The Fall's New Games For Commodore, Apple, Atari, and IBM



The Leading Magazine Of Home, Educational, And Recreational Computing

A Hands-On Report

The Commodore 1541 Save-With-Replace Bug: Proof That It's Real And How To Avoid It

The Witching Hour Haunting Strategy Game For Commodore 64, Atari, Apple, IBM PC/PCjr, TI-99/4A

Apple II Pull-Down Menus Add Mac-Style Features To Your II+, IIe, IIc

Lightning Renumber For Atari Powerful Tool For BASIC Programmers



Earth will be destroyed in 12 minutes to make way for a hyperspace bypass. Should you hitchhike into the next galaxy? Or stay and drink beer?

Simply slip the disk in your computer and suddenly you are Arthur Dent, the dubious hero of THE HITCHHIKER'S GUIDE TO THE GALAXY[™] a sidesplitting masterwork of interactive fiction by novelist Douglas Adams and Infocom's Steve Meretzky. And every decision you make will shape the story's outcome. Suppose for instance you decide to linger in the pub. You simply type, in plain English:

>DRINK THE BEER

And the story responds:

YOU GET DRUNK AND HAVE A TERRIFIC TIME FOR TWELVE MIN-UTES, ARE THE LIFE AND SOUL OF THE PUB, TELL SOME REALLY TERRIFIC STORIES, MAKE EVERYONE LAUGH A LOT, AND THEY ALL CLAP YOU ON THE DACK AND TELL YOU WHAT A GREAT CHAP YOU ARE AND THEN THE EARTH GETS UNEXPECT-EDLY DEMOLISHED, YOU WAKE UP WITH A HANGOVER THAT LASTS FOR ALL ETERNITY, YOU HAVE DIED. Suppose, on the other hand, you decide to:

SEXIT THE VILLAGE PUB THEN GO NORTH

In that case you'll be off on the most mindbogglingly hilarious adventure any earthling ever had.

The Hitchhiker's Guide to the Galaxy comes complete with Peril Sonsitive Surglasses, a Minroasopie Space Fleet, a DON'T PANIC Button, a package of Multipurpose Fluff and orders for the destruction of your home and planet. You communicate – and the story responds – in full sentences. Which means that at every turn, you have literally thousands of alternatives. So if you decide it might be wise, for instance, to wrap a towel around your head, you just say so:

WRAP THE TOWEL AROUND MY HEAD

And the story responds:

THE RAVENOUS BUGBLATTER BEAST OF TRAAL IS COMPLETELY BEWILDERED, IT IS SO DIM IT THINKS IF YOU CAN'T SEE IT, IT CAN'T SEE YOU.

But be careful about what you say. Or one moment you might be strapped down, forced to endure a reading of the third worst poetry in the galaxy; the next you could be hurtling through space with Marvin the Paranoid Android aboard a stolen spaceship.

And simply staying alive from one zany situation to the next will require every proton of puzzle solving prowess your mere mortal mind can muster. Even simple tasks can put you at wit's end:

>OPEN THE DOOR

And the story responds:

THE DOOR EXPLAINS, IN A HAUGHTY TONE, THAT THE ROOM IS OCCUPIED BY A SUPER-INTELLIGENT ROBOT AND THAT LESSER BEINGS (BY WHICH IT MEANS YOU) ARE NOT TO BE ADMITTED, "SHOW ME SOME TINY EXAMPLE OF YOUR INTELLIGENCE," IT SAYS, "AND MAYBE, JUST MAYBE I MIGHT RECONSIDER, "



Other interactive science fiction stories from Infocom include PLANETFALL," in which you're stranded on a mysterious deserted world. STARCROSS," a puzzling challenge issued eons ago and lightyears away. SUSPENDED, "the race to stabilize an entire planet's life support systems. And A MIND FORE VER VOYAGING," a radically new work of serious science fiction in which you explore the future of mankind.

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>CONSULT THE HITCHHIKER'S GUIDE ABOUT THE MOLECULAR HYPERWAVE PINCER

And the story responds:

SORRY+ THAT PORTION OF OUR SUB-ETHA DATABASE WAS ACCIDENTALLY DELETED LAST NIGHT DURING A WILD OFFICE PARTY+

So put down that beer, take that towel off your head, open the door, hitchhike down to your local software store today and pick up THE HITCH-HIKER'S GUIDE TO THE GALAXY. Before they put that bypass in.

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Too Many Caesars

I own two Commodore computers and a 1541 disk drive. I would like to connect both computers to the drive at once (of course, I would only send disk commands from one computer at a time). Everything works fine when only one computer is turned on, but when I turn on the second one, the first computer does a cold start. When I try to send disk commands from either computer, the entire system seems to lock up. Is there any way to accomplish what I'm trying to do?

