# HEWLETT-PACKARD 

HP-41

## USERS' LIBRARY SOLUTIONS

Games II



## NOTICE

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## INTRODUCTION

This HP-41C Solutions book was written to help you get the most from your calculator. The programs were chosen to provide useful calculations for many of the common problems encountered.

They will provide you with immediate capabilities in your everyday calculations and you will find them useful as guides to programming techniques for writing your own customized software. The comments on each program listing describe the approach used to reach the solution and help you follow the programmer's logic as you become and expert on your HP calculator.

## KEYING A PROGRAM INTO THE HP-41C

There are several things that you should keep in mind while you are keying in programs from the program listings provided in this book. The output from the HP 82143A printer provides a convenient way of listing and an easily understood method of keying in programs without showing every keystroke. This type of output is what appears in this handbook. Once you understand the procedure for keying programs in from the printed listings, you will find this method simple and fast. Here is the procedure:

1. At the end of each program listing is a listing of status information required to properly execute that program. Included is the SIZE allocation required. Before you begin keying in the program, press XEQ ALPHA SIZE ALPHA and specify the allocation (three digits; e.g., 10 should be specified as 010).

Also included in the status information is the display format and status of flags important to the program. To ensure proper execution, check to see that the display status of the HP-41C is set as specified and check to see that all applicable flags are set or clear as specified.
2. Set the HP-41C to PRGM mode (press the PRGM key) and press GTO $\square$ to prepare the calculator for the new program.
3. Begin keying in the program. Following is a list of hints that will help you when you key in your programs from the program listings in this handbook.
a. When you see " (quote marks) around a character or group of characters in the program listing, those characters are ALPHA. To key them in, simply press ALPHA, key in the characters, then press ALPHA again. So "SAMPLE" would be keyed in as ALPHA"SAMPLE" ALPHA.
b. The diamond in front of each LBL instruction is only a visual aid to help you locate labels in the program listings. When you key in a program, ignore the diamond.
c. The printer indication of divide sign is /. When you see / in the program listing, press $\ddagger$.
d. The printer indication of the multiply sign is $\underset{\%}{*}$. When you see $\underset{\%}{*}$ in the program listing, press $x$.
e. The $\vdash^{-}$character in the program listing is an indication of the APPEND function. When you see ${ }^{-}$, press $\square$ APPEND in ALPHA mode (press $\square$ and the K key).
f. All operations requiring register addresses accept those addresses in these forms:
nn (a two-digit number)
IND nn (INDIRECT: $\square$, followed fy a two-digit number)
X, Y, Z, T, or L (a STACK address: $-\quad$ followed by X, Y, Z, T, or L)
IND X, Y, Z, T or L (INDIRECT stack: $\quad$ followed by X, Y, Z, T, or L)
Indirect addresses are specified by pressing $\square$ and then the indirect address. Stack addresses are specified by pressing $\bullet$ followed by $\mathrm{X}, \mathrm{Y}, \mathrm{Z}, \mathrm{T}$, or L . Indirect stack addresses are specified by pressing $\square$ and $\mathrm{X}, \mathrm{Y}, \mathrm{Z}, \mathrm{T}$, or L .

Printer Listing

```
01*LBL "SAM
PLE*
    02 .-THIS IS
    A ".
    03 "\vdashSAMPLE
    0 4 ~ R V I E W
    0 5 6
    06 ENTERT
    07 -2
    08 -
    09 ABS
    10 STO IND
L
    11 "R3="
    12 ARCL 03
    13 AVIEW
    1 4 \text { RTN}
```


## Keystrokes



Display
01 LBL $^{\top}$ SAMPLE
$02^{\top}$ THIS IS A
$03^{\top}$ - SAMPLE
04 AVIEW
056
06 ENTER 〕
07 -2
08 /
09 ABS
10 STO IND L
$11^{\top}$ R3 $=$
12 ARCL 03
13 AVIEW
14 RTN

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Can you survive a trip through 67 interconnected caves,picking up nine items, and avoiding various hazards?
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The HP-41 is a tough opponent in this fast-moving adaptationof $8 \times 8$ chess.
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Become a "pinball wizard" without depositing a single quarter!
*4. TRUCK by Kenneth Sharp ..... 55
Breaker-Breaker! Deliver your shipment within 10 hours orpay a penalty. Put pedal to the metal, but watch out forsmokies and road hazards!
*5. FLIP0 by Dr. Robert Swanson71Try to both outwit and "out-flip" the HP-41.
6. CODE CRACK . . . . . . . . . . . . . . . by Edward Hume ..... 91
How many guesses will it take you to "crack" the hiddenHP-41 code?
*+7. ADVENTURE by Layne Johnson ..... 98
Use your intuition to survive a harrowing adventure, and then custom-design your own adventure with this "do-it-yourself" program.

* Requires three memory modules
** Requires four memory modules
+ Requires card reader


## PROGRAM DESCRIPTION $\square$

THE CAVES

By James Surber

Welcome to the "THE CAVES". The Caves is an adventure game in which the player (a wizard) moves about a series of 67 caves to pick up nine items of considerable value (for a total 1200 points) without dying from the hazards. The construction of the caves is a single stranded helix with interconnecting tunnels. The even numbered caves have tunnels going up to seven caves, while the odd numbered caves have tunnels going down to seven caves. These tunnels, and the tunnels going to the two intermediate caves on either side, make each cave connected to the three adjacent caves.

Upon entering the caves, you will be in cave number 0 which will always be empty and "SAFE". Five pieces of equipment will be given to you before starting through the caves, and three more pieces may be picked up while going through the game. These are to help you to get through the hazards and pick up the valuables. You will be given at the start of the game the following:

Keys, Water, Knife, Gloves, and a Lamp.
Only these five original pieces of equipment can be "SNATCHED" (taken) by the bats. Possession of these items is indicated in the display by setting flags 0-4; each number representing a different piece of equipment. (When set, these flag numbers appear along the bottom of the display.) The three pieces that are picked up along the way are immune to the bats due to a magical spell they have over them. These pieces are:

Wand, Magic Word, and a Cape.
If you lose any of the five original pieces of equipment the Wand will magically "PRESTO" return all lost pieces in one wand usage. The Wand will work only twice after each visit to the Wand Cave (not accumulative). The Magic Word "ABRAKADABRA" will take you out of the game at any time or place you wish to use it. The Cape will render you invisible to any dragon you may find in the cave. If the Cape is lost along the way, it may be reacquired by returning to the Cape Cave.

You will be given warnings of some of the hazards in the adjacent caves after you enter a new cave and have encountered any hazards present. These warnings appear after the word "SAFE" and do not have tones associated with them. Below is a list of the warnings and their hazards.
"FEEL DRAFT" a bottomless pit - end of the game. (no score) "YYEEEIIII THE PITS"
"SMELL DRAGON" if no cape, the dragon will eat you - end of the game. (no score) "CHOMP"

```
"HEAR SPLASH" cave is full of water and you will drown - end of
    the game. (no score) "ALL WASHED UP"
"DARK CAVE" if no lamp is present, you will fall into a bottomless
        pit - end of the game. (no score) "OOPS NO LAMP"
        "YYEEEIIII THE PITS"
"HEAR SQUEEKS" bats will "SNATCH" one piece of your equipment.
        "SNATCH" "BATS TOOK ( )"
"HEAR VOICE" a wizard will tell you all that occupies the six
        closest caves (usually the three on either side). He
        does not see stairs or forks.
"SEE LIGHT" a tunnel out of the caves will take you out - end of the
    game. (with score) "END GAME" "SCORE = ( )"
```

There will be other surprises lurking in "The Caves" without warning. These will be inconvenient or lethal only if equipment has been "SNATCHED".

There are caves with stairs and forks in them. The stairs will display "UP OR DOWN?". This will randomly place you either above (higher number) or below (lower number) the cave that the stairs are currently in. The fork will randomly select two caves and display them with no warnings. You must then choose between them. Once you are placed in a new cave (in both the stairs and fork cases), you must suffer any hazards there and will be given new warnings and adjacent caves. At each re-entry into a cave with stairs or forks, you will be given new random caves. You never know what you might find at the end of your tunnel.

At anytime you may go "BACK" and return to the last cave you were in. This function will also work with stairs and forks.

A list of all valuables and their points is given below. After you have placed a valuable "IN PACK" it is removed from the cave and that cave will be empty upon re-entry. When all the valuables are found the HP-41 will "beep" so you'll know when you have finished.

| DIAMONDS | 100 |
| :--- | :--- |
| IVORY | 100 |
| MING VASE | 100 |
| PEARLS | 100 |
| CRYSTAL (in one of the two "small caves") | 100 |
| RUBIES (locked in a chest) | 150 |
| SILK (locked in a chest) | 150 |
| AG (silver - too hot, use gloves) | 200 |
| AU (gold - too cold, use gloves) | 200 |

OPERATING LIMITS AND WARNINGS AND OPTIONS

The space requirement for this program is 319 registers.
The initialization of this program is done during the time the display is showing "THE CAVES". This process takes time to randomize the caves for your game. Please be patient while the HP-41 is "thinking". The same seed will generate the same game each time you play.

Flag 11 is used at one brief point in the program. If the calculator is shut off during the running of the program flag 11 may be set, therefore, the game will automatically start when it is turned back on. As long as you turn the calculator off at a prompt for a move this will not occur.

If the optional printer is used all warnings and the wizards' wise words will be printed in lower case letters.

## STATUS

SIZE: 076
FIX: 0
USER MODE: ON
TOTAL PROGRAM BYTES: 1703

## DATA REGISTERS

00-67 CAVES
68-70 ADJACENT CAVES
71 LAST CAVE
72 POINTS TOTAL
73 POSITION
74 SEED
75 LOOP CONTROLS

## FLAGS USED

0
Set: KEYS PRESENT
Clear: KEYS SNATCHED
1 Set: LAMP PRESENT
Clear: LAMP SNATCHED
2 Set: WATER PRESENT
Clear: WATER SNATCHED
3 Set: KNIFE PRESENT
Clear: KNIFE SNATCHED
4 Set: GLOVES PRESENT
Clear: GLOVES SNATCHED
5 Set: WAND PRESENT
Clear: WAND ABSENT
6 Set: WORD PRESENT
Clear: WORD ABSENT
7
Set: CAPE PRESENT
Clear: CAPE ABSENT

## FLAGS USED cont.

8

9

10

13

25

27

29

Set: DISPLAY WARNINGS, CAVE CONTENTS Clear: DISPLAY "NO WARNING"

Set: BATS TOOK NOTHING Clear: BATS TOOK ()

Set: 1 ST WAND USAGE
Clear: WAND USAGE USED
Set: CHEST WITH SILK Clear: CHEST WITH RUBIES

Set: TEST WARNINGS Clear: XEQ HAZARD

Set: NORMAL WARNING
Clear: FORK WARNINGS
Set: USER MODE ON
Clear: USER MODE OFF
Set: DECIMAL POINT
Clear: NO DECIMAL POINT

## SAMPLE PROBLEM

Once upon a time, there was a wizard who set out to make his name in the wonderful world of wizardry and to earn a fabulous fortune. The titillating trail that awaited him was the awesome task of travelling through "THE CAVES". As he traveled through this magically made maze he increased his strength to a new and higher order by receiving magical powers (the Wand, the Magic Word, and the cape). His fortune was found by placing the nine valuables of the caves in his pack. These powers and valuables could make him the world's wealthiest wizard. To start his journey he planted a magical seed (a fractional number) to form his puzzle. At this time he was given his equipment (keys, water, knife, gloves and lamp). The number he chose was 0.741 . The following tells of the treacherous trek he took.

Note: The last line of the display after moving to a new cave is in the format: \#*, \#, \#, \#. The first number (with the asterisk) is the cave you are in, the other three are the adjacent caves.


| DISPLAY | INPUT | FUNCTION | COMMENTS |
| :---: | :---: | :---: | :---: |
| 3* 2,4,0 <br> MOVING TO 4 <br> AU <br> TOO COLD <br> USE GLOVES <br> IN PACK <br> SCORE $=400$ <br> SAFE <br> NO WARNING <br> 4* 3,5,11 <br> MOVING TO 5 <br> FORK <br> 5* LT/RT, 45, 10 <br> MOVING TO 10 <br> HEAR SQUEEKS <br> SNATCH <br> BATS TOOK KNIFE <br> SAFE <br> HEAR SPLASH <br> 10* 9,11,17 <br> MOVING TO 9 <br> SAFE HEAR SQUEEKS <br> 9* 8,10,2 <br> MOVING TO 8 <br> SAFE <br> SEE LIGHT <br> 8* 7,9,15 <br> MOVING TO 15 <br> SAFE <br> SEE LIGHT <br> 15* $14,16,8$ <br> MOVING TO 16 <br> SAFE <br> HEAR SPLASH <br> 16* 15,17,23 <br> MOVING TO 23 <br> DIAMONDS <br> DIAMONDS IN PACK <br> SCORE $=500$ <br> SAFE <br> NO WARNING | 4 <br>  | [R/S] <br> [R/S] <br> [XEQ] "I" <br> [R/S] <br> [R/S] <br> [R/S] <br> [R/S] <br> [R/S] | To go the cave on the right <br> Note annunciator '3' no longer on |


| DISPLAY | INPUT | FUNCTION | COMMENTS |
| :--- | :--- | :--- | :--- |
| 23* 22,24,16 | 24 |  |  |
| MOVING TO 24 |  | [R/S] |  |
| WEB |  |  |  |
| BATS TOOK KNIFE |  |  | (You don't have a |
| GO BACK |  | knife to cut through |  |
|  |  |  |  |
| SAFE web) |  |  |  |



USER INSTRUCTIONS


USER INSTRUCTIONS

|  |  |  |  | SIZE: 076 |
| :---: | :---: | :---: | :---: | :---: |
| STEP | InStructions | INPUT | FUNCTION | DISPLAY |
| 8a | If you have found the "WAND" and the bats |  | [XEQ] "B" | PRESTO |
|  | have "SNATCHED" some of your equipment the |  | (wand) | SAFE |
|  | WAND will return all equipment taken |  |  | (warnings) |
|  |  |  |  | (cave display |
|  |  |  |  | of old caves) |
| 8b | If no "WAND" has been found or if the |  |  | NO WAND |
|  | "WAND" has been used twice since last |  |  | SAFE |
|  | "WAND CAVE" visit (visits not accumulative) |  |  | (warnings) |
|  |  |  |  | (cave display |
|  |  |  |  | of old caves) |
| 9 | At any time you wish to review the warnings |  | [XEQ] "C" | (warnings) |
|  | for the adjacent caves (this will not |  | (warn) | (cave display |
|  | function when a Fork or Stairs is displayed) |  |  | of old caves) |
| 10 | If you wish a review of the score to date |  | [XEQ] "D" | SCORE = ( ) |
|  |  |  | (score) | (cave display |
|  |  |  |  | of old caves) |
| 11 | If you wish a review of the equipment |  | [XEQ] "E" | BATS TOOK ( ) |
|  | "SNATCHED" by the bats |  | (equip) | (hazards or |
|  |  |  |  | valuables) |
|  |  |  |  | SAFE |
|  |  |  |  | (warnings) |
|  |  |  |  | (cave display |
|  |  |  |  | of old caves) |
| 12 | If you wish or were instructed to "GO BACK" |  | [XEQ] "J" | Same as 4 |
|  | to the last cave (this will function with |  | (back) |  |
|  | Forks and Stairs) |  |  |  |
| 13 | If at anytime you stop midgame and turn |  | [XEQ] "C" | Same as 9 |



## PROGRAM LISTING

|  |  | $\begin{array}{lll} 49 & \text { ECL } \\ 50 & 5 H T \end{array}$ |  |
| :---: | :---: | :---: | :---: |
| Gz CLFG |  | $515 T 0$ IHII |  |
| Q3 "SEET ? | Seed | 2 |  |
| 04 FROMPT |  | 52 ETH | CONTROL LOOP |
| $655 T 074$ |  | $53+$ LEL 97 |  |
| 06 "THE CAU |  | 54 XEQ 98 |  |
| ES" |  | 5515675 |  |
| g\% AYIEW | INITIALIZATION | 56 GTO 9 |  |
| 09 CF 29 | OF REGISTERS | 57 ETH |  |
| 69 EF 27 | AND FLAGS | $59+$ LEL 1 | GO BACK |
| 10 KEQ 59 |  | 59 ECL 71 | GO BACK |
| 11 FIX 9 |  | 6日 GTO 84 |  |
| $121-626$ |  | E.1*LEL I | GO RIGHT |
| 1357075 |  | Gz RCL PG |  |
| 14 XED |  | GЗ GTO ${ }^{\text {G }}+$ |  |
| 1518.026 |  | 64*LEL H | GO LEFT |
| 16 GT0 $\quad$ S |  | 65 RCL 69 | GO LEFT |
| $17 \times 8 \mathrm{P}$ |  | 6 $6 \cdot \mathrm{LEL}$ | MOVING TO () |
| 1824080 |  | TO'. Movikio |  |
| 20 REQ $9 ?$ |  | 68 ARCL $X$ |  |
| zi TOHE 9 |  | G9 AUIEL |  |
| $2 こ * L E L$ EG |  | 7 T XEQ 5E |  |
| 231 |  | 71*LEL E4 |  |
| $245 T 0 \in 8$ | STORE ADJACENT CAVES | $72 \times 8 \geqslant 3$ | STORE LAST |
| 253 | ADJACENT CAVES | 73 ST0 71 |  |
| $265 T 069$ | 100 | 74 RCL 73 |  |
| 275 |  | $75 \times 09$ |  |
| 2 STO 7 B |  | TG GTO EE |  |
| 29 GTO 55 |  | 7767 |  |
| 30*LEL 9 |  | 78 ¢ 6 ' |  |
| 31 REL 74 |  | 79 GTO |  |
| 329821 | RANDOM | 8 ECLL 73 |  |
| 35 \% | NUMBER | $E 11$ | FIND ADJACENT |
| 34 -21137 | GENERATOR | Q2 - |  |
| $35+$ |  | ES ETO EG |  |
| 36 FEC |  | 842 |  |
| $375 T 074$ |  | S5 + |  |
|  |  | 8657069 |  |
| 39 INT |  | 87 E | ODD OR EVEN |
| 40 FTH |  | 6 man |  |
| 41*LEL 9E |  |  |  |
| 4266 | STORAGE | 90 GTO ES |  |
| 43 XEQ 99 | LOOP | 91 ELL 73 |  |
| $44 \times=0$ |  | 9 F |  |
| 45 GTO 96 |  | 93 - | ODD |
| 46 ECL IHD |  | 949 | LOWER CAVE |
| $x$ |  | $95 \times \%$ |  |
| 47 ¢ $2 \times 0$ |  | $96 \times 29$ |  |
| 48 GTO 9 E |  | $976 T 076$ |  |


| 98 GTO 55 |  | 146 CF 13 |  |
| :---: | :---: | :---: | :---: |
| 99*LBL 68 |  | 147 "NO WRRH | NO WARNINGS |
| 100 RCL 73 |  | ING* |  |
| 101 ? | EVEN | 148 FC?C 08 |  |
| $102+$ | UPPER CAVE | 149 AVIEM |  |
| 10367 | UPPER CAVE | 150 PSE |  |
| $1048 \ggg$ |  | 151*LBL 77 |  |
| 105 X< ${ }^{10 \%}$ |  | 152 CLA | DISPLAY CAVES |
| $1065 T 070$ |  | 153 ARCL 73 |  |
| 107 GTO 55 |  | 154 "卜* . |  |
| $108+L B L 67$ |  | 155 ARCL 68 |  |
| 10962 | STORE | 156 "ト, " |  |
| 110 STO 69 | STORE | 157 ARCL 69 |  |
| 11164 | ADJACENT 67 | 158 "r. ${ }^{\text {\% }}$ |  |
| 112 STO 69 | CAVES TO 67 | 159 ARCL 70 |  |
| 11366 |  | 160 PROMPT |  |
| 114 STO 70 |  | 161 GTO "†" |  |
| 115 GTO 55 |  | $162+L B L 78$ |  |
| 116 *LBL 56 |  | 16.3 SF 25 | WARNINGS |
| 117 RCL 69 |  | 164 RCL IHD |  |
| 118 X='? | IF LEGAL MOVE | $x$ |  |
| 119 RTH |  | 165 FC? 25 |  |
| $120 \mathrm{X}<\mathrm{Y}$ |  | 166 GTO 77 |  |
| 121 RCL 69 |  | 16720 |  |
| $122 \times=\% ?$ |  | $168 \times \gamma \%$ |  |
| 123 RTH |  | 169 RTH |  |
|  |  | 176 SF 08 |  |
| 125 RCL 76 |  | 171 XEQ IND |  |
| $126 \mathrm{X}=\mathrm{Y}$ ? |  | ' |  |
| 127 RTH |  | 172 RTH |  |
| 128 "ILLEGAL |  | $173+$ LBL 91 |  |
| CAVE ${ }^{\text {c }}$ |  | 174 "MAGIC | MAGIC WAND |
| 129 XEQ 33 |  | AHD ${ }^{\text {P }}$ |  |
| 130 RCL 73 |  | 175 FS? 13 |  |
| 131 GTO 06 |  | 176 GTO 33 |  |
| $132+$ LBL 55 | XEQ HAZARDS | 177 KEQ 32 |  |
| 133 RCL IHD | \& VALUABLES | 178 SF 05 |  |
| 73 |  | 179 SF 10 |  |
| 134 GTO IHD |  | 180 GTO E0 |  |
| $x$ |  | 181*LBL B |  |
| 135*LBL E6 |  | 182 FC? 05 |  |
| 136 "SAFE" | SAFE | 183 -NO WAND | USE MAGIC |
| 137 KEQ 33 |  |  | WAND |
| 138*LBL C |  | 184 FS? 05 |  |
| 139 SF 13 | FIND WARNINGS | 185 "PRESTO" |  |
| 140 RCL 69 |  | 186 XEQ 32 |  |
| 141 XEQ 78 |  | 187 FC? 05 |  |
| 142 RCL 69 |  | 188 GTO E |  |
| 143 XEQ 78 |  | 189 FCPC 10 |  |
| 144 RCL 76 |  | 190 CF 05 |  |
| 145 XEQ 78 |  | $191 \times$ Q 58 |  |

