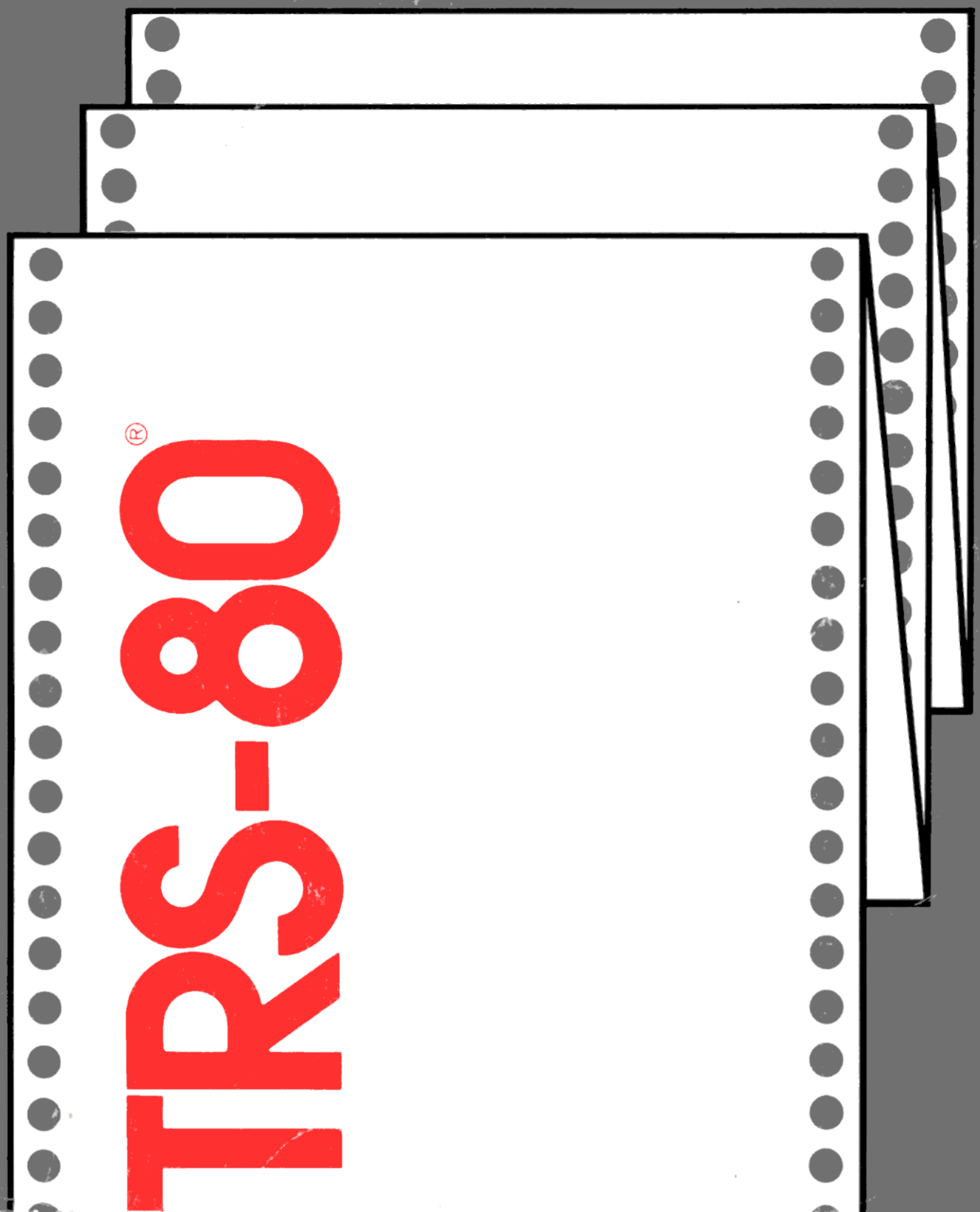
Mostly BASIC: Applications for Your TRS-80®

By Howard Berenbon



Mostly BASIC:

Applications for Your TRS-80®

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Howard Berenbon

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Preface

The microcomputer has come a long way since the 1975 introduction of the Altair 8800. It required program entry, in binary, through "front panel" switches. But now there are several different microcomputer systems to choose from. Most include a typewriter-type keyboard, some sort of video graphics display, and a BASIC language resident in ROM.

This book is written for the hobbyist who owns a Radio Shack TRS-80® computer. It's composed of 29 chapters filled with useful BASIC programs, and one assembly language program, for the home and office. It can help the hobbyist save money on energy usage, keep a record of medical expenses, teach foreign languages, and dial the telephone.

As an added feature, an educational Dungeons and Dragons* game program is included. It's called The Dungeon of Htam. It's a two level Dungeon where the player must answer math questions as he wanders through the maze. He receives gold for a correct response, and will lose gold for an incorrect response. His goal is to find the way out of the Dungeon, with as much gold as possible.

Also included is the Tarot Card Reader. It's a program based on the ancient deck of 78 cards, used in fortune-telling.

The programs are written in BASIC for the TRS-80. In some instances separate listings are included for Level I and Level II. In others, it will be necessary to have Level II to run the program. Many will RUN without modifications in other microcomputer BASICs. In some cases, the programs contain additional lines to insure some compatibility with the many dialects of BASIC.

The programs listed are only a fraction of the useful and practical programs that will be available to the computer hobbyist.

The application of the home computer is only limited by the imagination.

HOWARD BERENBON

* Dungeons and Dragons is a registered trademark of TSR Hobbies, Inc.

In memory of my grandfathers Morris Diem and Joe Berenbon.

To all my family and friends.

Contents

READ DATA FIX

Some TRS-80 Level II computers have a problem reading data from DATA statements. If your system has this problem, add the statement POKE 16553,255 to the beginning of programs using DATA statements. This will fix the problem.

SECTION I

Real Time Applications

This book begins with 5 "real time" applications for your microcomputer. They are a telephone dialer, a combination lock, a digital stopwatch, and a timer. Most require a simple hardware interface, for connection to the "outside world."

The cassette interface port is used to connect the TRS-80* to the "outside world." It requires a simple interface circuit, as shown in Fig. I-1, for

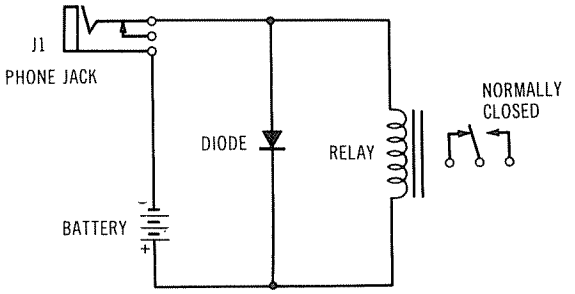

Fig. I-1. Interface circuit.

control applications. The circuit consists of a phone jack, one diode, a miniature relay, and a 9-volt battery (details on the cassette interface will be given later).

* TRS-80 is a registered trademark of Radio Shack.

CHAPTER 1

Basic Telephone Dialer

Here's an excellent application for your home computer. It's a telephone dialer program, written in BASIC, for your microcomputer. The program listing is given in Program 1-1.

THE PROGRAM

The program accesses phone numbers by comparing your string input (any string of characters) to the phone number list, stored in DATA statements beginning at program line 1000. If the entry is not found, then the program will display ENTRY NOT FOUND. When the entry is found, the number is dialed and displayed, one digit at a time. Pulses are outputed to the interface circuit through the i/o port of the computer, simulating the action of a rotary dial.

ENTERING PHONE NUMBERS

The phone numbers are entered in the following format:

1010 DATA "NAME",5,5,5,1,2,1,2,55

Separate each digit with a comma. The last entry must be 55. This is used to stop the dialing process. Also, the last data statement must be DATA "END". The number of phone numbers in your list is limited by your RAM memory size.

HARDWARE

A simple interface circuit is required to operate the dialer. It's connected in series with L1 of the phone, using the normally closed (N.C.) contacts of relay K1; it works with both dial and pushbutton phones (see Note 1-1).

NOTE 1-1

This device may be added to a privately owned home or company internal phone system. It is not intended to be connected directly to a subscriber's telephone set without compliance to local telephone company regulations. It is intended for demonstrating a practical application for the home computer.

INTERFACE

The interface circuit is shown in Fig. 1-1 and the parts list is given in Table 1-1. It consists of a subminiature phone jack, one 1N914 silicon diode, a 5 or 6 V dc miniature relay, and a 9 V dc transistor battery.