Charles Mitchell

Since you can connect more than one peripheral to a single computer, you might expect the reverse to be true. Why can't two computers share the same drive? The answer reveals a fundamental difference between a computer and peripheral devices such as disk drives and printers. The computer is designed to act as "absolute ruler" of the system. It not only sends and receives information (as peripherals can do), but also sends commands that control the whole system. Plugging two computers into the same disk drive is like creating a Rome with two Caesars: Each computer acts like the only commandgiver in existence, and the system becomes confused.

In the first case you describe, turning on the second computer sends a normal reset command to every device in the system-including the second computer, which responds as if it had reset itself. Sending a disk command (which goes to the other computer as well as the drive) makes things even worse. Serial communications require a complex exchange of "handshaking" signals between computer and peripheral to make sure one doesn't send data until the other is ready, and vice versa. Since the second computer isn't designed to respond as a peripheral, it can't complete the handshake and crashes the entire system.

One makeshift way to do what you want is to unplug the serial cable from one computer whenever you want to use the other. However, we definitely don't recommend this as a regular practice. The serial port connectors aren't designed for such heavy use, and you run the risk of sending garbage signals along the line. For long-term use you may want to buy a switching box which cleanly disconnects one computer from the serial bus before connecting the other.

ACCEPT On TI

I have a problem using ACCEPT on my TI-99/4A with Extended BASIC. When I try to enter numeric input with ACCEPT and accidentally press EN-TER before any input, the screen scrolls and I get an error message. Is there any way I can avoid this without using the CALL KEY statement?

Jory Rannow

The following program illustrates one solution to your problem:

100	CALL CLEAR
110	DISPLAY AT(1,1):"ROW
	#1"
120	ACCEPT AT(2,1)VALIDAT
	E(NUMERIC) X .
130	IF X\$="" THEN 120
14Ø	X=VAL(X\$)
150	PRINT X

After this program clears the screen, line 110 prints a message on line 1 so you can tell whether scrolling occurs. Line 120 takes in numeric input (numerals 0-9, period symbol, plus symbol, minus symbol, or E) and accepts the input as X\$. If at this point you hit ENTER by mistake, line 130 sends you back for another try with out scrolling the screen. Once you've entered a value, line 140 converts it from a string into the numeric variable X.

Unwanted Commodore Messages

I have written a machine language routine that loads several program modules into the Commodore 64 from disk. However, the computer prints the usual SEARCHING FOR and LOADING messages during every load. How can I prevent these messages from appearing on the screen?

Allen Kotomski

These messages are generated by the 64's operating system, which controls input/ output functions. Since Commodore calls the operating system the Kernal, they're known as Kernal control messages. One easy way to mask them is to change the character color to the same color as the screen background. The messages then print invisibly on the screen. However, since they may overprint an existing die play or cause the screen to scroll, it's usually better to suppress them altogether.

Location \$9D (157 decimal) holds a flag that tells the 64 what type of messages to display. When the flag contains 128 (bit 7 is set to 1), the computer prints Kernal control messages to tell you when it's searching, loading, saving, or verifying. When bit 7 is set to 0, control messages are not displayed. Though you rarely see them when using BASIC, the Kernal also has its own set of error messages. For instance, the Kernal equivalent of BASIC's FILE NOT FOUND message is I/O ERROR #4. Location \$9D controls Kernal error messages as well: They're displayed when the flag contains 64 (bit 6 is set to 1), and suppressed when hit 6 is clear

0 MUI

ichmi 4B 1B:

1618

lex: (

The Witching Hour

Brian Flynn

This game of skill and foresight is ideal for a bleak, stormy October night. Originally programmed for the IBM PC with color/graphics adapter and PCjr, versions have been added for the Commodore 64. expanded VIC-20, Atari 400/800, XL, and XE, TI-99/4A, and Apple II-series computers. The Commodore 64 and Atari versions require a joystick. When autumn winds send a shiver down your spine and the witching hour draws near, there's no better entertainment than a good computer game. "The Witching Hour" is an absorbing contest of strategy based on Alquerque, a board game played in ancient Egypt and still popular in Spain today. Type in and save The Witching Hour, referring to the listing for your computer. Since every version is similar, read the general game rules below, then check the specific notes for your computer before running

the program.

The witching Hour pits broomstick-straddling witches against ethereal ghosts and is played on a board of 25 squares with 12 pieces to a side. After choosing sides, you attempt to take your opponent's players by jumping over them. You can move vertically, horizontally, or diagonally. However, certain diagonal moves are illegal (the lines between squares show where you can go) and only one square is vacant when the game begins.

