; YOU MUST CHANGE 1'S"
160 PRINT "TO 0'S!!"
170 PRINT
180 PRINT "WHEN A 1 IS MADE 0, ITS IMMEDIATE NEIGHBORS CHANGE STATE, THAT IS,"
190 PRINT "1'S BECOME 0'S AND VICE VERSA. FOR EXAMPLE, IF YOUR MOVE WAS"
200 PRINT "TO CHANGE L,1 BOTH 1,2 AND 2,1 WOULD CHANGE STATE. IN ADDITION,"
210 PRINT "CHANGING CORNER POSITIONS ALSO CHANGES THE CENTER POSITION CHANGING"
220 PRINT "CENTER POSITION ALSO CHANGES OUTSIDE MIDDLE POSITIONS!!"
230 PRINT "(1,2)(2,1)(2,3)(3,2)."
240 PRINT
250 PRINT "IF YOU ARE STILL UNSURE, TRY THE GAME A FEW TIMES AND OBSERVE!!"
260 PRINT "WHAT HAPPENS ON THE BOARD!!"
270 PRINT "AFTER EACH MOVE THE NEW BOARD WILL BE PRINTED OUT!!"
280 PRINT
290 PRINT "PLEASE GIVE ME A RANDOM NUMBER TO START THE GAME OFF!!"
300 INPUT X
310 DIM A[3,3]
320 FOR M=1 TO 3
330 FOR N=1 TO 3
340 LET A[M,N]=INT(RND(X)+.5)
350 NEXT N
360 NEXT M
370 FOR Q=1 TO 5
380 PRINT
390 NEXT Q
400 PRINT
410 GOTO 980
420 PRINT
430 MAT PRINT A$
440 PRINT "MAKE YOUR MOVE!!"
450 INPUT M,N
460 PRINT
470 IF M=1 AND N=2 AND N=3 OR M=1 AND N=2 AND N=3 THEN 630
480 IF A[M,N]=0 THEN 600
490 LET A[M,N]=0
500 IF M=1 AND N=1 THEN 650
510 IF M=1 AND N=2 THEN 690
520 IF M=1 AND N=3 THEN 720
530 IF M=2 AND N=1 THEN 760
540 IF M=2 AND N=2 THEN 790
550 IF M=2 AND N=3 THEN 840
560 IF M=3 AND N=1 THEN 870
570 IF M=3 AND N=2 THEN 910
580 IF M=3 AND N=3 THEN 940
590 GOTO 40
600 PRINT "DON'T CHEAT! YOU MUST CHANGE 1'S TO 0'S."
610 PRINT "NOW, GIVE ME ANOTHER POSITION."
620 GOTO 450
630 PRINT "PLEASE GIVE ME PROPER DATA REFERRING TO BOARD."
640 GOTO 450
650 LET A[1,2]= NOT A[1,2]
660 LET A[2,1]= NOT A[2,1]
670 LET A[2,2]= NOT A[2,2]
680 GOTO 410
690 LET A[1,1]= NOT A[1,1]
700 LET A[1,3]= NOT A[1,3]
710 GOTO 410
720 LET A[1,2]= NOT A[1,2]
730 LET A[2,3]= NOT A[2,3]
740 LET A[2,2]= NOT A[2,2]
750 GOTO 410
760 LET A[1,1]= NOT A[1,1]
770 LET A[3,1]= NOT A[3,1]
780 GOTO 410
790 LET A[1,2]= NOT A[1,2]
800 LET A[2,1]= NOT A[2,1]
810 LET A[2,3]= NOT A[2,3]
820 LET A[3,2]= NOT A[3,2]
830 GOTO 410
840 LET A[1,3]= NOT A[1,3]
850 LET A[3,3]= NOT A[3,3]
860 GOTO 410
870 LET A[2,1]= NOT A[2,1]
880 LET A[3,2]= NOT A[3,2]
890 LET A[2,2]= NOT A[2,2]
900 GOTO 410
910 LET A[1,1]= NOT A[1,1]
920 LET A[1,3]= NOT A[1,3]
930 GOTO 410
940 LET A[2,3]= NOT A[2,3]
950 LET A[3,2]= NOT A[3,2]
960 LET A[2,2]= NOT A[2,2]
970 GOTO 410
980 IF A[1,1] AND A[1,2] AND A[1,3] AND A[2,1] THEN 1000
990 GOTO 1050
1000 IF A[2,3] AND A[3,1] AND A[3,2] AND A[3,3] THEN 1020
1010 GOTO 1060
1020 PRINT "CONGRATULATIONS - YOU SOLVED THE GREAT PUZZLE!!!!"
1030 PRINT
1040 MAT PRINT A$
1050 STOP
1060 IF NOT A[1,1] AND NOT A[1,2] AND NOT A[1,3] AND NOT A[2,1] AND NOT A[2,2] THEN 1080
1070 GOTO 420
1080 IF NOT A[2,3] AND NOT A[3,1] AND NOT A[3,2] AND NOT A[3,3] THEN 1100
1090 GOTO 420
1100 PRINT "SORRY - NO KAY YOU'LL WIN NOW!!!!"
1110 PRINT
1120 MAT PRINT A$
1130 STOP
1140 END

```

# Bus. & Soc. Sci. Simulations

## KING

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10 REM-KING
12 REM-ORIGINAL KING BY .....
15 REM- THIS VERSION BY .....TIES
20 DIM A$[5]
30 N5=N4=8
40 PRINT "INSTRUCTIONS"
50 INPUT AS
60 IF AS[1,1]!="N" THEN 390
70 PRINT
80 PRINT "CONGRATULATIONS! YOUVE BEEN MADE PREMIER OF SEIATS DETINU."
90 PRINT "A SMALL COMMUNIST ISLAND 30 BY 70 MILES LONG. YOUR JOB IS"
100 PRINT "TO DECIDE THE COUNTRY'S FATE."
110 PRINT
120 PRINT "THE MONEY SYSTEM IS RALLODS. EACH COUNTRYMEN MUST HAVE AT"
130 PRINT "LEAST 100 RALLODS/YEAR TO SURVIVE."
140 PRINT
150 PRINT "YOUR COUNTRY'S INCOME COMES FROM FARM PRODUCE, TOURISTS,"
160 PRINT "AND TAXES. HALF YOUR LAND IS FARM LAND WHICH MAY BE SOLD"
170 PRINT "TO FOREIGN INDUSTRY WHO IMPORT AND SUPPORT THEIR OWN WORKERS"
180 PRINT
190 PRINT "CROPS COST BETWEEN 10 AND 15 RALLODS PER SQ. MILE TO PLANT"
200 PRINT "AND THEY BRING IN BETWEEN 45 AND 65 RALLODS PER SQ. MILE"
210 PRINT
220 PRINT "INDUSTRY WILL BUY LAND FROM 95 TO 105 RALLODS PER SQ. MILE"
230 PRINT "AND WILL PAY TAXES OF 44 RALLODS PER SQ. MILE OF LAND."
240 PRINT "INDUSTRY BRINGS TOURIST TRADE. IT MUST OWN AT LEAST 2 SQ."
250 PRINT "MILES BEFORE YOU GET ANY TOURIST TRADE, AND INCOME FROM"
260 PRINT "YOUR TOURIST TRADE WILL INCREASE UNTIL INDUSTRY OWNS"
270 PRINT "26 SQ. MILES OF LAND."
280 PRINT "INDUSTRY ALSO BRINGS POLLUTION, WHICH IS MEASURED IN UNITS."
290 PRINT "POLLUTION MAY BE COMBATTED BY SPENDING .44 RALLODS PER UNIT"
300 PRINT "OF POLLUTION. POLLUTION WILL DECREASE TOURIST TRADE AND"
310 PRINT "CROP YIELD."
320 PRINT
330 PRINT "YOU CAN INCREASE YOUR CROP YIELD THROUGH EDUCATION. THE"
340 PRINT "VALUE OF CROPS IS DEPENDENT ON THE AMOUNT OF MONEY USED FOR"
350 PRINT "EDUCATION IN THE PAST 3 YEARS. 10 RALLODS PER PERSON IS"
360 PRINT "THE MAXIMUM USEFUL AMOUNT TO SPEND ON EDUCATION."
370 PRINT
380 PRINT "YOUR GOAL: TO COMPLETE YOUR" ;N4;" YEAR TERM."
390 PRINT "GOOD LUCK!"
400 LET M=INT(70000.+(RND(0)*1000)-(RND(0)*1000))
410 LET P=INT(500+(RND(0)*10)-(RND(0)*10))
420 LET L=2000
430 W=X2=E0=X1=E1=S9=S0=M5=S1=0
440 LET D1=INT(P/3)
450 LET L1=INT((RND(0)*5)+10)
460 LET L0=INT((RND(0)*10+95)
470 GOSUB 2200
480 PRINT "YOU HAVE" ;M;" RALLODS"
490 PRINT P;" COUNTRYMEN,";
500 IF W<0 THEN 520
510 PRINT W;" FOREIGN WORKERS,";
520 PRINT " AND" ;L;" SQ. MILES OF LAND."
530 PRINT "THIS YEAR INDUSTRY WILL BUY LAND FOR" ;L0;" RALLODS/SQ. MILE"
540 PRINT "LAND CURRENTLY COSTS" ;L1;" RALLODS/SQ. MILE TO PLANT"
550 IF S1=0 THEN 570
560 PRINT "POLLUTION LEVEL IS" ;S1;" UNITS."
570 GOSUB 2220
580 PRINT "HOW MANY SQ. MILES TO SELL TO INDUSTRY";
590 INPUT L2
600 IF L2<0 THEN 580
610 IF L2<(L-1000) THEN 680
620 PRINT " THINK AGAIN, YOU'VE ONLY" ;L-1000;" SQ. MILES OF FARM LAND"
630 IF X1 <> 0 THEN 580
640 PRINT "(FOREIGN INDUSTRY IS NOT INTERESTED IN FOREST LAND BECAUSE"
650 PRINT "OF THE GREATER DEVELOPMENT COST)"
660 LET X1=1
670 GOTO 580
680 LET M=INT(M-L2*L0)
690 LET L=INT(L-L2)
700 LET X9=INT(.44*(2000-L))
710 LET M2=0
720 LET M3=0
730 LET M4=0
740 PRINT "HOW MANY RALLODS TO DISTRIBUTE TO"
750 PRINT " YOUR COUNTRYMEN"
760 INPUT M1
770 IF M1<0 THEN 740
780 IF M1 <= M THEN 810
790 GOSUB 2250
800 GOTO 740
810 LET M=INT(M-M1)
820 IF M=0 THEN 1170
830 PRINT "HOW MANY SQ. MILES TO PLANT"
840 INPUT L3
850 IF L3<0 THEN 830
860 IF L3 <= P*2 THEN 890
870 PRINT "EACH COUNTRYMAN CAN ONLY PLANT 2 SQ. MILES"
880 GOTO 950
890 IF L3 <= L-1000 THEN 920
900 PRINT "ONLY GOT" ;L-L-1000;" SQ. MILES OF FARM LAND."
910 GOTO 950
920 LET M4=INT(L3*L1)
930 IF M4 <= M THEN 990
940 GOSUB 2250
950 PRINT "YOU CAN AFFORD" ;INT(M/L1);
960 PRINT " AND HAVE LABOR FOR" ;P*2;
970 PRINT " AND HAVE" ;L-L-1000;" SQ.MILES"
980 GOTO 830
990 LET M=INT(M-M4)
1000 IF M=0 THEN 1170
1010 PRINT "HOW MUCH TO SPEND FOR EDUCATION"
1020 INPUT M2
1030 IF M2<0 THEN 1010
1040 IF M2 <= M THEN 1070
1050 GOSUB 2250
1060 GOTO 1010
1070 LET M=INT(M-M2)
1080 IF M=0 THEN 1170
1090 IF L=2000 THEN 1170
1100 PRINT "HOW MUCH TO SPEND TO COMBAT POLLUTION"
1110 INPUT M3
1120 IF M3<0 THEN 1170

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1138 IF M3 <= M THEN 1160
1140 GOSUB 2250
1150 GOTO 1100
1160 LET M=INT(M-M3)
1170 GOSUB 2220
1180 LET D0=0
1190 LET E2=M2/P
1200 LET D2=INT(P-M1/100)
1210 IF D2 <= 0 THEN 1240
1220 LET D0=D2
1230 PRINT D2;" COUNTRYMEN DIED OF STARVATION"
1240 LET D3=INT((S1/100000.)*(.1+.4*RND(0))*P)
1250 IF D3 <= 0 THEN 1280
1260 PRINT D3;" COUNTRYMEN DIED FROM EXCESS POLLUTION."
1270 LET D0=D0+D3
1280 IF D0 <= 0 THEN 1400
1290 LET F=D0*9
1300 PRINT "YOU WERE FORCED TO SPEND";F;" RALLODS, FOR FUNERAL EXPENSES"
1310 LET M=INT(M-F)
1320 IF M <= 0 THEN 1400
1330 PRINT "INSUFFICIENT RESOURCES FORCED SALE OF LAND"
1340 LET T0=-INT((M-L0+1)/L0)
1350 LET L=L-T0
1360 IF L >= 1000 THEN 1390
1370 PRINT "NOT ENOUGH LAND TO SELL"
1380 GOTO 2270
1390 LET M=M+T0*L0
1400 IF D0>200 THEN 2300
1410 LET P=P-P0
1420 LET D1=D1-D0
1430 IF D1<0 THEN 2410
1440 IF D2 <= 2 THEN 1460
1450 IF M>500 THEN 2520
1460 IF L2=0 THEN 1520
1470 LET T0=INT(L2+L2*RND(2)*2)
1480 IF W=0 THEN 1500
1490 LET T0=INT(T0+.1*W)
1500 PRINT T0;" WORKERS CAME TO THE ISLAND AND"
1510 LET W=W*T0
1520 LET T0=INT((C500-P)/10-D3/3-D2/S)*.75*(1+RND(0)))
1530 PRINT ABS(T0); " COUNTRYMEN "
1540 IF T0<0 THEN 1570
1550 PRINT "CAME TO"
1560 GOTO 1580
1570 PRINT "LEFT"
1580 PRINT " THE ISLAND."
1590 LET P=P+T0
1600 IF P>W THEN 2480
1610 LET T0=0
1620 IF L=2000 THEN 1680
1630 LET T0=INT((S1/100000.)*L3)
1640 IF T0 <= L3 THEN 1660
1650 LET T0=L3
1660 IF T0=0 THEN 1680
1670 PRINT "OF";L3;" SQ. MILES PLANTED, "
1680 PRINT "YOU HARVESTED";L3-T0;" SQ. MILES OF CROPS."
1690 IF T0=0 THEN 1760
1700 IF X2 > 2 THEN 1760
1710 PRINT " (DUE TO )";
1720 IF X2=0 THEN 1740
1730 PRINT "INCREASED ";
1740 PRINT "POLLUTION LEVELS"
1750 LET X2=X2+1
1760 LET T1=INT((39+RND(0)*20)*(1+.25*(E0+E1)/20))
1770 PRINT " MAKING";INT(T1*(L3-T0));" RALLODS."
1780 LET M=M+INT(T1*(L3-T0))
1790 LET E0=E1
1800 IF E2 <= 10 THEN 1820
1810 LET E2=10
1820 LET E1=E2
1830 LET T0=2000-L
1840 IF T0<2 THEN 2100
1850 IF T0 <= 26 THEN 1870
1860 LET T0=26
1870 LET T0=INT(T0+500*(.52+.5*RND(0)))
1880 LET T1=S1/100000.
1890 IF T1 <= 1 THEN 1910
1900 LET T1=1
1910 LET T1=T1*T0
1920 PRINT "YOU MADE";INT(T0-T1);" RALLODS FROM TOURIST TRADE"
1930 LET M=M+INT(T0-T1)
1940 IF INT(T0-T1) <= M5 THEN 2080
1950 IF S1 <= S9 THEN 2080
1960 PRINT " DECREASE BECAUSE ";
1970 LET T2=RND(0)*10
1980 GOTO (T2/2)+1 OF 1990,2010,2030,2050,2070,2070
1990 PRINT "FISH POPULATION HAS DWINDLED DUE TO WATER POLLUTION"
2000 GOTO 2080
2010 PRINT "AIR POLLUTION IS KILLING GAME BIRD POPULATION"
2020 GOTO 2080
2030 PRINT "MINERAL BATHS ARE BEING RUINED BY WATER POLLUTION"
2040 GOTO 2080
2050 PRINT "UNPLEASANT SMOG IS DISCOURAGING SUN BATHERS"
2060 GOTO 2080
2070 PRINT "HOTELS ARE LOOKING SHABBY DUE TO SMOG GRIT"
2080 LET M5=INT(T0-T1)
2090 LET S9=S1
2100 LET S2=(2000-L)*2-M3/.44
2110 PRINT "YOU RECEIVED";X91;" RALLODS FROM TAXES ON INDUSTRY"
2120 IF S2 >= 0 THEN 2170
2130 LET S1=INT(S1+S2/2)
2140 IF S1 >= S0 THEN 2160
2150 LET S1=S0
2160 GOTO 2190
2170 LET S1=INT(S1+S2)
2180 LET S0=INT(S0+S2/10)
2190 LET NS=NS-1
2200 IF NS>0 THEN 450
2210 GOTO 2570
2220 PRINT
2230 PRINT
2240 RETURN
2250 PRINT "ONLY GOT";JM;" RALLODS LEFT!"
2260 RETURN
2270 PRINT "YOU HAVE BEEN THROWN OUT OF OFFICE AND YOU ARE NOW"
2280 PRINT "RESIDING IN PRISON."