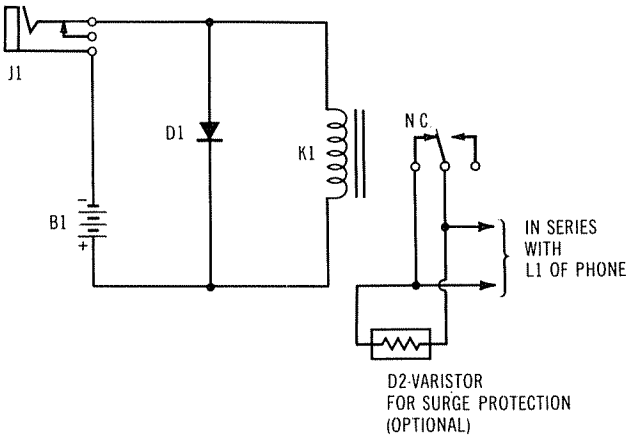

Fig. 1-1. Interface circuit.

The interface is connected to the cassette i/o port, FF. The subminiature phone plug, from the

Table 1-1. Parts List for Interface Circuit

Item	Description
B1	Battery, 9-volt transistor radio
D1	Diode, silicon, 1N914 or equiv
D2	Varistor, GE-V82ZA12 (Optional for surge protection)
J1	Jack, subminiature phone
K1	Relay 5- or 6-V dc, 500-ohm, spdt (Radio Shack 275-004 or equiv)
Misc	Battery clip

TRS-80 cassette interface cable, connects into the subminiature phone jack, J1, of the interface circuit. The statement OUT 255,04 activates the circuit, and OUT 255,00 deactivates it. The normally closed contacts (N.C.) of relay K1 are connected in series with L1 of the phone (see Note 1-1).

OPERATION

After you run the program, you have 3 options:

1. Print the phone number list by entering an L.
2. Access a phone number for dialing by entering a D.
3. Repeat the last number dialed by entering an R.

To dial a number, enter a D for the dial mode, then lift the telephone receiver and wait for a dial tone. Finally, enter the string access code of the phone number that you want dialed. See Fig. 1-2 for a sample run.

```
TRS-80 PHONE DIALER PROGRAM
LEVEL II BASIC
COPYRIGHT (C) 1979 BY HOWARD BERENSON

INSTRUCTIONS?

ENTER 'L' TO PRINT PHONE # LIST
ENTER 'D' TO DIAL A NUMBER
ENTER 'R' TO REPEAT LAST NUMBER
? L

                    PHONE NUMBER LIST

TIME              4  7  2  1  2  1  2
WEATHER           9  3  2  1  2  1  2
HARRY             5  5  5  1  2  8  2
FIRE              9  1  1
POLICE            9  1  1
LONG DISTANCE     1  2  1  3  5  5  5  1  2  1  2
RICK              5  5  5  5  2  1  9
DAVE              5  5  5  1  9  6  3
BRUCE             5  5  5  2  8  9  7
COMPUTER CENTER   5  5  5  2  1  5  1

INSTRUCTIONS?

ENTER 'L' TO PRINT PHONE # LIST
ENTER 'D' TO DIAL A NUMBER
ENTER 'R' TO REPEAT LAST NUMBER
? D


LIFT TELEPHONE RECEIVER BEFORE DIALING
WAIT FOR A DIAL TONE

ENTER ACCESS CODE (ANY STRING OF CHARACTERS)
? DAVE

SEARCHING LIST FOR DAVE

DIALING DAVE
 5  5  5  1  9  6  3
DIALING COMPLETE

INSTRUCTIONS?

ENTER 'L' TO PRINT PHONE # LIST
ENTER 'D' TO DIAL A NUMBER
ENTER 'R' TO REPEAT LAST NUMBER
?
```

Fig. 1-2. Basic telephone dialer sample run.

Program 1-1. Basic Telephone Dialer Program Listing, Level II

```
100 PRINT"TRS-80 PHONE DIALER PROGRAM"
110 PRINT"LEVEL II BASIC"
120 PRINT"COPYRIGHT (C) 1979 BY HOWARD BERENBON"
130 PRINT
140 GOTO 750
150 PRINT"LIFT TELEPHONE RECEIVER BEFORE DIALING"
160 PRINT"WAIT FOR A DIAL TONE"
170 PRINT
180 PRINT"ENTER ACCESS CODE (ANY STRING OF CHARACTERS)"
190 INPUT A$
200 CLS
210 PRINT"SEARCHING LIST FOR ";A$
220 READ C$
230 IF C$="END" THEN 440
240 IF C$<>A$ THEN 410
250 REM DIALING NUMBER FROM DATA
260 PRINT
270 PRINT"DIALING ";A$
280 READ C
290 IF C=55 THEN 710
300 PRINT C;
310 IF C=0 GOSUB 850
320 REM DIAL PHONE # 1 DIGIT AT A TIME
330 GOSUB 480
340 OUT 255,4
350 GOSUB 510
360 OUT 255,0
370 GOSUB 540
380 C=C-1
390 IF C=0 THEN 280
400 GOTO 340
410 READ C
420 IF C=55 THEN 220
430 GOTO 410
440 PRINT"ENTRY NOT FOUND"
450 RESTORE
460 PRINT
470 GOTO 140
480 FOR A=1 TO 110
490 NEXT A
500 RETURN
510 FOR A=1 TO 20
520 NEXT A
530 RETURN
540 FOR A=1 TO 13
550 NEXT A
```

Program 1-1—cont. Basic Telephone Dialer Program Listing, Level II

```
560 RETURN
570 PRINT TAB(20)"PHONE NUMBER LIST"
580 PRINT
590 READ A$
600 PRINT A$,
610 IF A$="END" THEN 680
620 READ A
630 IF A=55 THEN 660
640 PRINT A;
650 GOTO 620
660 GOSUB 870
670 GOTO 590
680 PRINT
690 RESTORE
700 RETURN
710 PRINT
720 PRINT"DIALING COMPLETE"
730 PRINT
740 RESTORE
750 PRINT"INSTRUCTIONS?"
760 PRINT
770 PRINT"ENTER 'L' TO PRINT PHONE # LIST"
780 PRINT"ENTER 'D' TO DIAL A NUMBER"
790 PRINT"ENTER 'R' TO REPEAT LAST NUMBER"
800 INPUT R$
810 IF R$="R" THEN 200
820 IF R$="D" THEN 150
830 IF R$="L" GOSUB 570
840 GOTO 750
850 C=10
860 RETURN
870 PRINT
880 FOR X=1 TO 400
890 NEXT X
900 RETURN
980 REM DATA STORAGE BEGINS AT LINE 1000
990 REM ENTER LAST DATA STATEMENT AS-DATA "END"
1000 DATA "TIME",4,7,2,1,2,1,2,55
1010 DATA "WEATHER",9,3,2,1,2,1,2,55
1020 DATA "HARRY",5,5,5,1,2,8,2,55
1030 DATA "FIRE",9,1,1,55
1040 DATA "POLICE",9,1,1,55
1050 DATA "LONG DISTANCE",1,2,1,3,5,5,5,1,2,1,2,55
1060 DATA "RICK",5,5,5,5,2,1,9,55
1070 DATA "DAVE",5,5,5,1,9,6,3,55
1080 DATA "BRUCE",5,5,5,2,8,9,7,55
1090 DATA "COMPUTER CENTER",5,5,5,2,1,5,1,55
1100 DATA "END"
```

CHAPTER 2

Assembly Language Telephone Dialer

Here's an assembly language program that converts your TRS-80 Level I microcomputer into a telephone dialer. See Program 2-1 for the program listing and Table 2-1 for the parts list. All that's required is a $4.00 interface connected to the remote control plug of your cassette interface cable. The interface consists of a relay, one diode, a phone jack, and a 9-volt transistor battery. See Fig. 2-1 for the interface circuit. It's connected in series with L1 of the phone and you're ready for dialing. See Note 2-1 before connecting the interface to the phone.

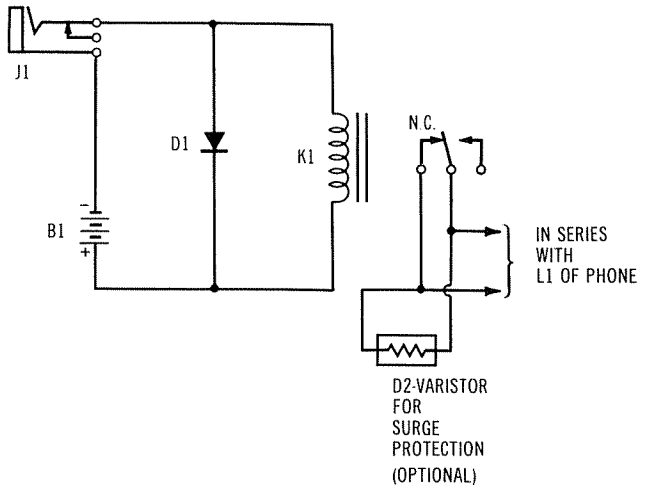

Fig. 2-1. Interface circuit.

NOTE 2-1

This device may be added to a privately owned home or company internal phone system. It is not intended to be connected directly to a subscriber's telephone set without compliance to local telephone company regulations. It is intended for demonstrating a practical application for the home computer.