Jumping an opposing player's

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piece removes that piece from the board. If no capture is possible, you may move any piece to an adjacent empty square. You may not pass up a capture—if it's possible to jump an opponent, you must always do so—and if the first capture puts you in position to make another, you must jump again (except in the Apple version). The computer won't let you make illegal moves.

Play ends when all the pieces from one side have been removed from the board. You can play against a friend or measure your skills against the computer (the IBM and TI versions also let you watch the computer play itself). Like other contests of strategy, The Witching Hour is simple to learn, but a challenge to master, and can be played at many different levels. Hint: It's sometimes smart to sacrifice a player to draw the opponent into a dangerous position.

IBM PC/PCjr Version

Each game square on the screen is marked with one of the letters of the alphabet. To move a piece, first type the letter for the square of the piece you want to move. Then type the letter of the square where you want to go. For instance, to move a witch from square L to square M, type L when the computer prompts you with FROM and type M when it prompts you with TO. If you press Enter without typing a letter, the computer takes that turn. Thus, to play alone against the computer, just press Enter every other turn. Press Enter on every turn to watch the computer play against itself.

Commodore 64 And VIC-20

Both Commodore versions of The Witching Hour offer a one- or twoplayer option when the game begins. The 64 version is played with a joystick. Plug the joystick into port 1 if you are playing alone (of course, two joysticks are needed for the two-player version). The colored box indicates which square you are on. Use the joystick to position the box on the piece you wish to move, then press the fire button: The box will change color. Now move the box to the square where you want the piece to go, and press the button again. If the move is legal, the piece appears in the new

square (if not, you get to try again).

The VIC-20 game requires at least 8K memory expansion and uses keyboard controls exactly like the IBM version. Each square is marked with a letter. When the computer prompts you with FROM and TO, make your move by entering the appropriate letters. Before loading the VIC version, you must enter the following two lines in di rect mode (don't add a line number, and hit RETURN after each line);

POKE 43,1:POKE 44,32:POKE 8192,0:NFW POKE 36869,240:POKE 36866,150:POKE 648,30:PRINT"{CLR}"

Atari Version

The Atari game requires a joystick (a pair for the two-player game) and is played like the Commodore 64 version. The joystick controls a colored box. Move the box over the piece you want to move, then press the fire button. After the box changes color, move it to the square where you want to put the piece, then press the button again. Player/ missile graphics are used to form the witch and ghost figures, and a short machine language routine moves them quickly around the screen.

Apple Version

The Witching Hour runs on any Apple II-series computer with DOS 3.3 or ProDOS. When the program starts, you must choose between a one- or two-player game. Then the game board is drawn and play begins. The flashing box shows which square you are on, and is moved with keyboard controls. Press the I key to go up, J to go left, K for down, and L for right. Press RE-TURN when the box is on the piece you want to move, then move the box to the desired square and press RETURN again.

TI-99/4A Version

This program runs on any TI-99/4A computer with either console BASIC or TI Extended BASIC. Every game square is labeled with a letter, and the pieces are moved on the board with keyboard controls. The first letter you enter (when the computer prompts FROM:) designates the piece you wish to move. The second letter (entered when the computer prints TO:) designates the square you will move to. The computer signals with a beep when you try an illegal move. The game may be played by one or two players, or the computer can play both sides. Whenever you press ENTER without typing a letter, the computer takes that move.



"The Witching Hour" for IBM PC/PCjr forms ghost and witch shapes with PUT statements.

Program 1: The Witching Hour, PC/PCjr Version

For Instructions on entering this listing, please refer to "COMPUTEI's Guide to Typing In Programs" published bimonthly in COMPUTEI.

- WK 10 GOSUB 530:GOTO 280
- 06 20 H=0:K=0:FOR A*7 TO 35:605 B 60:NEXT
- # 30 GOSUB 170:IF H<1 THEN 250 # 40 H-0.K-0.A-T.GOGUB 40.IF # 1 THEN 250
- HI 50 GOTO 30
- IX 60 IF B(A)=0 OR B(A)=-S OR B A)≠2 THEN RETURN
- 87 70/ FOR B≃0/ TO D(A-/):C=A+M(B :IF B(C)=S OR B(C)=2 THEN 160/
- E 80 IF B(C) THEN 120
- ND 90 SC=RND(1) #.9: IF H<SC THEN H=SC:F=A:T=C
- AE 1999 IF CK=1 AND T1=C THEN L= :B=7
- EA 110 GOTO 160
- NN 120 IF B(C+M(B)) THEN 160 JN 130 SC=1+RND(1)\$.9:IF H(SC I
- EN H=SC:F=A:T=C+M(B):K=C
- ^{NK} 14Ø IF CK≠Ø THEN 16Ø
- IF 150 IF T1=C+M(B) THEN L=1:K1
 C:B=7
- 6W 16Ø NEXT:RETURN
- M0 17Ø B(T)=B(F):B(F)=Ø:A=F:GOS B 76Ø
- び 180 IF K THEN B(K)=0:A=K:GOS B 760
- 190 A=T:GOTO 760
- H 200 GOSUB 520:IF S=1 THEN P NT"The witches win!":GOT 220
- M 210 PRINT"The ghosts win!" OF 220 LOCATE 23,10:PRINT"Hit
- key to play again" 0E 23Ø K\$=INKEY\$:IF K\$="" THEN
- 3Ø
- 6E 240 RUN
- NI 250 S=-S:H=0:A=7
- L⁰ 260 IF A=36 THEN 200 NL 270 GOSUB 40:IF H=0 THEN A= 1:GOTO 260