```

# HAMURABI

```

100 REM ** HAMURABI - GOVERN THE KINGDOM OF SUMERIA
110 REM ** MODIFIED BY PEOPLE'S COMPUTER COMPANY
120 REM ** VARIABLES USED IN THE PROGRAM
130 REM   A1 => POPULATION
140 REM   A2 => IMMIGRANTS LAST YEAR
150 REM   A3 => DEATHS LAST YEAR
160 REM   B1 => BUSHELS IN STOREHOUSES
170 REM   B2 => BUSHELS DESTROYED LAST YEAR BY RATS
180 REM   B3 => HARVEST PER ACRE LAST YEAR
190 REM   B4 => TOTAL HARVEST LAST YEAR
200 REM   C1 => ACRES OWNED BY CITY
210 REM   C2 => VALUE OF AN ACRE
220 REM   I => TEMPORARY VARIABLE
230 REM   J =>
300 REM ** INITIALIZATION
310 PRINT "HAMURABI - "
320 PRINT "WHERE YOU GOVERN THE ANCIENT KINGDOM OF SUMERIA."
330 PRINT "THE OBJECT IS TO FIGURE OUT HOW THE GAME WORKS!"
340 PRINT "(IF YOU WANT TO QUIT, SELL ALL YOUR LAND.)"
350 PRINT
400 A1=100
410 A2=5
420 A3=0
430 B1=2800
440 B2=200
450 B3=3
460 B4=3000
470 C1=1000
480 J=1
1000 REM ** REPORT TO HAMURABI
1010 PRINT
1020 PRINT "HAMURABI, I BEG TO REPORT THAT LAST YEAR"
1030 PRINT
1040 PRINT A3;"PEOPLE STARVED AND";A2;"PEOPLE CAME TO THE CITY."
1050 IF J>1 THEN 1100
1060 A1=A1-INT(A1/2)
1070 PRINT "THE PLAGUE KILLED HALF THE PEOPLE."
1080 PRINT "THE POPULATION IS NOW";A1
1090 PRINT
1100 PRINT "WE HARVESTED";B4;"BUSHELS AT";B3;"BUSHELS PER ACRE."
1130 PRINT "RATS DESTROYED";B2;"BUSHELS LEAVING";B1
1140 PRINT "BUSHELS IN THE STOREHOUSES."
1150 PRINT
1160 PRINT "THE CITY OWNS";C1;"ACRES OF LAND."
1170 C2=17+INT(6*RND(0))
1180 PRINT "LAND IS WORTH";C2;"BUSHELS PER ACRE."
1190 PRINT
1200 PRINT
1210 PRINT "HAMURABI . . ."
1300 REM ** BUY LAND?
1310 PRINT
1320 PRINT "BUY HOW MANY ACRES?"
1330 INPUT I
1340 I=INT(ABS(I))
1350 IF I=0 THEN 1500
1360 J=I*C2
1370 IF J < B1 THEN 1400
1380 GOSUB 9000
1390 GOTO 1310
1400 B1=B1-J
1410 C1=C1+I
1500 REM ** SELL LAND?
1510 PRINT "SELL HOW MANY ACRES?"
1520 INPUT I
1530 I=INT(ABS(I))
1540 IF I=0 THEN 1700
1550 IF I<C1 THEN 1600
1560 IF I>C1 THEN 9999
1570 GOSUB 9000
1580 GOTO 1510
1600 C1=C1-I
1610 B1=B1+C2*I
1700 REM ** DISTRIBUTE FOOD
1710 PRINT "HOW MANY BUSHELS SHALL WE DISTRIBUTE AS
1720 INPUT I
1730 I=INT(ABS(I))
1740 IF I <= B1 THEN 1770
1750 GOSUB 9000
1760 GOTO 1710
1770 B1=B1-I
1780 A2=A1-INT(I/20)
1790 A2=0
1800 IF A3 >= 0 THEN 1900
1810 A2=-A3/2
1820 A3=0
1900 REM ** PLANT LAND
1910 PRINT "HOW MANY ACRES SHALL WE PLANT?"
1920 INPUT I
1930 I=INT(ABS(I))
1935 IF I>C1 THEN 1960
1940 J=INT(I/2)
1950 IF J <= B1 THEN 1980
1960 GOSUB 9000
1970 GOTO 1910
1980 IF I>10*A1 THEN 1960
1990 B1=B1-J
2000 REM ** HARVEST, RATS, AND CHANGES IN POPULATION
2010 B3=INT(S*RND(0))+1
2020 B4=B3*I
2030 B2=INT((B1+B4)*.07*RND(0))
2040 B1=B1-B2+B4
2050 J=INT(10*RND(0))
2060 A2=INT(A2+(5-B3)*B1/600+I)
2070 IF A2 <= 50 THEN 2100
2080 A2=50
2100 A1=A1+A2-A3
2110 GOTO 1010
9000 REM ** ERROR SUBROUTINE
9005 PRINT
9010 PRINT "HAMURABI, THINK AGAIN - YOU ONLY HAVE"
9020 PRINT A1;"PEOPLE,";C1;"ACRES, AND"
9030 PRINT B1;"BUSHELS IN STOREHOUSES."
9040 PRINT
9050 RETURN

```

## CIVIL 2

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10 REM - CIVIL WAR SIMULATION
15 REM-ORIGINAL PROGRAM BY L. CRAM, L. GOODIE, D. HIBBARD
20 REM - MODIFIED BY GERRY PAUL--7/18/73
30 REM - REVISED BY ROGER HESS--10/24/73
35 REM- OF TIES, MINNEAPOLIS
40 DIM CS[4],XS[5],BS[5]
50 DIM S[4]
60 REM UNION INFO ON LIKELY CONFEDERATE STRATEGY
70 MAT READ S
80 DATA 25,25,25,25
90 PRINT
100 PRINT "DO YOU WANT INSTRUCTIONS?"
110 INPUT XS
120 IF XS="YES" THEN 160
130 IF XS="NO" THEN 370
140 PRINT "YES OR NO -- "
150 GOTO 110
160 PRINT ""
170 PRINT "THIS IS A CIVIL WAR SIMULATION."
180 PRINT "TO PLAY, TYPE A RESPONSE WHEN THE COMPUTER ASKS."
190 PRINT "REMEMBER THAT ALL FACTORS ARE INTERRELATED AND THAT YOUR"
200 PRINT "RESPONSES COULD CHANGE HISTORY. FACTS AND FIGURES USED ARE"
210 PRINT "BASED ON THE ACTUAL OCCURRENCE. MOST BATTLES TEND TO RESULT"
220 PRINT "AS THEY DID IN THE CIVIL WAR, BUT IT ALL DEPENDS ON YOU!!"
230 PRINT
240 PRINT "THE OBJECT OF THE GAME IS TO WIN AS MANY BATTLES AS POSSIBLE"
250 PRINT
260 PRINT "YOUR CHOICES FOR DEFENSIVE STRATEGY ARE:"
270 PRINT " (1) ARTILLERY ATTACK"
280 PRINT " (2) FORTIFICATION AGAINST FRONTAL ATTACK"
290 PRINT " (3) FORTIFICATION AGAINST FLANKING MANEUVERS"
300 PRINT " (4) FALLING BACK"
310 PRINT " YOUR CHOICES FOR OFFENSIVE STRATEGY ARE:"
320 PRINT " (1) ARTILLERY ATTACK"
330 PRINT " (2) FRONTAL ATTACK"
340 PRINT " (3) FLANKING MANEUVERS"
350 PRINT " (4) ENCIRCLEMENT"
360 PRINT "YOU MAY SURRENDER BY TYPING A 'S' FOR YOUR STRATEGY."
370 PRINT LIN(3),"ARE THERE TWO GENERALS PRESENT?"
380 PRINT "(ANSWER YES OR NO?)"
390 INPUT BS
400 IF BS="YES" THEN 430
410 IF BS <> "NO" THEN 380
420 PRINT "YOU ARE THE CONFEDERACY. GOOD LUCK!"
430 LET D=1
440 IF BS <> "YES" THEN 460
450 LET D=2
460 PRINT "SELECT A BATTLE BY TYPING A NUMBER FROM 1 TO 14 ON"
470 PRINT "REQUEST. TYPE ANY OTHER NUMBER TO END THE SIMULATION."
480 PRINT "BUT '0' BRINGS BACK EXACT PREVIOUS BATTLE SITUATION"
490 PRINT "ALLOWING YOU TO REPLAY IT"
500 PRINT
510 PRINT "NOTE: A NEGATIVE FOODS ENTRY CAUSES THE PROGRAM TO "
520 PRINT "USE THE ENTRIES FROM THE PREVIOUS BATTLE"
530 PRINT
540 PRINT "AFTER REQUESTING A BATTLE, DO YOU WISH "

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550 PRINT "BATTLE DESCRIPTIONS"
560 PRINT "(ANSWER YES OR NO?)"
570 INPUT XS
580 IF XS="YES" THEN 600
590 IF XS <> "NO" THEN 560
600 LET L=W=R1=Q1=M3=P1=P2=T1=T2=0
610 LET F(2)=H(2)=B(2)=R2=Q2=C6=F=W0=Y=Y2=U=U2=0
620 PRINT ""
630 PRINT "WHICH BATTLE DO YOU WISH TO SIMULATE?"
640 INPUT A
650 IF A=0 AND R1 <> 0 THEN 1140
660 IF A <= 0 OR A >= 15 THEN 2860
670 GOTO A OF 680,700,720,740,760,780,800,B20,B40,B60,B80,900,920,940
680 RESTORE 3440
690 GOTO 950
700 RESTORE 3450
710 GOTO 950
720 RESTORE 3460
730 GOTO 950
740 RESTORE 3470
750 GOTO 950
760 RESTORE 3480
770 GOTO 950
780 RESTORE 3490
790 GOTO 950
800 RESTORE 3500
810 GOTO 950
820 RESTORE 3510
830 GOTO 950
840 RESTORE 3520
850 GOTO 950
860 RESTORE 3530
870 GOTO 950
880 RESTORE 3540
890 GOTO 950
900 RESTORE 3550
910 GOTO 950
920 RESTORE 3560
930 GOTO 950
940 RESTORE 3570
950 READ C$,M1,M2,C1,C2,M
960 LET U=0
970 REM - INFLATION CALC
980 LET II=10*(L-W)*2
990 LET I2=10*(W-L)*2
1000 REM - MONEY AVAILABLE
1010 LET D(1)=100*INT(M1*(100-II)/2000)+(1+(R1-Q1)/(R1+I))*.5
1020 LET D(2)=100*INT(M2*(100-I2)/2000)+.5
1030 IF BS <> "YES" THEN 1050
1040 LET D(2)=100*INT(M2*(100-I2)/2000)*(1+(R2-Q2)/(R2+I))*.5
1050 REM - MEN AVAILABLE
1060 LET M5=INT(M1*(1+(P1-T1)/(M3+I)))
1070 LET M6=INT(M2*(1+(P2-T2)/(M4+I)))
1080 LET F15=M1/6
1090 PRINT ""
1100 PRINT "THIS IS THE BATTLE OF "CS
1110 IF XS="NO" THEN 1150
1120 GOTO A OF 3580,3650,3690,3720,3750,3780,3800,3830,3860,3890
1130 GOTO A-11 OF 3920,3950,3980
1140 PRINT CS" INSTANT REPLAY"
1150 PRINT
1160 PRINT " ","CONFEDERACY"," UNION"
1170 PRINT "MEN," " MS," " M6
1180 PRINT "MONEY," "$" ;D1," $" ;D2)
1190 PRINT "INFLATION," "II+15%" ;"Z," "II2%" ;"Z"
1200 REM - ONLY IN PRINTOUT IS CONFED INFLATION = II+15%
1210 REM - IF TWO GENERALS, INPUT CONFED. FIRST
1220 FOR I=1 TO D
1230 IF BS <> "YES" THEN 1260
1240 IF I=2 THEN 1260
1250 PRINT "CONFEDERATE GENERAL---"
1260 PRINT "HOW MUCH DO YOU WISH TO SPEND FOR"
1270 PRINT " - FOOD....."
1280 INPUT F
1290 IF F >= 0 THEN 1360
1300 IF R1 <= 0 THEN 1330
1310 PRINT "NO PREVIOUS ENTRIES"
1320 GOTO 1270
1330 PRINT "ASSUME YOU WANT TO KEEP SAME ALLOCATIONS"
1340 PRINT
1350 GOTO 1510
1360 LET F(1)=F
1370 PRINT " - SALARIES.."
1380 INPUT H(1)
1390 LET N=1
1400 IF H(1)<0 THEN 1490
1410 PRINT " - AMMUNITION"
1420 INPUT B(1)
1430 LET N=2
1440 IF B(1)<0 THEN 1390
1450 PRINT
1460 IF F(1)+H(1)+B(1) <= D(1) THEN 1510
1470 PRINT "THINK AGAIN! YOU HAVE ONLY $" ;D(1)
1480 GOTO 1270
1490 PRINT "NEGATIVE VALUES NOT ALLOWED."
1500 GOTO N OF 1370,1410
1510 IF BS <> "YES" THEN 1550
1520 IF I=2 THEN 1550
1530 PRINT "UNION GENERAL---"
1540 NEXT I
1550 FOR Z=1 TO D
1560 IF BS <> "YES" THEN 1620
1570 GOTO Z OF 1580,1600
1580 PRINT "CONFEDERATE"
1590 GOTO 1620
1600 PRINT " UNION "
1610 REM - FIND MORALE
1620 LET O=((2*F(2))+H(Z)+2)/F(1)+2
1630 IF O<10 THEN 1660
1640 PRINT "MORALE IS HIGH"
1650 GOTO 1700
1660 IF O<5 THEN 1690
1670 PRINT "MORALE IS FAIR"
1680 GOTO 1700
1690 PRINT "MORALE IS POOR"
1700 IF BS <> "YES" THEN 1760