## PROGRAM LISTING

| 192 GTO 90 |  | ころ7＂LOLKEI | LOCKED CHEST ROUTINE |
| :---: | :---: | :---: | :---: |
| $193 *$ LEL 59 |  | CHEST＂ |  |
| 194 CF 13 |  | 236 XEQ 33 |  |
| 195 CF 19 | $\underset{\text { INITIALIZE }}{ }$ | 239 FS 13 |  |
| 196 CF 9 C |  | 240 CF 11 |  |
| 197 CF 97 | RESET FLAGS | $241 \quad F 5 \% 13$ |  |
| 198 CF 06 |  | 242 FTH |  |
| 199 CF 05 |  | 243 GF 09 |  |
| 206＊LEL 5S |  | 244 XEQ 36 |  |
| 2015 EF 4 | RESET FLAGS FOR | 245 CF 05 |  |
| 202 SF 03 |  | 246 FE？ 96 |  |
| 203 SF 02 | WAND \＆GAME | 247 GTO 90 |  |
| 204 GF 01 |  | 245 FCT 11 |  |
| $2059 F 00$ |  | 249 ＂RUEIEG＊ |  |
| 206 CF 09 |  | 250 FSTC 11 |  |
| 207 RTH |  | 251＂SILK＂ |  |
|  | MAGIC WORD | 252 XEQ 33 |  |
| 269 ＂MAGIE H |  | 25.3150 |  |
| OEI： |  | 254 GT0 34 |  |
| 210 FS \％ 13 |  | $255+$ LEL 6E |  |
| 211 GTO 33 |  | 256 ＂ AG＂$^{5}$ | AG（SILVER） |
| 212 XEQ 32 |  | 257 XEQ 33 |  |
| 213 SF 06 |  | 258 FS \％ 13 |  |
| 214 GTO 60 |  | 259 ETH |  |
| $215 *$ LBL ${ }^{\text {a }}$ |  | 26日＂TOO HOT |  |
| 216 FC？ 06 |  | ＂ |  |
| 217＂NO MAGI | USE ！！AGIC WORD | 261 GTO 35 |  |
|  |  | $2 G z+L E L$ GT | AU（GOLD） |
| $218 \mathrm{FS} \mathrm{\%}$ ¢6 |  | 26.3 ＂ AU ＂ |  |
| 219 ＂ABRAKAD |  | 264 XEQ 3 |  |
| AERA＂ |  | $265 \mathrm{FS?} 13$ |  |
| 220 XEQ 3 3 |  | 2 EG ETH |  |
| 221 Fc？ $\mathrm{OG}_{6}$ |  | 26．${ }^{\text {aton col }}$ |  |
| 222 GTO 77 |  | II＇ |  |
| 223 GTO 57 |  | 2GE＊LEL 35 |  |
| 2こ4＊LEL 03 |  | 269 XEQ 33 |  |
| 225 ＂GAPE＂ |  | 270 FS \％ 64 | USE GLOVES |
| 2玉G FS？ 13 |  | 2T1＂USE＂ | ROUTINE |
| 227 GTO 3 | CAPE | 272 FG？ 04 |  |
| 22 XEQ 32 |  | 273 KEQ 43 |  |
| 229－IHyISIE |  | 274＂トGLOVES |  |
| LE TO＂ |  |  |  |
| $2367 \vdash$ DRAGO |  | $275 \times 2033$ |  |
| H． |  | 276 FC？ 14 |  |
| 231 XEQ 33 |  | 277 GTO 96 |  |
| 2325 EF |  | 278 CLA |  |
| 233 GTO 96 |  | 279200 |  |
| $234 *$ LBL 04 |  | 286 GT0 34 | PEARLS |
| 235 SF 11 | SILK | $2 \mathrm{S1*LEL}$ 69 |  |
| $236+$ LEL 95 | RUBIES | 2¢2＂FEARLG＊ |  |
|  |  | 2 ES GTO 37 |  |

$\square$

| 294＊LEL 10 |  | 336 GTO 4z |  |
| :---: | :---: | :---: | :---: |
| 285＂MING VA | MING VASE | 331 －LEL 14 |  |
| SE＂ |  | 332 ＂WEE＂ |  |
| 2 EG GTO 37 |  | $333 \mathrm{FS} \mathrm{\%} 13$ | WEB |
| 287＊LEL 11 |  | 334 GTO 33 |  |
| 2 se ＂IVORY＂ |  | 335 XEQ 31 |  |
| $2896 T 037$ | IVORY | 336 XEQ 44 |  |
| $290 *$ LEL 12 | DIAMONDS | 337 FS ？ 03 |  |
| 291 ＂IIAMOHD | DIAMONS | 338 GTO Q6 |  |
| $5 \cdot$ |  | 339 GTO 46 |  |
| 292＊LEL 37 | DISPLAY | 340＊LEL 15 |  |
| 293 XEQ 33 | VALUABLES | 341 ＂FIRE＂ |  |
| 294 FS？ 13 | VALUABLES | 342 FS ？ 13 |  |
| 295 RTH |  | 343 GTO 3. | FIRE |
| 296109 |  | 344 XEQ 31 | FIRE |
| $297 *$ LEL 34 | IN PACK | 345 FS ？ 92 |  |
| 298 ＂+ IN FA | IN PACK | 346 ＂USE＂ |  |
| CK． |  | 347 FC？ 12 |  |
| 299 XEQ 33 |  | 348 XEQ 43 |  |
| 306 ST＋72 |  | 349 ＂मHATER＂ |  |
| 301 RCL 72 |  | 356 XEQ 33 |  |
| 3021290 |  | 351 FS？日z |  |
|  | BEEP IF <br> 1200 POINTS | 352 GTO EG |  |
| 304 EEEF | 1200 POINTS | 353 GTO 46 |  |
| 305 XEQ 49 |  | $354 * L B L$ 16 |  |
| 3066 |  | 355 ＂LOCKED |  |
| $\frac{367}{73} \mathrm{STO}$ IHI | REMOVE VALUABLE FROM CAVE | DOOR 356813 | $\begin{aligned} & \text { LOCKED } \\ & \text { DOOR } \end{aligned}$ |
| 305 GTO 60 |  | 357 GTO 35 |  |
| $369 *$ LBL 31 |  | 358 XEQ 31 |  |
| 319 TOHE 5 |  | $359 *$ LBL 36 |  |
| 311 TOHE 3 | BAD | 36．FS？ 06 |  |
| 312 TOHE 9 | TONES | 361 ＂UEE＂ | USE KEY |
| 313 GTO 33 |  | 362 FC？ 09 | ROUTINE |
| $314 *$ LEL 32 |  | 363 XEQ 43 |  |
| 315 TOHE 1 | GOOD TONES | 364 ＂मКЕソ＂ |  |
| 316 TOHE 3 |  | 365 YEQ 33 |  |
| 317 TOHE 5 |  | 366 FS？ 98 |  |
| $318+L B L 3$ |  | 36.7 RTH |  |
| 319 FVIEM | AVIEW | $368 \mathrm{FS} \mathrm{\%}$ 日a |  |
| 320 FGE |  | 369 GTO 60 |  |
| 321 RTH |  | 370＊LEL 46 |  |
| $3 \Sigma 2+L B L 13$ |  | 371 －GO EACE | PROMPT FOR |
| Зころ＂UGLY TE | UGLY TROLL | ＂ | GO BACK |
| OLL＂ |  | 372 PROMPT |  |
| $324 \quad F \leqslant 7$ 13 |  | 373 GTO 1 |  |
| 325 GTO 33 |  | 374 ＋LEL GE | CRYSTAL |
| 326 XEQ 31 |  | 375 SF 69 |  |
| 327 XEQ 44 |  | $376+$ LBL 17 |  |
| $329 \mathrm{FG} \mathrm{\%} 93$ |  | 377 ＂SMALL © | SMALL CAVES |
| 329 GTO 96 |  | HVE＊ |  |

## PROGRAM LISTING

| 378 XEQ 33 |  | $4 \Sigma 6+$ LEL 20 |  |
| :---: | :---: | :---: | :---: |
| 379 FS? 13 |  | 427 "GEE LIG | SEE LIGHT |
| 396 CF GS |  | HT* |  |
| $3 \mathrm{SO}_{1} \mathrm{FS}$ ¢ 13 |  | 429 FG ? 13 |  |
| 3 SE RTH |  | 429 GTO З3 |  |
| 383 " DROF EI | DROP BIG CAPE | 436 XEQ 32 |  |
| G CAPE" |  | 431 L LEL 57 |  |
| 3 S 4 FSTC 67 |  | 432 "EHD GHM | END GAME |
| 395 XEQ 31 |  | E" |  |
| $3 \mathrm{S6}$ FC2C 69 |  | 433 XEQ 3.3 |  |
| 387 GTO 69 |  | $434 \times 2 \mathrm{CE} 4 \mathrm{~S}$ |  |
| 389 "CRYSTAL |  | 435 FROMPT |  |
| - |  | 436 GTO 45 |  |
| 389 GTO 37 |  | $437+$ LEL I |  |
| 396*LEL 18 |  | 436 XEQ 4 S | GIVE SCORE |
| $391 \quad \mathrm{FS}$ \% 13 |  | 439 GTO | Give score |
| 392 RTH |  | $446+$ LEL 49 |  |
| 393 "STAIES" | STAIRS | 441 - 4 CORE $=$ | SCORE $=()$ |
| 394 XEQ 33 | STAIRS |  | SCORE = () |
| 395 "UF OF D |  | 442 ARCL |  |
| OWH ? |  | 443 KED 32 |  |
| 396 FROMPT |  | 444 ETH |  |
| 397 GTO 18 |  | 445*LEL こ1 |  |
| 398*LBL F |  | 446 " IAREE CF |  |
| 399 RCL 73 | UP | VE" |  |
| 4666 |  | 447 F9? 13 | DARK CAVE |
| 401 XEQ 99 |  | 448 GTO З | dark Cave |
| 402 X< $\mathrm{Y}^{2}$ |  | 449 XEQ 3 |  |
| 403 GTO F |  | 456 CLG |  |
| 404 GTO 84 |  | 451 YEQ उ1 |  |
| 405*LEL G |  | 452 FSE |  |
| 406 RCL 73 | DOWN | 45.3 USE LAM |  |
| 46767 |  | F' |  |
| 409 XEQ 99 |  | 454 FS? 61 |  |
| 409 人>9? |  | $455 \times 203$ |  |
| 410 GTO |  | 456 FG ¢ 91 |  |
| 411 GTO 84 |  | 457 GTO CO |  |
| 412 LEL 19 |  | 458 "OOFS HO | NO Lait |
| 413 FS \% 13 |  | LAMF ${ }^{\text {a }}$ |  |
| 414 FTH |  | 459 KEQ 33 |  |
| 415 "FORK" | FORK | $46 \mathrm{6}+\mathrm{LEL} 22$ |  |
| 416 XEQ 33 |  | 461 "FEEL TE |  |
| 41767 |  | FFT. |  |
| 418 XEQ 99 |  | 462 FS? 13 | FEEL DRAFT |
| 419 STO 69 |  | 46.3 GTO 33 |  |
| 42967 |  | 464 XED 31 |  |
| 421 XEQ 99 | FIND \& STORE | 465 "YYEEEII |  |
| 422 ST0 76 | THE CAVES FOR | II. |  |
| 423 "LT/RT" | FORK | 466 "r THE F | PITS |
| 424 ASTO 6S |  | ITS ${ }^{\text {\% }}$ |  |
| 425 GTO 7 T |  | 467 GTO 4.5 |  |

## PROGRAM LISTING

```
\(46.3 *\) LEL 23
469 "HEAR \(\Theta F\)
LASH"
476 FS? 13
471 GTO 33
472 XED 31
473 "GLL HAS
HEI UF:
474 GTO 45
\(475+\) LEL 24
476 " \(\operatorname{sMELL}\) I
RAGOH"
477 FS? 13
478 GTO 3
479 XEQ 31
480 FS G
481 GTO 03
\(4 \Xi 2+L B L \quad 42\)
493 "CHOMF"
484 LEL \(45 \quad\) CHOMP
485 XED 33
4धG TOHE 1
487 TOHE 9
488 GTO "CAY
EG•
\(499 *\) LEL 44
490 FS G .
491 "USE "
492 FC? 13
493 KEQ 43 KNIFE ROUTINE
494 "トKHIFE"
495 XED 33
496 RTH
497 * LEL 25
498 "HEAR GQ
UEEKS'
499 XEQ 33
\(56 \mathrm{FS} \quad 13\)
501 ETH
562 TOHE 9
563 TOHE 9
5644
505 XEQ 99
506 CF IHD \(\because\)
507 GF 69
569 "SHATCH"
509 XEQ 3
\(510+L B L\) E
511 XEQ 43
\(512+\) LEL 47
513 FC GE
```

WATER
473 ＂GLL HAS
HEI UF：
474 GTO 45
$475+$ LEL 24
476 ＂SMELL I
RAGOH＂
$477 \mathrm{FS} ? 13$
479 GTO 3
479 XEQ 31
481 GTO 9.3
$4 \Xi 2+$ LEL 42
483 ＂CHOMF＂
494 LEL 45
495 XED 3 3
$4 \varepsilon 7$ TOHE 0 END GAME TONES
488 GTO＂CAV
E ${ }^{\circ}$
$4 \Xi 9$＊LEL 44
496 F 9 G .3
491 ＂USE＂
492 FC？ 0.3
493 XED 43
494 ＂トKHIFE＂
495 XED 3.3
497 ＊LEL 25
498 ＂HEAR GQ
UEEKS＂
499 XEQ 33
564 FS？ 13
$\begin{array}{ll}561 & \text { RTH } \\ 562 & \text { TOHE }\end{array}$
503 TOHE 9
．
565 XEQ 9G
506 CF IHD X
567 GF 69
506 ＂SHATCH＂
569 XED 3.3
$510 *$ LBL E BATS TOOK（）
511 XEQ 43
$512+$ LEL 47
513 FC？ 69

| 514 | ＂トKEY＂ | EQUIPMENT LIST |
| :---: | :---: | :---: |
| 515 | FC？ 01 |  |
| 516 | ＂FLAMF＊ |  |
| 517 | FC？ 92 |  |
| 518 | ＂－WATER |  |
| ． |  |  |
| 519 | FCO 63 |  |
| 520 | ＂- KNIFE |  |
| ． |  |  |
| 521 | FC？ 04 |  |
| 522 | ＂-GLOVES |  |
| ． |  |  |
| 523 | FC\％ 99 |  |
| 524 | ＂+ HOTHIH |  |
| $G^{\circ}$ |  |  |
| 525 | XEQ 33 |  |
| 526 | GTO 60 |  |
| 527＊ | ＊LEL 43 | BATS TOOK |
| 528 | ＂EATS TO |  |
| OK ${ }^{\text {－}}$ |  |  |
| 529 | RTH |  |
| $530+$ | －LEL 26 |  |
| 531 | ＂HEAR YT |  |
| ICE＊ |  |  |
| 532 | FS？ 13 |  |
| 53.3 | $G T 033$ | WIZARDS |
| 534 | XEQ 33 |  |
| 535 | TOHE 4 |  |
| 536 | TOHE 5 | WIZ．TONES |
| 537 | TOHE 6 |  |
| 538 | ＂HIZARD＂ |  |
| 539 | XEQ 33 |  |
| 540 | SF 13 |  |
| 541 | RCL 73 | SET BOUNDS |
| 542 | 3 | OF WIZARD |
| 543 | － |  |
| 544 | 1 |  |
| 545 | X＜ $\mathrm{Y}^{\text {P }}$ |  |
| 546 | X＜ $\mathrm{Y}^{\prime}$ |  |
| 547 | ST0 75 |  |
| 548 | 6 |  |
| 549 | $+$ |  |
| 550 | 67 |  |
| 551 | $\mathrm{X}>\mathrm{Y} \mathrm{l}$ |  |
| 552 | X＜＞Y |  |
| 55.3 | 1060 |  |
| 55.4 | ， |  |
| 555 | $5 T+75$ |  |
| $556+$ | LEL 96 | TEST CAVE |
| 557 | ＂CAVE | CONTENT |
| 558 | ARCL 75 |  |

515 FC？ 01
516 ＂トLAMF ：EQUIPMENT
517 FC？GZ LIST

519 FC？ 03
$520 \quad$－トKNIFE
．
521 FC 04
522 ＂トGLOVES
523 FC？ 69
524 ＂FHOTHIH
$G$
525 XEQ 33
526 GTO GG
$527 *$ LEL 43
52 ERATS TQ
OK
529 RTH
530 LEL 26
531 ＂HEAR YO
ICE：

WIZ．TONES

SET BOUNDS
OF WIZARD

TEST CAVE
557 ＂CAVE＂

## PROGRAM LISTING

|  | ${ }_{\substack{\text { pisplax } \\ \text { EFspry }}}$ <br> Eno |  |
| :---: | :---: | :---: |

# $5 \times 5$ CHESS 

by Valentin Albillo

This program challenges the user to play chess against the HP-41. The game is played on a $5 \times 5$ board instead of the standard $8 \times 8$ board, however, all standard chess rules are implemented, including pawn promotion.

The program is printer compatible. If the printer is present, it will print the board, making extensive use of the graphic capabilities of the printer. The player has the option of having the board printed after every move or just after the calculator's move (the latter saves time and space).

An $8 \times 8$ version of the game was originally considered, however, it was found that:
a) the $8 \times 8$ board could not be represented clearly if the player has an HP-82143A printer.
b) an $8 \times 8$ game occupied the full memory of an HP-41, so, unless the user has an HP-41CV or a quad module, neither a printer nor a card reader can be plugged in, making it very difficult to load and run the game.
c) an $8 \times 8$ game, using the same playing logic as the $5 \times 5$ version, took several hours per move and played a very weak game.

On the other hand the $5 \times 5$ version provides the following advantages:
a) the board is printed using BLDSPEC special characters, so the player can clearly see the positions of the pieces without using an actual board. All handling of the board is automatic.
b) though the board is $5 \times 5$, the standard chess pieces are used and are arranged in the same order: king, queen, bishop, knight, rook, and a row of pawns. All pieces have the same powers and restrictions as in standard chess.
c) this $5 \times 5$ version fits in 3 memory modules, leaving a port free to plug in a card reader and a printer if desired. Also, due to the reduction in size, the game progresses faster than in the $8 \times 8$ version, taking an average of 20 moves per game (vs. 40 in the $8 \times 8$ case). Both armies get into battle early, and the game is more active.
d) as the number of alterations for a given position is less than in the $8 \times 8$ version, the calculator's level of play is much better. The HP-41 plays a good, non-trivial game and will checkmate the player if he/she does not play well enough!!

All standard chess rules are implemented, with the following three exceptions:
a) as the king is already in the corner, no castling is necessary.
b) as there is only one empty row between the pawns, a pawn may advance just one position on its first move.
c) no capture "en passant" is allowed.

The above exceptions are due mostly to the size of the board. All other rules are the same. Pawn promotion is allowed: if a pawn reaches the opposite side, it becomes any desired piece (except a king or a pawn). In the case of pawn promotion, the calculator always selects a queen.

If one of the calculator's moves results in a check being given to the opposing king, then the display shows CHECK after the move. There are two exceptions to this rule:
a) if a pawn, promoted to a queen by the calculator, results in a check to the opposing king, this is not indicated.
b) if the calculator moves a piece that, while not giving check by itself, leaves the opposing king under attack from another piece, the check is not indicated.

## PROGRAM CHARACTERISTICS

This program is actually composed of 2 separate programs: MCHESS and $P$ (for print board). The main program, MCHESS is independent of $P$ and if the printer is not to be used then only MCHESS needs to be loaded. However, if a printer exists in the user's system, the $P$ routine should be loaded. The print board routine is separate from the main program so that a user without a printer need not waste memory space. The user can also create his/ her own subroutine without having to change the main program.

A separate data card is used that contains all BLDSPEC characters used by the P routine to print the pieces, as well as other useful constants. This card must be loaded at the beginning of every game. The following is a list of the contents of the card:

| R18 $=1$ | R26 $=-7$ | R34 $=20.023$ | R42 $=$ black pawn |
| :--- | :--- | :--- | :--- |
| R19 $=-1$ | R27 $=-11$ | R35 $=16.023$ | R43 $=$ dotted square |
| R20 $=-10$ | R28 $=19$ | R36 $=16.023$ | R44 $=$ white pawn |
| R21 $=-8$ | R29 $=17$ | R37 $=$ black king | R45 $=$ id. rook |
| R22 $=10$ | R30 $=7$ | R38 $=$ id. queen | R46 $=$ id. knight |
| R23 $=8$ | R31 $=11$ | R39 $=$ id. bishop | R47 $=$ id. bishop |
| R24 $=-1 S$ | R32 $=16.019$ | R40 $=$ id. knight | R48 $=$ id. queen |
| R25 $=-17$ | R33 $=24.031$ | R41 $=$ id. rook | R49 $=$ id. king |

Registers 18 through 36 contain numeric constants while registers 37 through 49 contain the alpha BLDSPEC characters used to represent the pieces. If a user without a printer were to create this card, he/she would have to load (any) alpha characters into registers 37-49 as the program requires these registers to be loaded with alpha data to run properly (whether it prints or not).

The BLDSPEC characters used to represent the characters in this game are:

| R37=black king $=0,96,122,127,122,96,0$ | R49=white one $=112,95,69,64,69,95,112$ |  |
| :--- | :--- | :--- | :--- |
| R38= id. queen $=0,96,114,127,114,96,0$ | R48= | id. $=112,95,77,64,77,95,112$ |
| R39= id. bishop $=0,100,110,123,110,100,0$ | R47= | id. $=110,91,81,68,81,91,110$ |
| R40= id. knight $=0,108,102,119,126,108,0$ | R46= | id. $=110,83,89,72,65,83,126$ |
| R41= id. rook $=0,102,124,126,124,102,0$ | R45= | id. $=103,89,67,65,67,89,103$ |
| R42= id. pawn $=0,96,102,126,102,96,0$ | R44= | id. $=96,95,89,65,89,95,96$ |

$$
R 43=85,0,65,0,65,0,85
$$

The calculator's average "thinking" time is 5 minutes per move. This is an average for a non printer game; if a printer is used execution time will be slowed by approximately $52 \%$. Actual time varies substantially with position, from a minimum of 15 seconds to a maximum of about 15 minutes. However, an entire game should last no more than 1-1/2 hours (without a printer).

GENERAL NOTES
Size MUST be set to exactly 97.
The initial positions of the pieces are as follows:

$$
\begin{aligned}
& \text { black (HP-41) : } \begin{array}{l}
\text { king queen bishop knight rook } \\
\\
\\
\text { pawn pawn pawn pawn pawn }
\end{array} \\
& \text { white (you) }: \begin{array}{l}
\text { pawn pawn pawn pawn pawn } \\
\\
\end{array} \text { king queen bishop knight rook }
\end{aligned}
$$

The calculator will never make an illegal move, but the player's moves are not tested for legality (the player is assumed to play honestly). If the player's king is under check, and the player moves another piece, the HP-41 will actually take your king on its next move!

There are two versions of the print routine "F" because of the different buffer capacities of HP-82143A (old) and HP-82162A (new) printers. If the board is to be printed correctly, the user must be careful to load the appropriate routine.

Do not turn the calculator off while it is making its move as you may generate errors due to the change in status of some flags at power-on. You may, however, turn the calculator off when it is halted and resume the game later.

The playing time can be shortened by simplifying positions, changing pieces, avoiding open spaces, etc. The execution time depends quadratically on the number of options the calculator has and linearly on the number of the player's responses to each option.

```
STATUS
```

SIZE: 097
FIX: 0
USER MODE: OFF
TOTAL PROGRAM BYTES: 972
P(82143A) 80 BYTES P(82162A) 82 BYTES

DATA REGISTERS
$\left.\begin{array}{c}00 \\ \ldots \\ 15\end{array}\right\} \quad$ scratch

With "P" entered, TOT. REG. 247
Without "P" entered, TOT. REG. 236

King \& Queen $\left\{\begin{array}{l}\text { move directions } \\ \text { arrays }\end{array}\right.$

Directions arrays pointers

BLDSPEC special characters

DATA REGISTERS Cont.
44 White Pawn
45 Id. Rook
BLDSPEC special
46 Id. Knight
47 Id. Bishop
48 Id. Queen
49 Id. King
37-96\} board (includes edges)
NOTE: Board and BLDSPEC chars. overlap without trouble

## FLAGS USED

00
01
02
03
04
05
06
07
08
09
10
11
12
25

Set: Board always print
Clear: Prints after HP's
Set: White King or Knight tested
Clear: Queen, Rook or Bishop tested
Set: Id. Pawn moves
Clear: W. Pawn not moving
Set: Id. King moves
Clear: W. King not moving
Set: Id. Pawn promotes
Clear: W. Pawn not promoting
Set: B. King or Knight tested
Clear: B. Queen, Rook or Bishop tested
Set: B. Pawn moves
Clear: B. Pawn not moving
Set: B. King moves
Clear: B. King not moving
Set: B. Pawn promotes
Clear: B. Pawn not promoting
Set: B. Queen, Rook or Bishop can follow
Clear: They can't
Set: W. Queen, Rook or Bishop can follow
Clear: They can't
Set: Auto Start
Clear: No Auto Start
Set: Double Wide Print
Clear: Normal Width
Set: Non-edge location
Clear: Edge location
Set: Print Board
Clear: Do not print board
Set: Move is off board
Clear: Move is valid
Set: Move is worse than first move tested
Clear: Better move than last

*Necessary only if a printer exists in the system. Remember, there are two versions of "p"--be careful to load the appropriate one.
**This prompt appears only if a printer is in the system.

| Initial board configuration | 12345 |
| :---: | :---: |
|  |  |
|  | こエエエエエ |
|  | $30 \%$ |
|  |  |
|  | 5¢8¢G\％ |

The player＇s move


From
51 to 41

From
33 to 24

12345
 マエエエエエ

 5 펴울

The calculator＇s move

> I Move
> FROK 220031
> 12345

> こエエエエエ
> Зエツ:ツ!
> 4프므ㅁㅡㅗㅗ
> 588玉g\%

I Woue
FROW 31 TO 42．CHES
12345

こエエエエ

4 4 エ․․모
5®8Gco

I Move
FROH 42 T0 53
12345

まエエエエ
3\％ロロ！
4 베모
5 5是

I mue
FROH 53 T0 52，CHECK
12345


3 3：\％
4 부！․․ㅗ
5 5\％

SIZE: 097



* This display appears only if there is a printer in the system.