E7 650 DIM D(28), 8(42), X(35), Y(3 5),N(28) DE 66Ø S = - 1: FOR A = Ø TO 7: READ M(A): NEXT : FOR A = Ø TO 28: READ D(A): NEXT 53 670 FOR A = 0 TO 4: FOR F = 0 TO 4iH = 6 + A + F + 7iX(H) = 4 + F + 11iY(H) = 4 $A_1N(0) = H_2G = G + 1_2$ NEXT F,A 58 680 FOR A = 0 TO 421 READ B(A): NEXT : FOR A = Ø TO 6: READ F: POKE 864 + A,F: NEXT : 60808 760: 60808 1 190: FOR A = 0 TO 42: 608 UB 1130: NEXT : RETURN C8 690 DATA -6,1,6,-1,-5,7,5,-7 44 700 DATA 7,3,7,3,7,0,3,7,3,7, τ 61 14 710 DATA 7,3,7,3,7,0,3,7,3,7, 3,0,7,3,7,3,7 MY 720 DATA 2,2,2,2,2,2,2,-1,-1, -1,-1,-1,2 44 730 DATA -1,-1,-1,-1,-1,Z,-1, -1,0,1,1,2 H 74Ø DATA 1,1,1,1,1,2,1,1,1,1, 1,2,2,2,2,2,2,2 38 750 DATA 1.0.4.0.44.62.0 A2 760 FOR A = 768 TO 855: READ F: POKE A,F: NEXT 7 770 POKE 6,01 POKE 7,141: IF PEEK (191 # 256) = 76 THE N PRINT CHR4 (4),"PR#A#3Ø Ø": GOTO 790 (8 780 POKE 54,0: POKE 55,3: CAL L 1002 E3 790 FOR A = 36352 TO 36567: R EAD F: PUKE A, F: NEXT 18 800 RETURN 20 1130 IF B(A) = 2 THEN RETURN 22 1140 VTAB Y(A) + 1: HTAB X(A) 45 1150 IF B(A) < 0 THEN PRINT " 9A9": HTAB X(A): PRINT " FGH": HTAB X(A): PRINT " LMN^H 3 1160 IF B(A) > 0 THEN PRINT " CDE": HTAB X(A): PRINT " IJK": HTAB X(A): PRINT " OPQ" AB 1170/ IF B(A) = 0/ THEN PRINT " RST": HTAB X(A): PRINT " UVW": HTAB X (A) : PRINT " XYZ" F3 1180 RETURN EA 1190 HCOLOR= 3 71 1200 FOR A = 11 TO 139 STEP 3 2: HPLOT 78,A TO 190,A NEXT M 1210 FOR A = 78 TO 190 STEP 2 8: HPLOT A,11 TO A,139: NEXT F8 1220 HPLOT 78,11 TO 194,140: HPLOT 194,11 TO 78,140 39 1230 HPLOT 78,76 TO 136,11 TO 194,76 TO 136,140 TO 78 ,76 2 1249 RETURN 12 1250 F = 2:T1 = 2:QS = 2 28 1260 SCALE* QS EI 1270 XDRAW 1 AT (T1 # 4 + 10) # 7 - 3, (F # 4) # 8 + 25 JE 1275 PRINT CHR\$ (F # 5 + T1 + 65); CHR\$ (8); A\$ - "": IF PEEK 47 128Ø A* (~ 163 84) > 128 THEN GET AS # 1285 XDRAW 1 AT (T1 # 4 + 10) \$ 7 - 3, (F \$ 4) \$ 8 + 25 F# 1297 QS = QS + 5: IF QS > 27 THEN QS = 2EE 1290 IF AS = "I" AND F > 0 TH ENF = F - 1#1 1291 IF A4 = "K" AND F < 4 TH EN F = F + 1