1710 LET O(2)=0
1720 NEXT Z
1730 LET O2=O(2)
1740 LET O=O(1)
1750 PRINT "CONFEDERATE GENERAL---"
1760 REM - ACTUAL OFF/DEF BATTLE SITUATION
1770 IF M3 THEN 1800
1780 PRINT "YOU ARE ON THE OFFENSIVE"
1790 GOTO 1840
1800 IF M <> 1 THEN 1830
1810 PRINT "YOU ARE ON THE DEFENSIVE"
1820 GOTO 1840
1830 PRINT "BOTH SIDES ARE ON THE OFFENSIVE"
1840 PRINT
1850 REM - CHOOSE STRATEGIES
1860 IF BS <> "YES" THEN 1910
1870 FOR I=1 TO 2
1880 GOTO I OF 1890,1920
1890 PRINT "CONFEDERATE STRATEGY"
1900 GOTO 1920
1910 PRINT "YOUR STRATEGY"
1920 INPUT Y
1930 IF ABS(Y-3)<3 THEN 1960
1940 PRINT "STRATEGY" ;Y;"NOT ALLOWED."
1950 GOTO 1910
1960 IF BS="YES" THEN 2000
1970 IF Y=5 THEN 2830
1980 GOSUB 3110
1990 GOTO 2170
2000 IF I=2 THEN 2040
2010 LET Y1=Y
2020 PRINT "UNION STRATEGY"
2030 NEXT I
2040 LET Y2=Y
2050 LET Y=Y1
2060 IF Y2>5 THEN 2020
2070 REM - SIMULATED LOSSES-NORTH
2080 LET C6=(2*C2/5)*(1+I/(2*(ABS(Y2-Y)+1)))
2090 LET C6=C6*(1-28*(5*M2/6)/(B(2)+1))
2100 LET C6=INT(C6*(I+1/02)+.5)
2110 REM - IF LOSS > MEN PRESENT, RESCALE LOSSES
2120 LET E2=100/02
2130 IF INT(C6+E2)<M6 THEN 2190
2140 LET C6=INT(13*M6/20)
2150 LET E2=7*C6/13
2160 LET U2=1
2170 REM - CALCULATE SIMULATED LOSSES
2180 PRINT
2190 PRINT "CONFEDERACY", "UNION"
2200 LET C5=(2*C1/5)*(1+I/(2*(ABS(Y2-Y)+1)))
2210 LET C5=INT(C5*(I+1/0)*(1-28+F1/(B(1)+1))+.5)
2220 LET E=100/0
2230 IF C5+100/0<M1*(I+(P1-T1)/(M3+I)) THEN 2270
2240 LET C5=INT(13*M1/20*(I+(P1-T1)/(M3+I)))
2250 LET E=7*C5/13
2260 LET U=1
2270 IF D=1 THEN 2500
2280 PRINT "CASUALTIES", C5,C6
2290 PRINT "DESERTIONS", INT(E), INT(E2)
2300 PRINT
2310 IF BS <> "YES" THEN 2530
2320 PRINT "COMPARED TO THE ACTUAL CASUALTIES AT "CS
2330 PRINT "CONFEDERATE:" ;INT(100*(C5/C1)+.5)"% OF THE ORIGINAL"
2340 PRINT "UNION:" ;INT(100*(C6/C2)+.5)"% OF THE ORIGINAL"
2350 PRINT
2360 REM - I WHO ONE
2370 IF U=1 AND U2=1 THEN 2460
2380 IF U=1 THEN 2420
2390 IF U2=1 THEN 2440
2400 IF C5+E=C6+E2 THEN 2460
2410 IF C5+E<C6+E2 THEN 2440
2420 PRINT "THE UNION WINS "CS
2430 GOTO 2600
2440 PRINT "THE CONFEDERACY WINS "CS
2450 GOTO 2600
2460 PRINT "BATTLE OUTCOME UNRESOLVED"
2470 LET W=W+1
2480 IF A=0 THEN 2790
2490 GOTO 2680
2500 LET C6=INT(17*C2*C1/(C5*20))
2510 LET E2=5*0
2520 GOTO 2280
2530 PRINT "YOUR CASUALTIES WERE "INT(100*(C5/C1)+.5)"% OF "
2540 PRINT "THE ACTUAL CASUALTIES AT "CS
2550 PRINT
2560 REM - FIND WHO WON
2570 IF U=1 THEN 2590
2580 IF C5+E>17*C2*C1/(C5*20)+5*0 THEN 2630
2590 PRINT "YOU LOSE "CS
2600 IF A=0 THEN 2790
2610 LET L=I+1
2620 GOTO 2680
2630 PRINT "YOU WIN "CS
2640 REM - CUMULATIVE BATTLE FACTORS WHICH ALTER HISTORICAL
2650 REM - RESOURCES AVAILABLE. IF A REPLAY DON'T UPDATE.
2660 IF A=0 THEN 2790
2670 LET W=W+1
2680 LET TI=T1+C5+E
2690 LET T2=TI+C6+E2
2700 LET P1=P1+C1
2710 LET P2=P2+C2
2720 LET O1=O1+((F(1)+H(1)+B(1)))
2730 LET O2=O2+((F(2)+H(2)+B(2)))
2740 LET R1=R1+M1*(100-II)/20
2750 LET R2=R2+M2*(100-I2)/20
2760 LET M3=M3+M1
2770 LET M4=M4+M2
2780 GOSUB 3300
2790 LET U=U2=0
2800 PRINT -----
2810 GOTO 620
2820 REM-----FINISH OFF
2830 PRINT "THE CONFEDERACY HAS SURRENDERED"
2840 GOTO 2860
2850 PRINT "THE UNION HAS SURRENDERED."
2860 PRINT LIN(S)

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2670 PRINT "THE CONFEDERACY "
2680 PRINT "HAS WON "W" BATTLES AND LOST "L"
2690 IF Y=5 THEN 2940
2700 IF Y2=5 THEN 2920
2710 IF W <= L OR Y=5 THEN 2940
2720 PRINT "THE CONFEDERACY HAS WON THE WAR"
2730 GOTO 2950
2740 PRINT "THE UNION HAS WON THE WAR"
2750 PRINT
2760 IF R1=0 THEN 3100
2770 PRINT "FOR THE "W+L+W0" BATTLES FOUGHT (EXCLUDING RERUNS)"
2780 PRINT " ", " "
2790 PRINT "CONFEDERACY," UNION"
3000 PRINT "HISTORICAL LOSSES", INT(P1+.5), INT(P2+.5)
3010 PRINT "SIMULATED LOSSES", INT(T1+.5), INT(T2+.5)
3020 PRINT
3030 PRINT "% OF ORIGINAL", INT(100*(T1/P1)+.5), INT(100*(T2/P2)+.5)
3040 IF BS="YES" THEN 3100
3050 PRINT
3060 PRINT "UNION INTELLIGENCE SUGGESTS THAT THE SOUTH USED "
3070 PRINT "STRATEGIES 1, 2, 3, 4 IN THE FOLLOWING PERCENTAGES"
3080 PRINT S[1];S[2];S[3];S[4]
3090 REM-----
3100 STOP
3110 REM - UNION STRATEGY IS COMPUTER CHOSEN
3120 PRINT "UNION STRATEGY IS "
3130 IF A <> 0 THEN 3180
3140 INPUT Y
3150 IF Y2>0 AND Y2<5 THEN 3290
3160 PRINT "ENTER 1, 2, 3, OR 4 (USUALLY PREVIOUS UNION STRATEGY)"
3170 GOTO 3140
3180 LET S0=0
3190 LET R=100*RND(1)
3200 FOR I=1 TO 4
3210 LET S0=S0+S[I]
3220 REM - IF ACTUAL STRATEGY INFO IS IN PROGRAM DATA STATEMENTS
3230 REM THEN R-100 IS EXTRA WEIGHT GIVEN TO THAT STRATEGY.
3240 IF R<S0 THEN 3270
3250 NEXT I
3260 REM - IF ACTUAL STRAT. IN, THEN HERE IS Y2= HIST. STRAT.
3270 LET Y2=1
3280 PRINT Y2
3290 RETURN
3300 REM LEARN PRESENT STRATEGY, START FORGETTING OLD ONES
3310 REM - PRESENT STRATEGY OF SOUTH GAINS 3*S, OTHERS LOSE S PROBABLY
3320 REM POINTS, UNLESS A STRATEGY FALLS BELOW S%
3330 LET S=3
3340 LET S0=0
3350 FOR I=1 TO 4
3360 IF S[I]<= S THEN 3390
3370 LET S[I]=S[I]-S
3380 LET S0=S0+S
3390 NEXT I
3400 LET S[Y]=S[Y]+S0
3410 RETURN
3420 REM - HISTORICAL DATA...CAN ADD MORE (STRAT., ETC) BY INSERTING
3430 REM DATA STATEMENTS AFTER APPRO. INFO. AND ADJUSTING READ
3440 DATA "BULL RUN",18000,18500,1967,2708,1
3450 DATA "SHILOH",40000,44894,10699,13047,3
3460 DATA "SEVEN DAYS",95000,115000,20614,15849,3
3470 DATA "SECOND BULL RUN",54000,63000,10000,14000,2
3480 DATA "ANTETAM",20000,50000,10000,12000,3
3490 DATA "FREDERICKSBURG",75000,120000,5377,12653,1
3500 DATA "MURFREESBORO",38000,45000,11000,12000,1
3510 DATA "CHANCELLORSVILLE",32000,90000,13000,17197,2
3520 DATA "VICKSBURG",50000,70000,12000,19000,1
3530 DATA "GETTYSBURG",72500,85000,20000,23000,3
3540 DATA "CHICKAMAUGA",66000,60000,18000,16000,2
3550 DATA "CHATTANOOGA",37000,60000,36700,58000,2
3560 DATA "SPOTSYLVANIA",62000,110000,17723,18000,2
3570 DATA "ATLANTA",65000,100000,8500,3700,1
3580 PRINT "JULY 21, 1861 GEN. BEAUREGARD COMMANDING THE SOUTH MET THE"
3590 PRINT "UNION FORCES WITH GEN. McDOWELL IN A PREMATURE BATTLE AT BULL"
3600 PRINT "RUN. GEN. JACKSON HELPED PUSH BACK THE UNION ATTACK!""
3610 GOTO 1150
3620 PRINT "APRIL 6-7, 1862. THE CONFEDERATE SURPRISE ATTACK AT SHILOH"
3630 PRINT "FAILED DUE TO POOR ORGANIZATION."
3640 GOTO 1150
3650 PRINT "JUNE 25-JULY 1, 1862 GENERAL LEE (CSA) UPHELD THE OFFENSIVE"
3660 PRINT "THROUGHOUT THE BATTLE AND FORCED GEN. McCLELLAN AND THE UND"
3670 PRINT "FORCES AWAY FROM RICHMOND."
3680 GOTO 1150
3690 PRINT "AUG. 29-30, 1862. THE COMBINED CONFEDERATE FORCES UNDER LEE"
3700 PRINT "AND JACKSON DROVE THE UNION FORCES BACK INTO WASHINGTON."
3710 GOTO 1150
3720 PRINT "SEPT 17, 1862 THE SOUTH FAILED TO INCORPORATE MARYLAND INTO"
3730 PRINT "THE CONFEDERACY."
3740 GOTO 1150
3750 PRINT "DEC 13, 1862 THE CONFEDERACY UNDER LEE SUCCESSFULLY REPULSED"
3760 PRINT "AN ATTACK BY THE UNION UNDER GEN. BURNside."
3770 GOTO 1150
3780 PRINT "DEC 31, 1862 THE SOUTH UNDER GEN. BRAGG WON A CLOSE BATTLE"
3790 GOTO 1150
3800 PRINT "MAY 1-6, 1863 THE SOUTH HAD A COSTLY VICTORY AND LOST ONE"
3810 PRINT "OF THEIR OUTSTANDING GENERALS, 'STONEWALL' JACKSON."
3820 GOTO 1150
3830 PRINT "JULY 4, 1863 VICKSBURG WAS A COSTLY DEFEAT FOR THE SOUTH"
3840 PRINT "BECAUSE IT GAVE THE UNION ACCESS TO THE MISSISSIPPI."
3850 GOTO 1150
3860 PRINT "JULY 1-3, 1863. A SOUTHERN MISTAKE BY GEN. LEE AT GETTYSBURG"
3870 PRINT "COST THEM ONE OF THE MOST CRUCIAL BATTLES OF THE WAR."
3880 GOTO 1150
3890 PRINT "SEPT. 15, 1863. CONFUSION IN A FOREST NEAR CHICKAMAUGA LED"
3900 PRINT "TO A COSTLY SOUTHERN VICTORY."
3910 GOTO 1150
3920 PRINT "NOV. 25, 1863. AFTER THE SOUTH HAD SIEGED GEN. ROSECRANS"
3930 PRINT "ARMY FOR THREE MONTHS, GEN. GRANT BROKE THE SIEGE."
3940 GOTO 1150
3950 PRINT "MAY 5, 1864. GRANT'S PLAN TO KEEP LEE ISOLATED BEGAN TO FAIL"
3960 PRINT "HERE, AND CONTINUED AT COLD HARBOR AND PETERSBURG."
3970 GOTO 1150
3980 PRINT "AUGUST, 1864. SHERMAN AND THREE VETERAN ARMIES CONVERGED ON"
3990 PRINT "ATLANTA AND DEALT THE DEATH BLOW TO THE CONFEDERACY."
4000 GOTO 1150
4010 END