The dialer program allows 20 variable length phone numbers to be accessed and dialed using a single letter code, A through T. It simulates the operation of a rotary dial, and will operate with both dial and pushbutton phones. An area of memory is set aside for storing the phone numbers, with 12 bytes per phone number the maximum. This allows for long distance numbers. Eleven bytes hold the number and the 12th is reserved for a carriage return (hex 0D) to flag the end of the phone number. If a 7 digit number is entered, then the 8th byte will contain the carriage return.

LOADING

The program begins at the address 4465. It requires approximately 1.5K bytes of RAM to run. It must be entered into your TRS-80 RAM in machine language (hexadecimal), using T-BUG or similar machine language monitor. T-BUG is available from Radio Shack.

SAVING THE DIALER

After loading the program, save it on cassette tape in the following format:

1. Load the starting address, 4465, at location 41FE and 41FF. Load 65 at 41FE and 44 at

Table 2-1. Parts List for Interface Circuit

Item	Description
B1	Battery, 9-volt transistor radio
D1	Diode, silicon, 1N914 or equiv
D2	Varistor, GE-V82ZA12 (Optional for surge protection)
J1	Jack, subminiature phone
K1	Relay 5- or 6-V dc, 500-ohm, spdt (Radio Shack 275-004 or equiv)
Misc	Battery clip

41FF. (Level I BASIC uses the address found at 41FE and 41FF as the starting address for the machine language tape.)
2. Save the program using the P command, beginning with the address 41FE and ending with 4900.

The tape will load through Level I BASIC by typing CLOAD. The dialer will begin after loading is complete.

THE DIALER SUBROUTINE

The dialer subroutine simulates the pulses created by a rotary dial, and outputs these pulses to the interface circuit for dialing. It is located from lines 2590 to 3210 of the assembly listing. This includes three delays: a 300 ms inter-digit delay; a 60 ms relay-off time delay; and a 40 ms relay-on time delay.

The ASCII digit is loaded into the accumulator from the number storage area, and the index register is incremented by one. The accumulator is tested for a carriage return (hex 0D), checking for the end of the phone number. If the carriage return is not found, then the number is logically AND with 0F. This drops the 3 from the ASCII number, leaving a number between 0 and 9 in the accumulator. If the number is a zero, it is replaced by 0A (decimal 10), since zero represents 10 pulses. The number is transferred to a register for counting the pulses. Each time the relay is pulsed, breaking and making the phone line, the counter is decremented by one. When zero is reached, a 300 ms delay is called. The process is repeated until a carriage return is detected.

OPERATING THE DIALER

The program is loaded from cassette by typing CLOAD. It takes about one minute to load, then starts automatically by printing C?. This indicates that the program is in the Control Mode. The program allows for three functions:

1. Load—L
2. Dial—D
3. Write to Cassette—W

Connection

Plug the cassette remote control subminiature plug, from the cassette interface cable, into J1 of the interface circuit. Connect the normally closed contacts (N.C.) of relay K1 in series with L1 of the phone. See Note 2-1. The interface may be left connected without disturbing normal telephone operation.

The Load Mode

Entering an L, when in the Control Mode, allows the entry of telephone numbers. The load function will allow entry of variable length phone numbers, up to 11 digits. After typing an L, an I and a space will be displayed. To enter the phone number, first type any letter from A through T. Then type the phone number desired. Do not leave spaces between digits, but a "-" may be used. Example:

C?LI B 555-1212

After entering the number press ENTER. The computer will print an I and a space, awaiting another letter and phone number. To exit the Load Mode, type an X after entering the last phone number. Entering an 11 digit number doesn't require pressing the ENTER key, but automatically enters the number for you.

There is an error erase feature built into the Load Mode. If a mistake is made while entering a number, it can be erased by typing the @ character. This will erase the digit from memory, but not from the display.

Load the 20 phone numbers beginning with A and ending with T. Keep a record of the name and number, that corresponds to each letter, on a sheet of paper. If you wish to change any of the numbers in your list, just enter the Load Mode and type the letter of the phone number to be changed. Then enter the new number.

The Dial Mode

Typing a D, when in the Control Mode, allows you to enter the Dial Mode. Any phone number that was previously loaded may be dialed. To dial, lift the telephone receiver and wait for a dial tone. Then enter the letter access code for the number you wish to dial. The number will be printed and dialed. After dialing is complete, an I and a space will be displayed. You can dial another number, or type X to exit the Dial Mode.

The Write to Cassette Mode

This feature allows you to save the entire program on cassette tape, including the phone number storage area. To write the program on cassette, set your recorder to record. Type a W, when in the Control Mode, to activate the recorder and save the program. The tape will load through Level I BASIC by typing CLOAD.

To exit the dialer, depress the TRS-80 reset button. This switch is located at the left rear of the keyboard, behind the expansion door. Your computer will return to BASIC.

Program 2-1. Assembly Language Telephone Dialer Program Listing

```
                00010 ;Z80 TELEPHONE DIALER PROGRAM
                00020 ;COPYRIGHT (C) 1978 BY HOWARD BERENBON
                00030 ;
                00040 ;TRS-80 LEVEL I VERSION
                00050 ;DIALS 20 PHONE NUMBERS
                00060 ;USING A SINGLE LETTER CODE, A-T
4465            00070         ORG 4465H;STARTING ADDRESS
4465 3E0C       00080 START   LD A,0CH;BEGIN
4467 D7         00090         RST 10H;CLEAR SCREEN
4468 3E1D       00100         LD A,1DH
446A D7         00110         RST 10H
446B D7         00120         RST 10H
446C D7         00130         RST 10H
446D 00         00140         NOP
446E 00         00150         NOP
446F 00         00160         NOP
4470 C37045     00170 STAR2   JP CTRL;TO CONTROL
0003            00180         DEFS 0003;STORAGE
0002            00190 DIG     DEFS 0002;DIGIT 4476
0002            00200 NUM     DEFS 0002;NUMBER 4478
000C            00210 A1      DEFS 0012;#A STORAGE, 12 BYTES 447A
000C            00220 B1      DEFS 0012;#B 4486
000C            00230 C1      DEFS 0012;#C 4492
000C            00240 D1      DEFS 0012;#D 449E
000C            00250 E1      DEFS 0012;#E 44AA
000C            00260 F1      DEFS 0012;#F 44B6
000C            00270 G1      DEFS 0012;#G 44C2
000C            00280 H1      DEFS 0012;#H 44CE
000C            00290 I1      DEFS 0012;#I 44DA
000C            00300 J1      DEFS 0012;#J 44E6
000C            00310 K1      DEFS 0012;#K 44F2
000C            00320 L1      DEFS 0012;#L 44FE
000C            00330 M1      DEFS 0012;#M 450A
000C            00340 N1      DEFS 0012;#N 4516
0004            00350         DEFS 0004;STORE4 4522
000C            00360 O1      DEFS 0012;#O 4526
000C            00370 P1      DEFS 0012;#P 4532
000C            00380 Q1      DEFS 0012;#Q 453E
000C            00390 R1      DEFS 0012;#R 454A
000C            00400 S1      DEFS 0012;#S 4556
000C            00410 T1      DEFS 0012;#T 4562
456E 00         00420         NOP
456F 00         00430         NOP
4570 3E43       00440 CTRL    LD A,43H;LOAD A WITH 'C'
4572 D7         00450         RST 10H;OUT 'C'
4573 3E3F       00460         LD A,3FH;LOAD A WITH '?'
4575 D7         00470         RST 10H;OUT '?'
4576 CD400B     00480 WA      CALL 0B40H;INPUT ROUTINE
4579 28FB       00490         JR Z,$-3;KEYBOARD SCAN-TO WA
457B FE4C       00500         CP 4CH;'L' LOAD?
457D 2811       00510         JR Z,$+19;TO LOAD
457F FE58       00520         CP 58H;'X' EXIT?
4581 28ED       00530         JR Z,$-17;TO CONTROL
4583 FE57       00540         CP 57H;'W' SAVE?
4585 CA4048     00550         JP Z,SAV
4588 FE44       00560         CP 44H;'D' DIAL?
```