88 1292 IF RW # "J" AND T1 > Ø T HEN TI = TI - 1 87 1293 IF A\$ = "L" AND T1 < 4 T HEN T1 = T1 + 1 A2 1300 IF A\$ < > CHR\$ (13) THEN 1260 4 1400 A\$ = CHR\$ (F \$ 5 + T1 + 65): RETURN N 1500 DATA 216, 120, 133, 69, 134, 70 2 1510 DATA 132,71,166,7,10,10 44 1520 DATA 176,4,16,62,48,4 88 1530 DATA 16,1,232,232,10,134 64 1540 DATA 27,24,101,6,133,26 A3 1550 DATA 144,2,230,27,165,40 95 1560 DATA 133,8,165,41,41,3 81 1570 DATA 5,230,133,9,162,8 3E 1580 DATA 160,0,177,26,36,50 99 1590 DATA 49,2,73,127,144,34 47 1600 DATA 145,8,230,26,208,2 % 1610 DATA 230,27,165,9,24,105 # 1620 DATA 4,133,9,202,208,226 87 1630 DATA 165,69,166,70,164,7 72 1640 DATA 88,76,240,253 71 1700 DATA 255, 129, 129, 129, 129 129 FI 1710 DATA 139,171,255,128,128 192 G 1720 DATA 192,208,212,224,255 . 192 &F 1730 DATA 192,192,194,202,234 100 9 1740 DATA 255, 129, 129, 225, 129 ,225 6 1750 DATA 225,225,255,128,128 ,135 \$ 1/60 DATA 104,200,238,200,200 .192 09 1770 DATA 192, 192, 192, 192, 192 . 172 00 1780 DATA 171,171,171,169,129 129 M 1790 DATA 193,199,229,181,181 ,165 9 1800 DATA 168,170,170,170,199 173 40 1810 DATA 193, 193, 193, 195, 199 . 294 N 1820 DATA 129, 129, 159, 255, 255 199 W 1830 DATA 193, 193, 159, 142, 142 255 CI 1840 DATA 255, 191, 191, 255, 192 248 € 1850 DATA 255,255,241,192,192 192 55 1860 DATA 223, 223, 255, 159, 135 127 72 1870 DATA 129,255,170,170,170 140 # 1880 DATA 170,139,128,255,216 ,240 49 1890 DATA 255, 193, 192, 192, 192 . 255 TE 1900 DATA 129,129,129,129,129 .129 13 1910 DATA 129, 255, 255, 254, 252 . 248 17 1920 DATA 248, 224, 128, 255, 193 , 193 47 1930 DATA 193, 192, 193, 207, 254 255 39 1940 DATA 127,1,1,1,1,1 4 1950 DATA 1,1,127,0,0,0 12 1960 DATA 0,0,0,0,127,64 25 1970 DATA 64, 64, 64, 64, 64, 64 M 1980 DATA 1,1,1,1,1,1 53 1990 DATA 1,1,0,0,0,0 20 2000 DATA 0,0,0,0,0,64,64 10 2010 DATA 64,64,64,64,64,64 78 2020 DATA 1,1,1,1,1,1 31 2030 DATA 1,127,0,0,0,0 FF 2040 DATA 0,0,0,127,44,44 F4 2050 DATA 64,64,64,64,64,127

A ghost is about to be jumped in this game of "The Witching Hour" for Apple II computers. - 1 R B $\mathcal{J} = \mathcal{J}$ ×. E. NITCH OF ALKN FROM: "The Witching Hour" for the TI-99/4A works with console BASIC as well as TI Extended BASIC. Program 6: The Witching Hour, TI-99/4A Version Version by Patrick Parrish, Programming Supervisor 100 GOTO 150 FOR Im1 TO LEN(H#) 110 CALL HCHAR(R,C+I,ASC(120 SEG#(H#,I,1))) 130 NEXT T 755 14Ø RETURN 150 DIM B(42), D(28), N(28) 924 ,X(35),Y(35) 160 608UB 1450 93ø 94ø GOTO 93Ø 170 950 106 U = 0760 190 K=Ø 97ø 200 FOR A=7 TO 35 78# GOSUB 310 210 770 | NEXT A 220 230 1000 G09U9 600 IF H<1 THEN 860 1010 240 1626 250 H=0 1939 260 K=Ø 164# 270 A=1 GOSUB 310 1836 280 290 IF HK1 THEN 860 1565 300 6010 230 1070 IF (B(A)<># (B(A)<>-1880 310 8) # (B(A) <>2) THEN 330 1596 320 RETURN 1100 330 FOR 85-0 TO D(A-7) 1110 340 C=A+M(85) 112# IF (B(C)=B) + (B(C)=2)T356