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# Science Fiction Games

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10 COM S[12,15],T[12,12],TS[72],B[3,12]
20 COM W,D9,K9,X9,D1,X1,P9,T9,S9,Y9,H
30 COM Y1,R9,G9,G,M[6,33],C[6,31]
35 COM S1,T1,R
40 REM *** STAR TRADERS ***
50 REM <<<GAME SET-UP MODULE>>>
60 REM S IS THE STAR SYSTEM INFO ARRAY
70 REM T IS THE TRADING SHIP INFO ARRAY
80 REM TS IS THE TRADING SHIP NAME STRING
90 REM M AND C DETERMINE A STAR'S PRODUCTIVITY/MONTH
92 REM PRODMO = S(J,J) * M(1,R1) * C(1,R1)
94 REM WHERE J IS THE STAR ID #, I THE MERCHANDISE #
96 REM AND R1 IS THE DEVELOPMENT CLASS OF THE STAR
100 REM B CONTAINS THE BANK ACCOUNTS
110 REM AS IS THE STANDARD INPUT BUFFER
120 DIM AS[61]
130 REM R9 IS THE SPEED OF A SHIP IN LIGHT-YEARS PER DAY
140 REM D9 IS THE MINIMUM DISTANCE ALLOWED BETWEEN STARS
150 REM G IS THE PROBABILITY OF A DELAY
160 REM K9 IS THE MAX NUMBER OF BIDDING ROUNDS
170 REM W IS THE MAX WEIGHT OF A TRADING SHIP
180 REM X9 CONTROLS THE PROFIT MARGIN. HIGH X9 LIMITS THE Z
190 REM G9 IS THE STELLAR DEVELOPMENT INCREMENT 1<=G9<=5
195 REM R=1 IF THIS IS A RESTART
200 LET R9=2/7
210 LET D9=15
220 LET G=.1
230 LET K9=3
240 LET W=30
250 LET X9=36
260 LET G9=1.25
265 LET R=0
270 REM DI IS THE DAY OF THIS YEAR (1<=DI<=360)
280 REM Y1 IS THIS YEAR
290 LET DI=1
300 LET Y1=2070
302 REM SET UP ECONOMETRICS MODEL
304 RESTORE 2410
306 MAT READ M,C
310 REM *** BLOCK #1
320 PRINT "INSTRUCTIONS (TYPE 'Y' OR 'N' PLEASE)"
330 INPUT AS
340 IF AS[1,1]!="N" THEN 590
350 PRINT
360 PRINT " THE DATE IS JAN 1, 2070 AND INTERSTELLAR FLIGHT"
370 PRINT "HAS EXISTED FOR 78 YEARS. THERE ARE SEVERAL STAR"
380 PRINT "SYSTEMS THAT HAVE BEEN COLONIZED. SOME ARE ONLY"
390 PRINT "FRONTIER SYSTEMS, OTHERS ARE OLDER AND MORE DEVELOPED."
400 PRINT
410 PRINT " EACH OF YOU IS THE CAPTAIN OF TWO INTERSTELLAR"
420 PRINT "TRADING SHIPS. YOU WILL TRAVEL FROM STAR SYSTEM TO"
430 PRINT "STAR SYSTEM, BUYING AND SELLING MERCHANDISE. IF YOU"
440 PRINT "DRIVE A GOOD BARGAIN YOU CAN MAKE LARGE PROFITS."
450 PRINT
460 PRINT " AS TIME GOES ON, EACH STAR SYSTEM WILL SLOWLY"
470 PRINT "GROW, AND ITS NEEDS WILL CHANGE. A STAR SYSTEM THAT"
480 PRINT "HOW IS SELLING MUCH URANIUM AND RAW METALS CHEAPLY"
490 PRINT "MAY NOT HAVE ENOUGH FOR EXPORT IN A FEW YEARS."
500 PRINT
510 PRINT " YOUR SHIPS CAN TRAVEL ABOUT TWO LIGHTYEARS IN A"
520 PRINT "WEEK AND CAN CARRY UP TO "W" TONS OF CARGO. ONLY"
530 PRINT "CLASS I AND CLASS II STAR SYSTEMS HAVE BANKS ON THEM."
540 PRINT "THEY PAY 5% INTEREST AND ANY MONEY YOU DEPOSIT ON ONE"
550 PRINT "PLANET IS AVAILABLE ON ANOTHER - PROVIDED THERE'S A LOCAL"
560 PRINT "BANK."
570 PRINT
580 REM *** BLOCK #2
590 PRINT "HAVE ALL PLAYERS PLAYED BEFORE?"
600 INPUT AS
605 PRINT
610 IF AS[1,1]!="Y" THEN 630
620 GOTO 660
630 PRINT "DO YOU WANT TO SET UP YOUR OWN GAME?"
640 INPUT AS
645 PRINT
650 IF AS[1,1]!="Y" THEN 760
660 PRINT "HOW MANY PLAYERS?"
670 INPUT P9
675 PRINT
680 GOTO P9-1 OF 710,710,710
690 PRINT "2,3, OR 4 CAN PLAY"
700 GOTO 660
710 T9=2+P9
720 S9=3+P9*1
730 Y9=Y1+5
740 GOTO 1350
750 REM *** BLOCK #3
760 PRINT "IS THIS A RESTART?"
770 INPUT AS
775 PRINT
780 IF AS[1,1]!="N" THEN 940
790 PRINT "LOAD THE TAPE INTO THE TAPE READER. WHEN I TYPE A '?'"
800 PRINT "YOU CAN FLIP THE SWITCH TO 'START' WHENEVER YOU'RE READY"
810 PRINT
820 INPUT TS
830 INPUT W,D9,K9,X9,D1,Y1
835 INPUT P9,T9,S9,Y9,T1,S1
840 FOR J=1 TO 59
845 FOR I=1 TO 9 STEP 4
850 INPUT S[I,J],S[I+1,J],S[I+2,J],S[I+3,J]
855 NEXT I
860 NEXT J
870 FOR J=1 TO T9
875 FOR I=1 TO 9 STEP 4
880 INPUT T[I,J],T[I+1,J],T[I+2,J],T[I+3,J]
885 NEXT I
890 NEXT J
900 FOR I=1 TO P9
910 INPUT B[I,1],B[2,1],B[3,1]
920 NEXT I
925 R=1
930 CHAIN "TRADES"
940 PRINT "HOW MANY PLAYERS?"
950 INPUT P9

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## STAR TRADER

(set-up module)

con't

# star trader

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955 PRINT
960 IF P9 >= 2 AND P9 <= 12 THEN 990
970 PRINT "2,3,4, ..., 12 CAN PLAY"
980 GOTO 940
990 PRINT "HOW MANY SHIPS PER PLAYER?"
1000 INPUT X
1005 PRINT
1010 IF X<1 THEN 990
1020 T9=P9*X
1030 IF T9 <= 12 THEN 1070
1040 PRINT "I CAN'T KEEP TRACK OF MORE THAN 12 SHIPS"
1050 PRINT P9;" PLAYERS TIMES";X;" SHIPS MAKES";T9
1060 GOTO 990
1070 PRINT "HOW MANY STAR SYSTEMS?"
1080 INPUT S9
1085 PRINT
1090 IF S9 >= 4 AND S9 <= 13 THEN 1120
1100 PRINT "FROM 4 TO 13 STARS"
1110 GOTO 1070
1120 PRINT "ENTER THE LENGTH OF GAME IN YEARS"
1130 INPUT X
1135 PRINT
1140 IF X >= 1 AND INT(X)=X THEN 1170
1150 PRINT "CHOOSE A POSITIVE INTEGER"
1160 GOTO 1130
1170 Y9=Y1+X
1180 PRINT "WHAT'S THE MAX CARGOE TONNAGE(USUALLY 30)"
1190 INPUT W
1195 PRINT
1200 IF W<25 THEN 1180
1210 PRINT "WHAT'S THE MINIMUM DISTANCE BETWEEN STARS(USUALLY 15)"
1220 INPUT D9
1225 PRINT
1230 IF D9 <= 25 AND D9 >= 10 THEN 1260
1240 PRINT "MIN SPACING 10, MAX 25"
1250 GOTO 1210
1260 PRINT "HOW MANY BIDS OR OFFERS(USUALLY 3)"
1270 INPUT K9
1275 PRINT
1280 IF K9<1 THEN 1260
1290 PRINT "SET THE PROFIT MARGIN(1,2,3,4 OR 5)...THE HIGHER"
1300 PRINT "THE NUMBER, THE LOWER THE PROFIT % ... USUALLY SET TO 2"
1310 PRINT "...YOUR NUMBER"
1320 INPUT X9
1330 X9=18*(ABS(X9) MIN 5)
1340 REM *** BLOCK #4.1
1350 S1[1,1]=S1[2,1]=0
1360 S1[7,1]=15
1370 REM *** BLOCK #4.2
1380 H=1
1390 S1=2
1400 GOSUB 1920
1410 S1=3
1420 GOSUB 1920
1430 S1=4
1440 GOSUB 2010
1450 FOR S1=5 TO S9
1460 GOSUB S1-3*INT((S1-1)/3) OF 1920,2010,2060
1470 NEXT S1
1480 REM *** BLOCK #4.3
1490 FOR S1=1 TO S9
1500 FOR J=1 TO 6
1510 S1,J,S1)=0
1520 NEXT J
1530 IF S1>1 THEN 1560
1540 I=1
1550 GOTO 1600
1560 I=4*INT((I4*RND(0))+5
1570 FOR J=2 TO S1-1
1580 IF I=S1,B,J) THEN 1560
1590 NEXT J
1600 S1,B,S1)=1
1610 S1,C,S1)=270
1620 S1,D,S1)=Y1-1
1630 NEXT S1
1640 REM *** BLOCK #4.4
1650 T1=L-1
1655 PRINT
1657 PRINT
1660 PRINT "CAPTAINS, NAME YOUR SHIPS (UP TO 6 LETTERS/BLANKS/NUMBERS)"
1670 FOR I=1 TO T9/P9
1680 PRINT
1690 FOR PI=1 TO P9
1700 T1,I,T1)=T1,2,T1)=T1,6,T1)=0
1710 T1,3,T1)=15
1720 T1,4,T1)=T1,5,T1)=10
1730 T1,7,T1)=25
1740 T1,9,T1)=D1
1750 T1,10,T1)=Y1
1760 T1,11,T1)=5000
1770 PRINT " CAPTAIN";PI;"WHAT DO YOU CHRISTEN YOUR SHIP #";I;
1780 INPUT T$[L,L+5]
1790 T1=T1+1
1800 L=L+6
1810 NEXT PI
1820 NEXT I
1830 REM *** BLOCK #4.5
1840 FOR B1=1 TO P9
1850 B1,I,B1)=0
1860 B1,2,B1)=D1
1870 B1,3,B1)=Y1
1880 NEXT B1
1890 CHAIN "TRADES"
1900 REM *** GOSUBS FOLLOW ***
1910 REM <FRONTIER> GOSUB
1920 X=(RND(0))-5)*100
1930 Y=50*RND(0)
1940 IF (ABS(X)>25) AND (Y<25) THEN 1920
1950 F=1
1960 GOSUB 2190
1970 IF F=0 THEN 1920
1980 S17,S1)=0
1990 RETURN
2000 REM *** <UNDERDEVELOPED> GOSUB
2010 E=100
2020 GOSUB 2110

```

```

2230 GOTO 2300
2240 Y=-Y
2250 GOTO 2300
2260 Z=X
2270 X=Y
2280 Y=Z
2290 REM SECOND, TEST PROXIMITY
2300 FOR J=1 TO S1-1
2310 IF SQR((X-S11,J))>=(Y-S12,J))>= D9 THEN 2340
2320 F=0
2330 Y=RND(0)*E2
2340 NEXT J
2350 REM FINALLY, ENTER CO-ORDS AND INCREMENT HALF-BOARD CTR
2360 S11,S1)=INT(X)
2370 S12,S1)=INT(Y)
2380 H=1+CH <= 3)*H
2390 RETURN
2400 REM *** DATA FOR ECONOMETRIC MODEL FOLLOWS ***
2410 REM MODEL #1
2420 DATA -1,-2,-1,0,-1,-1,0,1,-1,1,0,-1,-1,0
2430 DATA 1,-5,5,75,75,-15,-75,-1,5,-5,-1,-1,0
2440 DATA -5,5,1,5,-5
2450 END

```

# STAR TRADER

## (main module)

```

10 COM S[12,15],T[12,12],TS[72],B[3,12]
20 COM W,D9,K9,X9,D1,X1,P9,T9,S9,Y9,H
30 COM Y1,R9,G9,Q,M[6,3],C[6,3]
35 COM SI,T1,R
40 REN *** STAR TRADERS ***
50 REN MAIN MODULE
120 REM SET UP CALENDAR AND STAR SYSTEM NAMES
130 DIM CS[36],SS[60]
140 LET CS="JANFEBMARAPRMIYJUNJULAUGSEPOCTNOVDEC"
150 LET SS="SOLYORKHOYDIVANREEFHOOKESTANTASKSINKSANDQUINGAOLKIRK"
160 LET SS[53]= "KRISFATE"
170 REM S IS THE STAR SYSTEM INFO ARRAY
180 REM T IS THE TRADING SHIP INFO ARRAY
190 REM TS IS THE TRADING SHIP NAME STRING (6 CHARS PER SHIP)
200 REM P CONTAINS THE FAIR PRICES ON THE LOCAL PLANET
210 REM Q HAS THE FIXED PRICES
220 REM B CONTAINS THE BANK ACCOUNTS
230 DIM P[6],Q[6]
240 DIM AS[6],DS[5],NS[36],G[6]
250 RESTORE 270
260 MAT READ Q.
270 DATA 5000,3500,4000,4500,3000,3000
280 LET NS="UR MET HE MED SOFT GEMS"
290 REM FNZ COMPUTES THE PRICE WINDOW THROUGH WHICH A BID IS
300 REM ACCEPTABLE FOR FURTHER HAGGLING
310 DEF FNZ(X)=(FNY(X)*.5< NOT FNY(X))*X/(2*ABS(S[1],S1)))
320 DEF FNY(X)=X >= ABS(S[1],S1))
330 REM R9 IS THE SPEED OF A SHIP IN LIGHTYEARS PER DAY
340 REM D9 IS THE MINIMUM DISTANCE ALLOWED BETWEEN STARS
350 REM Q IS THE PROBABILITY OF A DELAY
360 REM K9 IS THE MAX NUMBER OF BIDDING ROUNDS
370 REM V IS THE MAX WEIGHT OF A TRADING SHIP'S CARGO
380 REM X9 CONTROLS THE PROFIT MARGIN; HIGH X9 LIMITS THE %
390 REM G9 IS THE STELLAR DEVELOPEMENT + INCREMENT 1<=G9<=5
400 REM *** BLOCK #5
402 IF R=0 THEN 430
404 GOSUB 3860
406 GOSUB 5190
408 FOR T2=1 TO T9
410 IF T2=T1 THEN 420
412 L=(T2-1)*6+1
414 PRINT TS[L,L+5];" IS ENROUTE TO ";SS[T[8,T2],T[8,T2]+3]
420 NEXT T2
424 L=(T1-1)*6+1
426 PRINT " AND ";TS[L,L+5];" IS ABOUT TO LEAVE ";SS[T[8,T1],T[8,T1]+3]
428 GOTO 2040
430 GOSUB 5190
432 GOSUB 3190
434 S1=T1=L=1
440 PRINT
450 PRINT "ALL SHIPS START AT SOL"
460 PRINT "ADVICE: VISIT THE CLASS III AND IV SYSTEMS -"
470 PRINT "SOL AND THE CLASS II STARS PRODUCE ALOT OF HE,MED AND"
480 PRINT "SOFT, WHICH THE POORER STAR SYSTEMS (CLASS III AND"
490 PRINT "IV) NEED. ALSO, THE POOR STARS PRODUCE THE RAW GOODS -"
500 PRINT "UR,MET,GEMS THAT YOU CAN BRING BACK TO SOL AND"
510 PRINT "THE CLASS II SYSTEMS IN TRADE"
520 PRINT
530 PRINT "STUDY THE MAP AND CURRENT PRICE CHARTS CAREFULLY -"
540 PRINT "CLASS I AND II STARS MAKE EXCELLENT TRADING PARTNERS"
550 PRINT "WITH CLASS III OR IV STARS."
560 FOR II=1 TO T9/P9
570 FOR PI=1 TO P9
580 PRINT
590 PRINT "PLAYER";PI;" WHICH STAR WILL ";TS[LI,LI+5];" TRAVEL TO"
600 GOSUB 2770
610 LI=LI+6
620 TI=TI+1
630 NEXT PI
640 NEXT II
650 REM *** BLOCK #6
660 D=T[9,1]
670 Y=T[10,1]
680 TI=1
690 FOR I=2 TO T9
700 IF T[10,I]<Y THEN 740
710 IF T[10,I]>Y THEN 770
720 IF T[9,II]>D THEN 770
730 IF T[9,II]=D AND RND(0)>.5 THEN 770
740 D=T[9,1]
750 Y=T[10,1]
760 TI=I
770 NEXT I
780 IF YI=Y THEN 900
790 DI=1
800 YI=Y
810 T2=TI
820 GOSUB 3190
822 IF YI <> 2071 THEN 830
824 GOSUB 4500
826 PRINT "THE LAST YEAR OF THIS GAME IS "Y9;" BUT IF YOU"
828 PRINT "WANT TO QUIT BEFORE THEN, YOU CAN TYPE 'SAVE' AS"
829 PRINT "YOUR NEXT PORT OF CALL - THIS WILL PUNCH A TAPE"
830 PRINT "SO YOU CAN CONTINUE THE GAME LATER"
831 TI=T2
840 IF YI<Y9 THEN 900
850 GOSUB 4500
860 PRINT "NEW GAME"
870 INPUT AS
880 IF AS[1,1] = "N" THEN 5500
890 CHAIN "TRADER"
900 DI=D
910 M=INT((DI-1)/30)
920 L=3*M+
930 PRINT
940 PRINT
950 PRINT "*****"
960 PRINT "+ ";CS[L,L+2];DI-30*M;" ";YI
970 L=(TI-1)*6+1
980 S1=T[B,T1]
990 MS[8,S1]
1000 PRINT "+ ";TS[L,L+5];" HAS LANDED ON ";SS[M,M+3]
1010 GOTO T[12,T1]+1 OF 1080,1060,1040,1020
1020 PRINT "3 WEEKS LATE - PIRATES ATTACKED MIDVOYAGE"