Program 2-1—cont. Assembly Language Telephone Dialer Program Listing

```
458A CA9946    00570          JP Z,DIAL
458D C37045    00580          JP CTRL;TO CONTROL
4590 3E49      00590 LOAD     LD A,49H;LOAD A WITH 'I'
4592 D7        00600          RST 10H;OUT 'I'
4593 3E20      00610          LD A,20H;LOAD A WITH 'SP'
4595 D7        00620          RST 10H;OUT SPACE
4596 CD400B    00630 LOADA    CALL 0B40H;INPUT ROUTINE
4599 28FB      00640          JR Z,$-3;TO LOADA
459B FE58      00650          CP 58H;'X' EXIT?
459D CA7045    00660          JP Z,CTRL
45A0 FE41      00670 NA       CP 41H;'A'?
45A2 C2AB45    00680          JP NZ,NB
45A5 217A44    00690          LD HL,447AH;LOAD #A ADDR
45A8 C37746    00700          JP CTLD;INPUT #
45AB FE42      00710 NB       CP 42H;'B' ?
45AD C2B645    00720          JP NZ,NC1
45B0 218644    00730          LD HL,4486H;LOAD #B ADDR
45B3 C37746    00740          JP CTLD;INPUT #
45B6 FE43      00750 NC1       CP 43H;'C' ?
45B8 C2C145    00760          JP NZ,ND
45BB 219244    00770          LD HL,4492H;LOAD #C ADDR
45BE C37746    00780          JP CTLD;INPUT #
45C1 FE44      00790 ND       CP 44H;'D' ?
45C3 C2CC45    00800          JP NZ,NE
45C6 219E44    00810          LD HL,449EH;LOAD #D ADDR
45C9 C37746    00820          JP CTLD;INPUT #
45CC FE45      00830 NE       CP 45H;'E' ?
45CE C2D745    00840          JP NZ,NF
45D1 21AA44    00850          LD HL,44AAH;LOAD #E ADDR
45D4 C37746    00860          JP CTLD;INPUT #
45D7 FE46      00870 NF       CP 46H;'F' ?
45D9 C2E245    00880          JP NZ,NG
45DC 21B644    00890          LD HL,44B6H;LOAD #F ADDR
45DF C37746    00900          JP CTLD;INPUT #
45E2 FE47      00910 NG       CP 47H;'G' ?
45E4 2006      00920          JR NZ,$+8;TO NH
45E6 21C244    00930          LD HL,44C2H;LOAD #G ADDR
45E9 C37746    00940          JP CTLD;INPUT #
45EC FE48      00950 NH       CP 48H;'H' ?
45EE 2006      00960          JR NZ,$+8;TO NI
45F0 21CE44    00970          LD HL,44CEH;LOAD #H ADDR
45F3 C37746    00980          JP CTLD;INPUT #
45F6 FE49      00990 NI       CP 49H;'I' ?
45F8 C20146    01000          JP NZ,NJ
45FB 21DA44    01010          LD HL,44DAH;LOAD #I ADDR
45FE C37746    01020          JP CTLD;INPUT #
4601 FE4A      01030 NJ       CP 4AH;'J' ?
4603 C20C46    01040          JP NZ,NK
4606 21E644    01050          LD HL,44E6H;LOAD #J ADDR
4609 C37746    01060          JP CTLD;INPUT #
460C FE4B      01070 NK       CP 4BH;'K' ?
460E C21746    01080          JP NZ,NL
4611 21F244    01090          LD HL,44F2H;LOAD #K ADDR
4614 C37746    01100          JP CTLD;INPUT #
```

Program 2-1—cont. Assembly Language Telephone Dialer Program Listing

```
4617 FE4C     01110 NL    CP 4CH;'L' ?
4619 C22246   01120       JP NZ,NM
461C 21FE44   01130       LD HL,44FEH;LOAD #L ADDR
461F C37746   01140       JP CTLD;INPUT #
4622 FE4D     01150 NM    CP 4DH;'M' ?
4624 C22D46   01160       JP NZ,NN
4627 210A45   01170       LD HL,450AH;LOAD #M ADDR
462A C37746   01180       JP CTLD;INPUT #
462D FE4E     01190 NN    CP 4EH;'N' ?
462F C23846   01200       JP NZ,NO
4632 211645   01210       LD HL,4516H;LOAD #N ADDR
4635 C37746   01220       JP CTLD;INPUT #
4638 FE4F     01230 NO    CP 4FH;'O' ?
463A C24346   01240       JP NZ,NP
463D 212645   01250       LD HL,4526H;LOAD #O ADDR
4640 C37746   01260       JP CTLD;INPUT #
4643 FE50     01270 NP    CP 50H;'P' ?
4645 C24E46   01280       JP NZ,NQ
4648 213245   01290       LD HL,4532H;LOAD #P ADDR
464B C37746   01300       JP CTLD;INPUT #
464E FE51     01310 NQ    CP 51H;'Q' ?
4650 C25946   01320       JP NZ,NR
4653 213E45   01330       LD HL,453EH;LOAD #Q ADDR
4656 C37746   01340       JP CTLD;INPUT #
4659 FE52     01350 NR    CP 52H;'R' ?
465B C26446   01360       JP NZ,NS
465E 214A45   01370       LD HL,454AH;LOAD #R ADDR
4661 C37746   01380       JP CTLD;INPUT #
4664 FE53     01390 NS    CP 53H;'S' ?
4666 C26F46   01400       JP NZ,NT
4669 215645   01410       LD HL,4556H;LOAD #S ADDR
466C C37746   01420       JP CTLD;INPUT #
466F FE54     01430 NT    CP 54H;'T' ?
4671 C27045   01440       JP NZ,CTRL
4674 216245   01450       LD HL,4562H;LOAD #T ADDR
4677 060C     01460 CTLD  LD B,0CH;SET INPUT CTR TO 12
4679 3E20     01470       LD A,20H
467B D7       01480       RST 10H;OUT SPACE
467C CD400B   01490 CALL  CALL 0B40H;INPUT ROUTINE
467F 28FB     01500       JR Z,$-3;TO CALL
4681 FE2D     01510       CP 2DH;'-' ?
4683 28F7     01520       JR Z,$-7; IGNORE '-' TO CALL
4685 FE40     01530       CP 40H;'@' ?
4687 CA3A48   01540       JP Z,ERA;ERASE ENTRY
468A 77       01550       LD (HL),A;STORE DIGIT
468B 23       01560       INC HL;INCREMENT POINTER
468C FE0D     01570       CP 0DH;LOOK FOR 'ENTER'
468E CA9045   01580       JP Z,LOAD;PHONE NUMBERED ENTERED
4691 C36F48   01590       JP FX;TEST FOR TOO MANY DIGITS
0005          01600       DEFS 0005;STORES 4694
4699 3E49     01610 DIAL  LD A,49H;LOAD AN 'I'
469B D7       01620       RST 10H;OUT 'I'
469C 3E20     01630       LD A,20H;LOAD A 'SP'
469E D7       01640       RST 10H;OUT SPACE
469F CD400B   01650 WAIT  CALL 0B40H;INPUT ROUTINE
46A2 28FB     01660       JR Z,$-3;TO WAIT
46A4 FE41     01670       CP 41H;'A' ?
46A6 CA3047   01680       JP Z,A2;DIAL #
```

Program 2-1—cont. Assembly Language Telephone Dialer Program Listing

```
46A9 FE42     01690        CP 42H;'B' ?
46AB CA3947   01700        JP Z,B2;DIAL #
46AE FE43     01710        CP 43H;'C' ?
46B0 00       01715        NOP
46B1 CA3F47   01720        JP Z,C2;DIAL #
46B4 FE44     01730        CP 44H;'D' ?
46B6 CA4547   01740        JP Z,D2;DIAL #
46B9 FE45     01750        CP 45H;'E' ?
46BB CA4B47   01760        JP Z,E2;DIAL #
46BE FE46     01770        CP 46H;'F' ?
46C0 CA5147   01780        JP Z,F2;DIAL #
46C3 FE47     01790        CP 47H;'G' ?
46C5 CA5747   01800        JP Z,G2;DIAL #
46C8 FE48     01810        CP 48H;'H' ?
46CA CA5D47   01820        JP Z,H2;DIAL #
46CD FE49     01830        CP 49H;'I' ?
46CF CA6347   01840        JP Z,I2;DIAL #
46D2 FE4A     01850        CP 4AH;'J' ?
46D4 CA6947   01860        JP Z,J2;DIAL #
46D7 FE4B     01870        CP 4BH;'K' ?
46D9 CA6F47   01880        JP Z,K2;DIAL #
46DC FE4C     01890        CP 4CH;'L' ?
46DE CA7547   01900        JP Z,L2;DIAL #
46E1 FE4D     01910        CP 4DH;'M' ?
46E3 CA7B47   01920        JP Z,M2;DIAL #
46E6 FE4E     01930        CP 4EH;'N' ?
46E8 CA8147   01940        JP Z,N2;DIAL #
46EB FE4F     01950        CP 4FH;'O' ?
46ED CA8747   01960        JP Z,O2;DIAL #
46F0 FE50     01970        CP 50H;'P' ?
46F2 CA8D47   01980        JP Z,P2;DIAL #
46F5 FE51     01990        CP 51H;'Q' ?
46F7 CA9347   02000        JP Z,Q2;DIAL #
46FA FE52     02010        CP 52H;'R' ?
46FC CA9947   02020        JP Z,R2;DIAL #
46FF FE53     02030        CP 53H;'S' ?
4701 CA9F47   02040        JP Z,S2;DIAL #
4704 FE54     02050        CP 54H;'T' ?
4706 CAA547   02060        JP Z,T2;DIAL #
4709 CD1E48   02070        CALL RET
470C CD1E48   02080        CALL RET
470F 00       02090        NOP
4710 FE58     02100        CP 58H;'X' EXIT?
4712 CA7045   02110        JP Z,CTRL;TO CONTROL
4715 3E3F     02120        LD A,3FH;LOAD '?'
4717 D7       02130        RST 10H;OUT '?'
4718 C39946   02140        JP DIAL
471B CD3748   02150        CALL RET2
471E 00       02160        NOP
471F 00       02170        NOP
0010          02175        DEFS 0016;STORE16 4720
4730 217A44   02180 A2     LD HL,A1
4733 CDAB47   02190 ACT    CALL DIALI;PRINT # & DIAL
4736 C39946   02200        JP DIAL
4739 218644   02210 B2     LD HL,B1
473C C33347   02220        JP ACT
```