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360 IF B(C) THEN 450 378 BC=RND1.9 385 IF H>=80 THEN 425 396 H=8C 490 F=A 410 T-C 428 IF (CK<>1)+(T1<>C)THE N 58Ø 436 11=1 440 BOTO 570 450 IF B(C+M(B5))THEN 580 468 SC=1+RND#.9 478 IF H>=80 THEN 528 480 H=8C 496 F=A 586 T=C+H(85) 510 K-C 520 IF CK=0 THEN 580 538 K=8 54# IF T1<>C+M(85)THEN 58 550 LL-1 360 K1-C 57# B5=7 580 NEXT B5 59Ø RETURN AGG ANE

618 B(T)=B(F)

65# B(K)=#

669 A=K

686 A=T

3(F)=6

63# 808UB 279#

676 BOSUB 2798

60T0 2796

80TO 75Ø

AGAIN"

808UB 219#

870 IF A=36 THEN 700

IF H-S THEN 898

956 IF 8<>1 THEN 986 966 H#="8H08T'S TURN"

980 H=="WITCH'S TURN"

1070 CALL KEY(8, KK, 88)

1080 IF 88-0 THEN 1060

IF KK<>13 THEN 1120

1129 IF (KK<65)+(KK>89)TH

GOTO 93#

808UB 31#

R=23

770 BOSUB 110

810 GOSUB 110

8=-8

A=A+1

740 BOBUB 1630

1010 GOBUB 110

1648 Hs="FROM:"

1030 GOSUB 110

1969 RANDOMIZE

1160 BOSUB 1630 1110 BOTO 180

EN 1868

1130 H#=CHR#(KK)

978 GOTO 998

R=24

C=9

G08UB 1630

IF S<>1 THEN 748

HS="THE WITCHES WIN!"

HA-"THE BHOSTS WIN!"

855 HS="HIT A KEY TO PLAY

CALL KEY(0,KK,88)

IF 88=# THEN 82#

648 IF K=8 THEN 689

629

670

700

710

72#

736

740 750

760

780

820

836

846

850

BAB 878 H=8

986

710 920

888 A=7

938 DD=6

998 R=22

1000 C=10

1020 R=23

1030 0-9

109905

790 0=5

le

114ø C=15 115# 60SUB 11# 1160 A=N(KK-65) 1170 Z=A TØ - " 1180 H+=" 1178 IF DD<>1 THEN 1218 1200 CALL HCHAR(23,10,32, 7) 1216 8=23 1220 C=17 1230 80808 110 1240 CALL KEY(0,KK,88) 1250 IF 88-0 THEN 1240 1268 H#=CHR# (KK) 1270 C=21 1285 GOSUB 115 T1=N(KK-65) 1290 1306 CK=1 131# LL=# 1326 K1=9 1330 BOSUB 310 134Ø CK=Ø 1338 H-8 1360 A=7 1370 IF A=36 THEN 1420 1386 GOSUB 316 1396 IF H>=1 THEN 1426 A=A+1 1468 1410 IF A<36 THEN 1380 1420 IF DD THEN 1468 1430 IF LL THEN 1490 CALL BOUND (50, 220, 5) 1440 1450 60T0 935 146# IF (LL<>#) *(K1<>#) TH EN 1490 1470 CALL SOUND (50,220,5) 1480 SOTO 1600 1490 IF (K1=0) + (H>=1) THEN 1446 1500 F=Z 131**0** K-K1 1520 T=T1 1530 808UB 600 1540 IF K1=0 THEN 860 1550 A-T 1560 Z=A 1570 H=0 1580 808UB 310 1590 IF H<1 THEN 86# 1600 DD=1 1610 CALL HCHAR(23,22,32) 1620 BOTO 1180 1638 CALL HCHAR (22, 1, 32, 9 1640 RETURN 1659 FOR I=96 TO 104 166# READ AS 1670 CALL CHAR(I,A\$) 1680 Next I 1679 DATA **Seesessesses** F. #101010101010101.F F898986888888888 1768 DATA FF6161616161616 1,808080808080808080,8 848251988848281 1710 DATA 010204081020408 6, 91610161610101#1FF, F F**9990000000000000**000 1720 FOR I=112 TO 115 173# READ A* 1748 CALL CHAR(I,A\$) 1758 NEXT T 1769 DATA BBBBBABFCFE7E3F1 E. 0008089C1C3E1CB8, 1 C090101E1FFE302, F#E8 CBC4E2FFE666 1779 FOR 1=129 TO 123 1780 READ A\$ 1798 CALL CHAR(I,A\$) 1800 NEXT I 1819 DATA ###11131131F430 7,40F030F4F6F4FCE9.0