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1030 GOTO 1080
1040 PRINT "2 WEEKS LATE - 'WE GOT LOST. SORRY''"
1050 GOTO 1080
1060 PRINT "I WEEK LATE - 'OUR COMPUTER MADE A MISTAKE'''"
1070 REM *** PRINT CARGO STATUS FOR CURRENT SHIP
1080 PRINT
1090 PRINT "% ON BOARD"INS1" NET WT"
1100 PRINT USING 1100;T11,T12,T13,T14,T15,T16,T17,T18,T19
1110 IMAGE DDXXXXXXDD,7(4X,2D)
1120 REM *** BLOCK #7
1130 GOSUB 3870
1140 PRINT
1150 PRINT "WE ARE BUYING!"
1160 J1=1
1170 FOR II=1 TO 6
1180 IF S11,SI1 >= 0 OR T11,T12 <= 5 THEN 1480
1190 PRINT TAB(5);S11,J1+5;" WE NEED "J=INT(S11,SI1)" UNITS."
1200 PRINT "HOW MANY ARE YOU SELLING?"
1210 GOSUB 4330
1220 IF X >0 THEN 1480
1230 IF X <= T11,T12 THEN 1270
1240 PRINT TAB(5);"YOU ONLY HAVE "J=T11,T12" UNITS IN YOUR HOLD"
1250 PRINT TAB(5);
1260 GOTO 1200
1270 IF X <= 2*INT(S11,SI1) THEN 1300
1280 X=2*INT(S11,SI1)
1290 PRINT TAB(5);"WE'LL BID ON "J" UNITS."
1300 FOR K1=1 TO K9
1310 IF K1*K9 MAX 2 THEN 1340
1320 PRINT TAB(5);"OUR FINAL OFFER!"
1330 GOTO 1350
1340 PRINT TAB(5);"WE OFFER "J
1340 Y=(J+1)*10/3
1350 PRINT 100+INT(.009*P111*X+.5);" WHAT DO YOU BID?"
1360 INPUT Y
1362 IF Y>P111*X/10 AND Y<P111*X*10 THEN 1370
1364 PRINT TAB(5);"WATCH YOUR TYPING -- TRY AGAIN"
1366 GOTO 1340
1370 IF Y <= P111*X THEN 1430
1380 IF Y<(1-FNZ(X))*P111*X THEN 1410
1390 P111=.8*P111+.2*Y/X
1400 NEXT K1
1410 PRINT TAB(5);"WE'LL PASS THIS ONE"
1420 GOTO 1480
1430 PRINT TAB(5);"WE'LL BUY!"
1440 T11,T12=T11,T12-X
1450 T17,T18=T17,T18-X*(II<5)
1460 T11,T12=T11,T12+Y
1470 S11,SI1=S11,SI1+X
1480 J1=J1+6
1490 NEXT II
1500 PRINT
1510 REM *** BLOCK #8
1520 PRINT "WE ARE SELLING!"
1530 J1=1
1540 FOR II=1 TO 6
1550 IF G111 <= 0 OR S11,SI1 <1 THEN 1960
1555 IF II <= 4 OR T11,T12 >= W THEN 1960
1560 PRINT TAB(5);S11,J1+5;" UP TO "J=INT(S11,SI1)" UNITS."
1570 PRINT "HOW MANY ARE YOU BUYING?"
1580 GOSUB 4330
1590 IF X=0 THEN 1960
1600 IF II>4 OR X+T17,T18 <= W THEN 1660
1610 PRINT TAB(5);"YOU HAVE "J=T17,T18" TONS ABOARD, SO "J"X"
1620 PRINT " TONS PUTS YOU OVER"
1630 PRINT TAB(5);"THE "JW" TON LIMIT."
1640 PRINT TAB(5);
1650 GOTO 1570
1660 IF X <= S11,SI1 THEN 1700
1670 PRINT TAB(5);"WE ONLY HAVE "J=INT(S11,SI1)" UNITS"
1680 PRINT TAB(5);
1690 GOTO 1570
1700 FOR K1=1 TO K9
1710 IF K1*K9 MAX 2 THEN 1740
1720 PRINT TAB(5);"OUR FINAL OFFER!"
1730 GOTO 1750
1740 PRINT TAB(5);"WE WANT ABOUT "J
1750 PRINT 100+INT(.01*P111*X+.5);
1760 PRINT "YOUR OFFER?"
1770 INPUT Y
1772 IF Y>P111*X/10 AND Y<P111*X*10 THEN 1780
1774 PRINT TAB(5);"WATCH YOUR TYPING -- TRY AGAIN"
1776 GOTO 1740
1780 IF Y > P111*X THEN 1840
1790 IF Y<(1-FNZ(X))*P111*X THEN 1820
1800 P111=.8*P111+.2*Y/X
1810 NEXT K1
1820 PRINT TAB(5);"THAT'S TOO LOW"
1830 GOTO 1960
1840 IF Y <= T11,T12 THEN 1910
1850 PRINT TAB(5);"YOU BID $"JY" BUT YOU HAVE ONLY $"JT11,T12"
1860 GOSUB 4310
1870 IF S17,SI1<10 OR T11,T12+B11,B12>Y THEN 1820
1880 PRINT TAB(5);
1890 GOSUB 4020
1900 IF Y>T11,T12 THEN 1820
1910 PRINT TAB(5);"SOLD!"
1920 T11,T12=T11,T12+Y
1930 T17,T18=T17,T18+X*(II<5)
1940 S11,SI1=S11,SI1-X
1950 T11,T12=T11,T12-Y
1960 J1=J1+6
1970 NEXT II
1980 REM *** BLOCK #9
1990 GOSUB 4310
2000 IF S17,SI1<10 OR T11,T12+B11,B12>0 THEN 2040
2010 PRINT
2020 GOSUB 4020
2030 PRINT
2040 PRINT "WHAT IS YOUR NEXT PORT OF CALL?"
2050 GOSUB 2770
2060 REM *** BLOCK #10.
2070 J=0
2080 FOR I1=1 TO 6
2090 IF S11,SI1 >= 0 THEN 2120
2100 IF S11,SI1<G11 THEN 660

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2110 J=J+1
2120 NEXT I
2130 IF J>I THEN 660
2140 REM *** BLOCK #10.2
2150 S(7,S1)=S(7,S1)+69
2160 GO=S(7,S1)
2162 IF GO#5 AND GO#10 AND GO#15 THEN 2220
2170 GOSUB 4580
2180 GOSUB 4500
2190 PRINT "STAR SYSTEM "JS$(S(8,S1),S(8,S1)+3)J" IS NOW A CLASS"
2200 PRINT D$J" SYSTEM"
2210 REM *** BLOCK #10.3
2220 IF S9=15 THEN 660
2230 J=0
2240 FOR I=1 TO S9
2250 J=J+S(7,I)
2260 NEXT I
2270 IF J/S9<10 THEN 660
2280 REM A NEW STAR IS BORN!
2290 S1=S9=S9+1
2300 GOSUB 4680
2310 GOSUB 2450
2320 S(9,S1)=D1
2330 S(10,S1)=Y1
2340 FOR J=1 TO 6
2350 S(J,S1)=0
2360 NEXT J
2370 GOSUB 4500
2380 PRINT "A NEW STAR SYSTEM HAS BEEN DISCOVERED! IT IS A CLASS IV"
2390 PRINT "AND ITS NAME IS"JS$(S(8,S1),S(8,S1)+3)
2400 GOSUB 5190
2410 GOTO 660
2420 STOP
2430 REM *** GOSUBS FOLLOW ***
2440 REM <FRONTIER> GOSUB
2450 X=(RND(0)-.5)*100
2460 Y=50*RND(0)
2470 IF (ABS(X)<25) AND (Y<25) THEN 2450
2480 F=1
2490 GOSUB 2550
2500 IF F=0 THEN 2450
2510 S(7,S1)=0
2520 RETURN
2530 REM *** <TEST STAR CO-ORDS> GOSUB
2540 REM FIRST CONVERT CO-ORDS TO NEXT HALF-BOARD
2550 GOTO H OF 2660,2620,2600,2560
2560 Z=X
2570 X=-Y
2580 Y=Z
2590 GOTO 2660
2600 Y=-Y
2610 GOTO 2660
2620 Z=X
2630 X=Y
2640 Y=Z
2650 REM SECOND TEST PROXIMITY
2660 FOR J=1 TO S1-1
2670 IF SQR((X-S(11,J))+2+(Y-S(12,J))+2) >= D9 THEN 2700
2680 F=0
2690 RETURN
2700 NEXT J
2710 REM FINALLY ENTER CO-ORDS AND INCREMENT HALF-BOARD COUNTER
2720 S(11,S1)=INT(X)
2730 S(12,S1)=INT(Y)
2740 H=H+(H <= 3)*H
2750 RETURN
2760 REM *** <NEXT ETA> GOSUB
2770 INPUT A$
2780 FOR I=1 TO S9
2790 J=S(8,I)
2800 IF A$(I,4)=S$(J,J+3) THEN 2870
2810 NEXT I
2820 IF A$(I,4) <> "SAVE" THEN 2832
2830 GOSUB 4770
2832 IF A$(I,3) <> "MAP" THEN 2840
2833 S2=S1
2834 GOSUB 5190
2835 S1=S2
2836 GOTO 2850
2840 IF A$(I,6) <> "REPORT" THEN 2848
2842 GOSUB 3160
2846 GOTO 2850
2848 PRINT A$(I,4); " IS NOT A STAR NAME IN THIS GAME"
2850 PRINT "NEXT STAR"
2860 GOTO 2770
2870 T(8,T1)=1
2880 IF I#S1 THEN 2910
2890 PRINT "CHOOSE A DIFFERENT STAR SYSTEM TO VISIT"
2900 GOTO 2850
2910 D2=50R((S(11,S1)-S(11,I))+2*(S(12,S1)-S(12,I))+2)/R9
2920 D2=INT(D2)
2930 IF RND(0)>(R/2) THEN 3030
2940 I=1+INT(RND(0)*3)
2950 GOTO I OF 3000,2980,2960
2960 PRINT "SHIP DOES NOT PASS INSPECTION"
2970 GOTO 3010
2980 PRINT "CREWMEN DEMAND A VACATION"
2990 GOTO 3010
3000 PRINT "LOCAL HOLIDAY SOON"
3010 PRINT " - "J" WEEK DELAY"
3020 D2=D2+7*I
3030 T(9,T1)=T(9,T1)+D2
3040 IF T(9,T1) <= 360 THEN 3070
3050 T(9,T1)=T(9,T1)-360
3060 T(10,T1)=T(10,T1)+I
3070 M=INT((T(9,T1)-I))
3080 L=3*M+1
3090 PRINT "THE ETA AT "JS$(J,J+3)J" IS "JS$(L,L+2)J" "JT(9,T1)-30*MJ"#
3100 REM UPDATE ETA PLUS RANDOM DELAY FACTOR (0,1,2 OR 3 WEEKS)
3110 J=(INT(RND(0)*3)+1)*(RND(0)>(R/2))
3120 T(9,T1)=T(9,T1)+J
3130 IF T(9,T1) <= 360 THEN 3160
3140 T(9,T1)=T(9,T1)-360
3150 T(10,T1)=T(10,T1)+I
3160 T(12,T1)=I
3170 RETURN