Program 2-1—cont. Assembly Language Telephone Dialer Program Listing

```
473F 219244    02230 C2     LD HL,C1
4742 C33347    02240        JP ACT
4745 219E44    02250 D2     LD HL,D1
4748 C33347    02260        JP ACT
474B 21AA44    02270 E2     LD HL,E1
474E C33347    02280        JP ACT
4751 21B644    02290 F2     LD HL,F1
4754 C33347    02300        JP ACT
4757 21C244    02310 G2     LD HL,G1
475A C33347    02320        JP ACT
475D 21CE44    02330 H2     LD HL,H1
4760 C33347    02340        JP ACT
4763 21DA44    02350 I2     LD HL,I1
4766 C33347    02360        JP ACT
4769 21E644    02370 J2     LD HL,J1
476C C33347    02380        JP ACT
476F 21F244    02390 K2     LD HL,K1
4772 C33347    02400        JP ACT
4775 21FE44    02410 L2     LD HL,L1
4778 C33347    02420        JP ACT
477B 210A45    02430 M2     LD HL,M1
477E C33347    02440        JP ACT
4781 211645    02450 N2     LD HL,N1
4784 C33347    02460        JP ACT
4787 212645    02470 O2     LD HL,O1
478A C33347    02480        JP ACT
478D 213245    02490 P2     LD HL,P1
4790 C33347    02500        JP ACT
4793 213E45    02510 Q2     LD HL,Q1
4796 C33347    02520        JP ACT
4799 214A45    02530 R2     LD HL,R1
479C C33347    02540        JP ACT
479F 215645    02550 S2     LD HL,S1
47A2 C33347    02560        JP ACT
47A5 216245    02570 T2     LD HL,T1
47A8 C33347    02580        JP ACT
47AB 227844    02590 DIALI  LD (NUM),HL;SAVE HL
47AE 00        02600        NOP
47AF 00        02610        NOP
47B0 CD5A48    02620        CALL PRINS;PRINT #
47B3 2A7844    02630 UP1    LD HL,(NUM);GET # ADDR
47B6 7E        02640        LD A,(HL);LOAD A WITH DIGIT
47B7 23        02650        INC HL;POINT TO NEXT DIGIT
47B8 227844    02660        LD (NUM),HL;SAVE POINTER
47BB FE30      02670        CP 30H;LOOK FOR ASCII '0'
47BD 2811      02680        JR Z,$+19;TO LD10
47BF FE0D      02690        CP 0DH;'CR' ?
47C1 CAD547    02700        JP Z,DONE
47C4 E60F      02710        AND 0FH;CVT ASCII TO DIGIT
47C6 327644    02720 LOADI  LD (DIG),A;SAVE DIGIT
47C9 57        02730        LD D,A;A TO D
47CA CDD847    02740        CALL DELYP;DIAL DIGIT
```

Program 2-1—cont. Assembly Language Telephone Dialer Program Listing

```
47CD C3B347    02750        JP UP1;CONTINUE
47D0 3E0A      02760 LD10   LD A,0AH;LOAD 10 DECIMAL
47D2 C3C647    02770        JP LOADI;CONTINUE
47D5 C9        02780 DONE   RET
0002           02790 NOZ    DEFS 0002;STORE NOZ 47D6
47D8 06FA      02800 DELYP  LD B,0FAH;300 MS DELAY
47DA 05        02810 DE1    DEC B
47DB CAF347    02820        JP Z,DEL
47DE 0E1A      02830        LD C,1AH
47E0 0D        02840 AG     DEC C
47E1 CADA47    02850        JP Z,DE1;LOOP 300 MS
47E4 32D647    02860        LD (NOZ),A;WASTE TIME
47E7 22D647    02870        LD (NOZ),HL
47EA 32D647    02880        LD (NOZ),A
47ED 32D647    02890        LD (NOZ),A
47F0 C3E047    02900        JP AG;LOOP 1 MS
47F3 3E04      02910 DEL    LD A,04H
47F5 D3FF      02920        OUT (0FFH),A;RELAY ON
47F7 CD0648    02930        CALL MS60;60 MS DELAY
47FA 3E00      02940        LD A,00H
47FC D3FF      02950        OUT (0FFH),A;RELAY OFF
47FE CD1F48    02960        CALL MS40;40 MS DELAY
4801 15        02970        DEC D;DECREMENT DIGIT
4802 C2F347    02980        JP NZ,DEL;PULSE RELAY
4805 C9        02990        RET
4806 063D      03000 MS60   LD B,3DH;60 MS DELAY
4808 05        03010 DT     DEC B
4809 CA1E48    03020        JP Z,RET
480C 0E1C      03030        LD C,1CH
480E 0D        03040 GN     DEC C
480F CA0848    03050        JP Z,DT;LOOP TO 60 MS
4812 32D647    03060        LD (NOZ),A;WASTE TIME
4815 22D647    03070        LD (NOZ),HL
4818 32D647    03080        LD (NOZ),A
481B C30E48    03090        JP GN;LOOP TO 1 MS
481E C9        03100 RET    RET
481F 0627      03110 MS40   LD B,27H;40 MS DELAY
4821 05        03120 CT     DEC B
4822 CA3748    03130        JP Z,RET2
4825 0E1C      03140        LD C,1CH
4827 0D        03150 AND    DEC C
4828 CA2148    03160        JP Z,CT;LOOP TO 40 MS
482B 323848    03170        LD (NON),A;WASTE TIME
482E 223848    03180        LD (NON),HL
4831 323848    03190        LD (NON),A
4834 C32748    03200        JP AND;LOOP TO 1 MS
4837 C9        03210 RET2   RET
0002           03220 NON    DEFS 0002;STORE NON 4838
483A 2B        03230 ERA    DEC HL
483B 04        03240        INC B
483C C37C46    03250        JP CALL
483F 00        03260        NOP
```

Program 2-1—cont. Assembly Language Telephone Dialer Program Listing

```
4840 3E65      03270 SAV   LD A,65H;SET START ADDR
4842 32FE41    03280       LD (41FEH),A
4845 3E44      03290       LD A,44H
4847 32FF41    03300       LD (41FFH),A
484A CDE90F    03310       CALL 0FE9H;ON RECORDER
484D 22FE41    03320       LD (41FEH),HL;TAPE START ADDR
4850 ED530049  03330       LD (4900H),DE;END ADDR
4854 CD4B0F    03340       CALL 0F4BH;SAVE DATA
4857 C37045    03350       JP CTRL
485A CD6048    03360 PRINS CALL OS;OUT SPACE
485D CD6448    03370       CALL PRI;PRINT PHONE #
4860 3E20      03380 OS    LD A,20H;LOAD A 'SP'
4862 D7        03390       RST 10H;OUT SPACE
4863 C9        03400       RET
4864 7E        03410 PRI   LD A,(HL);GET DIGIT
4865 D7        03420       RST 10H;PRINT DIGIT
4866 FE0D      03430       CP 0DH;'CR' ?-END OF #
4868 2803      03440       JR Z,$+5;TO RETN
486A 23        03450       INC HL;POINT TO NEXT DIGIT
486B C36448    03460       JP PRI;CONTINUE
486E C9        03470 RETN  RET
486F 05        03480 FX    DEC B;CHECK DIGIT INPUT
4870 78        03490       LD A,B
4871 FE01      03500       CP 01H;'1' ?
4873 C27C46    03510       JP NZ,CALL
4876 3E0D      03520       LD A,0DH;LOAD 'CR'
4878 77        03530       LD (HL),A;STORE 'CR'-END OF #
4879 3E0D      03540       LD A,0DH;LOAD 'CR'
487B D7        03550       RST 10H;OUT 'CR'
487C C39045    03560       JP LOAD;CONTINUE LOADING
0000           03570       END
00000 TOTAL ERRORS
RETN    486E
PRI     4864
OS      4860
NON     4838
AND     4827
CT      4821
GN      480E
DT      4808
MS40    481F
MS60    4806
AG      47E0
DEL     47F3
DE1     47DA
NOZ     47D6
LD10    47D0
DELYP   47D8
LOADI   47C6
DONE    47D5
UP1     47B3
PRINS   485A
DIALI   47AB
```