76F8F1F3F3F1C88.E8C8 8000000000000 1828 CALL CLEAR 1830 CALL COLOR(11,4,1) CALL COLOR (12, 15, 1) 1840 1850 FOR I=1 TO 8 1964 CALL COLOR(1,16,1) 1878 NEXT I 1880 CALL SCREEN(2) 1890 PRINT TAB(6);"THE WI TCHING HOUR": 1988 CALL HCHAR(14,8,112) 1918 CALL HCHAR(14,9,113) 1920 CALL HCHAR(15,8,114) 1938 CALL HCHAR(15,9,115) 1948 CALL HCHAR(14,23,128) 1958 CALL HCHAR(14,24,121) 1960 CALL HCHAR(15,23,122) 1979 CALL HCHAR(15,24,123) 1988 FOR A=0 TO 7 1995 READ M(A) 2000 NEXT A 2010 FOR A=0 TO 28 2020 READ D(A) 2930 NEXT A 2646 FOR A=4 TO 2#50 FOR F=0 TO 4 2568 H=6\$A+F+7 2070 X(H)=4*F+8 2080 Y(H)=4\$A+2 2079 N(8)=H 2199 8=8+1 211# NEXT F 2120 NEXT A 2138 DATA -6.1.6.-1.-5.7. 5,-7 2140 DATA 7,3,7,3,7,0,3,7 ,3,7,3,0 DATA 7,3,7,3,7,0,3,7 2150 ,3,7,3,8,7,3,7,3,7 2168 DATA 2,2,2,2,2,2,2,-1,-1,-1,-1,-1,2 2170 DATA -1, -1, -1, -1, -1, -1, 2,-1,-1,6,1,1,2 2180 DATA 1,1,1,1,1,2,1,1 1,1,1,2,2,2,2,2,2,2,2 2190 CALL COLOR(11,1,1) 2266 8=-1 2210 CALL COLOR(12,1,1) 2229 CALL COLOR(9,1,1) 2239 CALL COLOR(10,1,1) 224# CALL CLEAR 2256 Has"... SETTING UP GA ME BOARD" 226# R=23 227# C=3 2280 608UB 110 2290 FOR ROW-3 TO 17 STEP 23## FOR COL=8 TO 24 STEP 2310 CALL HCHAR(RDW.COL.1 Ø3) 2326 NEXT COL 2330 NEXT ROW 2348 FOR ROW=2 TO 18 STEP 2350 FOR COL=7 TO 23 STEP 236# CALL HCHAR(ROW,COL+3 166) 2378 CALL HCHAR (ROW+1, COL +4,99) 2386 CALL HCHAR (ROW, COL, 9 2398 CALL HCHAR (ROW-1, COL +2.96) 2450 CALL HCHAR(ROW+1,COL +3,98) 2410 CALL HCHAR (ROW+2, COL +1,99)

2429 CALL HCHAR(ROW+2,COL	21
+2,104)	
243Ø NEXT COL	25
2440 NEXT ROW	
2450 FOR ROW=3 TO 19 STEP	20
4	
2460 CALL HCHAR(ROW,7,97)	20
2479 CALL HCHAR(ROW, 26, 10	
Ø)	2
2489 GALL HCHAR(ROW, 27, 32	2
)	2
249Ø NEXT ROW	2
2566 FOR COL=8 TO 24 STEP	
4	24
251ø CALL HCHAR(1,COL,96,	26
2)	26
2520 CALL HCHAR(20,COL,10	20
4)	27
253# NEXT COL	23
234Ø FOR ROW=4 TO 12 STEP	
B	27
2550 FOR COL=10 TO 18 STE	27
P B	27
2560 CALL HCHAR(ROW,COL,1	2
Ø1)	27
2570 CALL HCHAR(ROW,COL+S	27
,1#2)	2
· · · · · · · · · · · · · · · · · · ·	

58ø CALL HCHAR(ROW+1,COL 4,192> CALL HCHAR (ROW+4, COL 596 +1,182) 600 CALL HCHAR(ROW+5,COL ,102) 610 CALL HCHAR(ROW+4,COL +4,101) 620 NEXT COL 630 NEXT ROW 640 RESTORE 2160 650 CALL HCHAR (23, 3, 32, 2 5} 560 Q = 0670 FOR A=# TO 42 680 READ B(A) 608UB 2790 590 769 IF B(A)=2 THEN 2730 CALL HCHAR(Y(A)-1,X(710 A)-1,Q+65) 720 0-0+1 NEXT A 739 CALL COLOR(9,14,1) CALL COLOR(10,14,1) 745 758 CALL COLOR(11,4,1) 760 770 CALL COLOR(12,15,1) 790 RETURN