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3180 REM *** <REPORT> GOSUB
3190 GOSUB 4500
3200 PRINT TAB(10); "JAN 1, " ; Y1; TAB(35); "YEARLY REPORT #"; Y1-2069
3210 PRINT
3220 PRINT
3230 IF Y1>2070 THEN 3450
3240 PRINT "STAR SYSTEM CLASSES:"
3250 PRINT " I COSMOPOLITAN"
3260 PRINT " II DEVELOPED"
3270 PRINT " III UNDERDEVELOPED"
3280 PRINT " IV FRONTIER"
3290 PRINT
3300 PRINT
3310 PRINT "MERCHANDISE"
3320 PRINT " UR URANIUM"
3330 PRINT " MET METALS"
3340 PRINT " HE HEAVY EQUIPMENT"
3350 PRINT " MED MEDICINE"
3360 PRINT " SOFT COMPUTER SOFTWARE"
3370 PRINT " GEMS STAR GEMS"
3380 PRINT
3390 PRINT
3400 PRINT TAB(5); "EACH TRADING SHIP CAN CARRY MAX "; W; " TONS CARGO."
3410 PRINT "STAR GEMS AND COMPUTER SOFTWARE, WHICH AREN'T SOLD BY THE"
3420 PRINT "TON, DON'T COUNT."
3430 PRINT
3440 PRINT
3450 PRINT TAB(20); "CURRENT PRICES"
3460 PRINT
3470 PRINT
3480 PRINT "NAME CLASS"; NS
3490 PRINT
3500 FOR S1=1 TO S9
3510 GOSUB 3870
3520 FOR I=1 TO 6
3530 P[I]=SGN(S[I,S1])*P[I]
3540 NEXT I
3550 GOSUB 4580
3560 PRINT USING "#,4A,2X"; $[S[8,S1],S[8,S1]+3]
3570 PRINT USING "5A,6(5SD)"; D$, P[1], P[2], P[3], P[4], P[5], P[6]
3580 IF S1/2 <> INT(S1/2) THEN 3600
3590 PRINT
3600 NEXT S1
3610 PRINT
3620 PRINT "(+ MEANS SELLING AND -- MEANS BUYING)"
3630 PRINT
3640 PRINT
3650 PRINT TAB(22); "CAPTAINS"
3660 PRINT
3670 PRINT
3680 PRINT "NUMBER $ ON SHIPS $ IN BANK CARGOES TOTALS"
3690 FOR B1=1 TO P9
3700 GOSUB 4380
3710 NEXT B1
3720 FOR P1=1 TO P9
3730 PRINT
3740 M1=M2=0
3750 FOR I1=0 TO T9/P9-1
3760 M1=M1+T[I1,P9*I1+P1]
3770 FOR K1=1 TO 6
3780 M2=M2+T[K,P9*I1+P1]*Q[K]
3790 NEXT K
3800 NEXT I1
3810 M3=M2+M1+B[I1,P1]
3820 PRINT USING 3830; P1, M1, B[I1,P1], M2, M3
3830 IMAGE 2X,2D,2X,4(2X,DDXXXXXXX)
3840 NEXT P1
3850 RETURN
3860 REM *** <PRICES> GOSUB
3870 R1=I+(S[7,S1] >= 5)*S[7,S1] >= 10
3880 D2=12*(Y1-S[10,S1])+(D1-S[9,S1])/30
3890 FOR I=1 TO 6
3900 G[I]=(I+S[7,S1]/15)*(M[1,R1]*S[7,S1]+C[1,R1])
3910 IF ABS(G[I])>01 THEN 3940
3920 P[I]=0
3930 GOTO 3970
3940 S[1,S1]=SGN(G[I])*ABS(G[I]*12) MIN ABS(S[1,S1])+D2*G[I])
3950 P[I]=Q[I]*(1-SGN(S[1,S1]))*ABS(S[1,S1])/(G[I]*X9))
3960 P[I]=100*INT(P[I]/100+.5)
3970 NEXT I
3980 S[9,S1]=D1
3990 S[10,S1]=Y1
4000 RETURN
4010 REM *** <BANK CALL> GOSUB
4020 PRINT "DO YOU WISH TO VISIT THE LOCAL BANK?"
4030 INPUT A$ 
4040 IF A$(1,1)="Y" THEN 4060
4050 RETURN
4060 GOSUB 4310
4070 GOSUB 4380
4080 PRINT TAB(5); "YOU HAVE $" ; B[I,B1]; " IN THE BANK"
4082 PRINT TAB(5); "AND $" ; T[I,T1]; " ON YOUR SHIP"
4090 IF B[I,B1]=0 THEN 4190
4100 PRINT TAB(5); "HOW MUCH DO YOU WISH TO WITHDRAW"
4110 INPUT Z
4120 IF Z <= B[I,B1] THEN 4150
4130 PRINT TAB(5); "TOO MUCH; "
4140 GOTO 4100
4150 IF Z <= 0 THEN 4190
4160 B[I,B1]=B[I,B1]-Z
4170 T[I,T1]=T[I,T1]+Z
4180 RETURN
4190 PRINT TAB(5); "HOW MUCH DO YOU WISH TO DEPOSIT"
4200 INPUT Z
4210 IF Z >= 0 THEN 4240
4220 PRINT TAB(5); "YOU CAN'T DEPOSIT A NEGATIVE NUMBER"
4230 GOTO 4190
4240 IF Z <= T[I,T1] THEN 4270
4250 PRINT TAB(5); "YOU HAVE $" ; T[I,T1]; " ON YOUR SHIP"
4260 GOTO 4190
4270 T[I,T1]=T[I,T1]-Z
4280 B[I,B1]=B[I,B1]+Z
4290 RETURN
4300 REM *** <B1> GOSUB
4310 B1=T1
4320 FOR I=1 TO S9/P9

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4330 IF S1 <= P9 THEN 4360
4340 B1=B1-P9
4350 NEXT I
4360 RETURN
4370 REM *** <BANK UPDATE> GOSUB
4380 B11,B12=B11+((1-.05*(T1-B13,B1)+(D1-B13))/360))
4390 B12,B11=D1
4400 B13,B12=T1
4410 RETURN
4420 REM *** <INPUT> GOSUB
4430 INPUT X
4440 IF INT(X)=X AND X >= 0 THEN 4480
4450 PRINT TAB(5); "TYPE A ZERO IF YOU WANT TO PASS THIS ONE."
4460 PRINT TAB(5); "BUT NO NEGATIVES OR DECIMALS"
4470 GOTO 4430
4480 RETURN
4490 REM *** <GA> GOSUB
4500 PRINT
4520 PRINT
4530 PRINT TAB(20), "*** GENERAL ANNOUNCEMENT ***"
4540 PRINT
4550 PRINT
4560 RETURN
4570 REM *** <DS> GOSUB
4580 GOTO S17,S17/S1 OF 4650,4630,4610,4590
4590 DS="" I ""
4600 RETURN
4610 DS="" II ""
4620 RETURN
4630 DS="" III ""
4640 RETURN
4650 DS="" IV ""
4660 RETURN
4670 REM *** <STAR NAME> GOSUB
4680 IF S1>I THEN 4710
4690 I=1
4700 GOTO 4750
4710 I=4*INT((4*RND(0))+5
4720 FOR J=2 TO S1-1
4730 IF I=S18,J) THEN 4710
4740 NEXT J
4750 S18,S13=1
4760 RETURN
4770 REM *** <SAVE GAME ON TAPE> GOSUB
4780 PRINT "WHEN I TYPE '?' THIS IS WHAT YOU SHOULD DO:"
4790 PRINT
4800 PRINT " 1. PUSH THE 'ON' BUTTON ON THE TAPE PUNCHER"
4810 PRINT " 2. PRESS THE 'HERE IS' KEY (UPPER RIGHT) 3 TIMES"
4820 PRINT " 3. PUSH THE 'OFF' BUTTON ON THE TAPE PUNCHER"
4830 PRINT " 4. TYPE ANY NUMBER"
4840 PRINT " 5. PRESS THE 'RETURN' KEY"
4850 PRINT
4860 PRINT "WHEN I TYPE '!!!' THAT MEANS I'LL START PUNCHING"
4870 PRINT "THE TAPE IN ABOUT 10 SECONDS, SO:"
4880 PRINT
4890 PRINT " *** DON'T FORGET TO TURN THE PUNCHER BACK ON ***"
4900 PRINT LIN(3)
4910 INPUT X
4920 PRINT "!!!"
4930 FOR I=1 TO 10000
4940 X=X+1
4950 NEXT I
4960 PRINT TS;""
4970 PRINT W1;"JD97";"JK9";"JX9";"JD1";"Y1";"
4980 PRINT P9;"T9";"IS9";"Y9";"ST1";"IS1";"
4990 FOR J=1 TO 59
5000 FOR I=1 TO 9 STEP 4
5010 PRINT S1,I,J);";"S1+1,J);";"S1+2,J);";"S1+3,J);"
5040 NEXT I
5060 NEXT J
5070 FOR J=1 TO T9
5080 FOR I=1 TO 9 STEP 4
5090 PRINT T1,I,J);";"T1+1,J);";"T1+2,J);";"T1+3,J);"
5120 NEXT I
5140 NEXT J
5150 FOR I=1 TO P9
5160 PRINT B1,I,J);";"B2,I,J);";"B3,I,J);"
5170 NEXT I
5172 FOR I=1 TO 50
5174 PRINT " ";
5176 NEXT I
5180 STOP
5190 REM *** <PRINT STAR MAP> GOSUB
5200 PRINT LIN(3)
5210 PRINT TAB(22); "STAR MAP"
5220 PRINT TAB(20); "*****"
5230 PRINT
5240 DIM L$(55)
5250 FOR LI=15 TO -15 STEP -1
5260 IF LI <> 0 THEN 5290
5270 L$="-----|-----|-----|-----*SOL-----|-----|-----|-----"
5280 GOTO 5340
5290 L$=""
5300 IF ABS(LI)/3=INT(ABS(LI)/3) THEN 5330
5310 L$(26,26)="I"
5320 GOTO 5340
5330 L$(26,26)=""
5340 Y=L1*10/3
5342 YO=(L1+1)*10/3
5350 FOR SI=2 TO 59
5360 IF S12,S13) >= YO OR S12,S13) < Y THEN 5400
5370 XI=INT(26+S11,S13)/2
5380 L$|XI,XI|="""
5390 L$|XI+1,XI+4|=S5(S18,S13),S18,S13)+3
5400 NEXT SI
5410 FOR I=55 TO 26 STEP -1
5420 IF LS1,I) <> " " THEN 5440
5430 NEXT I
5440 PRINT LS1,I)
5450 NEXT LI
5460 PRINT
5470 PRINT "THE MAP IS 100 LIGHT-YEARS BY 100 LIGHT-YEARS."
5480 PRINT "SO THE CROSS-LINES MARK 10 LIGHT-YEAR DISTANCES"
5490 RETURN
5500 END

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# Last Chapter

## LUNAR

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1000 REM LUNAR
1010 PRINT "DO YOU WANT INSTRUCTIONS"
1020 INPUT A$(1,1)
1030 IF A$="Y" THEN 1130
1040 PRINT "GROUND CONTROL CALLING LUNAR LANDER"
1050 PRINT "ON-BOARD AND GROUND COMPUTERS KAPUT"
1060 PRINT "TAKE OVER!!!"
1070 PRINT "CAPSULE WEIGHT 33000 LBS - AVAILABLE FUEL 16500 LBS"
1080 PRINT "ESTIMATED FREE FALL IMPACT TIME 120 SECONDS"
1090 PRINT
1100 PRINT "SET RETRO ROCKET BURN RATE TO ANY VALUE FROM 0 LBS/SEC"
1110 PRINT "(FREE FALL) TO 300 LBS/SEC, TYPE A COMMA AND THEN"
1120 PRINT "GIVE THE BURN TIME LENGTH."
1122 PRINT "THE BURN RATE IS THE AMOUNT OF FUEL THAT YOUR"
1124 PRINT "RETRO ROCKETS WILL BURN EACH SECOND. THE BURN TIME LENGTH"
1126 PRINT "IS THE NUMBER OF SECONDS YOU WANT YOUR RETRO ROCKETS"
1128 PRINT "TO BURN AT THIS RATE.)"
1130 PRINT
1140 PRINT "GOOD LUCK!"
1150 PRINT
1160 PRINT "SEC")TAB(10))"MI + FT")TAB(26))"MPH")TAB(37))"LB FUEL"
1170 PRINT TAB(50))"BURN RATE.TIME"
1180 PRINT
1190 A=120
1200 V=1
1210 M=33000.
1220 N=16500
1230 G=.001
1240 Z=1.8
1250 L=0
1260 PRINT L;TAB(10))INT(A);INT(5280*(A-INT(A)));TAB(25))3600*V;TAB(37))
1270 PRINT M-N;TAB(50))
1280 INPUT K,T
1290 IF M-N<.001 THEN 1400
1300 IF T<-.001 THEN 1260
1310 S=T
1320 IF M >= N+S*K THEN 1340
1330 S=(M-N)/K
1340 GOSUB 1790
1350 IF I <= 0 THEN 1650
1360 IF V <= 0 THEN 1380
1370 IF J<0 THEN 1710
1380 GOSUB 1590
1390 GOTO 1290
1400 PRINT "OUT OF FUEL AT";L;"SEC"
1410 S=(-V+SGR(V*V*2*A*G))/G
1420 V=V+G*S
1430 L=L+S
1440 W=3600*V
1450 PRINT "ON MOON AT";L;"SEC - IMPACT VELOCITY";W;"MPH"
1460 IF W>1-2 THEN 1490
1470 PRINT "GREAT LANDING !!! (LUCKY)"
1480 STOP
1490 IF W>10 THEN 1520
1500 PRINT "GOOD LANDING"
1510 STOP
1520 IF W>60 THEN 1560
1530 PRINT "CRAFT DAMAGE. YOU ARE STRANDED UNTIL A RESCUE MISSION"
1540 PRINT "ARRIVES. HOPE YOUR OXYGEN HOLDS OUT."
1550 STOP
1560 PRINT "YOU CRASHED - NO SURVIVORS."
1570 PRINT "YOU BLASTED A NEW LUNAR CRATER";W+.2777;"FT DEEP"
1580 STOP
1590 L=L+S
1600 T=T-S
1610 M=M-S*K
1620 A=1
1630 V=J
1640 RETURN
1650 IF S<.005 THEN 1440
1660 D=V+SGR(V*V*2*A*(G-Z*K/M))
1670 S=2*A/D
1680 GOSUB 1790
1690 GOSUB 1590
1700 GOTO 1650
1710 W=(1-MG/(Z*K))/2
1720 S=M*V/(Z*K*((W+SGR(W+W+V/Z))+.05
1730 GOSUB 1590
1740 IF I <= 0 THEN 1650
1750 GOSUB 1590
1760 IF J>0 THEN 1290
1770 IF V>0 THEN 1710
1780 GOTO 1290
1790 G=S*K/M
1792 REM *** PATCH TO PREVENT UNDERFLOW
1794 IF G>.000001 THEN 1800
1796 G=0
1800 J=V+G*S-Z*Q*(1+Q*(-.5+Q*(1/3+Q*(-.25+Q/5))))
1810 I=A-G*S+S/2-V+S+Z*S*Q*(-.5+Q*(1/6+Q*(1/12+Q/20)))
1820 RETURN
1830 END
```

# CRASH