## PROGRAM LISTING

| 96 AVIEH |  | 143 XEQ＂F＊＊ | print board |
| :---: | :---: | :---: | :---: |
| 97 PI |  | 144 FO？ 55 | İf printer，stop |
| $985 T 069$ | Init．＂good move＂ | 145 STOP |  |
| 99 96．055 | value | $14 \epsilon$ GTO 99 |  |
| 166 ST0 $0^{2}$ | Board index | $147+$ LEL 97 | Queening move？ |
| 161 CHS |  | 1486 | Row 1 |
| 102 STO EG | Initial best move | 149 RCL 91 | Destination |
| $103+$ LEL 11 | value | 156 X 15 | Piece not in |
| 104 REL IHI | Scan for move | 151 ETH | last row？ |
| 62 | Recall position | 152 z | Rook value |
| 105 SIGN |  | 153 RCL IHI | Get piece value |
| $166 \times=0$ ？ | Off board？ | 01 |  |
| 107 GTO G0 | Skip eval．pos． | 154 X＞年 | Not a pawn？ |
| 108 LASTX | Black piece？（b） | 15.5 RTH | Piece to replace |
| $109 \times 80$ | Eval．b moves | 156 PRIEGE？＂ | pawn |
| 116 XEQ 12 |  |  |  |
| 111＊LBL 112 g （1） | Next position | 01 | Store new piece |
| 113 GTO 11 | Next position | 159 RTH | Pawn promotion？ |
| 114 RCL 69 | Best move value | 16日＊LEL 9. |  |
| 115 FI | No good move？ | 161 ABS | Rook |
| $116 \times=\gamma \%$ | Stalemate | $16 z 2$ | Not pawn move？ |
| 117 GTO 65 |  | 163 Xr ？ |  |
| 118 ＂YOU＂ |  | 164 RTH | Row 1 |
| 119－25 |  | 16592 |  |
| 120 RCL 06 | Best move <br> Your checkmate？ | 166 RCL 13 | Not in last row |
| $121 \times$ रु | Checkmate | 167 X＜Y？ |  |
| $122 \mathrm{GTO} \quad 04$ |  | 168 RTH | Queen |
| 124 X＜IHI | Final move | 176 STO IHD | Store piece |
| 12 |  | 13 | value |
| $125 S T 0$ IND |  | 171 RTH |  |
| 13 |  | 172＊LEL 94 | Announce |
| 126 XEQ OG | Pawn promotion？ | $173 \mathrm{ASTO} \times$ | checkmate |
| 127 ＂FROM＂ |  | 174 － 17 HEOKMF |  |
| 128 RCL 12 | Origin | TE＊ |  |
| 129 XEQ 99 | Get board loc． | 175 AVIEA |  |
| $136 \cdots$ TO |  | 176 EEEF |  |
| 131 RCL 13 | Destination | 177 CLA |  |
| 132 XEQ 99 | Get board loc． | 178 ARCL $X$ |  |
| 133 RCL 96 | Move value | 179 ＂ 5 WロH： |  |
| 134 FRC |  | 189 PROMFT |  |
| 135 RCL 22 | 10 | $181+L E L$ ES | Announce |
| $136 *$ |  | 182 ＂STALEMA | Stalemate |
| 137 FPE |  | TE＂ |  |
| $136 \times 76$ | Is move | 183 EEEF |  |
| 139 ＂t，CHES | checking？ | 184 PROMPT |  |
| K＇ |  | 185＊LEL E9 | Translate reg． |
| 140 EEEF |  | 186 INT | address to |
| 141 AVIEM |  | 187 EHTERT | board position． |
| $142 \mathrm{FS} \mathrm{\%} 5$ | if printer， | 1 ES ENTERT |  |

PROGRAM LISTING


## PROGRAM LISTING

| 288 | $\begin{aligned} & \text { RCL } 2 \\ & \text { GTO } 0 \end{aligned}$ | Dest. position | $\begin{aligned} & 3.55 \\ & 28 \end{aligned}$ | STO | IHI | Back in dest. |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 29 | $.4$ | B king move | - 36 | RTH |  |  |
| 291 | FS\% 日 | Decrease move | 337* | LEL | 12 | B Pawn move |
| 292 | ST- 06 | value | 338 | - 5 |  |  |
| 293 | 59766 | B pawn move? | 339 | ST+ | 06 | Increase move |
| 294 | XEQ $1 z$ | Not king move? | 346 | 92 |  | value |
| 295 | FC? ${ }^{\text {GEG }}$ | Evaluate move | 341 | FCL | De | Dest. Position |
| 296 | XEQ 13 |  | 342 | R<Y? |  | Not queening? |
| 298 | RCL 06 | Best move value | 344 | SF | 9 | Queening |
| 299 | $\mathrm{X}<=\mathrm{Y} ?$ | Current move | 345 | 9 |  |  |
| 360 | RTH |  | 346 | ET+ | $\underline{6}$ | Increase move |
| 361 | RCL $\mathrm{F}^{\text {as }}$ | Test piece | 347 | ETH |  | value |
| 362 | FS? as | Promoting Pawn? | 348* | LEL | 13 |  |
| 30.3 304 | -5. ${ }^{69}$ | Promote to Queen | 349 | FS? | 6E | B Pawn move? |
| 68 | STO IND | Move piece to | 351 | RCL | 03 | Pawn 2nd move |
| 365 | CLX | est. | 352 | 36 |  | Current piece |
| 366 | STO IHD | Clear move orig. | 35.3 | - |  |  |
| 02 |  | W side board | 354 | RCL | IHI | 32-36, move dir. |
| 367 | 56-696 | index |  |  |  | pointer |
| 309 | 510 | Init. better | 356 | LEL | 63 |  |
| 316 | CF 19 | move flag | 357 | RCL |  | Dest. position |
| $311 *$ | LBL 21 | W move test | 358 | STO | $10^{6}$ |  |
| 312 | RCL IHD | Piece to test | 359* | LBL | 16 | Off |
| 11 |  |  | 360 | RCL | IHI | Offset to |
| 313 | SIGH |  | $\underline{1}$ |  |  |  |
| 314 | X=6? | Off board? | 361 | $5 T+$ | 19 |  |
| 315 | GTO 60 |  | 362 | FEL | $10^{1}$ | Dest. position |
| 316 | LAST\% | Piece to move | 363 | XEQ | 69 |  |
| 317 | X $<=0$ ? | B-or no piece? | 364 | FS? | 19 |  |
| 318 | GTO 96 | Next piece | 365 | GTO | 6e | Next move |
| 319 | XEQ $\square^{\text {a }}$ | Eval. white move | 366 | XEQ | 12 | Evaluate move |
| 326 | FS? 19 | Worst move then | 36.7 | $\mathrm{X}=\mathrm{Y}$ ? |  | Move of equal |
| 321 | GTO 94 | last? | 36.8 | RTH |  | value to last |
| 322* | LBL EG6 |  | 369 | FS? | E 5 | Ki or Kn move |
| 323 | I5G 11 | Next pos. to test | 376 | GTO | $\underline{0}$ | Next move |
| 324 | GTO 21 |  | 371 | LAST | \% | Place value |
| 325 | RCL 09 | Index | 372 | $\mathrm{X}=\mathrm{E}$ ? |  | Empty? |
| 326 | STO G6 | Best move value | 373 | GTO | 19 |  |
| 327 | RCL 62 | B board position | 374* | LEL | 66 |  |
| 328 | STO 12 |  | 375 | $15 G$ | 61 | Next dir. pointer |
| 329 | RCL $\mathrm{g}^{\text {c }}$ | Move destination | 376 | GTO | $\underline{1}$ |  |
| 336 | STO 13 |  | 377 | RTH |  |  |
| 331* | - 1 EL 64 |  | 378* | LBL | 13 | Destination |
| 332 | RCL 613 | B piece | 379 | RCL | 96 | Offset forw, left |
| 333 | GTO IHD | Back in origin | 3 E 9 | REL | 22 | diagonal test |
| 62 |  |  | 391 | REQ | E6 |  |
| 3.34 | RCL 97 | Dest. piece | 382 | RCLL | 09 | Destination |


| 3338 | Offset forw， | 431 GTO 29 |  |
| :---: | :---: | :---: | :---: |
| 394＊LBL 0日 | right diagonal | $432+$ LBL E6 | Next move |
| 365 XEQ 09 | Add offset \＆test | 433 ISG 14 | Increment Offset |
| 386 FS ？ 19 | dest． | 434 GTO 29 | pointer |
| 397 ETH | Off board？ | 435 RTH |  |
| $388+$ LEL 12 |  | $436 \cdot$ LEL 36 | W King move |
| 359 IHT | Piece | $4375 F 03$ |  |
| 3906 | King | $439+$ LEL 33 | W Knight move |
| 391 X才才？ | Is dest．piece | 4395 F 01 |  |
| 392 ETH | not the w King？ | 440＊LEL 32 | W Rook move |
| $393-41$ | Increment move | 441 ＋LEL 34 | W Bishop move |
| 394 ET＋ 6. | value piece | $442+$ LEL 35 | W Queen move |
| 396 RTH |  | 443 RTH 12 | W Pawn move W Pawn move flag |
| $397+L B L$ 97 | W move evaluation <br> Init．piece flags | 445 FF Q2 | Pawn position |
| 398 CF 91 |  | 446 RCL 11 | Forward offset |
| 399 CF 62 |  | 447 ECL 17 | Add offset \＆test |
| 409 CF G3 | Rook | 448 XEQ 09 | Off board？ |
| 4612 | Is piece a Pawn？ | 449 FS ？18 |  |
| 402 स $407 \%$ |  | 4561 | Unoccupied dest？ |
| 403 GTO 1z |  | $451 \times 2 \mathrm{Q}$ ？ | Evaluate move |
|  |  | 452 XEQ 13 | Worse than last |
| 40530 $466+$ | Gen．index for steps 402 \＆ 403 | $453 \mathrm{FS?} 19$ | move？yes |
| 467 YEQ IHD | 32－36（431－437） | 454 RTH | Current move orig |
| $x$（ 8 （ | Set piece flags | 456 RCL 20 | Forw，left diag． |
| 408 FCL IHI | 32－36，move | 457 KEQ EG |  |
| $\chi$ | offset pointer | 458 FS？ 19 | Worse move？ |
| $4095 T 014$ | Store offset pointer | 459 RTH |  |
| $416+$ LEL 29 | pointer | 46 CRCL 11 | Current move orig |
| 411 RCL 11 | Current move | 461 RCL 21 | Forw，right offse |
| 412 STO 15 | origin | $462+L E L$ 06 |  |
| $413+$ LBL 29 |  | 463 XEQ 93 | test |
| 414 RCL IHD | First poss．move offset | $\begin{array}{lll}464 & \text { FS？} & 16 \\ 465 & \text { RTH }\end{array}$ |  |
| $4159 T+15$ | Actual dest． | $466 \times \pm 6 ?$ | Occupied by which |
| 416 RCL 15 |  | $467 \times 8 \mathrm{C}$ ？ | pieces？ |
| 417 XEQ Ge | Move off board？ | 46 E FTH |  |
| 419 FS ？ 19 |  | 469 LEL 13 | Evaluate w move |
| 419 GTO Q® | Next poss．move | 476 FRC |  |
| $420 \times>0 ?$ | W piece there？ | 471 HES |  |
| 421 GTO Q＠ | Next possibility | 4721 E 2 |  |
| 422 CF 10 | Init．empty | 473 ＊ | Value of dest． |
| 423 X＝0？ | space flag | 474 FS？93 | contents |
| 424 SF 10 | Empty space？Yes | 475.4 | W King move？ |
| 425 XEQ 13 | Move value？ | 476 FS ？ 13 | Decreased value |
| 426 FS？ 19 | Worse than last？ | 477 － | W King move |
| 427 RTH | Yes | 478 FS ？ Q 2 | Decreased value |
| 428 FG ？ 91 | W Ki or Kn？ | 479 XEQ 13 | W Pawn move？ |
| 429 GTO EG | Next possibility | 486 FCL 96 | Eval．Pawn move |
| 43 F FS\％ 19 | Blank space？ | $4818<3 \%$ | B move value |

## PROGRAM LISTING

| $482-$ | Diff. between b | 529 | X $=6$ ? | alpha then |
| :---: | :---: | :---: | :---: | :---: |
| 483 RCL 00 | \& w move value | 530 | EF 18 | Off board |
| $44^{4} 4 \times \geqslant$ | Best b move value | 531 | LAST: | Recall contents |
| $485 \times 8=Y$ | Worse move? | 532 | - EHD. | of destination |
| 486 GF 19 | Yes |  |  |  |
| $4 \mathrm{ST} \mathrm{X} \times \mathrm{Y}$ | Worse move? |  |  |  |
| 4 Se RTH | Yes |  |  |  |
| 489 RCL 09 | Better move - get |  |  |  |
| 496 X< 4 | white's best |  |  |  |
| 491 र< 4 ? | Better move? |  |  |  |
| 492 ST0 69 | New w best move |  |  |  |
| 493 RTH | value |  |  |  |
| $494 *$ LEL 13 | Eval. w Pawn move |  |  |  |
| $495-5$ | Increased move |  |  |  |
| 497 RCL 2 | value |  |  |  |
| 49866 | Row 5 |  |  |  |
| 499 X< ${ }^{4}$ | Init. w Pawn |  |  |  |
| 560 CF 04 | promotion flag |  |  |  |
| $501 \times 8=Y$ | Move to row 5? |  |  |  |
| 502 SF 04 | Prom. move value |  |  |  |
| 563 RCL 2 | Increased value |  |  |  |
| 504 FC? 54 | Due to promo. |  |  |  |
| 506 CLX | Promotion? |  |  |  |
| $567+$ | No promotion |  |  |  |
| 508 RTH | Add to move value |  |  |  |
| $569+L E L$ 1G |  |  |  |  |
| 510 "Y" |  |  |  |  |
| 511 GSTO Y | Print every move? |  |  |  |
| S12."PRINT Y |  |  |  |  |
| 513 "+ MOVE? |  |  |  |  |
| 514 AOH |  |  |  |  |
| 515 PROMPT |  |  |  |  |
| 516 ASTO $X$ |  |  |  |  |
| 517 AOFF |  |  |  |  |
| 518 X=Y? |  |  |  |  |
| 519 SF 60 | If Yes SFOO |  |  |  |
| 520 RTH |  |  |  |  |
| $5 こ 1 *$ LEL 09 |  |  |  |  |
| $522+$ | Add offset |  |  |  |
| $523+$ LBL 09 | Move off board? |  |  |  |
| 524 CF 13 | Init. valid move |  |  |  |
| 525 SF 25 | flag |  |  |  |
| 526 RCL IHI | Init. error |  |  |  |
| X | ignore flag |  |  |  |
| 527 SIGH | Recall contents |  |  |  |
| 528 FS?C 25 | of dest. pos. if nonexistent or |  |  |  |

## PROGRAM LISTING

| HP－82143 Version |  | HP－82162A Version |
| :---: | :---: | :---: |
| 日1＊LEL＂F＂ | Print board | 日1＊LEL＂F＇ |
| G2 EF 21 | routine | Q2 EF 21 |
| GS ATV |  | 0.3 aty |
| $645 \% 12$ | Set double width | 04 SF 12 |
| 059 | mode | 059 |
| QG EKPGUL | Skip 9 columns | DG SKPEOL |
| 6749 6． 6 | Characters＂1＂\＆ | $0749=053$ |
| $695 T 013$ | ＂5＂ | Qe ST0 13 |
| 09＊LEL 06 |  | 69＊LEL 00 |
| 16 ACCHE | ＂1＂－＂5＂ | 10 GCOHR |
| 112 |  | 112 |
| 12 SKPGOL |  | 12 SKFCOL |
| 13 人＜＞ |  | 13 र＜＞ |
| 14 TSG | Next numeral | 14 ISG $\chi$ |
| 15 GTO CO | （8） | $156 T 000$ |
| 16 FREDF | Index to row 1 | $1656=06$ |
| 1756.66 | Index to row 1 | 17 STO 15 |
| $185 T 015$ |  | $18 * L E L C 1$ |
| $19+$ LEL 91 |  | 19 FEEUF |
| 20 RCL 13 | column headers | 20 FCL 13 |
| E1 ACCHE | Numeral index | 21 MCCHE |
| $22+L E L G E$ | Row header | $22 * L E L E 2$ |
| 23 |  | 232 |
| 24 GKFCOL | Skip 2 columns | 24 GKFCOL |
| $2_{15}^{5}$ RCL IHD | Get piece from | 25 FCLL IHII |
| EG IHT | board | 26 IHT |
| 2743 | Generate index | 2743 |
| $2 \mathrm{E}+{ }^{2}$ | to special characters | $29+$ |
| 29 ECL IHD | Get special char． | $\bigcirc 9 \mathrm{RCL}$ IHD |
| 30 ACSFE |  | 30 HCSPEC |
| 31 IGG 15 | Accumulate spec． | 3115615 |
| З2 GTO 02 | char．in print | 32 GTO Gz |
| 334.669 | buffer | $334=009$ |
| $3451+15$ | Next board pos． Next row | $3451+15$ |
| 3515013 | Next row Increment row | 3515013 |
| 36 GTO 91 | Increment row | 36 GTO 61 |
| З 7 ADV | index | 37 FREUUF |
| 36 ATV |  | 38 ¢TV |
| 39 AIV |  | 39 MDV |
| 46 CF 12 |  | 46 ADV |
| 41 －EHIT． |  | 41 CF 12 |
|  |  | 42 EHT |

## PROGRAM DESCRIPTION

## PINEALL

by Craig A. Pearce

Welcome to the "Wizard of Pinball" game. This program simulates, as closely as possible, the actual play in a genuine pinball machine. The user interactis with the game through the digit keys 1 and 3 (designated the left and right flippers respectively), and the digit 2, which is the tilt option. Failing to hit the correct flipper will still leave the user the option of "tilting" the machine and placing the ball back in play (maybe!).

The "Wizard of Pinball" allows from 1 to 4 players, with play alternating from player 1 to player 2 and so on back to player 1. Each player will receive a total of 5 balls for each game. The ability to win a free ball is also possible. In this case, the same player stays until the extra ball is lost, after which the play rotates to the next player (unless another free ball is won).

Shooting the ball is accomplished by pressing any numeric key. As in most genuine pinball games, the "Wizard of Pinball" returns the same ball to the same player to be reshot if no score was made and the ball exits immediately. The game allows up to three free game thresholds that award a credit (free game) when passed. Also, the program checks for a score that passes the previous "high - score to date". Another free game is awarded if any or all of the players pass this previously stored "HI-SCR".

## THE DEVICES

Listed below are the several different scoring devices used in the program. The "device" name is given first as it is displayed on the HP-41. The full name of the device is given in parentheses after the formatted name, followed by a brief description of the device and of how it scores.
"*STAR-50" (Star Rollovers) These are stars, like buttons on the play field. Each time the ball rolls over one of these buttons, the player receives 50 points.
"*LANE-300" (Lane Rollovers) Lane rollovers are special paths that the ball travels through and scores an immediate 300 points for the player.
"THUMP-x00" (Thumper-Bumpers) Sometimes called "Jet or Pop Bumpers". In this game 100 points are scored each time the ball strikes the bumpers. At any given time, the ball can bounce 1 to 10 times, scoring 100 to 1000 points. When this display comes up, the value of "x00" is the amount of points scored; $x$ being the number of bumps the ball made.
"SPIN-xy0" (Spinner Gate) Spinner gates on pinball machines are the devices that spin on a horizontal axis as the ball passes under
them. In this game, the spinner gate can spin up to 25 times, scoring 10 points for each spin, and showing the actual points made (also a tone is heard for each spin). In addition, for each 5 spins of the gate, the Out Bonus is advanced by 1000 points.
"KICK-x00" (Kick Out Hole) Kick out holes (or saucers) are those devices that the ball drops into, scores some points and is kicked back out into play. On "Wizard", the points for the kick out hole begins at 2000 and advances by 2000 each time the ball drops in one, until a point value of 10,000 is reached. This value is held for all additional hits of the hole.
"SLING-10" (Sling Shot Kickers) The sling shot kickers are devices that propel the ball away when struck, and score 10 points.
"DROP-X" (Drop Targets) Drop targets are scoring devices that fall away when struck, and score some points in the process. They are reset with each new ball, or when they are all down, which is a special case. In this game, there are three drop targets. Hitting the first and the second results in an immediate 10 points and a display of "DROP-1" and "DROP-2". When the third is hit, the player receives 100 points and is awarded another ball; the display will show SHOOT AGAIN. Although the targets are reset and can be knocked down again, only one extra ball can be earned per ball in play. When the current ball is lost, the same player then plays the "extra ball" (it is possible to win another extra ball with the free ball currently in play).
"*A-" to "*F-" (Alpha Targets) These are stationary targets that award the player an immediate 500 points each time they are struck. Also, during the play of any one ball, the calculator remembers the targets hit (in any order) and provides for higher Out Bonus scoring as follows:

Hitting A \& B displays "BONUS x 2" and the player will receive twice the Out Bonus when the ball exits.

Getting $A, B, C, \& D$ displays "BONUS x 3 " with resulting triple Out Bonus score.

If all 6 targets are hit in one turn, the Out Bonus is quintupled.

OUT BONUS
All of the above devices whose formatted name begins with a "*" increase the Out Bonus by 1000 points (unless otherwise stated). When the ball exits the OUT HOLE, the player collects all the Out Bonus points accumulated during that play. The maximum limit on Out Bonus points is 29,000 . This value is then multiplied by the "BONUS $x$ " factor, allowing for a maximum of 145,000 points when the ball exits. The display shows the total out bonus points and decrements this count by 1000 , adding 1000 points to the player's score each time.

FLIPPERS, TILTING, AND OUT
When the ball reaches the left or right flipper the display will show LEFT-1 or RGHT-3 (respectively). At this point the player has approximately one second to press the appropriate key (1 or 3) in order to put the ball back into play. Failure to hit the proper key will result in the ball exiting through the Out Hole.

Whenever the ball enters the Out Hole, the display shows "OUT" for about one second. During this time the player has the option of TILTING the machine in a last attempt to put the ball back in play. Tilting is accomplished by pressing key "2" while OUT is displayed. The chances are 4 out of 5 that the ball will be placed back in play. However, if that one remaining chance comes up, the display will show *TILT* and all bonus points are lost! Also, any free ball gained during that turn will be lost! The player's score is displayed and the play moves on.

END OF GAME
When the end of the game is reached, and the last player's score is reviewed, the program will select a random number as the MATCH DIGIT. This number is always between $00 \& 90$ (multiples of 10) and is compared against the last digits of the player(s) score(s). If any player has a match a free game is awarded. The display will be shown as MATCHxO, this is the number chosen by the calculator. If any player's score has passed the high score to date, the old HISCR- is changed; otherwise, it remains the same. The high score will be displayed as "HISCR-xxx,xx0. If any (or all) player score(s) passed the HISCR, a CREDIT is awarded.