2790 IF B(A)<>2 THEN 2010 28øø RETURN IF B(A)<>0 THEN 2850 2810 2820 CALL HCHAR(Y(A),X(A) 32,2) 283# CALL HCHAR (Y (A) +1, X (A),32,2) 2849 GOTO 2958 285# IF B(A) ># THEN 291# CALL HCHAR (Y (A), X (A) 2869 ,112) 287# CALL HCHAR(Y(A),X(A) +1,113) CALL HCHAR(Y(A)+1,X(A),114) 2880 CALL HCHAR (Y (A) +1, X (2876 A)+1,115) 2988 GOTO 2956 CALL HCHAR (Y (A), X (A) 2910 ,120) 2920 CALL HCHAR(Y(A), X(A) +1,121) 2930 CALL HCHAR (Y (A) +1, X (A), 122) 2940 CALL HCHAR(Y(A)+1,X(A)+1,123) Q 2950 RETURN



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The Beginners Page

Tom R. Halfhill, Editor

Clearing Up Variable Cloudiness

If you're just learning to program, variables can be confusing at first especially because there are so many varieties of variables. Last month's column introduced the concept of numeric variables. But, depending on your computer's BASIC, there are also integer variables, double-precision variables, string variables, numeric array variables, and string array variables. This month we'll cover integer variables and tackle the rest later.

Numeric variables, you'll recall, represent ordinary numbers For instance, you can store the number 10 in the variable X with the BASIC statement X = 10. Numeric variables can represent fractions just as easily, as in X = 98.6. An *integer variable* is similar, but with one important difference. As the term implies, integer variables can only represent *integers*—whole numbers. Fractions like 98.6 aren't allowed. There's one other limitation, too. In most BASICs which allow integer variables, the value cannot range beyond a maximum of 32,767 or a minimum of -32,768.

At first, these restrictions may seem odd. What's the advantage of limiting a variable to a whole number, and especially a whole number within a relatively narrow range?

The answer has to do with the way computers manipulate numbers. Internally, they use the binary numbering system instead of our everyday decimal system. Translating decimal numbers into binary gets tricky when the decimal number is a fraction, or *floating point* number (so-called because the decimal point can "float" to the left or right, as in 98.6 or 9.86). The conversion process requires a few valuable microseconds, and it takes several bytes of memory just to store a single floating point number.

Are Integers Faster?

Integer variables can greatly simpli-

fy matters for a computer. Because fractions aren't allowed, the operating system doesn't have to spin its wheels performing lengthy floating point conversions. And when the integers are limited to a range of -32,768 to 32,767, each number can be stored in only two bytes of memory.

Saving a few bytes of memory isn't a terribly important consideration anymore, now that nearly all personal computers come with at least 64K of RAM. But on certain computers, integer variables *can* help your programs run faster often significantly faster.

In Commodore BASIC, Applesoft, and IBM BASIC, you declare an integer variable by appending a percent symbol (%) to the variable name, as in X% = 10. (Integer variables are not available in TI BASIC or Atari BASIC, but are supported in Atari Microsoft BASIC.) A common mistake is to accidentally omit the % symbol in a statement somewhere, often leading to a mysterious error or unexpected result. Keep in mind that two variable names such as X and X% are treated by the computer as completely separate variables-they can store independent values and are as different as A and Z.

To test the performance of integer variables versus regular variables on your computer, enter this simple program:

- 10 FOR X=1 TO 32000
- 20 Y=Y+1 30 NEXT X
- 40 PRINT Y

Use a watch to measure how long this program takes to execute. Jot down the result, then change all three occurrences of Υ to integer variables by adding the % symbol. Now run the program and time it again.

Surprising Results

What happened? If you have an

IBM PC or PCjr, the program should run measurably faster. But if you have a Commodore or Apple, the program actually runs *slower*. What's going on?

Integer variables are indeed faster and more memory-efficient on IBM computers. But on Commo dore and Apple computers, integer variables actually execute slower and consume just as much memory as regular variables. This is true even though all three computers have versions of Microsoft BASIC. The reason is that the math routines in the Commodore and Apple are designed to handle floating-point numbers only. Therefore, the computer must convert integer variables into floating-point values, perform the math requested by the program, and then convert the results back into integers. All this conversion takes so long (in computer terms) that integer variables really aren't any faster than regular variables on Commodore or Apple computers.

It would seem, then, that integer variables are useless if you have a Commodore or Apple. But in fact, they can speed up your programs and save memory when used to construct *arrays*—a future column topic.

In the meantime, let's clear up another mystery raised by the above program. If you examine it closely, you might wonder why converting Y to Y% makes it run faster even on the IBM. Since the FOR-NEXT loop is incrementing Y by steps of one, Y is never a fraction, anyway—it's always a whole number. But computers handle all numeric variables as floating point numbers, even when the value is a whole number and not a fraction. Defining a variable as an integer variable forces the IBM to treat it as an integer. C

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