Program 2-1—cont. Assembly Language Telephone Dialer Program Listing

```
ACT     4733
RET2    4837
RET     481E
T2      47A5
S2      479F
R2      4799
Q2      4793
P2      478D
O2      4787
N2      4781
M2      477B
L2      4775
K2      476F
J2      4769
I2      4763
H2      475D
G2      4757
F2      4751
E2      474B
D2      4745
C2      473F
B2      4739
A2      4730
WAIT    469F
FX      486F
ERA     483A
CALL    467C
NT      466F
NS      4664
NR      4659
NQ      464E
NP      4643
NO      4638
NN      462D
NM      4622
NL      4617
NK      460C
NJ      4601
NI      45F6
NH      45EC
NG      45E2
NF      45D7
NE      45CC
ND      45C1
NC1     45B6
CTLD    4677
NB      45AB
NA      45A0
LOADA   4596
LOAD    4590
DIAL    4699
```

Program 2-1—cont. Assembly Language Telephone Dialer Program Listing

```
SAV     4840
WA      4576
T1      4562
S1      4556
R1      454A
Q1      453E
P1      4532
O1      4526
N1      4516
M1      450A
L1      44FE
K1      44F2
J1      44E6
I1      44DA
H1      44CE
G1      44C2
F1      44B6
E1      44AA
D1      449E
C1      4492
B1      4486
A1      447A
NUM     4478
DIG     4476
CTRL    4570
STAR2   4470
START   4465
```

CHAPTER 3

Combination Lock

The Combination Lock program will allow your computer to accept input of a combination, to activate a control circuit. It can be used to open a safe, turn on a light, switch on your tv, or unlock a door. The program is written in BASIC for your microcomputer. An interface circuit is required for operation. See Program 3-1 for TRS-80 Level I program listing, and Program 3-2 for TRS-80 Level II listing.

INTERFACE

The interface and control circuits are shown in Fig. 3-1. The parts list is given in Table 3-1. The cassette i/o port is used to activate the circuit. The subminiature phone plug, from the TRS-80 cassette interface cable, connects into the subminiature phone jack, J1, of the interface circuit. The normally open contacts (N.O.) of relay K1 operate the control circuit. Relay K2 is a power relay for controlling lights or appliances. The Level I program uses the statement INPUT #A to activate the circuit, and the Level II version uses the statement OUT 255,4 to activate it.

LEVEL I PROGRAM

The Level I program allows entry of up to 18 digits for the combination. Entering a 1 will allow you to load a new combination. This entry is in the form: X,Y,Z. Limit to 6 digits per variable. Entering a 2 will allow access to the entry mode for operating the control circuit. Enter the combination as in the following examples:

21034,111,1802

or

2153,101,0

The two commas are required; all three variables require an input.

After entering the access mode, the program is locked into that mode. Entering the correct combination will activate the control circuit, and OPEN will be displayed. The circuit will remain activated until the TRS-80 reset pushbutton is depressed. If there is an error in entry, it will display ERROR, RE-ENTER. After 3 unsuccessful tries, it will display NO ENTRY. Depress the BREAK key to return to READY.

LEVEL II PROGRAM

The Level II version allows entry of numbers and letters for the combination, limited to 250 characters. Enter the combination as in the following example:

2054ABCDEFGH

This program is similar to the Level I version, except that you enter a C to deactivate the control circuit.

USES

Computerized Lock

A solenoid may be used in place of K2, to design a computer activated lock. See Fig. 3-2 for the

Table 3-1. Parts Lists for Interface and Control Circuits

Item	Description
B1	Battery, 9-volt transistor
B2	Battery, 6-volt lantern
D1, D2	Diode, silicon 1N914 or equiv
J1	Jack, subminiature phone
K1	Relay 5- or 6-V dc, 500-ohm, spdt (Radio Shack 275-004 or equiv)
K2	Relay 6-V dc, 350-ohm, spdt, contacts rated at 3.5A, 117 V ac (Allied Electronics 802-1880, series 1345 or equiv)
Misc	AC outlet box; 117 V ac line cord with plug; battery clips

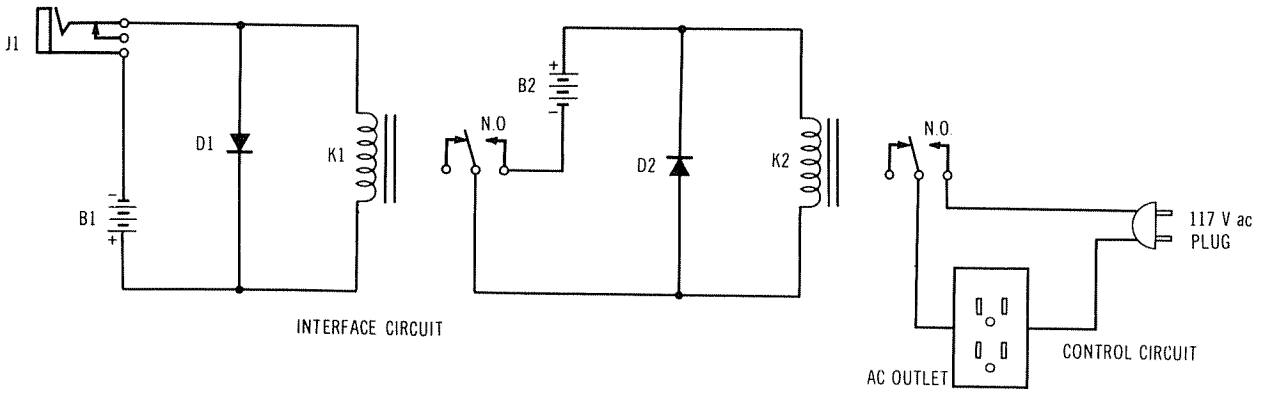

Fig. 3-1. Interface and control circuits.

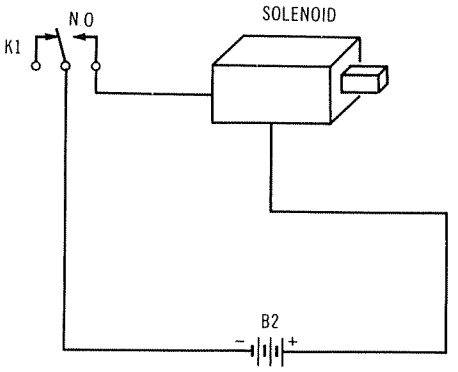

Fig. 3-2. Solenoid circuit for computerized lock.

```
COMBINATION LOCK:TRS-80 LEVEL II
COPYRIGHT (C) 1980 BY HOWARD BERENBON

ENTER MODE?
'1' TO LOAD NEW COMBINATION
'2' TO ACCESS COMBINATION LOCK
? 1
LOAD NEW COMBINATION
ENTER UP TO 250 CHARACTERS,
LETTERS AND/OR NUMBERS
? 2054ABCDEFGH


COMBINATION LOADED
ENTER MODE?
'1' TO LOAD NEW COMBINATION
'2' TO ACCESS COMBINATION LOCK
? 2



ACCESS MODE

ENTER COMBINATION
? 2054ABCDEFGH
OPEN
ENTER A 'C' TO CLOSE
? C
CLOSED


ACCESS MODE

ENTER COMBINATION
?
```

Fig. 3-3. Combination lock sample run.

circuit changes. K1 and B2 are the same as in Fig. 3-2. The solenoid is a 6-volt, 2-oz at ¼" limit (Allied Electronics 802-1111, or equiv). The plunger of the solenoid is used to latch the lock on a door or safe.

A "foolproof" system would require an external keypad for entering the combination. This will eliminate direct access to the computer, to prevent tampering with the program.

Light or Appliance Lock

A light or appliance may be activated with the program. The appliance is plugged into the ac outlet box for activation.

See Fig. 3-3 for a sample run.