Finally, all the player's scored are reviewed a final time and compared against the 3 free game thresholds. For each player who's score passes each of these thresholds, another free game is credited. Finally, the display shows GAME OVER.

## STATUS

SIZE: 064
FIX: 0,2
USER MODE: ON
TOTAL PROGRAM BYTES: 1108 (Including utility program)

## FLAGS USED

Set: Hi-score has been beat
Clear: No new hi-score
Set: Reset player count to 0
Clear: Don't reset count
Set: Score has been made
Clear: No score yet
Set: Free ball awarded
Clear: No free ball
Set: Score spinner gate
Clear: Score thumper-bumpers
Set: Target A has been hit
Clear: Target A not hit
Set: Target $B$ has been hit
Clear: Target B not hit
Set: Target $C$ has been hit
Clear: Target $C$ not hit
Set: Target $D$ has been hit
Clear: Target D not hit
Set: Target $E$ has been hit
Clear: Target E not hit
Set: Target F has been hit
Clear: Target F not hit
Set: Bonus has a multiplier
Clear: No multiplier
Set: Printer is enabled
Clear: Printer disabled
Set: Digit key pressed
Clear: Digit key not pressed
Set: USER Mode ON
Clear: USER Mode OFF
Set: Set radix to point
Clear: Set radix to comma

When "PINBALL WIZARD" is run, or when "[shift] [a]" is pressed, all flags from F00 to F10 are cleared automatically. All flag operations are handled by the program.

## DATA REGISTER ALLOCATION -

All data enclosed in quotes (" ") is string (Alpha) data, to be stored as shown. Numeric data is shown without quotes, again to be stored as shown. When a register number is followed by an alpha-string NOT enclosed in quotes, this is merely a description of what the register is used for, in the program.

Examples: ROO: "OUT" (Indicates reg. 00 contains the word "OUT").
R40: 1000 (Indicates reg. 40 contains the NUMBER 1000).
R35: Match Digit (Indicates the program uses reg. 35 to store the Match Digit when generated. The user stores nothing in this register prior to program operation).

| ROO: "OUT" | R21: "SHOOT" | R42: Player 2 score |
| :---: | :---: | :---: |
| R01: "*STAR-" | R22: "AGAIN" | R43: Player 3 score |
| R02: "*LANE-" | R23: "MATCH-" | R44: Player 4 score |
| R03: "THUMP-" | R24: "HISCR-" | R45: No. of players in game |
| R04: "SPIN-" | R25: "SCORE-" | R46: Bonus Count |
| R05: "KICK-" | R26: "X 2" | R47: Kick Out Hole score |
| R06: "SLING-" | R27: "X 3" | R48: No. of current player up |
| R07: "DROP-" | R28: "CREDIT" | R49: Bonus multiplier |
| R08: " *A-" | R29: "X 5" | R50: Ball count |
| R09: " *B-" | R30: "PLAYER" | R51: Drop Target count |
| R10: " *C-" | R31: "*TILT*" | R52: Total cash spent on games |
| R11: " *D-" | R32: not used | R53: Total CREDITs count |
| R12: " *E-" | R33: not used | R54: 200,000 (Free game threshold \#1) |
| R13: " *F-" | R34: not used | R55: 250,000 (Free game threshold \#2) |
| R14: "RGHT-3" | R35: Match Digit | R56: 290,000 (Free game threshold \#3) |
| R15: "BALL " | R36: Hi-score to date | R57: Indirect use register |
| R16: "LEFT-1" | R37: 10 | R58: Player Indirect register |
| R17: not used | R38: 50 | R59: not used |
| R18: "GAME | R39: 100 | R60: not used |
| R19: " OVER" | R40: 1000 | R61: not used |
| R20: "BONUS " | R41: Player 1 score | R62: not used |
|  |  | R63: Random seed |

$\square$

Sample problem: Seed = . 251 One player, 2 credits


| DISPLAY | INPUT | FUNCTION | COMMENTS |
| :---: | :---: | :---: | :---: |
| $\begin{aligned} & \text { RGHT - } 3 \\ & \text { SPIN - } 210 \\ & \text { SPIN - } 240 \\ & \text { RGHT - } 3 \\ & \text { LEFT - } 1 \\ & \text { DROP - } 2 \\ & \text { THUMP - } 500 \\ & \text { SLING - } 10 \\ & \text { OUT } \\ & \text { *LANE - } 300 \\ & \text { SLING - } 10 \\ & \text { SPIN - } 40 \\ & \text { SLING - } 10 \\ & \text { KICK - } 2000 \\ & \text { *STAR - } 50 \\ & \text { *A-500 } \\ & \text { *LANE - } 300 \\ & \text { SPIN - } 130 \\ & \text { OUT } \\ & \text { BONUS SCORE - } \\ & 18,000 \\ & 17,000 \\ & 16,000 \\ & \bullet \\ & 1,000 \\ & \text { PLAYER } 1- \\ & \text { SCORE - } \\ & 23470 \\ & \text { PLAYER NO. } 1 \\ & \text { BALL } 2 \\ & \text { SPIN - } 160 \\ & . \\ & \text { etc. } \end{aligned}$ | 3 <br> 3 <br> 1 <br> 2 <br> 6 |  | Try to keep it in play one more time. <br> Let it go this time. <br> Continue game |



## USER INSTRUCTIONS

|  |  |  |  | SIZE: 064 |
| :---: | :---: | :---: | :---: | :---: |
| STEP | Instructions | INPUT | FUNCTION | DISPLAY |
| 9b | The ball is near the left flipper; |  |  | LEFT-1 |
|  | to keep it in play | 1 |  | --devices--etc |
| 9c | The ball is in the exit hole. To try to |  |  | OUT |
|  | save the ball (by "tilting") | 2 |  | --devices--etc |
|  |  |  |  | or *TILT* |
|  |  |  | Pla | X-score-YYYYO |
| 10 | If the player's score is displayed then |  |  |  |
|  | play goes to the next player. GO T0 |  |  | PLAYER NO. X |
|  | STEP 8. |  |  | BALL Y |
| 11 | When ball goes out (no tilt) |  |  | BONUS SCORE - |
|  | (for description of bonus score display, |  |  | X000 |
|  | see page 38) |  |  | $(\mathrm{X}-1) 000$ |
|  | GO TO STEP 8 |  |  |  |
|  |  |  | Pla | X-score-YYYYO |
| 12 | When the last player's last ball goes |  |  | BONUS SCORE - |
|  | "OUT" |  |  | X000 |
|  |  |  |  | (X-1) 000 |
|  |  |  |  | - |
|  |  |  |  | X-score-YYYYo |
|  |  |  |  | MATCH - XO |
|  |  |  |  | HISCR - XXXXX |
|  |  |  |  | 1-score-AAAAA |
|  |  |  | (Pla | 2-score-BBBBB) |
|  |  |  |  | ! |
|  |  |  |  | GAME OVER |
| 13 | To review money spent to date |  | [XEQ] "E" | \$X. 00 |
| 14 | To review total (existing) credits |  | [XEQ] "D" | X CREDIT |

USER INSTRUCTIONS


APPENDIX C: UTILITY ROUTINE FOR USE WITH "THE WIZARD OF PINBALL" PROGRAM
(NOTE: This program can reside in a three (3) memory module HP-41C, coresident with the WIZARD OF PINBALL program).

Because the WIZARD OF PINBALL uses the previously stored "High Score to Date (HISCR)" to determine if a CREDIT should be awarded, and can make use of the previously stored seed, number of credits, changes made in the Free Game thresholds, etc., a routine has been written to allow the user to save all the variables of the game, and return to it at a later date. This routine is given below:

LBL: "DTXR/W" (Data read/write via the 'X' register).
USE: This program will allow the user to save on magnetic cards the random seed of the game, the Free Game Thresholds, Hi -Score to Date and other data that is required to be restored before the original game continues or is restarted. Specifically, the registers are R36, to be saved on side one of the card, and R52 through R63 to be saved on side two of the card.
When reading in the card, the display will prompt with:
READ SIDE 1 and READ SIDE 2
When writing to a card, the 41C "BEEPS" and displays the word "WARNING" to indicate that a write, and NOT a read is about to be performed. Then, the display will prompt:

WRITE SIDE 1 and WRITE SIDE 2


INSTRUCTIONS:

1. Get a blank mag-card ready. (This can be reused over and over).
2. To WRITE data TO the card, press: [shift] [e] (The HP-41 will BEEP a warning that a write is to be performed, followed by the prompts described above).
3. When display reads: "WRITE SIDE 1", feed side one of the card into the reader. When display reads "WRITE SIDE 2", insert side two of the card into the reader. The required registers are now saved.
4. To READ data FROM a card, press: [A]
5. When display reads "READ SIDE 1", insert that side into the card reader. When display reads "READ SIDE 2", insert side two into the reader.

## PROGRAM LISTING

| ARI＊LEL＂4Iz | Check for | 56 | RCL $\mathrm{X}=6 \mathrm{C}$ | Credits＝0？ Yes－go to LBLD |
| :---: | :---: | :---: | :---: | :---: |
| Ez FRC | fractional seed | 52 | GTO D | No－reset player |
| $0.31 \%$ |  | 53 |  | count？ |
| 04 LAST\％ |  | 54 | FS？C E1 | Yes－reset to 0 |
| 05 ST0 63 | Store seed | 55 | 5 SO 45 |  |
| 66 FI\％ 9 |  | 56 | RCL 45 | Player count at |
| Q7 GF 27 | Initialize | 5 | $\begin{aligned} & 4 \\ & 8 \\ & 8 \end{aligned}$ | 4 ？ |
| $68 " C A P-F I$ |  | 5 | $X=Y ?$ |  |
| HEPLL |  | 59 | $\begin{gathered} \mathrm{GTO} \\ 1 \end{gathered} 11$ | Yes－go to LBL 11 |
| G9 RUIEN |  | 60 | ${ }_{5}^{1} T+45$ | No－increment |
| 16＋LEL $\exists$ |  | 61 | ET＋ 5.5 | player count |
|  | Clear Flags 0－10 | 63 |  | Deduct 1 credit |
|  |  | 64 | XEQ ${ }^{\text {d }}$ | Display credits |
| 14 ISG \％ |  | 65 | FSE |  |
| 15 GTO 10 |  | 66 | LBL 11 |  |
| 16 SF O1 |  | 67 | CLA | players |
| 17 CF 20 |  | 68 | ARCL 30 |  |
| 18 CF 21 | Set Status F21 | 69 | $\because \vdash G="$ |  |
| 19 FS？ 5.5 | to match F55 | 76 | ARCL 45 |  |
| 20 SF 21 |  | 71 | AVIEW |  |
| 21 RTH | （Cash Register） | $\bigcirc$ | RTH | （Start Game） |
| zz＊LBL E | （Cash Register） | 74 | REL 45 |  |
| 23 FIX 2 |  | 75 | RCL $\mathrm{X}=69$ | Any players？ |
| 24 ＂事＂ |  | 76 | RTH | No－stop |
| 25 ARCL 52 | Recall \＄\＄\＄spent | 77 | 46 | Yes－create loop |
| $\begin{array}{cc}26 & \text { FIX } \\ 27 & \text { AVIEM }\end{array}$ |  | 75 |  | counter from 41 |
| ze RTH |  | 79 | RCL 4日 | to \＃of players |
| $29 * L E L C$ | （Coin Insert） | 86 | $\checkmark$ |  |
| 30.25 |  | 81 | 41 |  |
| $315 T+52$ | Add 25\＄to cash | 82 | ST0 5e | Store player |
| 32 TOHE 4 | register | 83 | ＋ | pointer |
| $33 \quad 39$ |  | 84 | 0 |  |
| 34 RCL 53 | No．of Credits | 85 | LBL 12 |  |
| $35 \times 39$ | 40 or more？ | 86 | GTO IHD | Set all players＇ |
| 36 GTO D | Jump past＂INC．＂ | Y |  | scores to 0 |
| 37 ISG 53 | Increment credits | 87 | ISG Y |  |
| $38 * L B L ~ D ~$ |  | 88 | GTO |  |
| 39 CLA | Display credits | 99 |  |  |
| 46 HRCL 53 | routine | 96 | ST0 49 | Player up＝1 |
| 41 ＂+ |  | 91 | 57056 | Ball count＝1 |
| 42 ARCL 28 |  | 92 | TOHE 9 | Start up tune |
| 43 RCL 53 |  | 93 | TOHE E |  |
| 441 |  | 94 | TGHE ${ }^{\text {T }}$ |  |
| 45 人才才？ | Test for sing． | 95 | TOHE 9 |  |
| 46 ＂15＂ | or plural | 96 | TOHE ？ |  |
| 47 FUIEU | credit（s） | 97 | TOHE ？ |  |
| 4 6 RTH |  | 98 | EEEF |  |
| $49 *$ LEL E | （credit Button） | 99 | TOHE 8 |  |

## PROGRAM LISTING

| 169 | TOHE | 8 |  | 151 | LBL | 17 | （score made） |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 191 | TOHE |  |  | 152 | SF |  | Set score flag |
| 102 | TOHE |  |  | 153 | CLA |  | Display device |
| 163＊ | LEL | 13 | New ball－ | 154 | ARCL | IHD | hit |
| 104 | 41 |  | reset player | $\times$ |  |  |  |
| 105 | ${ }^{3} \mathrm{~T}$（0 | 58 |  | 15.5 | GTO | IHD | Do dev．routine |
| 107 | sTo | 48 |  |  |  |  |  |
| $108+$ | LEL | 14 | Same ball－ | 156 |  |  | （f1ipper |
| 109 | 1 |  | next player | 158 | $x<\gg$ |  | If－2，same as |
| 119 | 5 TO | 46 | Outbonus－1 | 159 | $\mathrm{X}=\mathrm{Y}$ ？ |  | 0 ；set display |
| 111 | 1.000 |  | Reset drop | 16. | $\underline{\square}$ |  |  |
| 112 | STO |  | targets | 161 | $x<6$ |  | If－1 or -3 go to |
| 114 | 5 SO | 47 | Kick out hole＝0 | 162 | GTO |  | flipper routine |
| 115 | 25 |  |  | 16.3 | CLC |  | else－dsp＂OUT＂ |
| 116 | STO | 49 | Bonus multiplier | 165 | PSE |  |  |
| 117 | XEQ |  | Clear flags | 16. | FE？ | 22 | Tried a tilt？ |
| 118 | SF |  |  | 16. | GTO | 20 | Tried a tilt？ |
| 119 | CF $\square^{\text {c }}$ |  | Display which | 16.8 |  |  | Yes－test for key |
| 121 | ARCL | 30 | player is up | 169 | Х夫ソ？ |  | go it？ |
| 122 | ＂ H | 10．${ }^{\text {a }}$ |  | 176 |  |  | Yes－go get |
| 123 | ARCL | 48 |  | 172 | XEQ |  | random \＃ |
| 124 | AVIE |  |  | 173 | 1 |  | ＂TILT＂if 1 |
| 125 | PSE |  |  | 174 | $\mathrm{X}=\mathrm{Y}$ ？ |  |  |
| 126 | CLA |  | Display ball | 175 | GTO |  |  |
| 127 | ARCL | 15 |  | 176 | GTO |  |  |
| 128 | ARCL | 56 |  | $177+$ | LBL |  | No tilt tried |
| 129 | CF 2 |  |  | 178 | CLA |  | display＂OUT＂ |
| 130＊ | LBL | 15 | Loop until digit | 179 | ARCL | 20 |  |
| 131 | GVIE |  | key is pressed | 189 | FRCL | IHI | Out bonus |
| 132 | FSE |  |  | 49 |  |  |  |
| 133 | FC？C | 22 |  | 181 | FVIE |  |  |
| 134 | GTO | 15 |  | 182 | FSE |  |  |
| $135+$ | LBL | 16 | （select．scoring | 183 | RCL |  | Act．bonus score |
| 136 | 12 |  | device） | 154 | 29 |  | Bonus＜29？ |
| 137 | XEQ | 69 | Get random \＃ | 185 | X＜Y？ |  |  |
| 138 | 4 |  | －3＞＝rand\＃＞＝8 | 186 | 5 TO |  | Reset if greater |
| 139 | － |  |  | 187 | RCL |  | multiplier |
| 146 | 人＞6？ |  | Score？ | 189 | 24 |  | Reduce to normal |
| 141 | GTO | 17 | Yes－go to LBL17 | 189 | － |  |  |
| 142 | FS？ | E2 | Any other score？ | 196 | ST＊ | 46 | bonus X multip． |
| 143 | GTO | 18 | Yes－go to Lbl18 | 191 | RCL | 46 | bonus val．＝ |
| 144 | ＂ HO | ＂ | No－give ball | 192 | RCL | 46 |  |
| 145 | AREL | 25 | back to be | 193 | ＊ |  |  |
| 146 | ARCL | 21 | reshot | 194 | $\mathrm{sT}+$ | IHII | Add to player |
| 147 | ARCL | 22 |  | 59 |  |  | score |
| 148 | AVIE |  |  | 195 | FIX | 3 | Set display for |
| 149 | PSE |  |  | 196 | CF 2 | 8 | bonus loop |
| 150 | GTG | 14 | Start over | 197 | RCL | 46 |  |

## PROGRAM LISTING



## PROGRAM LISTING

| 297 | AVIEM |  | 346 | X＜＞\％ |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 296 | 54.056 | Test final | 347 | 17 |  |
| 299 | RCL IHD | scores for free | 345 | $+$ |  |
| 57 |  | game | 349 | X＜$\%$ |  |
| 360 | EHTEFT |  | 350 | CLA |  |
| $3611+$ | － LBL こ |  | 351 | GRCL IHD | Flipper to hit |
| 362 | CL\％ |  | $\gamma$ |  | Floper to hit |
| 363 | FCL IHII |  | 352 | GUIEM |  |
| 2 |  |  | 353 | FSE |  |
| 304 | X＜$=9$ | Free game？ | 354 | FCPC 22 | Player response |
| 36. | XEQ 24 | Yes | 35.5 | GTO 29 |  |
| 366 | $15 G 2$ |  | 356 | X＝Y？ | Proper response？ |
| 307 | GTO 23 |  | 357 | GTO 16 | Proper response？ |
| 368 | ISG 5\％ |  | $358+$ | LEL 29 | Missed flipper |
| 369 | GTO ze |  | 359 |  | Missed flipper |
| 319 | CLA | Announce end of | 36.6 | GTO 18 | One free credit |
| 311 | ARCL 19 | Announce end of | 361＊ | LSL 24 | One free credit |
| 312 | ARCL 19 |  | 36.2 | CLX | Increment credits |
| 313 | GVIEN |  | 36.3 | 1 | Increment credits |
| 314 | $\underline{9}$ |  | 364 | $5 T+53$ |  |
| 315 | STO 45 | No players | 365 | CLX |  |
| 316 | EEEF |  | 366 | FCL 5 |  |
| 317 | RTH |  | 367 | 46 |  |
| $318+$ | LEL 69 | Pseudo－random | 368 | X＜$=$ Y？ | No，store 40 |
| 319 | RCL 63 | number generator | 369 | 57053 | Yes，give credit |
| 320 | $9 \mathrm{gz1}$ |  | 370 | EID |  |
| 321 | ＊ |  | 371 | TOHE 9 |  |
| 322 | －玉113こて |  | 372 | RTH |  |
| 323 | ＋ |  | 373＊ | LEL 91 | Start rollovers |
| 324 | FRC | Store new seed | 374 |  | Increment out－ bonus |
| 325 | 510 ¢ |  | 375 | ETt 36 |  |
| 327 | 1 |  | 377 | $\mathrm{GT}+\mathrm{THD}$ | Award 50 points |
| 329 | ＋ |  | $5 \cdot$ |  | Display device |
| 329 | IHT |  | 378 | AREL $X$ | name |
| 3.30 | ETH |  | 379 | FUIEM |  |
| $331+1$ | LBL 21 | TILT routine | 386 | TOHE 5 |  |
| 3.32 | CF 93 | Clear free ball | 391 | TOHE 5 |  |
| 33.3 | CLA |  | 392 | TOHE S |  |
| 334 | ARCL 31 | Display＂＊TILT＊＂ | 353 | TOHE 5 |  |
| 335 | FYIEM |  | 384 | TOHE 5 |  |
| 336 | TOHE 4 |  | 395 | GTO 16 |  |
| 337 | TOHE 3 |  | 3E6＊ | LEL 日2 | Lane rollovers |
| 339 | TOHE 2 |  | 387 | 1 | Increment out－ |
| 339 | TOHE 1 |  | 398 | $E T+46$ | bonus |
| 346 | TOHE ${ }^{\text {a }}$ |  | 389 | 361 | Award 300 points |
| 341 | FSE |  | 396 | $\mathrm{ST}+\mathrm{IHD}$ |  |
| 342 | GTO | Next player | 59 |  |  |
| 343＊ | LEL 19 | Flippers routine | 391 | GRCL $X$ | Display device |
| 344 | EHTERT |  | 392 | AVIEM | name |
| 345 | AES |  | 393 | TOHE 6 |  |


| 394 TONE 6 |  | 443 | RCL 46 | Score 1000＊ |
| :---: | :---: | :---: | :---: | :---: |
| 395 TONE 6 |  | 444 | － | kick－out |
| 396 GTO 16 |  | 445 | $\mathrm{ST}+\mathrm{IHI}$ |  |
| $397+L B L$ E3 | Thumper－bumpers | 58 |  |  |
| 398 RCL 39 | Score 100 points | 446 | ARCL $\times$ | Display device |
| 399 STO 62 | Temp．storage | 447 | RUIEM |  |
| 4096 | \＃for tone | 448＊ | LEL 32 | Tone for every |
| 461 EHTERT |  | 449 | TOHE ？ | 1000 points |
| $4 \mathrm{E2} 10$ | Max．number hits | 450 | ISE $Y$ |  |
| 463＊LEL 36 | Handle spinner | 451 | GTO 32 |  |
| 464 XEQ 09 | Random number | 452 | GTO 16 | Go back for more |
| $405 \times \ll 2$ | Trade with score | 453 | LBL E6 | Sling shot |
| 406 RCL 62 | Store bounces | 454 | 10 | kickers |
| $4076 T 061$ |  | 455 | ST＋IHI | Score 10 points |
| $408 * *$ | Total points | 59 |  | Display device |
|  | Add to score | 456 | $\text { AFEL } X$ AVIEH | name |
| 416 ARCL $X$ | Device name | 458 | TOHE 5 |  |
| 411 GVIEM | Device name | 459 | GTO 16 |  |
| $412+L E L 31$ |  | 46.6 | LBL $\square^{7}$ | Drop targets |
| 413 TONE IND | Play tones for correct score | 461 | ISG 51 | Drop targets <br> Increment \＃hit |
| 2 | correct score | 46.2 | GT0 33 |  |
| 414 TSE 62 |  | 46.3 | 1－643 | reset them |
| 415 GTO 31 |  | 464 | STO 51 |  |
| 416 FSPC 04 | Spinner？ <br> Yes，return | 46.5 | SF 03 | Score 100 points |
| 417 RTH | Yes，return <br> No，go for more | 466 | RCL 39 | Score 100 points |
| 418 GTO 16 | Spinner gate | 46.7 | $\mathrm{ST}+\mathrm{IHD}$ |  |
| 419 L L BL 94 | Spinner gate | 58 |  |  |
| 420 RCL 37 | 10 points \＆up | 46.8 | CLA | Display same |
| 421 STO G2 |  | $4 \epsilon 9$ | AREL $こ 1$ | player prompt |
| 4225 | Tone \＃in＇Y＇ | 476 | ARCL 22 |  |
| 423 EHTERT |  | 471 | GVIEN |  |
| 42425 | Rndm \＃limit | 472 | TOHE 8 |  |
| 425 SF 04 | Spinner gate | 473 | TOHE 8 |  |
| 426 XEQ 30 | Score | 474 | GTO 16 | Go back for more |
| 427 RCL 61 | Recall spins | 475＊ | LEL 33 | Not all down |
| 4285 | For each 5 spins， | 476 | RCL 51 | Score 10 points |
| 429 | add 1 to out－ | 477 | 1 |  |
| 436 INT | bonus | 478 | － |  |
| $4315 T+46$ |  | 479 | ARCL 8 | Display \＃hit |
| 432 GTO 16 | Go back for more | 486 | BVIEH |  |
| $433+$ LBL 95 | Kick－out hole | 481 | TOHE 5 |  |
| 4348 |  | 492 | 10 | Score points |
| 435 RCL 47 | Score＞10K | 483 | $\mathrm{ST}+\mathrm{IHI}$ |  |
| $436 \times>9 ?$ | If yes－switch | 58 |  |  |
| 437 人く＞y | with 8K | $4 \Theta 4$ | GTO 16 | Go back for more |
| 4362 |  | 4 ES | － 1 日 6 | Alpha targets |
| $439+$ |  | 4 E 6 | 1 | Increment out |
| 449 STO 47 | New score | 4 E 7 | $5 T+46$ | bonus |
| 441 EHTERT |  | 489 | 6 | Random \＃（1－6） |
| 442 ENTERT |  | 469 | XEQ 09 |  |