```

10 REM *** CRASH - A MODIFIED VERSION OF LANDER (A CONTRIBUTED PROGRAM)
12 REM *** MODIFIED BY PEOPLE'S COMPUTER COMPANY, MENLO PARK, CA
100 DIM A$(72)
210 PRINT
220 PRINT "DO YOU WANT INSTRUCTIONS (YES OR NO)?"
230 INPUT A$(1,1)
240 PRINT
250 IF A$(1,1)="N" THEN 1000
300 PRINT "CONGRATULATIONS! YOU ARE AT THE CONTROLS OF A SPACE MODULE."
310 PRINT "AS POSSIBLE."
315 PRINT
320 PRINT "YOU START AT A GIVEN HEIGHT ABOVE THE SURFACE WITH YOUR MODE"
330 PRINT "MOVING TOWARD THE SURFACE."
335 PRINT "YOU CHOOSE THE AMOUNT OF FUEL TO BE BURNED DURING THE"
340 PRINT "NEXT ONE SECOND."
345 PRINT
350 PRINT "    IF YOU BURN ZERO, YOUR SPEED INCREASES DUE TO GRAVITY."
360 PRINT "    IF YOU BURN EXACTLY THE AMOUNT REQUIRED TO OVERCOME GRAVITY"
370 PRINT "    YOUR VELOCITY REMAINS CONSTANT."
375 PRINT "    IF YOU BURN MORE, YOUR SPEED DECREASES BUT BURNING TOO MUCH"
380 PRINT "    MAY BEGIN TO MOVE YOU UPWARD (YOUR VELOCITY BECOMES POSITIVE)."
390 PRINT "THERE IS MORE THAN ENOUGH FUEL, BUT BE CAREFUL NOT TO WASTE IT."
400 PRINT "YOU MAY TRY TO LAND ON THE MOON, ON THE EARTH, OR ON PERSEPHONE."
405 PRINT "LANDING ON THE MOON IS EASTEST, SO TRY THAT FIRST."
410 PRINT "PERSEPHONE IS AN UNKNOWN PLANET SO YOU WILL HAVE TO SPECIFY IT."
415 PRINT "ALL THE INITIAL CONDITIONS (HEIGHT, VELOCITY, MAXIMUM BURN,)" 
420 PRINT "AND BURN TO CANCEL GRAVITY.)"
425 PRINT
1000 PRINT "GOOD LUCK AND HAPPY LANDINGS!"
1005 REM
1006 LET X0=V0=0
1007 PRINT
1010 INPUT A$
1030 PRINT "LOCATION: MOON, EARTH, OR PERSEPHONE"
1040 INPUT AS
1042 PRINT
1043 LET K=0
1045 IF A$(1,1)="M" THEN 1060
1047 LET K=1
1048 IF A$(1,1)="E" THEN 1060
1049 IF A$(1,1)="P" THEN 4000
1050 PRINT "THAT LOCATION IS NOT RECOGNIZED."
1055 GOTO 1030
1060 LET G5=27*K
1070 LET M=30+60*K
1075 IF X0>0 THEN 1100
1080 LET X=X0+500+1500*K
1090 LET V=V0=-50-100*K
1100 PRINT "INITIAL CONDITIONS: STANDARD OR RANDOM?"
1110 INPUT AS
1120 IF A$(1,1)="S" THEN 1170
1130 LET X=500+1500*K
1140 LET V=-50-100*K
1145 GOTO 1200
1170 LET X=INT(RND(0)*(100+K*100))+10+100
1180 LET V=-INT(RND(0)*(100+K*100))+5
1190 IF V>V*2*(M-G)*X THEN 1180
1200 LET X0=X
1210 LET V0=V
1220 LET F=INT(SQR(M*(V*2+2*G*X)/(M-G)))+13+.5)*10
1300 PRINT
1302 PRINT "INITIAL HEIGHT: ";;X;" FEET"
1303 PRINT "INITIAL VELOCITY: ";;V;" FEET/SEC"
1305 PRINT "TOTAL FUEL SUPPLY: ";;F;" UNITS"
1307 PRINT "MAXIMUM BURN: ";;M;" UNITS/SEC"
1308 PRINT "AMOUNT OF BURN TO CANCEL GRAVITY: ";;G;" UNITS/SEC"
1320 PRINT
1330 PRINT
1340 PRINT "TIME", "HEIGHT", "VELOCITY", "FUEL", "BURN"
1350 PRINT
2000 LET T=-1
2010 LET T=T+1
2020 PRINT T,X,V,F," ";
2030 INPUT B
2040 LET BI=ABS(B)
2050 IF BI <= M THEN 2080
2060 PRINT " ,MAX BURN IS ";;M;" BURN "
2070 GOTO 2030
2080 LET T9=T8=2
2090 IF BI=0 THEN 2110
2100 LET T9=F/B1
2110 LET A=B-G
2120 LET R=V*V-2*A*X
2140 IF R<0 THEN 2200
2150 IF A=0 THEN 2180
2160 LET TB=-(V+SQR(R))/A
2170 GOTO 2200
2180 IF V >= 0 THEN 2200
2190 LET TB=-X/V
2200 IF TB>0 AND TB <= 1) OR T9 <= 1 THEN 2300
2210 LET X=X+V*A/2
2220 LET V=V+A
2230 LET F=F-B1
2235 IF X>.0001 THEN 2010
2240 LET T=T+1
2245 GOTO 2630
2300 IF TB>0 AND TB <= T9 THEN 2600
2310 PRINT T+T9,"OUT OF FUEL"
2320 LET F=B1=0
2330 LET X=X+V*T9+A*T9*2/2
2340 LET V=V+A*T9
2350 LET A=-G
2360 LET TB=(V+SQR(V*V-2*A*X))/G
2370 IF TB<1-T9 THEN 2500
2380 LET X=X+V*(1-T9)+A*(1-T9)*2/2
2390 LET V=V+A*(1-T9)
2400 LET T=T+1
2410 PRINT T,X,V
2420 LET T8=(V+SQR(V*V-2*A*X))/G
2430 IF T8 <= 1 THEN 2600
2440 LET X=X+V*A/2
2450 LET V=V+A
2460 GOTO 2400
2500 LET T=T-T9
2600 LET F=F-B1*T8
2610 LET T=T-T8
2620 LET V=V+A*T8
2630 PRINT T,0,V,F
2640 PRINT
2650 PRINT
2700 IF V<-1 THEN 2800
2710 GOTO INT(RND(0)*5+1) OF 2720,2730,2740,2750,2760
2720 PRINT "YOU ARE NOW A QUALIFIED ASTRONAUT."
2725 GOTO 1007
2730 PRINT "AS GENTLE AS A KITTEN'S PURR!!"
2735 GOTO 1007
2740 PRINT "A BUTTERFLY COULDN'T HAVE DONE BETTER!!"
2745 GOTO 1007
2750 PRINT "AS SOFT AS A SNOWFLAKE!!"
2755 GOTO 1007
2760 PRINT "MR. SPOCK WOULD BE PROUD OF YOU!!!""
2765 GOTO 1007
2800 IF V<-5 THEN 2900
2810 GOTO INT(RND(0)*4+1) OF 2820,2830,2840,2850
2820 PRINT "A BIT ROUGH, BUT YOU ARE STILL IN ONE PIECE!!"
2825 GOTO 1007
2830 PRINT "IF YOU HAD BEEN DRIVING A 1970 LTD, THAT WOULD HAVE COST $"
2831 PRINT " YOU $500!!"
2835 GOTO 1007
2840 PRINT "ANY FASTER AND YOU WOULD HAVE BOUNCED!!"
2845 GOTO 1007
2850 PRINT "YOU HAD BETTER CHECK YOUR LANDING GEAR!!"
2855 GOTO 1007
2900 IF V<-10 THEN 3000
2910 GOTO INT(RND(0)*5+1) OF 2920,2930,2940,2950,2960
2920 PRINT "IS YOUR MEDICAL INSURANCE PAID UP??"
2925 GOTO 1007
2930 PRINT "YOU GOT DOWN, BUT YOU WILL NEVER BE AN ASTRONAUT!!"
2935 GOTO 1007
2940 PRINT "NEIL ARMSTRONG DID IT THE FIRST TIME!!"
2945 GOTO 1007
2950 PRINT "THE BEST LAID SCHEMES OF MICE AND MEN."
2951 PRINT " OFT GO ASTRAY."
2955 GOTO 1007
2960 PRINT "HAVE YOU EVER THOUGHT OF A DIFFERENT LINE OF WORK??"
2965 GOTO 1007
3000 GOTO INT(RND(0)*3+1) OF 3010,3020,3030
3010 PRINT "YOUR NEXT OF KIN WILL BE NOTIFIED."
3015 GOTO 1007
3020 PRINT "YOU JUST CREAMED A 29 MEGABUCK LANDER!!"
3025 GOTO 1007
3030 PRINT "AREN'T YOU GLAD THIS IS ONLY A COMPUTER SIMULATION!!"
3035 GOTO 1007
4000 REM *** SET UP INITIAL CONDITIONS FOR 'PERSEPHONE'
4010 PRINT
4020 PRINT "INITIAL HEIGHT (FEET)"
4030 INPUT X
4040 PRINT "INITIAL VELOCITY (FEET/SEC) (USUALLY NEGATIVE)"
4050 INPUT V
4060 PRINT "TOTAL FUEL SUPPLY (UNITS)"
4070 INPUT F
4080 PRINT "MAXIMUM BURN (UNITS/SEC)"
4090 INPUT M
4100 PRINT "AMOUNT OF BURN TO CANCEL GRAVITY (UNITS/SEC)"
4110 INPUT G
4120 GOTO 1320
9999 END

```

# ZEROS

```

10 REM *****ZEROS MATH GAME*****
20 REM *****MARCH 1971*****D. RESEK + P. ROWE*****
30 DIM A$(10),X$(30),M(20),P(20)
40 X$="--- 1 2 3 4 5 6 7 8 9 0 1 1 2 1 3 1 4 1 5 1 6 1 7 1 8"
50 TAB$5
60 PRINT "RULES"
70 INPUT AS
80 IF AS(1,1)!="Y" THEN 210
90 PRINT "WE START WITH A BOARD LIKE THIS:"
100 PRINT """;TAB(1A)";" 1 2 3 4 5 6 7 "
110 PRINT TAB(12);" 0 0 0 0 0 0 0 "
120 PRINT "YOU AND I TAKE TURNS. WE CHOOSE ONE OF THE NUMBERS AND I"
130 PRINT "DRAW A BRIDGE BETWEEN THE TWO 0'S BELOW THAT NUMBER."
140 PRINT "ONCE AN 0 HAS BEEN USED FOR A BRIDGE, IT CAN'T BE USED AGAIN"
150 PRINT "FOR INSTANCE, IF YOU CHOOSE THE NUMBER 3,"
160 PRINT TAB(14);" 1 2 3 4 5 6 7 "
170 PRINT TAB(12);" 0 0 0 0 0 0 0 "
180 PRINT TAB(18);"-----"
190 PRINT "THEN I CAN'T CHOOSE NUMBERS 2 OR 4."
200 PRINT "THE WINNER IS THE LAST PERSON WHO CAN DRAW A BRIDGE."
202 PRINT "P.S. IF YOU WANT ME TO GO FIRST, PRESS THE 'RETURN' KEY"
204 PRINT "FOR YOUR FIRST MOVE."
206 PRINT
208 PRINT "HERE WE GO ... "
210 N=7
220 MAT M=ZER
230 GOSUB 990
240 GOSUB 1080
250 I=-1.7145
260 GOTO 330

```

# REVERSE

```

100 REM *** REVERSE - A GAME OF SKILL
110 REM *** PEOPLE'S COMPUTER COMPANY, MENLO PARK CA
120 DIM A(20)
130 REM *** N = NUMBER OF NUMBERS (1 THRU N)
140 LET N=9
150 PRINT "DO YOU WANT THE RULES (1=YES 0=NO)?"
160 INPUT A
170 IF A=0 THEN 210
180 GOSUB 710
190 REM *** MAKE A RANDOM LIST A(1) TO A(N)
200 FOR I=1 TO N
210 A(I)=1
220 NEXT I
230 FOR I=N TO 2 STEP -1
235 K=INT(I*RND(0))+1
240 T=A(I)
245 A(I)=A(K)
250 A(K)=T
255 NEXT I
260 REM *** PRINT ORIGINAL LIST AND START GAME
265 PRINT
270 PRINT "HERE WE GO ... THE LIST IS:"
275 LET T=0
280 GOSUB 610
285 PRINT "HOW MANY SHALL I REVERSE?"
290 INPUT R
295 IF R=0 THEN 520
300 IF R <= N THEN 390
310 PRINT "OOPS! TOO MANY - I CAN REVERSE AT MOST";N
320 GOTO 330
330 LET I=1+1
340 REM *** REVERSE R NUMBERS AND PRINT NEW LIST
350 FOR K=1 TO INT(R/2)
360 LET Z=A(K)
370 LET A(K)=A(R-K+1)
380 LET A(R-K+1)=Z
390 NEXT K
400 GOSUB 610
410 REM *** CHECK FOR A WIN
420 FOR K=1 TO N
430 IF A(K) >> K THEN 330
440 NEXT K
450 PRINT "YOU WON IN";I;"MOVES!!!!"
460 PRINT "AGAIN (1=YES 0=NO)?"
470 INPUT A
480 IF A <> 0 THEN 210
490 STOP
500 REM *** SUBROUTINE *** PRINT LIST A(1) TO A(N)
510 PRINT
520 FOR K=1 TO N
530 PRINT A(K);
540 NEXT K
550 PRINT
560 RETURN
570 REM *** SUBROUTINE *** PRINT THE RULES
580 PRINT
590 PRINT "THIS IS THE GAME OF 'REVERSE'. TO WIN, ALL YOU HAVE"
600 PRINT "TO DO IS ARRANGE THE LIST OF NUMBERS (1 THROUGH";N$";)"
610 PRINT "IN NUMERICAL ORDER FROM LEFT TO RIGHT. TO MOVE, YOU"
620 PRINT "TELL ME HOW MANY NUMBERS (COUNTING FROM THE LEFT) TO"
630 PRINT "REVERSE. FOR EXAMPLE, IF THE CURRENT LIST IS:"
640 PRINT
650 PRINT " 2 3 4 5 1 6 7 8 9"
660 PRINT
670 PRINT "AND YOU REVERSE 4, THE RESULT WILL BE:"
680 PRINT " 5 4 3 2 1 6 7 8 9"
690 PRINT
700 PRINT "NOW, IF YOU REVERSE 5, YOU WIN!"
710 PRINT
720 PRINT " 1 2 3 4 5 6 7 8 9"
730 PRINT
740 PRINT "NO DOUBT YOU WILL LIKE THIS GAME OF SKILL, BUT"
750 PRINT "IF YOU WANT TO QUIT, REVERSE 0 (ZERO)."
760 PRINT
770 PRINT
780 PRINT
790 PRINT
800 PRINT
810 PRINT
820 PRINT
830 PRINT
840 PRINT
850 PRINT
860 PRINT
870 PRINT
880 PRINT
890 PRINT
900 PRINT
910 PRINT
920 PRINT
930 IF AS(1,1)="N" THEN 1460
940 PRINT "HOW MANY NUMBERS?"
950 INPUT N
960 N=INT(N)
970 IF N >= 1 AND N <= 18 THEN 220
980 PRINT "I CAN ONLY PLAY WITH BOARDS OF 1 TO 18 NUMBERS"
990 GOTO 940
1000 FOR I=1 TO N
1010 P(I)=1
1020 NEXT I
1030 PRINT """;TAB(13);"
1040 PRINT " ";X$(2*I+1,2*I+2);
1050 NEXT I
1060 PRINT
1070 RETURN
1080 PRINT TAB(11);
1090 FOR I=1 TO N+1
1100 PRINT " 0";
1110 NEXT I
1120 PRINT "";
1130 RETURN
1140 PRINT """;TAB(3*I+10);""----";
1150 GOTO 1250
1160 PRINT "";
1170 FOR I=1 TO N
1180 IF M(I)=0 THEN 1230
1190 PRINT TAB(3*I+10);
1200 FOR J=1 TO 4
1210 PRINT X$(M(I),M(I));
1220 NEXT J
1230 NEXT I
1240 PRINT "";
1250 F=J=0
1260 FOR I=1 TO N
1270 J=J+P(I)
1280 NEXT I
1290 IF J THEN 1310
1300 F=1
1310 RETURN
1320 F=0
1330 FOR J=1 TO N
1340 IF I=P(J) THEN 1370
1350 NEXT J
1360 GOTO 1300
1370 P(I)=P(J+1)=0
1380 IF J=1 THEN 1400
1390 P(J-1)=0
1400 RETURN
1410 PRINT "USE THE BOARD NUMBERS"
1420 GOTO 330
1430 PRINT "ILLEGAL MOVE"
1440 GOTO 890
1450 END

```

# TAXMAN