Program 3-1. Level I Combination Lock Program Listing

```
100 PRINT"COMBINATION LOCK:TRS-80 LEVEL I"
110 PRINT"COPYRIGHT (C) 1980 BY HOWARD BERENBON"
120 PRINT
130 PRINT"ENTER MODE?"
140 PRINT"'1' TO LOAD NEW COMBINATION"
150 PRINT"'2' TO ACCESS COMBINATION LOCK"
160 INPUT A
170 IF A=1 THEN 200
180 IF A=2 THEN 260
190 GOTO 130
200 PRINT"LOAD NEW COMBINATION"
210 PRINT"ENTER UP TO 6 DIGITS PER VARIABLE"
220 PRINT"IN THE FORM: X,Y,Z"
230 INPUT X,Y,Z
240 PRINT"COMBINATION LOADED"
250 GOTO 130
260 CLS
270 PRINT"ACCESS MODE"
280 PRINT
290 PRINT"ENTER COMBINATION"
300 N=3
310 INPUT U,V,W
320 N=N-1
330 IF (X=U) * (Y=V) * (Z=W) THEN 350
340 GOTO 390
350 GOSUB 420
360 INPUT #A
370 PRINT"NO ENTRY"
380 GOTO 380
390 IF N=0 THEN 370
400 PRINT"ERROR, RE-ENTER"
410 GOTO 310
420 PRINT"OPEN"
430 RETURN
```

Program 3-2. Level II Combination Lock Program Listing

```
100 PRINT"COMBINATION LOCK:TRS-80 LEVEL II"
110 PRINT"COPYRIGHT (C) 1980 BY HOWARD BERENBON"
120 PRINT:CLEAR 600
130 PRINT"ENTER MODE?"
140 PRINT"'1' TO LOAD NEW COMBINATION"
150 PRINT"'2' TO ACCESS COMBINATION LOCK"
160 INPUT A
170 IF A=1 THEN 200
180 IF A=2 THEN 260
190 GOTO 130
200 PRINT"LOAD NEW COMBINATION"
210 PRINT"ENTER UP TO 250 CHARACTERS,"
220 PRINT"LETTERS AND/OR NUMBERS"
230 INPUT A$
240 PRINT"COMBINATION LOADED"
250 GOTO 130
260 CLS
270 PRINT"ACCESS MODE"
280 PRINT
290 PRINT"ENTER COMBINATION"
300 N=3
310 N=N-1
320 INPUT B$
330 IF A$<>B$ THEN 460
340 GOSUB 490
350 OUT 255,4
360 PRINT"ENTER A 'C' TO CLOSE"
370 INPUT C$
380 IF C$<>"C" THEN 360
390 OUT 255,0
400 PRINT"CLOSED"
410 FOR A=1TO990
420 NEXT A
430 GOTO 260
440 PRINT"NO ENTRY"
450 GOTO 450
460 IF N=0 THEN 440
470 PRINT"ERROR, RE-ENTER"
480 GOTO 310
490 PRINT"OPEN"
500 RETURN
```

CHAPTER 4

Digital Stopwatch

This program turns your system into a digital stopwatch. It's written in BASIC for your microcomputer. See Program 4-1 for the program listing.

THE PROGRAM

The program displays the HRS MIN SEC on the display beginning with 0 HRS 0 MIN 0 SEC. It will RUN to 1000 before it resets to zero. See Fig. 4-1 for a sample run. To stop the stopwatch press BREAK on the TRS-80. A suggested use would be as a long distance phone call timer.

```
DIGITAL STOPWATCH
TRS-80 LEVEL II
COPYRIGHT (C) 1980 BY HOWARD BERENBON

PRESS 'BREAK' TO STOP TIMER

PRESS 'ENTER' TO START
?



     DIGITAL STOPWATCH



HRS  0  : MIN  1  : SEC  8
```

Fig. 4-1. Digital stop watch sample run.

Program 4-1. Digital Stop Watch Program Listing, Level II

```
100 CLS
110 PRINT"DIGITAL STOPWATCH"
120 PRINT"TRS-80 LEVEL II"
130 PRINT"COPYRIGHT (C) 1980 BY HOWARD BERENBON"
140 PRINT
150 PRINT"PRESS 'BREAK' TO STOP TIMER"
160 PRINT
170 PRINT"PRESS 'ENTER' TO START"
180 INPUT A$
190 W=0
200 T=1000
210 X=0:Y=0:Z=0
220 CLS
230 PRINT CHR$(23)
240 PRINT TAB(5)"DIGITAL STOPWATCH"
250 PRINT @ 448,"HRS ";Z;" : MIN ";Y;" : SEC ";X,
260 GOSUB 340
270 X=X+1
280 IF X=60 THEN 300
290 GOTO 250
300 X=0
310 Y=Y+1
320 IF Y=60 THEN 370
330 GOTO 250
340 FOR A=1 TO 330
350 NEXT A
360 RETURN
370 Y=0
380 Z=Z+1
390 IF Z=T THEN 210
400 GOTO 250
```

CHAPTER 5

The Time Machine

Here's a program that allows your computer to operate as a 24-hour digital clock and timer, for controlling lights or appliances plugged into a power control circuit. It's written in BASIC for your microcomputer. A simple interface circuit is required for interfacing your computer to the "outside world." See Program 5-1 for the program listing.

THE PROGRAM

The program accepts entry of the 24-hour time, the time for circuit activation, and the time for circuit deactivation. After entering a 1 to begin, the program displays the 24-hour time, the activation time, and the deactivation time in hours and minutes. After each minute has passed, the display is updated. When the timer reaches the activation time, the circuit is activated, and CIRCUIT ACTIVATED is displayed. When it reaches the deactivation time, the circuit is deactivated, and CIRCUIT DEACTIVATED is displayed. See Fig. 5-1 for a sample run.

INTERFACE

The interface circuit and control circuit are shown in Fig. 5-2. The parts list is given in Table 5-1. The cassette i/o port is used to activate the circuit. The subminiature phone plug, from the TRS-80 cassette interface cable, connects into the subminiature phone jack, J1, of the interface circuit. The statement OUT 255,4 activates the circuit, and OUT 255,0 deactivates it. The normally open contacts (N.O.) of relay K1 operate the power control circuit, for controlling lights or appliances.

Table 5-1. Parts Lists for Interface and Control Circuits

Item	Description
B1	Battery, 9-volt transistor
B2	Battery, 6-volt lantern
D1, D2	Diode, silicon 1N914 or equiv
J1	Jack, subminiature phone
K1	Relay 5- or 6-V dc, 500-ohm, spdt (Radio Shack 275-004 or equiv)
K2	Relay 6-V dc, 350-ohm, spdt, contacts rated at 3.5A, 117 V ac (Allied Electronics 802-1880, series 1345 or equiv)
Misc	Ac outlet box; 117 V ac line cord with plug; battery clips

```
THE TIME MACHINE:TRS-80 LEVEL II
COPYRIGHT (C) 1980 BY HOWARD BERENBON

THE TIME MACHINE WILL TURN YOUR
SYSTEM INTO A TIMER, FOR CONTROLLING
LIGHTS OR APPLIANCES.

ENTER THE CURRENT 24 HOUR TIME IN HRS
AND MINUTES (HRS,MIN)
? 15,20

ENTER THE ACTIVATION TIME (24 HR)
IN HRS AND MINUTES (HRS,MIN)
? 21,00


ENTER THE DEACTIVATION TIME (24 HR)
IN HRS AND MINUTES (HRS,MIN)
? 25,15


ENTER A '1' TO START THE TIMER
? 1









THE TIME MACHINE
24 HR TIME
HRS    15    :  MIN    20

ACTIVATION TIME
HRS    21    :  MIN    0

DEACTIVATION TIME
HRS    25    :  MIN    15
```

Fig. 5-1. Time machine sample run.

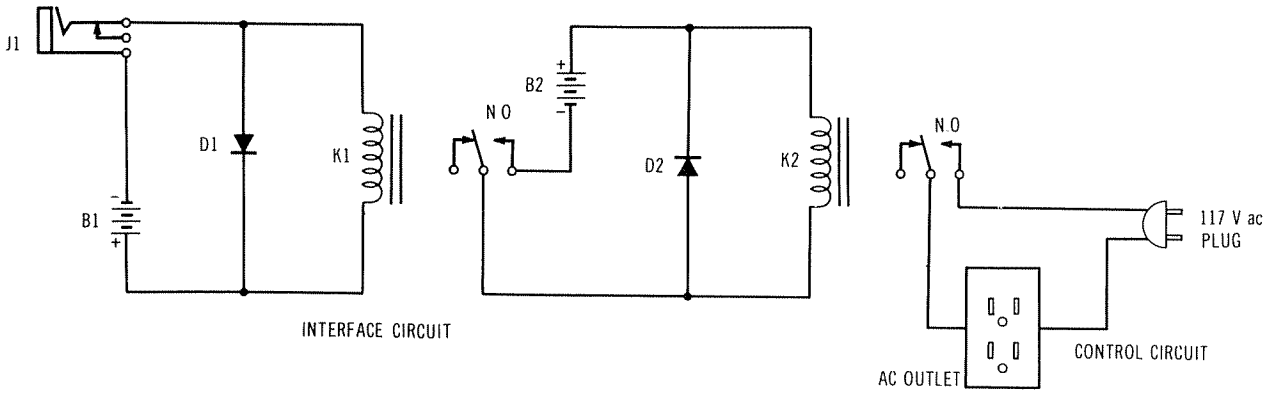

Fig. 5-2. Interface and control circuits.