PROGRAM LISTING

| 496 | EHTERT |  | 539 GTO 16 | Go back for more |
| :---: | :---: | :---: | :---: | :---: |
| 491 | EHTERT |  | 539 . EHD. |  |
| 4924 | 4 |  |  |  |
| $493+$ | + |  |  |  |
| 494 \% | XCV |  |  |  |
| 495 ? | 7 |  |  |  |
| $496+$ | + |  |  |  |
| 497 | CLA |  |  |  |
| 496 | HECL IHI |  |  |  |
| \% | HREL THD | Display hit |  |  |
| 499 | GF IHD ' | Set target flag |  |  |
| 506 | 56 C |  |  |  |
| 5615 | $\Xi T+I H D$ | Score 500 points |  |  |
| 562 | HRCL $\%$ |  |  |  |
| 503 | FUIEM |  |  |  |
| 504 T | TOHE 6 |  |  |  |
| 505 | TOHE 6 |  |  |  |
| $506 T$ | TOHE G |  |  |  |
| 567 T | TOHE 6 |  |  |  |
| 509 T | TOHE $G$ |  |  |  |
| 509 | FC? 05 |  |  |  |
| 516 | GTO 34 | Target A? |  |  |
| 511 F | FC? GE |  |  |  |
| 512 | GTO 34 | Target B? |  |  |
| 513 | SF 20 |  |  |  |
| 5142 | 26 | Set bonus flag |  |  |
| 515 | STO 49 |  |  |  |
| 516 | FC? 07 | Bonus multiplier |  |  |
| 517 | GTO 34 | Target C? |  |  |
| 518 F | FC? 98 | Target D? |  |  |
| 519 | GTO 34 |  |  |  |
| 526 | 27 | Bonus multiplier |  |  |
| 521 | GTO 49 |  |  |  |
| 522 F | FC? 99 | Target E? |  |  |
| 523 | GTO 34 |  |  |  |
| 524 | FC? 16 | Target F? |  |  |
| 525 | GTO 34 |  |  |  |
| 526 | TOHE 9 |  |  |  |
| 527 | TOHE 9 |  |  |  |
| 528 | 29 | Bonus multiplier |  |  |
| 529 | STO 49 |  |  |  |
| 536*L | LEL 34 | Display bonus |  |  |
| 531 F | FC? 20 | Bonus? |  |  |
| 532 | GTO 16 | Go back for more |  |  |
| 533 C | CLA | Display value |  |  |
| 534 | FRCL 20 |  |  |  |
| 535 | AREL IHI |  |  |  |
| 49 |  |  |  |  |
| 536 | AYIEN |  |  |  |
| 537 P | FSE |  |  |  |

## PROGRAM DESCRIPTION

## TRUCK

By Kenneth Sharp

BREAKER - BREAKER 19 --- ALL YOU WOULD-BE EIGHTEEN WHEELERS!!!
You must get your shipment delivered within ten hours or be charged a penalty. Smokies are patrolling the roads and obstructions on the road slow you down. Listen closely to your CB for messages. Any of three roads $(95,89$, or 97 ) will get you to your destination, but you may need to change routes several times during your run. Route changes are permitted only at designated exits. Smokies will fine you if they catch you speeding, wreckers will charge you for repairs if they must pull you from a crash. Get into your rig and put the pedal to the metal. See you on the flip-flop.

## STATUS

SIZE: 019
FIX: 0
USER MODE: ON
TOTAL PROGRAM BYTES: 1640

## DATA REGISTERS

00-03 Time Smokey will remain (Route \#95)

04-06 Time to clear slide (Route \#89)
07 Time for road to dry
08 Time to clear slide (Route \#97)
09 Time to repair bridge
10 Random number
11 Route
12 Speed
13 Previous position
14 Present position
15 Money
16 Present position or HMS conversion
17 Trip time
18 Driving time

## FLAGS USED

00-03
04-06
07
08
09
27
29

Set: Smokey Present (Route \#95)
Clear: Road Clear (Route \#95)
Set: Rock Slide (Route \#89)
Clear: Road Clear (Route \#89)
Set: Wet Road
Clear: Road Clear
Set: Rock Slide
Clear: Road Clear
Set: Bridge Out
Clear: Road Clear
Set: USER Mode
Clear: USER Mode Off
Set: Digit Grouping
Clear: No Digit Grouping

You must drive from "Start" to "Destination" in less than 10 hours. You can change roads only at exits. A perfect run will net you $\$ 100.00$.


Route 95 is 725 miles long. It is heavily patrolled by "smokies".
Route 89 is 550 miles long. It is a mountain road plagued by rock slides.
Route 97 is 500 miles long. It has a curve that gets slick when wet, rock slides and a bridge that perpetually falls down.
( ) = mile post of exits



| DISPLAY | INPUT | FUNCTION | COMMENTS |
| :---: | :---: | :---: | :---: |
| BREAKER 19 |  |  |  |
| ROCK SLIDE |  |  |  |
| M.P. 405 ON 97 |  |  |  |
| CLOSED 4 HR. |  |  |  |
| ROUTE NO. 97 |  |  | We made the exit |
| SPEED $=55 \mathrm{MPH}$ |  |  | Speed was not changed |
| MI. POST 340 |  |  | New Position |
| CH. SPEED/RT.? | $N$ | [R/S] | Let's keep going for a while |
| BREAKER 19 |  |  |  |
| SMOKEY AT |  |  |  |
| M.P. 135 ON 95 |  |  |  |
| ROUTE NO. 97 |  |  |  |
| SPEED $=55 \mathrm{MPH}$ |  |  |  |
| MI. POST 395 |  |  |  |
| CH. SPEED/RT.? | $N$ | [R/S] | Keep trucking |
| BREAKER 19 |  |  |  |
| ROCK SLIDE |  |  |  |
| M.P. 405 ON 97 |  |  |  |
| CLOSED 7 HR. |  |  |  |
| *ROCKS* |  |  | OH NO-0-0-0-0! ! ! |
| ***CRASH*** |  |  | OUCH |
| CALL WRECKER |  |  |  |
| REPAIRS-\$45 |  |  | Repair bill |
| ROUTE NO. 97 |  |  |  |
| SPEED $=55 \mathrm{MPH}$ |  |  |  |
| MI. POST 405 |  |  | Wrecker pulled us through slide |
| CH. SPEED/RT.? |  | [R/S] | Behind schedule--speed up |
| SPEED-A/RT.-B |  | [XEQ] "A" | Press "A" to change speed |
| SPEED? | 65 | [R/S] | Increase speed to 65 MPH |
| ROUTE NO. 97 |  |  |  |
| SPEED $=65 \mathrm{MPH}$ |  |  | New speed |

\begin{tabular}{|c|c|c|c|}
\hline DISPLAY \& INPUT \& FUNCTION \& COMMENTS \\
\hline \begin{tabular}{l}
MI. POST 405 \\
CH. SPEED/RT.? \\
BREAKER 19 \\
ROCK SLIDE \\
M.P. 405 ON 97 \\
CLOSED 11 HR. \\
ROUTE NO. 97 \\
SPEED \(=65\) MPH \\
MI. POST 470 \\
CH. SPEED/RT.? \\
BREAKER 19 \\
WET ROAD AT \\
M.P. 165 ON 97 \\
SPEED LMT. 35 \\
LATE \\
MONEY = \$18 \\
TIME: OVER \\
1HR.29MIN.3SC. \\
ROUTE NO. 97 \\
SPEED \(=0 \mathrm{MPH}\) \\
MI. POST 500
\end{tabular} \& \(N\)

N \& \begin{tabular}{l}
[R/S] <br>
[R/S] <br>
[R/S] <br>
[R/S]

 \& 

Let's move out <br>
Keep going <br>
Well, at least we made it Lousy pay, isn't it? <br>
Stopped at our destination
\end{tabular} <br>

\hline
\end{tabular}

## USER INSTRUCTIONS




## PROGRAM LISTING

| G1＊LEL＂TRU |  |  |
| :---: | :---: | :---: |
| CK＇ |  |  |
| 02 | FIX ${ }^{\text {a }}$ |  |
| 63 | SF 27 |  |
| 94 | CF 29 |  |
| 05 | CF 21 |  |
| 06 | FS？55 |  |
| 67 | 5 F 己1 | Clear Flags 0－9 |
| 68＊LBL a |  |  |
| 09 | ． 669 |  |
| 16＋LEL G1 |  |  |
| 11 CF INI $\%$ |  |  |
| 12 | ISG $\%$ |  |
| 13 GTO Et |  |  |
| 14 | EREG EQ | Clear necessary |
| 15 CLE registers |  |  |
| 16 EREG GG |  |  |
| 17 CLS |  |  |
| 18 G |  |  |
| 19 | STO 14 | ＂Seed＂for Random |
| 20＂SEED $\%$ Number |  |  |
| こ1 FREMFT |  |  |
| $225 T 010$ |  |  |
| 23106 |  |  |
| $245 T 015$ |  |  |
| 2510 |  |  |
| 26 ST0 17 |  |  |
|  | LEL 1こ | ＂Route＂Prompt |
| 28＂ROUTE $?$ Route Prompt |  |  |
| 29 FROMFT |  |  |
| 30 STO 11 |  |  |
| 3197 Test for invalid |  |  |
| 33 GTO A Route |  |  |
|  |  |  |
| 34 FEDH |  |  |
| 3595 |  |  |
| $36 \times 7 \%$ |  |  |
| 37 GTO A |  |  |
| 38 FDH |  |  |
| 3989 |  |  |
| $49 \mathrm{X}=\mathrm{Y}$ |  |  |
| 41 र\％ 4 ？ |  |  |
| 42 GTO 12 |  |  |
| $43 \cdot$ | LEL A |  |
| 44 | －SPEEI？ | ＂Speed＂Prompt |
| ＊ |  |  |
| 45 | FROMFT |  |
| 46 |  |  |
| 47 | GTO A |  |
| 48 | HES |  |

$\begin{array}{lll}49 & 5 T 0 & 2 \\ 56 & 65\end{array}$
51 －
$5 \approx \times>6$
53 GTO H
$54 *$ LEL 16
55 SF 2 g
56 ＂ROUTE
0.

57 GREL 11
58 GVIEM
59 FSE
G日＂GFEED＝＂
G1 ARCL $1 z$
62＂ト MFH＂
G3 HVIEN
64 FSE
6.5 MI ．FOS
$T$
GE FRCL 14
GT GUIEN
GE FSE
69 ＂CH．SPE
ED－RT．
76 FROMFT
$71 \quad \mathrm{X}=\mathrm{Y}$ ？
ア2 GTO 13
73 ＂SFEET－A
ET．－${ }^{\circ}$
74 FROMFT
75＊LEL 13
TG KEQ E日
771
$7 \mathrm{BT}-17$
79 RCL 14
8 ETO 13
81 FCL 12
E2 ST＋ 14
S3 XED IHI
11
E4 GTO za
85＊LEL 6日
EG RCL 12
$97 \quad 8<=0 ?$
ES XEQ 1日
89 ＂EREAKER
19
Ge FVIEM CB Messages
Test for excessive speed
＂Position＂
Display

Test for speed／ route change

Deduct one hour from time

Store＂Previous＂ position

Test if＂Moving＂

G1 EEEF
G2 REQ EZ
935 F IHM 8

## PROGRAM LISTING

| 948 XE IHD |  | 143 | FVIEW |  |
| :---: | :---: | :---: | :---: | :---: |
| 8 |  | 144 | FSE |  |
| 95 ETH |  | 145 | $z$ |  |
| $96+L B L E$ | Random Number | 146 | ＊ |  |
| 97 ECL 16 | generation | 147 | ST－ 15 |  |
| 989821 |  | 148 | ＂FIHE OF | Fine for speeding |
| 99 ＊ |  | 韦＂ |  |  |
| 16日－211327 |  | 149 | GRCL $X$ |  |
| $101+$ |  | 150 | GVIEW |  |
| 162 FRC |  | 151 | F＇SE |  |
| $1635 T 016$ |  | 152 | ． 25 | ＂Time＂penalty |
| 1 E 41 El |  | 153 | ST－17 |  |
| 105 ＊ |  | 154 | FCL 16 |  |
| 1EG INT |  | 155 | $5 T 014$ | Restore position |
| 1 ET R RTH |  | 156 | GTO 19 | Restore position |
| 169＊LEL 95 | Route 95－Test | 157＊ | LEL こ2 |  |
| 16914 | position | 158 | ECL 11 | Determine＂Route＂ |
| $1195 T 018$ | see if past | 159 | 95 |  |
| 111135 | smokey | 16.4 | $\chi=Y$ ？ |  |
| 112 STO 16 | smokey | 161 | GTO 52 |  |
| $113 \mathrm{FS} \mathrm{\%}$ 60 |  | 162 | RCL 11 |  |
| 114 XEQ 19 |  | 163 | 89 |  |
| 115896 |  | 16.4 | X＝＇？ |  |
| 116 STG 16 |  | 16.5 | GTO 53 |  |
| 117 FS\％ 01 |  | 16.6 | FECL 14 |  |
| 119 XEQ 19 |  | 167 | 56 C |  |
| 119445 |  | 168 | STO 1s | at destination |
| 12日 STO 16 |  | 169 | － |  |
| 121 FS？日2 |  | 176 | X＜6？ |  |
| 122 XED 19 |  | 171 | GTO 51 |  |
| 123575 |  | 172＊ | LEL 54 |  |
| 124 STO 1E |  | 173 | FCL 12 | Correct＂Time＂ |
| 125 FS ？ 63 |  | 174 | $\checkmark$ | and＂Position＂ |
| 126 XEQ 19 |  | 175 | $5 T+17$ | if at Destination |
| 127 ETH |  | 176 | RCL 18 |  |
| 12 E LEL 14 | Test for speeding | 177 | $5 T 014$ |  |
| 129 RCL 12 |  | 178 | ECL 17 |  |
| 1365 |  | 179 | ＜＜6？ |  |
| $131-$ |  | 186 | GTO 55 |  |
| $132 \quad 8<6=6$ |  | 181 | ＂OH TIME | Test for＂On |
| 133 RTH |  | ＊ |  | Time＂or＂Late＂ |
| 134 ＂EEE． | Police car | 182 | HVIEN |  |
| － |  | 183 | FSE |  |
| 135 AVIEM |  | 184＊ | LEL 56 |  |
| 136 TOHE 8 |  | 185 | －MOHEY＝ |  |
| 137 TOHE 3 |  | ＊ |  |  |
| 13 S TOHE 3 |  | 186 | ARCL 15 |  |
| 139 TOHE 9 |  | 187 | GVIEW | Display＂Earnings＂ |
| 14 G TOHE 8 |  | 188 | E |  |
| 141 TOHE 9 |  | 189 | $\operatorname{sTg} 12$ |  |
| 142 ＂SHOKEY＂ |  | 196 | STGF |  |

## PROGRAM LISTING



## PROGRAM LISTING

| 297496 |  | $\begin{array}{lll} 334 & \text { M.F. } & 29 \\ 60 H & 95 \% & \end{array}$ |  |
| :---: | :---: | :---: | :---: |
| $288 \operatorname{STO} 16$ |  | 日 0H 95" |  |
| 2 Eg FS? 69 |  | 335 HVIEW |  |
| $296 \times E Q 19$ |  | 336 FSE |  |
| 291 RTH |  | 337 RTH |  |
| $292+L E L 19$ |  | 338*LBL 62 |  |
| 293 RCL 16 | Test to see if | 3393 |  |
| 294 RCL 13 | past obstacle | $340 \mathrm{ST}+\mathrm{az}^{3}$ |  |
| $295-$ |  | 341 LLEL 25 |  |
| $2968<6=$ |  | 342 XEQ 33 |  |
| 297 FTH |  | 343 "M.P. 44 |  |
| 298 RCL 14 |  | 5 OH 95" |  |
| 299 RCL 16 |  | 344 HVIEN |  |
| 360 - |  | 345 FSE |  |
| $3018<06$ |  | 346 ETH |  |
| 362 ETH |  | 347*LBL 03 |  |
| 363 GTG IHD |  | 3483 |  |
| 15 |  | $3495 T+63$ |  |
| 364 +LEL 20 |  | $350+$ LBL 26 |  |
| $365 \text { "SPLASH" }$ |  | $351 \times 2 \mathrm{XE} 33$ |  |
| 3 E6 FVIEN | "Hit" Bridge Out | 352 M.F. 57 |  |
| 367 FSE |  | $50 \mathrm{M} 95^{\circ}$ |  |
| 368 "WET FEE |  | 353 HVIEN |  |
| T* |  | 354 FSE |  |
| 309 GTO 21 |  | 355 FETH |  |
| $316+$ LEL 18 | Test speed at | $356 *$ LEL 33 |  |
| 311 FCL 12 | "Wet Road" | 357 "SMOKE' | "Smokey" Message |
| 312 |  | 358 RVIEW |  |
| $3148<00$ |  | 359 FSE |  |
| 315 FTH |  | 366 RTH |  |
|  | $\begin{aligned} & \text { Skid } \\ & \text { Road" } \end{aligned}$ | 361*LBL 144 | Messages |
| 317 HVIEM |  | $3635 T+04$ | Time for |
| 318 FSE |  | 364 RED | obstacle |
| 319 GTO 11 |  | 365*LEL 27 |  |
| 326*LEL 60 |  | 366 XEQ 17 |  |
| 3213 |  | 367 MM.P. 14 |  |
| $3225 T+60^{\text {a }}$ |  | $5 \mathrm{OH} 89 \times$ |  |
| $323+$ LEL 23 | Mile Posts for | 368 HVIEW |  |
| 324 XEQ 33 | CB Messages | 369 FSE |  |
| 325 - M.F. 13 |  | 376 GTO 15 |  |
| 5 OH 95. |  | 371 *LEL 65 |  |
| 326 HVIEN |  | 3723 |  |
| 327 FSE |  | 3735 ST 55 |  |
| 328 RETH |  | 374 RDH |  |
| $329+$ LEL E1 |  | $375+L B L$ 2S |  |
| 3363 | Input (Increase) | 376 XEQ 17 |  |
| $3315 T+61$ | Time for | 377 M-F = 36 |  |
| $332+L E L \quad 24$ | obstacle | 日 OH 89* |  |
| 333 XEQ 33 | obstacle | 378 HVIEN |  |

## PROGRAM LISTING

```
379 FSE
380 GTO 15
381*LBL 06
3E24
3@3 ST+ 06
384 RDH
385*LBL 29
386 KEQ 17
387 "M.F. 46
50H 89"
3E8 HVIEN
389 FSE
390 GTO 15
391*LBL 17
392 "ROCK SL
IDE"
393 AVIEW
394 FSE
395 RTH
396*LEL ET
397 3
398 GT+ 6T
399*LBL 3G
4@日 "WET ROF
II AT"
401 FYIEN
4 0 2 ~ F S E ~
403 "M.F. 16
5 OH 97."
404 GVIEN
405 F'SE
466 "SPEED L
MT. 35"
4 0 7 ~ F V I E N
40E FSE
4 0 9 ~ R T H
410*LBL G!
4114
412 ST+ 0S
4 1 3 ~ R D H
414*LBL 31
415 XEQ 17
416 "M.F. 40
50N 97."
417 GVIEN
418 FSE
4 1 9 ~ G T O ~ 1 5 , ~
420*LEL E9
4こ1 4
422 ST+ 09
423 RINH
```

＂Rock Slide＂ Warning
IDE
393 AVIEN
394 FSE
395 RTH
$396+$ LEL 07
3973
398 ET＋ 67
$399+$ LBL 30
460 ＂NET ROA
If $\mathrm{AT}^{\text {．}}$
461 BVIEM
402 FSE
403 ＂M．F． 16
$50 \mathrm{OH} 97^{\circ}$
464 HVIEN
465 FSE
464 ＂SPEED L
MT． 35
Mar HVEW
408 FSE
469 RTH
410 L LEL 09
4114
$412 \mathrm{ST}+5 \mathrm{~B}$
413 RDH
415 XEQ 17
416 ＂M．F． 46
50 OH 97.
417 GVIEN
418 FSE
419 GTO 15
$420+$ LEL 09
$422 \mathrm{ST}+69$
423 RIH

424 ＋LBL 32
425 －BRITIGE
GUT＂
4こG GVIEN
$427 \quad F \Xi E$
42 B ＂M．F． 49
© OH 97．
429 GVIEN
436 FSE
431 ＋LEL 15
432 CLOSEH
．
433 HRCL IHI
x
434 ＂ト HR：＂
435 RVIEM
436 FGE
437 ETH
$438 *$ LEL E $\quad$ Route＂Change
439 RCL 12
$446 \times \neq 0$ ？
441 GTG 58
442 TOHE E
443 ＂HOT MOV
IHG：
444 FVIEN
$445 \mathrm{~F} G \mathrm{E}$
446 GTO 10
447 ＊LEL 58
448 RCL 14
$4495 T 016$
456 DRIVIHG
TIME＂
451 FROMFT
452 HF
453 STO 18
454 IHT
$455 \quad$ 人76？
456 GTO E
457 KEQ 6E
458 RCL 18
459 AES
46 ET － 17
461 RCL 16
462 STO 13
46.3 RCL 12

464 RCL $1: 3$
$465:$
$4 \epsilon 65 T+14$
46.7 RCL $1 \Xi$
$468 \quad \ll 6 \%$
＂Bridge Out＂
Warning
＂Driving Time＂
Prompt
Convert from Hours

Test for invalid
time

Restore
＂Positions＂

## PROGRAM LISTING



## PROGRAM LISTING

| 56.948 |  |  |
| :---: | :---: | :---: |
| $\begin{aligned} & 568 \\ & 569 \\ & 570 \end{aligned}$ | ENTE |  |
|  | 4 |  |
| 571 | XEQ |  |
| 572 | GTO |  |
| 573 | LBL |  |
| 574 | 89 |  |
| 575 | STO |  |
| 576 | 135 |  |
| 577 | ST0 |  |
| 578 | GTO |  |
| 579 | LEL | 41 |
| 580 | 89 |  |
| 581 | STO |  |
| 582 | 285 |  |
| 583 | 5 TO |  |
| 584 | GTO | 3 |
| 585 | LBL |  |
| 586 | 89 |  |
| 587 | $5 T 0$ |  |
| 588 | 456 |  |
| 589 | 570 |  |
| 596 | GTO | 9 |
| 591 | LBL | ， |
| 592 | 95 |  |
| 593 | STO |  |
| 594 | 130 |  |
| 95 | STO |  |
| 596 | GTO |  |
| 597 | LBL |  |
| 598 | 95 |  |
| 599 | 5 TO |  |
| 606 | 285 |  |
| 601 | STO |  |
| 602 | GTO | 39 |
| 603 | LEL |  |
| 604 | 95 |  |
| 605 | 5 TO | 11 |
| 606 | 436 |  |
| 607 | STO | 1 |
| 608 | GTO | 39 |
| 609 | LBL |  |
| 610 | 97 |  |
| 611 | STO |  |
| 612 | 106 |  |
| 613 | ST0 | 1 |
| 614 | GTO | 39 |
| 615 | LBL | 47 |
| 616 | 97 |  |
| 617 | $5 T 0$ |  |
| 18 | 3 |  |


| 619 | ETO 14 |  |
| :---: | :---: | :---: |
| 620 | GTO 39 |  |
| 621 | LBL 49 |  |
| 622 | 97 |  |
| 623 | STG 11 |  |
| 624 | 465 |  |
| 625 | STO 14 |  |
| 626 | GTO 39 |  |
| 627 ＊ | LEL I | ＂Time＂Display |
| 628 | ＂TIME： |  |
| 629 | FEL 17 |  |
| 630 | x＜6？ |  |
| 631 | ＂ 1 OVER＂ |  |
| 632 | X＞${ }^{\text {c }}$ ？ |  |
| $633$ | ＂ト TO Gロ |  |
| 6.34 | HVIEM |  |
| 635 | FSE |  |
| 636 | HMS |  |
| 637 | ABS | Minutes－Seconds |
| 635 | $5 T 016$ |  |
| 639 | IHT |  |
| 646 | CLA |  |
| 641 | HREL $X$ |  |
| 642 | ＂ 1 HR．${ }^{\text {c }}$ |  |
| 643 | RCL 16 |  |
| 644 | FRE： |  |
| 645 | 1 EZ |  |
| 646 |  |  |
| 647 | STO 1E |  |
| 648 | INT |  |
| 649 | FRCL $X$ |  |
| 65.5 | ＂トME．＂ |  |
| 651 | RCL 16 |  |
| 6.52 | FRE |  |
| 65.3 | 1 E （ |  |
| 6.54 | － |  |
| 65.5 | IHT |  |
| 656 | ARCL $X$ |  |
| 6.57 | ＂トSC． |  |
| 658 | GVIEM |  |
| 659 | STOF |  |
| 66.6 | GTO 16 |  |
| $6 E 1$ | LEL C | ＂Status＂Display |
| $6 E 2$ | $\cdots$ STATUS： |  |
| 66.3 | BUIEN |  |
| 66.4 | $23-632$ | Messages |
| 66.5 | ENTERT |  |
| 66.6 | － $\mathrm{E}_{1}$ |  |
| 66.7 | LEL 49 |  |

$\rightleftharpoons$ PROGRAM LISTING $\square$


# PROGRAM DESCRIPTION 

FLIPO<br>By Dr. Robert E. Swanson

"FLIPO" is played on an $8 \times 8$ board; the playing pieces are discs which are black on one side and white on the other. The player with the most discs of his/her color on the board at the end of the game is the winner.