```

90 REM *** TAXMAN - LAWRENCE HALL OF SCIENCE PASSED THE IDEA ON
92 REM *** BUT THEY DON'T KNOW WHOSE IT WAS ORIGINALLY
102 PRINT "THE HUMAN TAKES A NUMBER"
104 PRINT "HI, I'M THE TAXMAN.."
106 PRINT "DO YOU WANT THE REGULATIONS (I=YES,0=NO)?"
108 INPUT R
110 IF R=1 THEN 900
120 REM *** INITIALIZATION
122 GOSUB 800
124 REM *** THE HUMAN TAKES A NUMBER
126 GOSUB 500
128 REM *** COMPUTE THE HUMAN'S AND TAXMAN'S TOTALS
130 GOSUB 570
132 REM *** PRINT THE NEW LIST
134 GOSUB 600
136 REM *** CHECK IF ANY NUMBERS STILL HAVE FACTORS
138 GOSUB 650
140 IF M=1 THEN 126
142 REM *** FIND THE WINNER
144 GOSUB 700
146 REM *** AGAIN?
148 GOTO 750
149 REM
150 REM *** THE HUMAN MOVES
152 GOSUB 500
154 PRINT
156 PRINT "YOU TAKE"
158 INPUT K
160 LET K=INT(K)
162 IF K <= 0 THEN 750
164 IF K <= N THEN 518
166 PRINT K;"IS NOT IN THE LIST -- TRY AGAIN."
168 GOTO 502
170 IF L(K)=0 THEN 514
172 REM FIND ALL THE FACTORS
174 IF K>1 THEN 530
176 PRINT "THERE ARE NO FACTORS OF";K;"FOR ME."
178 GOSUB 502
180 LET M=0
182 FOR I=1 TO K/2
184 IF L(I)=0 THEN 544
186 IF K > I*INT(K/I) THEN 544
188 LET M=M+1
190 LET T(M)=I
192 LET L(I)=0
194 NEXT I
196 REM CHECK WHETHER THERE WERE ANY FACTORS
198 LET L(K)=0
200 RETURN
202 REM
204 REM *** COMPUTE THE HUMAN'S AND TAXMAN'S TOTALS
206 REM
208 LET Y=Y+K
210 PRINT "YOUR TOTAL IS";Y
212 FOR I=1 TO M
214 PRINT T(I);
216 LET Z=Z+T(I)
218 NEXT I
220 PRINT
222 PRINT "MY TOTAL IS";Z
224 RETURN
226 REM
228 REM *** PRINT THE NEW LIST
230 REM
232 PRINT
234 PRINT "NEW LIST:"
236 LET M=0
238 FOR I=1 TO N
240 IF L(I)=0 THEN 614
242 PRINT I;
244 LET M=1
246 NEXT I
248 RETURN
250 REM
252 REM *** CHECK IF ANY NUMBERS STILL HAVE FACTORS
254 REM CHECK IF THE LIST IS EMPTY
256 IF M=0 THEN 690
258 FOR I=N TO 4 STEP -1
260 FOR J=2 TO I/2
262 IF L(J)=0 THEN 664
264 IF I > J*INT(I/J) THEN 664
266 LET M=1
268 RETURN
270 NEXT J
272 NEXT I
274 REM THE TAXMAN GETS THE REST OF THE NUMBERS
276 PRINT
278 PRINT "I GET "
280 FOR I=1 TO N
282 IF L(I)=0 THEN 682
284 PRINT I;
286 LET Z=Z+I
288 NEXT I
290 PRINT " BECAUSE NO FACTORS OF ANY NUMBER ARE LEFT."
292 PRINT "MY TOTAL IS";Z
294 LET M=0
296 RETURN
298 REM
300 REM *** FIND THE WINNER
302 REM
304 PRINT
306 IF Z>Y THEN 708
308 PRINT "YOU";Y;" TAXMAN";Z;" YOU WIN !!!"
310 RETURN
312 PRINT "TAXMAN";Z;" YOU";Y;" THE TAXMAN WINS."
314 RETURN
316 REM
318 REM *** AGAIN?
320 REM
322 PRINT
752 PRINT
754 PRINT "AGAIN (I=YES,0=NO)?"
756 INPUT R
758 IF R=0 THEN 999
760 GOTO 122
762 REM
764 REM *** INITIALIZATION
766 PRINT
768 PRINT "HOW MANY NUMBERS DO YOU WANT IN THE LIST?"
770 INPUT N
772 LET N=INT(N)
774 IF N <= 0 THEN 999
776 IF N <= 50 THEN 816
778 PRINT "AT THIS TIME, REGULATIONS ALLOW A MAXIMUM OF 50 NUMBERS."
780 GOTO 800
782 DIM L(50),T(10)
784 LET Y=0
786 LET Z=0
788 PRINT
790 PRINT "THE LIST IS:"
792 FOR I=1 TO N
794 PRINT I;
796 LET L(I)=1
798 NEXT I
800 IF N>1 THEN 844
802 PRINT
804 PRINT "HOW VERY GENEROUS OF YOU TO FORFEIT ALL TO THE TAXMAN."
806 PRINT "TAXMAN I YOU 0 THE TAXMAN WINS."
808 RETURN
810 REM
812 REM *** INSTRUCTIONS
814 PRINT
816 PRINT "YOU TRY TO BEAT THE TAXMAN."
818 PRINT "WE START WITH A LIST OF WHOLE NUMBERS IN NUMERICAL ORDER (YOU DECIDE HOW MANY)."
820 PRINT "YOU TAKE A NUMBER FROM THE LIST -- THE TAXMAN GETS ALL THE FACTORS OF YOUR NUMBER THAT ARE STILL LEFT."
822 PRINT "YOUR NUMBER AND ALL ITS FACTORS ARE THEN DELETED."
824 PRINT "FOR EXAMPLE, SUPPOSE YOU WANT 10 NUMBERS TO BE IN THE LIST."
826 PRINT "THEN THE LIST WOULD BE: 1 2 3 4 5 6 7 8 9 10."
828 PRINT "IF YOU TOOK 8, THE TAXMAN WOULD GET 1, 2, AND 4."
830 PRINT "AND THE NEW LIST WOULD BE: 3 5 6 7 9 10."
832 PRINT "THE TAXMAN MUST GET SOMETHING EVERY TIME SO YOU CAN"
834 PRINT "ONLY PICK A NUMBER THAT HAS FACTORS LEFT."
836 PRINT "WHEN NONE OF THE REMAINING NUMBERS HAS ANY FACTORS, THE TAXMAN GETS THEM!!"
838 PRINT "YOUR SCORE IS THE SUM OF THE NUMBERS YOU TAKE."
840 PRINT "IF YOU WANT TO GIVE UP, TAKE 0."
842 PRINT "GOOD LUCK!"
844 GOTO 122
999 END

```

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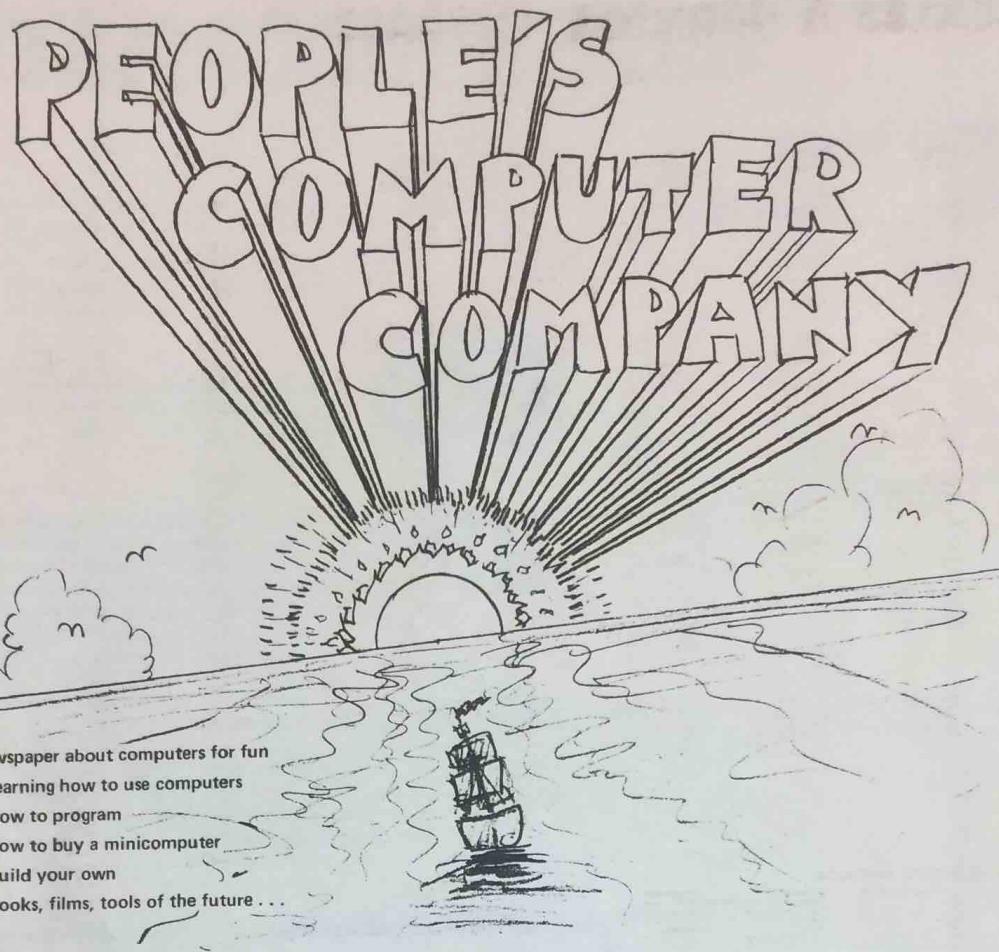
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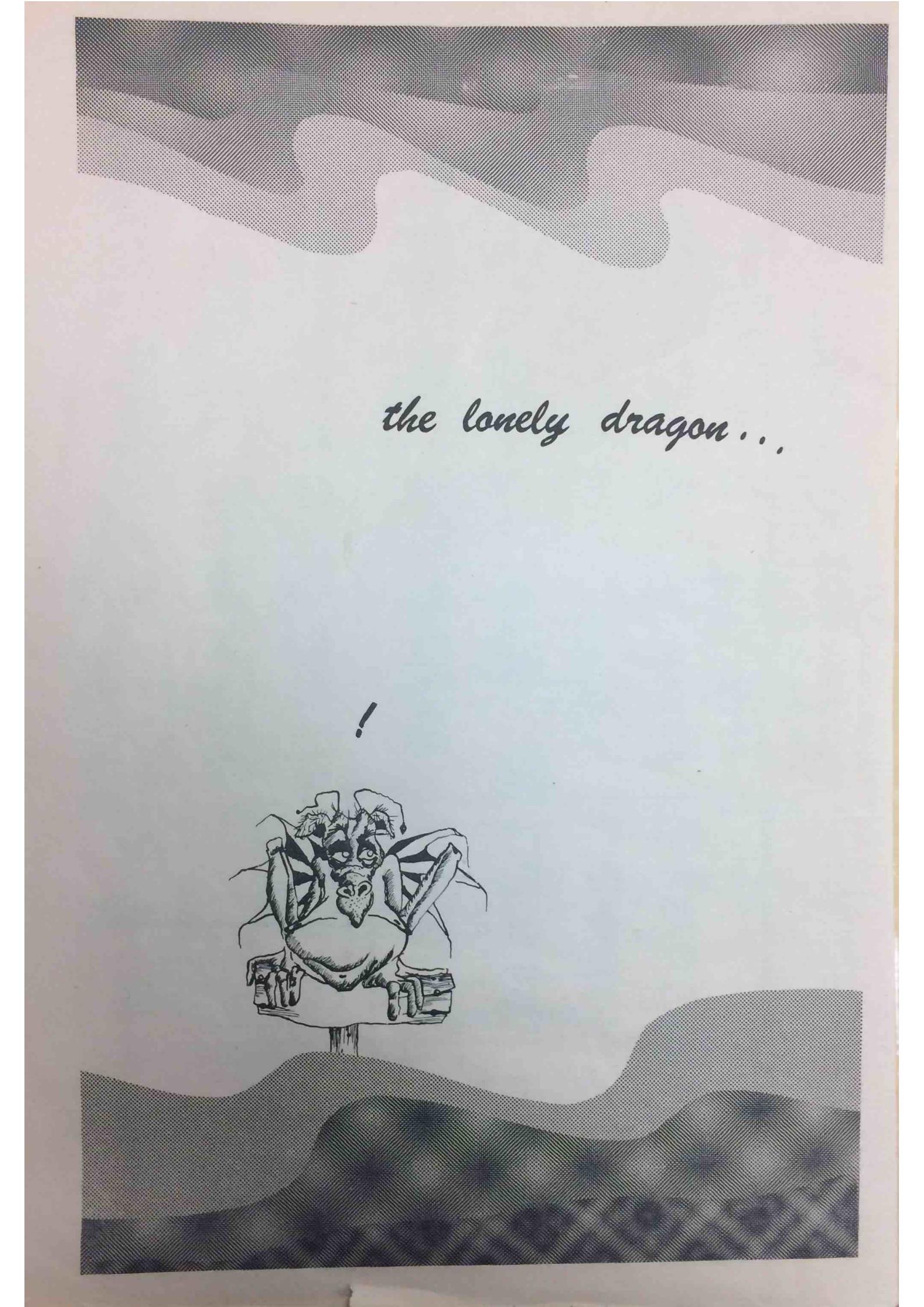
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*the lonely dragon...*

!

# What To Do After You Hit

UNIVERSITY OF ILLINOIS-URBANA



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## WHY GAMES AT ALL?

Games encourage imaginative and constructive responses. The results of games are unimportant — we take risks, tolerate uncertainty, and proceed with less-than-complete understandings. Our abilities to react creatively to new and unexpected situations are constantly changing. We develop our decision-making capabilities and problem-solving skills. *Games are fun!*

## WHY COMPUTER GAMES?

A computer waits patiently while we experiment with different lines of thought. It's available to play any game we want, as many times as we'd like. *Games are fun!*

## WHY PLAY THESE GAMES WITHOUT A COMPUTER?

*Why not! Most of these games can be played without a computer.*

When we play these games without a computer, one of us is the computer. The "computer" has to be "programmed" for each game; it processes information and always responds logically. Being the computer enables us to see the game from another perspective and better understand its structure. Modifying the games and trying new variations is easy when one of us is the computer; how to actually write a computer program for the games is clearer. *Games are fun!*

## WHY COMPUTER GAMES? — continued

A simulation is a model of a real-life situation. The computer does the complicated bookkeeping — you create the initial conditions, manipulate the parameters, and analyze the results. The effects of each parameter can be isolated; the simulation can be repeated as often as you want. *Games are fun!*

## WHY GAMES AT ALL? — continued

Competition is one relationship among players. We can transform a competitive two-player game into a cooperative five-player game; instead of always playing one side, a person alternates playing each side throughout the game.

Games can introduce new ideas. Games are open-ended, multi-purposed, and can be selected to suit our needs. *Games are fun!*

HEWLETT  PACKARD

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