A move consists of placing a piece on an empty square so that at least one of the opponents pieces is enclosed between the piece just played and any other disc of the same color. The surrounded pieces are then flipped, i.e., they become the color of the captor's discs. Any number of discs may be enclosed in one or more rows (a row being a continuous straight horizontal, vertical, or diagonal line of discs). However, an empty square may not be enclosed, only full rows of opponent pieces may be flipped. If more than one row is outflanked by a single move, all pieces must be flipped. A disc may be outflanked only by placing a piece on the board; opponent pieces left enclosed because of other factors are not considered "captured". Working through the sample game should help make these rules clear.

## I. Board Information

The board may be represented by an $8 \times 8$ matrix ( 8 rows by 8 columns) of squares. The squares are identified by their row number, $R$, and column number, C, where R and C range from 1 to 8 . Each board is represented in the calculator by the register with the same numeric value.

## II Generating Plays

In order for the calculator to "recognize" an outflanking location, an algorithm based on Hasegawa's rank order of board positions is used. This ordering assigns corner locations the highest rank and works down from there through all 60 locations. This leads to the development of a routine which generates board positions in rank order to test for outflankability. The first position that meets this simple criterion, then, becomes the machine-generated play for that round.

According to the rules of the game, if you can not outflank any of your opponent's discs, you forfeit your turn. (This is the only condition under which you can skip a turn.) You indicate forfeiture by pressing the [R/S] key without keying in a numeric entry at the prompt for your play. Don't be surprised if the calculator discovers that you have overlooked a play! It will make the play for you and display it, together with the number of flips, in the usual manner. As a matter of fact, you could use the "no play" feature even when you know you have several playable positions, but are unsure which of them to play. The program will terminate the game when neither side can make use of any of the remaining vacant squares. (Or when all squares are occupied.)

The board count that is displayed along with the play and the flips needs some clarification for the special case of "no play". The disc counter, R01, is always 1 disc ahead of the actual number of discs that have been played; i.e. the disc counter expects that the next play will, in fact, take place. A "no play" gets displayed along with the expected disc count. This should not cause any confusion, because a "no play" does not increment R01. The next play (by the opponent) will be displayed with the same disc count.

## III. Data Processing

Once a "play" code appears in the stack, whether it was generated by the program or entered by the user, it is tested to see if it corresponds to a vacant board square. (User input is first tested to see if it corresponds to a board square at all.) If the play passes the preliminary screening tests, it is subjected to further scrutiny by the program. It determines: 1) Which, if any, of the 8 adjacent squares are occupied by the opponent's discs, and 2) if there is a peripheral outflanker disc. If an outflanker exists, then all the intervening opponent discs must be "flipped" and counted. If the user's input does not correspond to an outflanking position, then it is rejected and the user is prompted again for input.

## IV. Routines and Labels

The "See Bd" routine (label C) permits you to call for a review of the calculator's version of the game board before your next play (see User Instruction Notes $4 \& 5$ ). As is true for all other portions of the program, "See Bd" may be activated with or without a printer. With the "Automatic See Bd" routine (label A) you can obtain the review automatically after each round of play. Key "A" acts as a toggle, i.e., it enables "Automatic See Bd" if previously disabled, and vice versa.

The "Tally" routine (label E) is executed automatically at the end of every game. Its main purpose is to calculate the number of black and white discs on the board, and also the differential black-white count. Pressing key E at a program halt will cause the game to terminate prematurely. (However, you can resume the game by pressing key B; the prompt for your play will appear in the display.) The execution time for "Tally" is fairly long, so to let you know that you have pressed the right key, the message "TALY:" appears almost immediately in the display to replace the "flying goose" annunciator.

Label D calls the routine which allows the user to have the first play of the game. If you want the machine to have the first play, then press the R/S key at the "YOU FIRST?<D>" prompt, otherwise press key D. (The program automatically sets user mode for you.) The "Back" (to your play) routine (label B) will prompt for your next play. This is normally used in two places in the game: 1) When you wish to abort the "See Bd" routine. 2) When you wish to resume the game after a midgame tally.

It should perhaps be noted here that: When you press kets A-E, the routine for which the keyboard access is intended will be executed if, and only if, it is appropriate to do so; otherwise, the program pointer will be returned to the prompt that was in force at that time.

## V. Game Variations

There are four variations built into this program: 1) The user may choose to play first, or let the calculator have the first play, 2) when the calculator plays first, it can select any one of four possible plays, 3) it is possible to have the program select a play on the user's behalf, and 4) the user may forfeit $1,2,3$ or all 4 corners when playing a game with handicaps. This forfeiture option provides a remarkably broad range of difficulty and game variety, especially in view of the second variation. Furthermore, the method used for increasing the level of difficulty does not significantly increase the execution time per game.

## VI. Recreating Board Positions

From time to time you may realize that a certain play, or series of plays, just cost you the game. You can quickly reestablish the board positions as they existed at the time of the crucial play and try an alternate tactic IF you have kept a record of the plays. You only need to change one line (temporarily) of the program; just follow these instructions: GTO .348. In PRGM mode see RCL 02. Delete this line and insert a STOP in its place. PRGM mode off; GTO..; PACKING. Begin a new game. (Note: If the machine played first in the game, you will have to be sure that the status of flags 07 and 08 correspond to that particular play.) Enter your plays in the usual manner. The program will halt at the new STOP. Enter the play the machine previously made for that round. After all the desired plays have been entered then: Enter PRGM mode, GTO .348, delete the STOP, reinsert RCL 02, PACK. Press key B, the prompt for your play will appear in the display. You may now continue the game as before.

Alternately, if you have a record of the plays up to the point where you would like to change tactics, you could go back to step 4 and make the same plays (the calculator's plays are not random).
VII. Some Game Notes

You must have at least 256 registers available to play this game.
The game always begins with four discs already positioned on the four central squares: White occupies 44 \& 55; Black occupies 45 \& 54.

The first player is always black, and the first plays are limited to squares $34,43,56,65$.

To view the board at any prompt for your play (including the prompt for your first play) [XEQ] "C" or [XEQ] "A". The latter will cause the board to be displayed after each round of play.

The calculator may be shut off and play resumed later, provided that the data registers have not been disturbed; the stack, however, may be used for other purposes. It's a good idea to record the calculator 's "board" before shutting down.

Warning: Do not press [R/S] followed by [XEQ] "B" when the calculator is processing your play and computing its own move. It's too difficult, although not impossible, to recover from the effects of a partial run.

GLOSSARY
Adjacent square - A board square which is in physical contact with the square upon which a disc has just been placed.

Board square; register - Each board square is assigned a two-digit number to identify its position in an $8 \times 8$ matrix. Each board square is represented in the calculator by the correspondingly - numbered data register.

Central squares - The four squares in the center of the playing board; $44,45,54$, and 55.

Codes, alpha - "B" = black disc, "W" = white disc. On the board "*" denotes a black disc, and "0" denotes a white disc.

Flip - To turn over the opponents piece(s).
Handicap - Abbr. "Hdc" - The forfeiture of one or more corner board squares by the stronger player to the weaker player before the game begins.

NG (abbr. of No Good) - A message that appears in the display after the user enters an inappropriate number as a play.

No Play - Forfeiture of a play when no opponent discs can be outflanked from any of the remaining vacant squares.

Outflank - Placing a disc so that your opponent's row (or rows) of disc(s) is enclosed by your discs (i.e. one at each end of a row).

Peripheral square - Any board square which is not adjacent to the current play square.

Play square - A square upon which the user has just placed a disc.
Rounds (of play) - A set of two consecutive plays, user's (first) and machine's (second). The first round of a game is an incomplete one if the calculator plays first. The last round may also be incomplete.

STATUS
SIZE: 103
FIX: 0, 2
USER MODE: ON/OFF
TOTAL PROGRAM BYTES: 1071

## DATA REGISTERS

| 00 | Pointer, IND GTO |
| :--- | :--- |
| 01 | Bd COUNT |
| 03 | Guard* |
| 04 | Guard* |
| 05 | Pointer, IND ST0 |
| 06 | Machine last play |
| 07 | Your last play |
| 08 | $0.00001 \quad$ Guard |
| 09 | 0.00009 |

$10,19,20,29,30,39,40,49,50,59,60,69,70,79,80,89$, 94-99 Guard*
11-18
21-28
31-38
41-48
Board
51-58
61-68
71-78
81-88
$90 \quad 1007$
$91101\}$ Indirect address
92102 J
93 FLP CT
$100 \quad 0.1$
101 "W"
102 "B"
*Guard registers are primarily used to detect illegal plays and for processing moves

01

Set: Automatic see board
Clear: No automatic see board
Set: Printer is ON
Clear: Printer is OFF or disconnected
Toggled on alternate executions of routine
Toggled on every execution of routine (Status of these flags determine which of four opening plays machine begins game with) Set: Print double wide
Clear: Print single wide
Set: Printer enable
Clear: Printer disable
Set: Ignore error
Clear: Halt, if error
Set: USER mode on
Clear: USER mode off
Set: Execute line . 286
Clear: Skip line . 286
Set: Printer is on line
Clear: No printer
(Second definition)
Machine plays for you (Machine's play next, if F142 You entered a play and F143 are clear)

## SAMPLE PROBLEM

A straightforward game without handicapping, calculator plays first.
You must have 153 program registers and 103 data registers available for this program.

[XEQ]"A"
YOU 1ST? <D>
If playing without a printer, [R/S] must be pushed to see each line of the board. Press $[R / S]$ to continue the game. (Printout of board:

|  | 1234598 |
| :---: | :---: |
|  |  |
| 7 | -------- |
|  | ---0:*ー- |
| 5 | - - + 0 |
| 6 | ------- |
| 7 |  |
|  |  |

1.B65.01 W?
(1st disc played. Black disc square 65. One white disc was flipped. White move?)
Note: Press [XEQ] C to see the board before entering a move. Automatic See Bd is cancelled (only) after the calculator has made the first play.
After the last row is viewed, the prompt for whites move reappears.
PLAY W? 66 [R/S]
2.W66. 01

The calculator makes its move, etc.


## SAMPLE PROBLEM

If the printer is attached tally is printed as：
Where－ 8 is the difference between Black and White discs

```
THLY:E28,H36
    -9 *゙な*
```

The final board looks like：

12345678
1 ： 00000000
z：＊000000：
3：＊000000＊
4：＊0000＊0＊
5：＊0＊0＊00＊
6：$* 00 * 0 * 0 *$

を：＊＊＊＊か口口゙か

Game 1 was actually generated entirely by the calculator, but in a slightly different way from that illustrated above: The player entered 65 to get the game started, and the calculator responded with 66 to complete the round. At every prompt thereafter, R/S was pressed without making an entry to have the calculator find each play.

1. B65.01
2. W66. 01
3. B34. 01
4. W33. 01
5. B43.01
6. W35. 02
7. B36. 01
8. W53. 03
9. B63.01
10. W46.01
11. B56. 02
12. W64.02
13. B25. 02
14. W16.01
15. B15. 01
16. W14.01
17. B42. 02
18. W31. 01
19. B41.01
20. W51.02
21. B24.01
22. W47. 07
23. B52.03
24. W13.02
25. B48.04
26. W38. 01
27. B74.01
28. W61.03
29. B75.01
30. W83. 02
31. B84. 01
32. W86. 03
33. B85. 02
34. W58. 01
35. B57. 02
36. W68. 02
37. B26.03
38. W37. 05
39. B23.04
40. W32. 03
41. B17. 02
42. W18.01
43. B12.02
44. W11.01
45. B21.01
46. W62.05
47. B73.02
48. W76.02
49. B67.03
50. W82. 01
51. B81.02
52. W78. 05
53. B28. 05
54. W27. 01
55. B88.05
56. W22.01
57. B71.05
58. W87. 04
59. B77. 01
60. W72.02


Execution time: Without printer, 18 minutes With printer, 28 minutes


NOTE: The following is the format used to indicate the display during play: DD. XRC. dd (Y?). Where DD. is the number of discs placed on the board so far (excludes 4 central discs, but includes any handicapped discs); $X$ is code for player ( $B$ for black, $W$ for white); $R C$ is the row and column number of the newly occupied square; dd is the number of flips; and $Y$ ? is the prompt for your play. (B if you made the first play, W if you made the second.)

| 6a | If you want to have the first play |  | [XEQ] "D" | PLAY : B? |
| :---: | :--- | :---: | :---: | :--- |
|  | Enter your play |  | RC | [R/S] |
|  | The calculator computes its move |  | DD.BRC.dd |  |
|  | Enter your next move |  |  | DD.WRC.dd B? |
|  |  |  | RC |  |
|  | etc. |  |  | DD.BRC.dd |
|  |  |  |  | DD.WRC.dd B? |
|  |  |  |  |  |





## PROGRAM LISTING




## PROGRAM LISTING

| 286 | ＂PLA＇Y：＂ |  | 333 | GTO | 64 | To ． 504 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 287 | ARCL INI | Copy your alpha | 334 ＊ | LBL | 01 | From ． 328 |
| 92 |  | code in R102 | 335 | XEQ | 57 | ． 608 |
| 288 | $\because \vdash ?$ | into alpha reg． | 336 | DEG |  | CF 42 or 43 |
| 289 |  | into alpha reg． | 337 | DSE | 05 | Change frm 7 to 6 |
| 296 | STO 05 | Save ptr．to save | 338＊ | LBL | 日： | From ． 304 |
| 291 | CF 12 | your next play \＆ | 339 | RCL | IHD | Occupied sq code |
| 292 | CLST | flips in R07 | 96 |  |  | \＆mach＇s sign |
| 293 | TONE 6 |  | 346 | FS？ | 42 | digit |
| 294 | GRAD | In case ． 304 xeqd | 341 | GTO | 61 | No legal play？ |
| 295 | PROMFT | Dsp．mach．＇s play | 342 | CHS |  | To ． 347 |
| 296 | CLE | （Safeguard | 343 | RCL | 01 | Convert sign digit |
| 297 | INT | against 0．1） | 344 | XEQ | 02 | \＃of discs＋1 |
| 298 299 | STO ST0 St | Save play or 0 | 345 | ARCL | IND | ． 590 （ARCL X，etc． |
| 360 | RCL 01 | In case ． 304 xeq | 346 | $\mathrm{R}+$ |  | Mach＇s alpha code |
| 301 | XEQ 55 | No．of discs＋1 | 347 | Ft |  | $\begin{aligned} & (+.1 \text { or }-.1 \text { now } \\ & \text { in } x) \end{aligned}$ |
| 302 | ARCL IND | Ck．prtr status A．ppend you disc | $348 *$ | LBL | 61 | From ． 340 |
| 392 | RCL 93 | $\alpha$－code | 349 | RECL | 62 |  |
| 304 | $X=6$ ？ | Recover your play | 351 | LBL | ${ }^{\text {H }}$ | To ． 242 |
| 305 | GTO 02 | No play for you？ | 352 | FC？ | 日1 | Auto See Bd |
| 306 | RAD | To ． 337 | 353 | SF | 1 | Toggle flag 01 From 309 etc |
| 307 | RCL 10 | SF 43，CF 42 | 354 ＋ | LBL | 0.3 | From． 325.309 etc． |
| 308 | $x<\gg$ | 10 Val idate | 355 | FIX | $\square$ |  |
| 369 | X＜＝ Y ？ | Validate | 356 | ARCL | 0.3 | ＇No Good＇ |
| 310 | GTO 03 | ． 353 your | 357 | $\cdots$ | IG＊ |  |
| 311 | RCL 89 | 89 entry | 358＊ | LBL | E | Disable xeq＇n of <br> .499 if B was |
| 312 313 |  |  | 359 | GTO | IND | pressed |
| 314 | 人＜ $\mathrm{Yr}^{\text {r }}$ |  | $360+$ | LBL | 06 | To ． 283 or ． 155 |
| 315 | RCL IND |  | 361 | XEQ | 01 | （Play Sq．in X，／ |
| X |  |  | 36.2 | $x<1$ |  | 0.1 in Y） |
| 316 | $x=Y$ \％ | Guard register？ | 36.3 | RCL | 09 | Copy（－Sq）into X |
| 317 | GTO 03 |  | 36.4 | － |  | 0.00009 （ISG，DSE |
| 318 | FRC |  | 36.5 | XEQ | 01 | index） |
| 319 | $x \neq 6$ ？ | Square already | 366 | $x<>$ |  | Process next pr． |
| 320 | GTO 03 | taken？ | 36.7 | RCL | 08 | 0.00001 |
| 321 | ST0 04 | Clr．rnd counter | 368 | $+$ |  | ISG，DSE index＝10 |
| 322 | RCL IHD | Occupied sq code | 369 | XEQ | 01 | Process next pr． |
| 96 |  | mach＇s sign in $X$ | 376 | $x<>$ |  |  |
| 323 | RCL 03 | Your play in $X$ | 371 | RCL | 08 |  |
| 324 | XEQ 60 | To ． 359 | 372 | － |  | ISG，DES index＝11 |
| 325 | $x=0 ?$ | No flips found？ | 373 | XEQ | 01 | Process 4th pr． |
| 326 | GTO 03 | To ． 353 | 374 | CLX |  |  |
| 327 | LBL 01 |  | 375 | $x<>$ | 93 | Flip ct；clr R93 |
| 328 | $X=Y$ ？ | Cont．the game？ | 376 | $x=6$ |  | No flips found？ |
| 329 | GTO 01 | To ． 333 | 377 | ETH |  | To ． 257 or ． 324 |
| 330 | 5 | To term．game | 378 | R $\dagger$ |  | Play Sq．in X |
| 331 | ST0 60 | For IND GT0 | 379 | IHT |  |  |
| 332 | BEEP |  | 386 | $x<\gg$ |  | Flip count in $X$ |


| 381 382 | RCL 91 | 101 | $427$ | RCL IMD | sq/edge is encountered |
| :---: | :---: | :---: | :---: | :---: | :---: |
| $383+$ | + |  | 428 | FRC |  |
| 384 | STO IND | Save flips in R06 | 429 | $\mathrm{X}=\mathrm{Y}^{\prime}$ ? | Another opp disc? |
| 05 |  | (mach.),R07 (you) | 430 | GTO 13 |  |
| 385 | ARCL $X$ |  | 431 | CHS |  |
| 386 | $x<\rangle \gamma$ | . 1 \& opp. sign | 432 | ' $\mathrm{X} \boldsymbol{\prime} \mathrm{Y}$ ? | A vacant square |
| 387 | CHS | . 1 \& players sign | 433 | RTH | or edge? |
| 388 | SIGH | Current player's | 434 | SIGH |  |
| 389 | LASTX | sign dig | 435 | RBS |  |
| 390 | ABS | 0.1 | 436 | CHS | -1 |
| 2915 | ST+ IHD | Code, occupied sq | 437 438 | $\mathrm{X}<\gg$ $\mathrm{R}+\mathrm{y}$ |  |
| 392 | RDH |  | 439 | $\mathrm{R}+$ | Play sq in $X$ |
| 393 | ST* IND | Copy curr. player | $440+$ | LBL 14 | X |
| Y |  | sign digit in | 441 | DSE $X$ | Start moving |
| 394 | ABS ST+ | the play sq | 442 | AOFF $\mathrm{x}=\mathrm{r}$ | toward the play |
| 396 | $5 \mathrm{ST}+04$ | Inc. disc counter | 444 | GT0 ${ }^{\text {ct }}$ | sq |
| 397 F | FS? 04 | Incr. rnd counter | 445 | RT | back to starting |
| 398 | PRA | printer on | 446 | ST* IND | $\underset{-1}{ } \text { pt.? to }$ |
| 399 | RCL 69 | 60 | ' |  | Change the sign |
| 40018 | RCL 61 $\times<=Y ?$ | Any vac. sq left? | 447 448 | ST- 93 | digit (flip) |
| 402 | ENTERT | continue playing | 449 | GTO 14 | Increment the |
| 403 R | RTH | To . 257 or . 324 | 450 | LBL 1 | flip counter |
| 404 + | LBL 01 | Process adj sqs | 451 | RTH |  |
| 405 | STO 2 | Save play sq in Z | 452 | RTH |  |
| 406 | $\mathrm{X}<>\mathrm{Y}$ | +.1 or -. 1 in $X$ | $453+$ | LBL E | Tally routine |
| 4071 | ISG' Y | Adj in Y | 454 + | LBL 05 | From . 512 or . 578 |
| 408 A | GOFF | (NOP) | 455 | 7 |  |
| 409 P | RCL IHI | Copy adj reg. | 456 | STO 00 | Ptr for IND GTO |
| ' |  | into X | 457 | XEQ 55 | Ck printer status |
| 410 F | FRC |  | 458 | "TRLY: ${ }^{\text {c }}$ |  |
| 411 | $X=Y$ ? | Opp's disc here? | 459 | XEQ 57 | . 608 (AVIEW) |
| 412 | XEQ 13 |  | 460 | PSE |  |
| 413 | x<> T | Test adj sq on | 461 | 11-088 | Pointer, R11-88 |
| 414 | CHS | opp side of the | 46.2 | SF 25 | Error ignore flag |
| 415 | STO 2 | current | 463 | 0 |  |
| 416 | X< $\mathrm{Cl}^{\text {r }}$ | directional axis | 464 | ENTER $\uparrow$ |  |
| 417 I | ISG $\gamma$ |  | 465 | LN | Error for right |
| 418 | ROFF |  | $466+$ | LBL 06 | scroll |
| 419 R | RCL INI |  | 467 | RCL IND | Calculate the |
| Y |  |  |  |  | number of black |
| 420 | FRC |  | 468 | FRC | discs now on the |
| 421 | $X \neq Y$ ? | No opp disc here? | 469 | $x \neq 0 ?$ | board, and do a |
| 422 | RTH |  | 470 | SIGN | dififerential |
| 423 + | LBL 13 | Keep moving out | 471 | $x<6 ?$ | count. |
| 424 | RDH | in same directior | 472 | $s T-z$ |  |
| 4251 | ISG $\gamma$ | until outflanking | 473 | + |  |
| 426 ค | HOFF | disc or vacant | 474 | OCT | NOPS to reduce |

## PROGRAM LISTING

| 4751 | DEC ISG | scrolling rate | 524 525 | XEQ 03 | ． 601 |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 477 G | GTO 06 | Format the display of disc count by color | 526 | $x<>L$ | Rnd counter in $X$ |
| 478 － | ＂トB＂ |  | 527 | 1 |  |
| 479 F | FIX 0 |  | 528 | $x>y ?$ | Were there 2 |
| 480 C | CF 29 |  | 529 | CLX | ＇no plays＇in |
| 481 A | ARCL Y |  | 536 | － | succession？ |
| 482 | ＂ト，W＂ |  | 531 | ＋ |  |
| 483 | CHS |  | 532 | XEQ 02 | ． 590 |
| 484 | － |  | 533 | ARCL IND | ． 590 |
| 485 | TONE 7 |  | 91 |  |  |
| 486 X | XEQ 56 | $.604$ <br> Differential disc count Is printer on？ | 534 | RCL 06 |  |
| 487 L | LASTX |  | 535 | XED 03 | llach＇s last play $.601$ |
| 488 F | FSPC O4 |  | 536 | PDV PSE |  |
| 490 | ADV |  | $538 \cdot$ | LBL 11 |  |
| 491 L | LEL 97 |  | 539 | KEO 55 |  |
| 492 C | CF 12 |  | 540 | FIX ${ }^{\text {a }}$ | Check printer |
| 493 F | FC？ 55 | Restore standard conditions． | 541 | CF 29 |  |
| 494 C | CF 21 |  | 542 | 11.018 |  |
| 495 | SF 29 |  | 54.3 | STO 03 | Ptr for IND RCL |
| 496 D | DEG |  | 544 | 1． 008 | of board reg＇s |
| 497 F | FIX 2 |  | 545 | STO 05 | Count rows |
| 4985 | STOP |  | 546 | －＂ |  |
| 499 G | GTO $0^{\text {a }}$ | ＇Final＇stop | 547 ＋LBL 08 |  |  |
| $500+$ L | LBL B |  | $\begin{aligned} & 548 \text { ARCL } X \\ & 549 \text { ISG } X \end{aligned}$ |  | Generate column numbers |
| 561 R | RCL 日2 | Initialize to resume game after a mid－ game tally To ． 285 |  |  |  |
| 502 | STO EG |  | 550 | GTO Q8 |  |
| 503 G | GRAD |  | 551 | FS？ 04 |  |
| 504 G | GTO IND |  | 552 | PRA |  |
| $x$ |  |  | $553+$ | LEL 09 | Begin major loop |
| 50．5＋L | LEL 64 |  | 554 ＂＊ |  |  |
| 506 | ADV | Auto See Bd \＆／or end game | 555 | ARCL 05 | Current row no． |
| 507 G | GRAD |  | 556 | ＂ト： |  |
| 5090 | CF 21 |  | 557 | LBL 11 | Begin minor loop |
| 509 A | PVIEW |  | 558 | RCL IND | Recode the discs |
| 510 P | PSE | Pause to view last play | 0.3 |  | （by color）and |
| 511 P | PSE |  | 559 FRC |  | vacant squares in the row for the alpha reg． |
| 512 F | FC？ 01 | Not Auto See Bd <br> To ． 453 <br> From ． 170 <br> Prtr 0N，last rnd？ To ． 537 | 56.0 | $x<6 ?$ |  |
| 513 G | GTO 05 |  | 561 ＂ト＊＂ |  |  |
| 514 L | LBL C |  | $56.2 x=0 \%$ |  |  |
| 515 F | FS？ 04 |  | 56.3 ＂トー＂ |  |  |
| 516 | GTO 61 |  | $\begin{array}{ll} 564 & x>0 ? \\ 565 & \because r 0 \end{array}$ |  |  |
| 517 R | RCL 01 |  |  |  |  |  |
| 518 R | RCL 04 | Reassemble disc count and the last round of plays for review | 565 | $15 \mathrm{G} \quad 0$ |  |
| 519 | － |  | 567 |  |  |
| $520 \times$ | XEQ 55 |  | 568 | TOHE 7 |  |
| 521 A | ARCL IND |  | 569 | AVIEM | Update pointer for IND RCL of next row |
| 92 |  |  | 570 | 2.01 |  |
| 522 R | RCL 97 | Your last play |  | $5 T+0.3$ |  |
| 523 T | TONE 7 | Your last play | 572 | ISG 05 |  |

## PROGRAM LISTING



CODE CRACK

Given a fractional number the program uses a simple random number generator to create a "secret" code which you must guess (in as few guesses as possible). You must specify the length of the hidden code, and the highest number to be used in that code. Lengths may vary from 4 to 6 elements and allowable highest numbers are 6 through 9 .

Each guess you make is compared to the calculator's hidden code. The number of correct characters in the correct position, and the number of guess characters found in the hidden code but in the wrong position is calculated. The resulting display shows your guess along with an "*" for a "perfect" element and a "+" for each one which is right, but in the wrong place. The order of the "+"s and "*"s is irrelevant.

A couple of notes: Numbers may be repeated in a given code. Entering the same "seed" (fractional number) will cause the calculator to generate the same sequence of codes (unless the other options are different).

SIZE: 024
FIX: 0
USER MODE: ON/OFF
TOTAL PROGRAM BYTES: 269

| DATA REGISTERS |  |
| :---: | :---: |
| 00 | Guess |
| 017 |  |
| 02 | Code Element |
| 03 | Inventory List |
| 04 |  |
| 05 |  |
| 06 | Helps calculate +'s |
| 07 |  |
| 08 |  |
| 09 |  |
| 10 | Seed |
| 11 | Highest code number |
| 12 | Number of code digits |
| 13 | PSE looping |
| 14 | Number of guesses |
| 15 | Scratch |
| 16 | MSD |
| 17 |  |
| 18 | Hidden code by element |
| 19 \} |  |
| 20 |  |
| 21 |  |
| 22 | Number of *'s |
| 23 | Number of +'s |

```
FLAGS USED
    5 Set: Re-initializing inventory list
        Clear: Calculating +'s
    21 Set: Printer Enable
        Clear: Printer disabled
        Set: Set User mode
        Clear: Clears User mode
            Set: Digit grouping commas
        Clear: No comma
```

1. The first game is played with the least difficult options selected.
a) Number of digits in hidden sequence : 4
b) Highest digit allowed in sequence : 6
c) Seed : . 5284163
2. This game uses the same conditions as \#1.


|  |  |  |  | SIZE: 024 |
| :---: | :---: | :---: | :---: | :---: |
| STEP | INSTRUCTIONS | InPuT | FUNCTION | DISPLAY |
| 1 | Enter the program |  | [GTO] . . | PACKING |
| 2 | Set size 024 |  |  |  |
| 3 | Execute program |  | [XEQ] "CC" | NO. DIGITS? |
| 4 | Enter number of digits in hidden code |  |  |  |
|  | (must be 4, 5 or 6) | n | [R/S] | NO. IN CODE? |
| 5 | Enter highest number allowed in code | m | [R/S] | SEED? |
|  | $(6 \leq M \leq 9)$ |  |  |  |
| 6 | Enter a seed. May be any fractional number | seed | [R/S] | GUESS N |
| 7 | Enter first guess - N digits | guess | $[R / S]$ | guess [ 1 |
|  | In the display [ ] may contain nothing or |  |  |  |
|  | +(s) and/or *(s). |  |  |  |
| 8 | Enter next guess | guess | [R/S] | guess [ |
| 9 | Repeat step \#8 until display shows: |  |  | OK, X guesses |
|  | Where $X$ is number of guesses |  |  |  |
| 10 | To play another game with the same |  |  |  |
|  | conditions. |  | [XEQ] "C" | GUESS N |
| 11 | To play another game with different |  |  |  |
|  | conditions. |  | [XEQ] "CC" | NO. DIGITS? |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |


| Gi＊LEL＂QE＂ |  | 471 |  |
| :---: | :---: | :---: | :---: |
| Qz FIK |  | $455 T+14$ | \＃of guesses |
| 63 GF |  | 496 | \＃of guesses |
| 64 GF E1 |  | $565 T 022$ | Initialize \＃of |
| Gre HO．DIT | Prompts for and | $515 T 023$ | correct elements |
|  | stores \＃of | 52＊LEL 16 |  |
| G\％FROM | digits in code | 53 RUL 6 de |  |
| $6 \mathrm{HHO}=\mathrm{IH}$ | Highest code \＃ | 558006 |  |
| CuIE？： | and seed | $56+L B L 62$ | Process guess |
| 09 FROMPT |  | 57 FCL 15 | Process gues |
| $105 T 011$ |  | 5810 |  |
| 11 ＂GEET？ |  | 59 |  |
| 12 FEOMPT |  | 60 FRC |  |
| 13 ETO |  | G 1 LASTX |  |
| $14 * L E L C$ |  | 62 IHT |  |
| 15 CF ¢ 7 |  | $6.5 T 015$ |  |
| 169 |  | 6.4 RDH |  |
| 17 EHTEFT |  | 6510 |  |
| 186 | Zeros \＃of | $66 \%$ |  |
| 19 OTO 14 | guesses | 671 |  |
| $20 *$ LEL BE |  | 6 GFO FS | Clear flag？ |
| 21 GTO IHT | Zeros R9－R1 | $69 \mathrm{ST}-\mathrm{IHL}$ | Modify inventory |
| ＇ |  | Y | list for（＋） |
| $z z^{2} \mathrm{IE}$ ¢ |  | 76 FS？ 05 | elements |
| 23 GTO 90 |  | $718 T+I H 1$ | Set flag？ |
| z4 XED 日6 |  | Y | Change to evaluat |
| 25＊LEL 91 | Changes Value in | 72 Fs？ 05 | next guess |
| $z \mathrm{E}$ ECL 16 | R10（seed） | 73 GTO 11 |  |
| 玉\％ 997 | Random number | 74 RDH |  |
| $29 \%$ | generator | 75 ECL IHI | CHECK for |
| 29 FRC |  | 13 | completely |
| $305 T 010$ |  | $76 \mathrm{X}=9 \%$ | correct elements |
| 31 FCL 11 |  | 77 SEQ 03 |  |
| 3 E ： | Store by element | $78+$ LEL 11 | Loop for each |
| 33 THT | R16－R21 | 79 DSE 13 | element of |
| 341 |  | 86 GTO Gz | guess |
| $35+$ | Store＂Inventory | G1 FS\％0s |  |
| 36 STG IHD | List＂R9－R1 | 92 GTO 12 |  |
| 13 |  | 83 RCL 12 |  |
| 371 |  | 84 FCL 22 |  |
| $3 \mathrm{ST}+\mathrm{IHT}$ |  | $85 \quad \mathrm{x}=\mathrm{y}$ ？ | Is guess |
| Y |  | SG GTO 04 | ＇perfect＇ |
| 39 ISE 13 |  | 879 |  |
| 4 CTO CL |  | 6857013 |  |
| 41 ＂GUESG＂ |  | $89 *$ LBL 65 |  |
| 42 ARCL 12 | Prompt for 1st | 96 REL IHI | Used modified |
| 43 FVIEA | Game | 13 | inventory to |
| $44 *$ LEL 14 | Evaluate Guess | 91 र＞9？ | calculate＋ |
| $45 \mathrm{CF} 日$ | Clear－modify | $925 T+23$ | guesses |
| 4657090 | inventory R9－R1 | 93 ISE 13 | guesses |

## PROGRAM LISTING



# PROGRAM DESCRIPTION 

ADVENTURE<br>By Layne K. Johnson

This adventure takes place at an automated dam (which is currently being held by terrorists) located high in the Alps. The object of the game is to get past the security systems of the dam and shut off the computer without being detected by the terrorists. The player must use intuition and guesswork to determine which command(s) to use in any given situation. The commands to be used in this adventure are listed on page 100-101.

The adventure exists solely in the HP-41's data storage registers. With guidance from the program (which provides verb and noun input routines as well as outputs results) any number of adventures can be created. An adventure is limited only by your imagination.

## CREATING YOUR OWN ADVENTURE

The purpose of the program is to provide the interface between the user and the adventure data. To be able to write an adventure of your own you must understand how the program works. You should also go through the program listing and comments (very thoroughly) before writing an adventure. If you wish to play an adventure first, skip the following section and go to the example adventure.

To understand the verb routines, you must understand the manner in which the items are encoded. Each item is contained in two or more registers. One register contains the name of the item, and the other register(s) contain any numerical code(s) for the item. The encoding is done as follows: (R09 \& R10 are used as an example)

```
R09 (sign) x.fgghhiijj Ekk
R10 Name of the item
```

Sign: if positive, R09 references an item. If negative, R09 tells the program to search for an auxiliary routine starting with the Interpreter.
$x$ : If $x$ is greater than 1, an item from the inventory is needed to complete the action of the verb. The program will ask "WHAT?" on the verbs "FEED" and "GIVE".
f: If $f$ is 5, item HH must not exist or the verb will not work. If $f$ is 6 , item HH must exist or the verb will not work. If $f$ is 7 , the player must be in room HH or the verb will not work. If $f$ is 8 , and an improper verb has been used, the program will search the list five registers back. This allows multiple verbs to work on an item. If $f$ is 9, "GET" can not be used on this item.
gg: This value is the verb number that will work on this item.
hh: This is the necessary item (or room) needed (to be in) to complete the action of the verb.
kk: This is the number of the register that contains the item's name. (In this example, this is R10.)
ii: The event that will occur if the right verb is used and the $f$ condition is met. The event list follows:

00: Return and complete the action of the verb.
01: Add item jj to the room the play is in.
02: There is a passage to room jj. "GO IN?" is displayed.
03: Move the player to room jj.
04: Change this item's code to the code contained in register jj.
05: Remove item jj from the inventory.
06: Display the message starting at register jj. Do NOT complete
the action of the verb. This option allows the adventure to tell
the player why an action cannot be performed.
07: Exchange the player's inventory with room jj's item list.
08: Exchange the room's exits with room jj"s exit list.
09: End the adventure. Display "THE END".
10: Display the message which starts at register jj.
11: The player is dead. Display the message starting at register jj, then display "YOU DIED".
12: Change item jj's code list to the contents of this item's register location minus five. This allows action taken on one item to affect another item.
13: Exchange the room's i.tem list with room jj's item list.
14: Ask the question starting at this item's register minus one. The answer for the primary event is in register jj. Events are stored as follows: 0. primary Secondary as 0.iijjiijj in the register just after the question.

If ii is greater than 14 then 14 is subtracted from ii and the HP-41 will execute event 10 starting at the item's code register minus one. This allows the adventure to describe what happened when the player worked with the item.

The action of the verbs "GET" and "ATTACK" can NOT be event 02. If the register that contains what room the player is in has changed and the program cannot complete the verb, that item will not be removed from the room. The same is true for happening 03.

On multiple verbs ( $f=8$ ), the verbs "GET", "THROW", "GOTO", and "EXAMINE", will not get to the alternate item code.

Verb/Name/Number List:

| GET | -01 | PRESS | -08 | INVentory | - Not applicable |
| :--- | :--- | :--- | :--- | :--- | :--- |
| OPEN | -02 | READ | -09 | DROP | - Not applicable |
| THROW | -03 | GIVE | -10 | Look | - Not applicable |
| FEED | -04 | MOVE | -11 | $?$ | - Not applicable |
| EXAMINE -05 | LIFT | -12 | $\wedge N$ | - Not applicable |  |
| GOTO | -05 | PULL | -13 | $\wedge S$ | - Not applicable |
| WORK | -06 | ATTACK -14 | $\wedge E$ | - Not applicable |  |
| CLIMB | -07 |  |  | $\wedge W$ | - Not applicable |

## SPECIFIC VERB ROUTINES

Lines 151-176 contain the "PUSH", "PRESS", "OPEN", "WORK", "READ", "MOVE", and "LIFT" verb routines. Since these verbs do not physically change the adventure data (except by the happening routines) they all use the same entrance and exit from the processing routines. Since each verb only needs to be represented by a label, its name, and an ID number, this part of the program is very flexible. Verbs can be added, deleted, or even have their names changes.

Lines 187-197 contain the "FEED" and "GIVE" routines. If one of these is the verb called for, the processing routine will ask "WHAT?" item the play is feeding or giving away. If it is the right item, that item is then removed from the game.

Lines 232-258 contain a utility routine. Each verb, after its completion, passes through this routine. The number of the room the player is in is checked and if it is over 90 the routine subtracts 90 and prompts the player to read in the appropriate card set. Since registers available for the adventure data are 03-95, the programmer can create from one to ten different parts for the same adventure. Since reading in a new card set causes the loss of the items in the inventory, the adventure created should be of the "accomplish-a-goal" type, or the "escape" type rather than an adventure based on finding treasure.

GENERAL NOTES (for working your way through an adventure):
The following verbs are available for your use in accomplishing the adventure's goals:

Verbs that work on items "YOU SEE"... (Input verb [R/S], Item name [R/S])

| GET | PRESS |
| :--- | :--- |
| OPEN | READ |
| THROW | GIVE |
| FEED | MOVE |
| EXAMINE | LIFT |
| GOTO | PULL |
| WORK | ATTACK |
| CLIMB | DROP (out of the player's inventory) |

Information verbs (Input verb [R/S])
INV Inventory of items carried
L Look at room again
? Look at room exits again
Movement verbs (Input verb [R/S])

| ${ }^{\wedge} N$ | Go north |
| :---: | :---: |
| ${ }^{\wedge}$ S | Go south |
| ${ }^{\wedge} E$ | Go east |
| ${ }^{\wedge}$ W | Go west |

Other notes:
-At times when the player asks the program to do something and the HP-41 replies "I CAN'T", the player can ask to try again with something in the inventory.

Example:

| "OPEN DOOR" | $[R / S]$ | "I CAN'T" |
| :--- | :--- | :--- |
| TRY | $[R / S]$ | "TRY?" |
| KEY | $[R / S]$ | "OK" |
| (and the DOOR opens) |  |  |

This can only be tried once after the "I CAN'T" or "HA" displays. If this does not complete the actions, the action must be entered again before the player can try another item from the inventory.
-When the player "FEED"'s or "GIVE"'s an item from the inventory to an item in the adventure (and if one of these is the verb called for), then the program will ask the player "WHAT?" item is to be fed or given away.

Example:

| "GIVE" | $[\mathrm{R} / \mathrm{S}]$ | "GIVE?" |
| :--- | :---: | :--- |
| "DROID" | $[R / S]$ | "WHAT?" |
| "TOOLS" | $[R / S]$ | "OK" |
| (Item now removed from game) |  |  |

-The player should never attempt to carry more than four items and never add more than five items to a room (things will start disappearing).
-The player can not "READ", "OPEN", "FEED", "EXAMINE", or "WORK" on an item in the inventory.
-To go through a "GO IN?" display, the player must either press [R/S] or key in another command.
-If the "HUH?" display is shown, the player has either given the HP-41 a command it does not know, or misspelled the verb or the item's name.
-Be aware that this program uses flags 05 through 19. It is therefore suggested that the user not use a printer with this program. Also, before using a peripheral, the user may want to check the status of the appropriate flag(s).

## STATUS

SIZE: 096
FIX: 0
USER MODE: OFF
TOTAL PROGRAM BYTES: 1116

## DATA REGISTERS

00 Inventory - contains the register numbers of the codes for the items you're carrying.
01 Scratchpad
02 Room pointer - the beginning of the description of the room you're in.
03-95 Adventure data
Each room of the adventure is set up as follows. Registers 03-08 are used only as example.

03
04
05

06
07 AA.BBCCDDEE
08 Register numbers of codes for items in room
In reg 07
AA - Register with room's name
BB - Register which starts data for room to the North (optional)
CC - As BB - for room to South
DD - As in BB - for room to East
EE - As in BB - for room to West
(If BB - EE are non-zero, then that direction is an exit direction)

## FLAGS USED

Set: You can't have item HH, to complete verb processing.
Set: You have to have item HH to complete verb processing.
Set: You have to be in room HH to complete verb processing. /Utility.
Set: Wrong verb used? Try item code list five registers back.
Set: You can not GET this item.
Set: You need an item from the inventory to complete the verb, ask WHAT? item (for the GIVE and FEED verbs), or use the "I CAN'T/TRY" routine for the rest.

Set: The DROP routine becomes the THROW routine when this flag is set.

Set: Bypass the verb completion barriors, but not the happening barriors.
Set: The FEED and GIVE routines set this flag, it get the WHAT? routine rather than the "I CAN'T/TRY" routine.

Set: Display message after the completion of the happening. /Utility.
Set: Set if the player can TRY to input (use) some item from the inventory, otherwise the TRY input is ignored.

Set: When done with the happening go through the Look routine.
Set: Do the "SO?" display rather than the "OK" display.
Set: Utility.
Set: Do the "HA" display rather than the "I CAN'T" display.
Set: Printer enabled.
Clear: Printer disabled.
Set: Alpha data entered.
Clear: No data entered.
Set: Ignore 1 error.
Clear: Don't ignore errors.

The situation: An automated dam located high in the Alps controls the yearly flooding of this time of year. Downstream a U.N. meeting on nuclear disarmament is being secretly held on an island in a tributary to the Rhone. Ninety percent of the world governments have representatives present and there is a problem. Terrorists bent on destroying the U.N. meeting have taken control of the dam's computer and have set it to open the locks, releasing the flood waters. Officials of the U.N. do not want to interrupt the meeting in fear that it will be impossible to again get the world governments together for this meeting. Your mission is then to get past the security systems of dam and shut down the computer without activating the terrorist's program. Good luck.

You have been flown to the dam and start in the helicopter hangar.
If you get in a situation from which there is no egress, load the data set for that section of the Adventure and start it over.



| RROO - 0 |  | RR48 - "LOSES" |  |
| :---: | :---: | :---: | :---: |
| RR01-0 |  | RR49 - "DOOR C" |  |
| RR02-9 |  | RR50 - 2.90499 *E57 | (SLOT) |
| RR03 - -95. | I (CELL) | RR51 - 2.904701628*E57 | (SLOT) |
| RRO4 - 0 | I | RR52 - "ALARM" |  |
| RRO5 - "R HERE" | I (HANGER) | RR53 - 1.902001604*E18 | (DOOR) |
| RRO6 - "OR DOO" | I | RR54 - " ON" |  |
| RR07 - "ELAVAT" | I | RR55 - "SENSOR" |  |
| RR08-94. | I | RR56 - 1.906002650*E55 | (SENSOR) |
| RRO9 - . 92 | I | RR57 - "SLOT" |  |
| RR10 - -77. | I (VATOR) | RR58-1.805000150*E18 | (D00R) |
| RR11 - . 798385 | I | RR59 - "OFFICE" |  |
| RR12 - "ARRAY" | I (LOUNGE) | RR60 - "MURAL" |  |
| RR13 - "OF DIS" | I | RR61 - "DIME" |  |
| RR14 - "SIGNS" | I | RR62 - "CHAIRS" |  |
| RR15-74.2211 | I | RR63 - "ID" |  |
| RR16 - . 736968 | I | RR64 - "LOCKER" |  |
| RR17 - " AHEAD" | I (OFFICE) | RR65 - 1.601 *E61 | (DIME) |
| RR18 - "D00R" | I | RR66 - "0 SAFE" |  |
| RR19 - "RITY" | I | RR67 - "NOPE N" |  |
| RR2O - "A SECU" | I | RR68 - 1.911001067*E60 | (MURAL) |
| RR21-59.0016 | I | RR69 - 1.905000165*E62 | (CHAIRS) |
| RR22 - . 5856 | I | RR70 - 1.601 *E63 | (ID) |
| RR23 - "ABOVE" | I (GEN RM) | RR71 - 1.905000170*E64 | (LOCKER) |
| RR24 - "CE UP" | I | RR72 - "HMM.." |  |
| RR25 - "L OFFI" | I | RR73 - 1.902001871*E64 | (LOCKER) |
| RR26- "CONTRO" | I | RR74 - "LOUNGE" |  |
| RR27-45. | I | RR75 - "LEVER 1" |  |
| RR28 - . 474736 | I | RR76 - "LEVER 2" |  |
| RR29 - " HERE" | I (OFFICE) | RR77 - "VATOR" |  |
| RR30 - "L DESK" | I | RR78 - 1.902000316*E18 | (DOOR) |
| RR31 - "CONTRO" | I | RR79-1.9 *E18 | (D00R) |
| RR32-59. | I | RR80 - 1.908002679*E75 | (LEVER 1) |
|  |  | RR81 - "MOVES" |  |

ADVENTURE DATA SET 1 - TERRORIST DAM

| RR33 - . 344337 |  | RR82 - "VATOR" |  |
| :---: | :---: | :---: | :---: |
| RR34-1.9 *E93 | (DESK) | RR83 - 1.908002704*E75 | (LEVER 1) |
| RR35 - "STAIRS" |  | RR84 - "KLUNK" |  |
| RR36 - 1.907000333*E35 | (STAIRS) | RR85-1.913002683*E76 | (LEVER 2) |
| RR37-1.907000328*E35 | (STAIRS) | RR86 - "ALARM" |  |
| RR38-1.911000392*E44 | (PHONE) | RR87 - 1.902001704*E18 | (D00R) |
| RR39 - "ARM-" |  | RR88 - "LOSES" |  |
| RR40 - "CH -AL" |  | RR89 - "DOOR C" |  |
| RR41 - "CE MAT" |  | RR90 - 1.913001611*E91 | (LATCH) |
| RR42 - "NO VOI" |  | RR91 - "LATCH" |  |
| RR43-2.806651704*E44 | (PHONE) | RR92-1.805000190*E18 | (D00R) |
| RR44 - "PHONE" |  | RR93 - "DESK" |  |
| RR45 - "GEN RM" |  | RR94 - "HANGER" |  |
| RR46 - "GEN" |  | RR95 - "CELL" |  |
| RR47-1.9 *E46 | (GEN) |  |  |


| RROO - 0 |  | RR48 - "D00R" |  |
| :---: | :---: | :---: | :---: |
| RR01-0 |  | RR49 - 1.913000230*E53 | (LATCH) |
| RRO2 - 9. |  | RR50 - "L00R" |  |
| RR03 - -95. | I (CELL) | RR51 - " 3RD F" |  |
| RR04 - 0 | I | RR52 - 1.906002646*E70 | (LIFT) |
| RRO5 - " HERE" | I (OFFICE) | RR53 - "LATCH" |  |
| RRO6 - "L DESK" | I | RR54 - "SHAFT" |  |
| RR07 - "CONTRO" | I | RR55 - 1.911000224*E59 | (PANEL) |
| RR08 - 94. | I | RR56 - "HIDES" |  |
| RR09 - . 92883684 | I | RR57 - "DR0ID" |  |
| RR10 - "ABOVE" | I (GEN RM) | RR58 - 1.902002715*E62 | (DROID) |
| RR11 - "CE UP" | I | RR59 - "PANEL" |  |
| RR12 - "L OFFI" | I | RR60 - "T0 A" |  |
| RR13 - "CONTR0" | I | RR61 - "MOVES" |  |
| RR14-83. | I | RR62 - "DR0ID" |  |
| RR15 - . 818180 | I | RR63 - 1.805001555*E62 | (DROID) |
| RR16-"D HERE" | I (GEN RM) | RR64 - 1.911002684*E79 | (KNOB 1) |
| RR17 - "E DROI" | I | RR65 - "ALARM" |  |
| RR18- "SERVIC" | I | RR66 - $1.911001704 * E 77$ | (KNOB 3) |
| RR19-83. | I | RR67 - "OFF" |  |
| RR20 - . 63818180 | I | RR68 - "GEN 2" |  |
| RR21 - "E LIFT" | I (SHAFT) | RR69 - 1.911002676*E78 | (KNOB 2) |
| RR22- "SERVIC" | I | RR70 - "LIFT" |  |
| RR23-54. | I | RR71 - 1.907000320*E85 | (STAIRS) |
| RR24 - . 4652 | I | RR72 - "ALERT" |  |
| RR25 - "RS" | I (R00M) | RR73 - "DROID" |  |
| RR26 - "LOCKE" | I | RR74 - "N OFF," |  |
| RR27-"TORAGE" | I | RR75 - "ALL GE" |  |
| RR28 - TOOL S" | I | RR76-1.911001389*E79 | (KNOB 1) |
| RR29-45.35000024 | I | RR77 - "KNOB 3" |  |
| RR30 - . 4040 | I | RR78 - "KNOB 2" |  |
| RR31 - "R HERE" | I (HALL) | RR79 - "KNOB 1" |  |
| RR32 - "TY D00" | I | RR80 - 1.907000309*E85 | (STAIRS) |

ADVENTURE DATA SET 2 - TERRORIST DAM

| RR33 - "SECURI" | I | RR81 - 1.705201315*E82 | (GEN) |
| :---: | :---: | :---: | :---: |
| RR34 - 86.0030 | I | RR82 - "GEN" |  |
| RR35 - . 43 | I | RR83 - "GEN RM" |  |
| RR36-1.9 *E87 | (PHONE) | RR84-1.907000315*E85 | (STAIRS) |
| RR37 - "ALARM" |  | RR85 - "STAIRS" |  |
| RR38 - 1.902001604*E48 | (D00R) | RR86 - "HALL" |  |
| RR39 - "LOCKED" |  | RR87 - "PHONE" |  |
| RR40 - 1.902001039*E44 | (LOCKER) | RR88 - 1.9 *E91 | (DESK) |
| RR41 - "BOARD" |  | RR89 - . 8876696684 |  |
| RR42 - "INPUT" |  | RR90 - "ON" |  |
| RR43 - 1.805001793*E48 | (D00R) | RR91 - "DESK" |  |
| RR44 - "LOCKER" |  | RR92 - 1.908002789*E93 | (SWITCH) |
| RR45 - "R00M" |  | RR93 - "SWITCH" |  |
| RR46 - 1.911000220*E59 | (PANEL) | RR94 - "OFFICE" |  |
| RR47 - 1.905000149*E48 | (D00R) | RR95 - "CELL" |  |

## ADVENTURE DATA SET 3 - TERRORIST DAM

| RROO - 0 |  | RR48 - "MEMORY" |  |  |
| :---: | :---: | :---: | :---: | :---: |
| RR01 - 0 |  | RR49 - "PLUG" |  |  |
| RR02-9. |  | RR50-1.6 | *E38 | (KEY) |
| RR03 - -95. | I (CELL) | RR51 - . 5253546464 |  |  |
| RR04-0. | I | RR52-1.6 | *E55 | (PLIERS) |
| RR05 - "R HERE" | I (HALL) | RR53-1.6 | *E56 | (S DRVR) |
| RRO6 - "TY DOO" | I | RR54-1.6 | *E57 | (WRENCH) |
| RR07 - "SECURI" | I | RR55 - "PLIERS" |  |  |
| RR08 - 94.0015 | I | RR56- "S DRVR" |  |  |
| RR09 - . 89888766 | I | RR57 - "WRENCH" |  |  |
| RR10 - "RS" | I (R00M) | RR58 - 1.913000215 | *E59 | (LATCH) |
| RR11 - "LOCKE" | I | RR59 - "LATCH" |  |  |
| RR12 - "TORAGE" | I | RR60-1.702090893 | *E81 | (D00R) |
| RR13- "T00L S" | I | RR61 - "SHAFT" |  |  |
| RR14 - 63.09000017 | I | RR62 - "LOCKER" |  |  |
| RR15 - . 6464 | I | RR63 - "R00M" |  |  |
| RR16 - -61. | I (SHAFT) | RR64 - 2.902501351 | *E62 | (LOCKER) |
| RR17 - . 5860 | I | RR65 - "ALARM" |  |  |
| RR18 - "PUTER" | I (R00M) | RR66-1.902001604 | *E81 | (D00R) |
| RR19 - "TY COM" | I | RR67 - . 60 |  |  |
| RR20 - "SECURI" | I | RR68 - . 777666 |  |  |
| RR21-63.000927 | I | RR69 - . 797866 |  |  |
| RR22 - . 3529 | I | RR70 - 1.908000204 | *E90 | (KEY C) |
| RR23 - "UTER" | I (R00M) | RR71 - 1.908000204 | *E91 | (KEY B) |
| RR24 - "L COMP" | I | RR72 - 1.908000204 | *E92 | (KEY A) |
| RR25 - "CONTRO" | I | RR73 - . 7066 |  |  |
| RR26-63.00000022 | I | RR74 - . 7166 |  |  |
| RR27 - . 394537 | I | RR75 - . 7266 |  |  |
| RR28 - "ALARM" |  | RR76 - 1.908001375 | *E91 | (KEY B) |
| RR29-1.913001704 *E49 | (PLUG) | RR77 - 1.908001374 | *E92 | (KEY A) |

## ADVENTURE DATA SET 3 - TERRORIST DAM

| RR30-2.902520140 *E48 | (MEMORY) | RR78 - 1.908001374 *E90 | (KEY C) |
| :---: | :---: | :---: | :---: |
| RR31 - "BYE UN" |  | RR79 - 1.908001373 *E91 | (KEY B) |
| RR32 - "OPEN" |  | RR80 - "OPEN" |  |
| RR33 - "LOCKS" |  | RR81 - "D00R" |  |
| RR34-2.902530136 *E44 | (COMP) | RR82 - 1.908002767 *E92 | (KEY A) |
| RR35-2.914001237 *E44 | (COMP) | RR83-. 8266 |  |
| RR36-2.901001033 *E47 | (MICRO) | RR84 - 1.908001383 *E90 | (KEY C) |
| RR37-1.905000150 *E48 | (MEMORY) | RR85 - 1.908001373 *E91 | (KEY B) |
| RR38 - "KEY" |  | RR86 - . 858466 |  |
| RR39-1.806001033 *E44 | (COMP) | RR87 - 1.908001368 *E90 | (KEY C) |
| RR40-1.913001044 *E46 | (DISKS) | RR88 - 1.908001386 *E91 | (KEY B) |
| RR41 - "SAFE" |  | RR89 - 1.908001369 *E92 | (KEY A) |
| RR42 - "FF, UN" |  | RR90 - "KEY C" |  |
| RR43 - "UTER 0" |  | RR91 - "KEY B" |  |
| RR44 - "COMP" |  | RR92 - "KEY A" |  |
| RR45-1.913001044 *E49 | (PLUG) | RR93 - -94.2215 |  |
| RR46 - "DISKS" |  | RR94 - "HALL" |  |
| RR47 - "MICRO" |  | RR95 - "CELL" |  |


$\square$

| 91*LEL "AD' |  | $44 \mathrm{E}^{4} \mathrm{E}$ |  |
| :---: | :---: | :---: | :---: |
| 02 FIX | Some program | $\begin{aligned} & 459 T 091 \\ & 46 \end{aligned}$ |  |
| Gz FIX E | comments are | $4 \overline{6}$ ¢\%\% |  |
| 04 FOH | the program | $48 \cdots+\mathrm{H}$ |  |
| 65*LEL "L" | description | 49 FRC |  |
| Q6 RUL EZ |  | 50 ECL 41 |  |
| $0 \% 1$ |  | 51 +: |  |
| Qe -- |  | $528>9$ |  |
| 69 ECL THI |  | $53 \sim \vdash$ |  |
| $\%$ |  | 54 FRC |  |
| 16 "YOURE |  | 55 FCL 91 |  |
| H 9 - | LOOK ROUTINE: | 56 * |  |
| 11 ARCL IH | (begins at | $57 \times 1 \%$ 58 |  |
| \% GUIEU | line 4) | 59 FRE |  |
| 12 AVIEM 13 FSE | 5-11 displays | $60 \times 76$ |  |
| 14 र<6 | the room's name. | 61 "+4" |  |
| 15 GTO CO | If R07 is | $G 2 \mathrm{CLH}$ |  |
| 16.4 TH | positive; the | $63 * L E L 36$ |  |
| 17 AVIEM | optional room | 64 GTOF | VERB ENTRY: |
| 18 CLA | description is | $65 * L E L$ 16 | Verb Entry. |
| 19 RDH | displayed. | 66 FEL 60 |  |
| z6 1 |  | 6 ETO 00 |  |
| 21 |  | 68 ST0 06 |  |
| 22 XEQ 10 |  | 695061 |  |
| 23 FSE |  | 7 CB LEL 2 E |  |
| 24*LBL 60 |  | 71 CFINI | through 19. |
| $\begin{array}{lll}25 & \mathrm{RCL} \\ 26 & \mathrm{RCL} \\ \text { IHI }\end{array}$ |  | $\begin{array}{ll} 72 & 156 \\ 73 & 60 \\ \hline \end{array}$ |  |
| $\mathrm{z}^{2} \mathrm{RCL}$ IHT |  | $\bigcirc 4$ GTO |  |
| ${ }^{\chi} 27 \quad \mathrm{X}=0 \mathrm{l}$ |  | $\bigcirc 4$ ASTO |  |
|  |  | 75 ASTO $\gamma$ |  |
|  |  | 76 ASHF |  |
| 29 "YOU SEE | the room. | $\begin{array}{ll} 77 & \text { ASTO L } \\ 78 & \end{array}$ | verb entry. |
| 30 FYIE |  | 79 ARCL $\%$ |  |
| $315 \% 14$ |  | SG ASTO |  |
| 32 REQ 21 |  | B1 " ${ }^{\text {\% }}$ |  |
| 33*LEL "\% |  | S2 ARCL $\%$ |  |
| 34 RCL gz |  | 83 ASHF |  |
| 351 |  | E4 ASTO |  |
| $36-$ |  | ES CLA | Get first two |
| 37 LASTX |  | SG ARCL Y | letters of the |
| 3 EFEL IHI |  | 97 ARCL L | verb. |
| Y |  | 86 EF 25 |  |
| 39 FRC |  | 89 GTO IHD |  |
| 49 AES |  | $\chi$ |  |
| $418=6 ?$ |  | $96 \mathrm{GTO} \mathrm{S}^{3}$ |  |
| 42 GTO 3 C |  |  | GET ROUTINE: |
| 43 "EXITS | Display the room | $\begin{aligned} & 929 F \\ & 93 \\ & 97 \end{aligned}$ |  |

## PROGRAM LISTING



## PROGRAM LISTING

| 196 GTO 90 |  | 246 | CLA |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| $191+L B L$＂GI＂ | GIVE ROUTINE： | 241 | XEQ 1E |  |  |
| 19219 |  | 242 | LBL EE |  |  |
| 193＊LEL EG |  | 243 | RCL ge |  |  |
| 194 SF 13 | FEED or GIVE， | 244 | 96 |  |  |
| 195 KEQ 27 | remove the item | 245 | － |  | Need to read next |
| 196 RCL 91 | fed or given away | 246 | $x<=67$ |  | data set？ |
| 197 KEQ 05 | from the game． | 247 | GTO 96 |  |  |
| 198 GTO 11 |  | 248 | －REAI | ： | YES？prompt for |
| 199＊LBL＂GO＂ | GOTO ROUTINE ： | 249 | ARCL $\because$ |  | and read the data． |
| 290＋LBL＂EX＂ | EXAMINE ROUTINE： | 256 | AVIEM |  |  |
| 201 GF 12 |  | 251 | RDTA |  |  |
| 2 E SF 17 |  | 252 | GF 16 |  |  |
| 2035 |  | 253 | LBL 日G |  | Return to LOOK |
| 204 KEQ z7 |  | 254 | FS？C 16 |  | routine？ |
| 205 GTO 11 |  | 25.5 | GTO＂L＂ |  |  |
| 206＊LEL＂TN＂ | GO NORTH | 256 | $" s \mathrm{~s}$ |  | Else give proper |
| 2072 |  | 257 | FC？c 17 |  | response． |
| 20860060 | GO SOUTH | 258 | ＂Or゙＂ |  |  |
| 209＊LEL＂けS＂ | GO SOUTH | 259 | GTO 36 |  |  |
| 2104 |  | 260 | LEL 27 |  | ROUTINE： |
|  | GO EAST | 261 | STO 61 |  |  |
| 2136 |  | 26.3 | KEQ 15 |  |  |
| 214 GTO GG | GO WEST | 264 | E |  |  |
| 215＊LSL＂†小＂ | GO WEST | 26.5 | LBL 2 z |  |  |
| 2168 |  | 266 | IHT |  |  |
| 217＊LEL 日E |  | 26.7 | $s T+69$ |  |  |
| 218 101\％ |  | 268 | 2 |  |  |
| 219 RCL 92 | MOVEMENT | 269 | FCL IHI |  |  |
| 2201 | ROUTINES | 66 |  |  |  |
| 221 |  | 276 | EHTEET |  |  |
|  |  | 271 | LOĞ |  |  |
| 223 RCL IHL |  | 272 | IHT |  |  |
| Y |  | 278 | $10+\%$ |  |  |
| 224 ABS |  | 274 | $\checkmark$ |  | Get item code |
| 225 ＊ |  | 275 | X＞9？ |  | Ask WHAT？not the |
| 226 IHT |  | 276 | 5 F 10 |  | Ask WHAT？not the <br> I CANT／TRY routine |
| 2271 Ez |  | 277 | FRC |  | I CANT／TRY routine |
| 228 MOH |  | 278 | 16 |  |  |
| $229 \mathrm{x}=0$ ？ | This exit | 279 | ＊ |  |  |
| 230 GTO こ3 | possible |  | SF IHD | 8 | Set flag＝F |
| 231 STO 92 | NO？go to HUH？ | 281 | FRC |  | （see page 98） |
| $2325 F 16$ | routine | 282 | 1 E 2 |  |  |
| $233+$ LEL 11 | UTILITY ROUTINE： | 283 | ＊ |  |  |
| 234 FC\％C 14 | page 100 of text | 284 | INT |  |  |
| 235 GTO ¢9 |  | 295 | RCL 91 |  |  |
| 236 RCL 日G |  | 286 | X才才？ |  |  |
| 2371 |  | 287 | GTO 62 |  | Wrong Verb？ |
| 238 |  | 289 | LAST\％ |  | YES？go to 02 |
| 239 IHT |  | 289 | FFE |  |  |

## PROGRAM LISTING

| 2961 Ez |  | 341 ET |  |
| :---: | :---: | :---: | :---: |
| 291 * |  | 342 INT |  |
| 292 IHT |  | 343 RCL 91 | Wrong item? |
| 293 FCTC 07 | Need to be in the | 344 X\%\% | YES? go to I CANT |
| 294 GTO 90 | right room? | 345 GTO 25 | display. |
| 295 RCL 92 | (see page 3) | 346*LBL 01 |  |
| $2968=9 ?$ | NO? go to 00 | 347 RCL INI |  |
| 297 GTO 1 | Right room? go | $\underline{16}$ |  |
| $298+L B L G 2$ | to 01 | 348 EHTEET |  |
| 299 FSTC 12 | Possible to | 349 LOG |  |
| 306 RTH | override verb | 356 INT |  |
| 301 RCL 09 | completion | 351 101\% |  |
| 302 IHT | barriors? | 352 |  |
| 303 ST - 00 | YES? then return. | 3531 E? |  |
| 3045 |  | 354 * |  |
| $365-700$ |  | $355+L B L 29$ | Break item code |
| 306 FSTC 08 | with verb needed | 3561 E 2 | into happening\# |
| 367 GTO 22 | in register 5 | 357 MOD | and the happening |
| 308 GTO 25 | back? | 358 INT | data. |
| 399*LBL 90 | YES? do so, else | 359 LASTX |  |
| $316 \times=0$ | go to I CANT | 360 FRC |  |
| 311 GTO 01 | display. | 3611 E 2 |  |
| 312 FSTC 10 | Go to 'WHAT?' | $362 *$ |  |
| 313 GTO G6 | routine? YES? go | 363 INT |  |
| 314 RCL 96 | to 00 . | 364 X< ${ }^{3}$ |  |
| 315 FRC |  | 36514 |  |
| $316 * L E L 24$ | Routine to check | 366 X<Y\% | Does a message |
| 31916 | if $F=5$ or 6 | 367 SF 14 | need to be shown? |
| $\begin{array}{ll}318 & * \\ 319 & \text { IHT }\end{array}$ | conditions are |  | YES? set flag 14. |
| $326 \mathrm{X}=\mathrm{Y}$ ? | met. (see page 3) | 370 RDH |  |
| 321 SF 13 |  | $371 \times<>$ |  |
| 322 RDH |  | 372 CLF |  |
| 323 LASTX |  | 373 GTO INI | $\frac{\text { Go to happening }}{\text { II }=00 \text { ROUTINE: }}$ |
| 324 FRC |  | Y | page 99 of text |
| $325 \times 109$ 326 GT0 24 | Conditions met? | $374+$ LBL 06 | II-01 ROUTINE: |
| 327 FS?c 06 | N0? go to the | $376+L B L$ gi | page 99 of text |
| 328 FS ¢C 16 | I CANT display. | $377 \mathrm{ST}+\mathrm{IND}$ | Add the item to |
| 329 FSTC 15 |  | 02 | the room and |
| 330 GTO 25 |  | 3781 EZ | change this item's |
| 331 GTO G1 |  | 379 STV IHD | code so it can't |
| $332+L B L$ 6日 | 'WHAT?' routine. | 02 | add another item. |
| 333 "HHAT" |  | 38 ECL R IHD |  |
| 334 SF 15 |  | 06 |  |
| 335 FC ? 13 | Ask WHAT? item | $3 \mathrm{SF}^{\text {SCI }} 5$ |  |
| 336 GTO 25 | the player is | 332 FHD |  |
| 337*LBL 29 | going to use from | 3 S 3 FIX 0 |  |
| 338 STO 01 | their inventory | 384 STO IHD |  |
| 339 CLX | to complete the | 06 |  |
| 3408 CQ 15 | verb. | 385 SF 16 |  |

## PROGRAM LISTING



## PROGRAM LISTING



## HEWLETT-PACKARD

## HP-41

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ROW 117 (513: 516)

ROW 118 (516:518)


ROW 120 (522: 524)

ROW 121 (524:527)


ROW 122 (528:530)



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CHESS






HEWLETT PACKARD SOLUTIONS BOOK: GAMES II

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PINBALL
PROGRAM REGISTERS NEEDED: 143
HEWLETT PACKARD
SOLUTIONS BOOK:
GAMES II

```











ROW 73 (384: 387)


ROW 79 (405: 406)

ROW 80 (406:415)


ROW 82 (416: 422)


ROW 84 (425:428)


ROW 85 (428: 432)


ROW 87 (436:443)




ROW 127 ( 676 : 676)


FLIPO
PROGRAM REGISTERS NEEDED: 153

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\begin{tabular}{ll} 
CODE CRACK & HEWLETT PACKARD \\
& SOLUTIONS BOOK: \\
PROGRAM REGISTERS NEEDED: 39 & GAMES II
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NOTES

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}

\section*{GAMES II}
THE CAVES
5 X 5 CHESS
PINBALL
TRUCK
FLIPO
CODE CRACK
ADVENTURE
(h) \(\begin{aligned} & \text { HEWLETT } \\ & \text { PACKARD }\end{aligned}\)```