Program 5-1. Time Machine Program Listing, Level II

```
100 CLS
110 PRINT"THE TIME MACHINE:TRS-80 LEVEL II"
120 PRINT"COPYRIGHT (C) 1980 BY HOWARD BERENBON"
130 PRINT
140 PRINT"THE TIME MACHINE WILL TURN YOUR"
150 PRINT"SYSTEM INTO A TIMER, FOR CONTROLLING"
160 PRINT"LIGHTS OR APPLIANCES."
170 PRINT
180 PRINT"ENTER THE CURRENT 24 HOUR TIME IN HRS"
190 PRINT"AND MINUTES (HRS,MIN)"
200 INPUT H,M
210 PRINT
220 PRINT"ENTER THE ACTIVATION TIME (24 HR)"
230 PRINT"IN HRS AND MINUTES (HRS,MIN)"
240 INPUT I,N
250 PRINT
260 PRINT"ENTER THE DEACTIVATION TIME (24 HR)"
270 PRINT"IN HRS AND MINUTES (HRS,MIN)"
280 INPUT J,K
290 PRINT
300 PRINT
310 PRINT"ENTER A '1' TO START THE TIMER"
320 INPUT C
330 CLS
340 PRINT@ 64,"THE TIME MACHINE"
350 REM DISPLAY TIMER
360 PRINT@128,"24 HR TIME"
370 PRINT@192,"HRS  ";H;"  :  MIN  ";M
380 PRINT@320,"ACTIVATION TIME"
390 PRINT@384,"HRS  ";I;"  :  MIN  ";N
400 PRINT@512,"DEACTIVATION TIME"
410 PRINT@576,"HRS  ";J;"  :  MIN  ";K
420 GOSUB 440
430 GOTO 340
440 FOR A=1TO261*60
450 NEXT A
460 M=M+1
470 IF H=I AND M=N THEN 550
480 IF H=J AND M=K THEN 590
490 IF M=60 THEN 510
500 RETURN
510 M=0
520 H=H+1
530 IF H=25 THEN H=1
540 RETURN
550 CLS
560 OUT 255,4
570 PRINT@94,"CIRCUIT ACTIVATED"
580 GOTO 490
590 CLS
600 OUT 255,0
610 PRINT@94,"CIRCUIT DEACTIVATED"
620 GOTO 490
```

SECTION II

Educational Programs

There is a need for educational software, to utilize the home computer for learning. This section contains programs to aid in learning.

In a classroom situation, where each student has his own terminal, the computer allows the teacher more time for individual instruction.

In the home, you can use your computer to supplement your children's education, and your own. The Dungeon of Htam is a math educational game. The Language Flash Card program and the Word Board will aid in learning French, Spanish, Italian, and German. Constellation 10 and The Sun will help out in astronomy. Also included is a visual perception game, a math test, a spelling test, a memory test game, and a reading pacer.

These programs are written in BASIC for your microcomputer. Some will operate, without modification, in most home computer BASICs.

CHAPTER 6

The Dungeon of Htam

The Dungeon of Htam is an educational fantasy game, where the player must answer math questions as he wanders through the chambers and corridors of the dungeon. It's a 2 level dungeon, based on the fantasy role playing game Dungeons and Dragons*. It's written in BASIC for your microcomputer. See Program 6-1 for the program listing.

THE PROGRAM

You are given 1000 gold pieces, and then teleported to a random location in the lower level of this 128 chamber, 2 level dungeon (64 chambers per level). Your goal is to find your way out, with as much gold as possible. Gold pieces are acquired by answering math questions asked by monsters that occupy the dungeon. Each time a question is answered correctly, a random amount of gold is given as a reward. If your answer is incorrect, then a random amount of gold is taken away. The level of math is simple addition, subtraction, multiplication, and division. The game is directed towards children, as an incentive for learning math. See Fig. 6-1 for a sample run.

The Math Problems

The problems are generated randomly using program lines 3250 through 4100. A random number generator subroutine at line 3860 is used to generate the X and Y components of the problems. Division is slightly different than the others. In order to have the answer as an integer, multiplication is used to create the problem, with $Z = X * Y$. It is generated using $X = Z/Y$, where X is the answer entered.

In the lower level of the dungeon, level 2, the problems are generally less difficult than those at level 1. The maximum value generated for X and Y is 30 at level 1, and 15 at level 2. The values in the random number generator subroutine may be changed for different difficulty levels.

ACTIONS OR MOVES

In your trip into the dungeon, you will encounter math monsters, thieves, empty chambers, trap doors, secret doors leading to North-South or East-West corridors, maps, and enchanted keys.

Enter the letter in parentheses for the following actions or moves in the dungeon:

1. (N) ORTH movement (up)
2. (E) AST movement (right)
3. (S) OUTH movement (down)
4. (W) EST movement (left)
5. (U) P movement
6. (M) AP display
7. (G) OLD pieces left

North Movement

Entering an N allows you to move North through the dungeon. You may not move North under the following conditions.

1. If you reach the North Wall you cannot pass through.
2. If you enter an East-West corridor (through a secret door), North movement is not allowed.

East Movement

Entering an E allows you to move East. You may not move East under the following conditions:

* Dungeons and Dragons is a registered trademark of TSR Hobbies, Inc.

```
YOU WILL BE TELEPORTED TO . . .

THE DUNGEON OF HTAM

ENTER YOUR CHARACTERS NAME?
? RICK THE GREAT

YOU CARRY 1000 GOLD PIECES WITH YOU

RICK THE GREAT . . . YOU ARE ON YOUR WAY
```

```
THERE IS A THIEF IN THIS CHAMBER

. . . . . HE SURPISES YOU.
AS HE QUICKLY PASSES BY YOU HE
SNATCHES . . .  325  GOLD PIECES

RICK THE GREAT,  WHAT IS YOUR ACTION OR MOVE?

(N)ORTH, (E)AST, (S)OUTH, (W)EST
(U)P, (M)AP, (G)OLD
? E
```

```
YOU HAVE ARRIVED AT . . . .

THE DUNGEON OF HTAM . . . LEVEL 2

YOU WILL ENCOUNTER MONSTERS AND
THIEVES, AND GOLD . . . BUT WATCH
YOUR STEP  . . . . . .
TRAP DOORS CAN BE COSTLY . . . .
```

```
THERE IS A THIEF IN THIS CHAMBER
YOU SURPRISED THE THIEF . . . .
AS HE RUNS OUT HE DROPS . . . .
 . . .  103  GOLD PIECES.
YOU PICK UP THE GOLD PIECES

YOU SEARCH THE CHAMBER AND
YOU . . . . . FIND A MAP

RICK THE GREAT,  WHAT IS YOUR ACTION OR MOVE?

(N)ORTH, (E)AST, (S)OUTH, (W)EST
(U)P, (M)AP, (G)OLD
? N
```

```
YOU ARE IN A COLD AND DARK
 . . . . . EMPTY CHAMBER

RICK THE GREAT,  WHAT IS YOUR ACTION OR MOVE?

(N)ORTH, (E)AST, (S)OUTH, (W)EST
(U)P, (M)AP, (G)OLD
? N
```

```
YOU DISTURBED A MONSTER IN THIS CHAMBER
AND HE SPEAKS . . . . . .

HALT *** I AM DDA

YOU MAY NOT PASS THRU UNTIL
YOU ANSWER THIS MATH QUESTION.

WHAT IS . . .
 13    +    27    =    ? 40

CORRECT
YOU WIN  160  GOLD PIECES

RICK THE GREAT,  WHAT IS YOUR ACTION OR MOVE?

(N)ORTH, (E)AST, (S)OUTH, (W)EST
(U)P, (M)AP, (G)OLD
? W
```

```
YOU DISTURBED A MONSTER IN THIS CHAMBER
AND HE SPEAKS . . . . . .

STOP *** I AM BUS

YOU MAY NOT PASS THRU UNTIL
YOU ANSWER THIS MATH QUESTION.

WHAT IS . . .
 30    -    3    =    ? 27

CORRECT
YOU WIN  352  GOLD PIECES

RICK THE GREAT,  WHAT IS YOUR ACTION OR MOVE?

(N)ORTH, (E)AST, (S)OUTH, (W)EST
(U)P, (M)AP, (G)OLD
? S
```

```
YOU DISTURBED A MONSTER IN THIS CHAMBER
AND HE SPEAKS . . . . . .

STOP *** I AM VID

YOU MAY NOT PASS THRU UNTIL
YOU ANSWER THIS MATH QUESTION.
```

Fig. 6-1. The Dungeon of Htam sample run.

```
WHAT IS . . .
 399    /    21    =    ? 19←
19
CORRECT
YOU WIN  379  GOLD PIECES


RICK THE GREAT, WHAT IS YOUR ACTION OR MOVE?

(N)ORTH, (E)AST, (S)OUTH, (W)EST
(U)P, (M)AP, (G)OLD
? W




YOU OPEN A SECRET DOOR AND . . . .
 . . . ENTER AN EAST-WEST CORRIDOR


RICK THE GREAT, WHAT IS YOUR ACTION OR MOVE?

(N)ORTH, (E)AST, (S)OUTH, (W)EST
(U)P, (M)AP, (G)OLD
? W




YOU ARE AT A STAIRWAY
 . . . . . GOING UP


RICK THE GREAT, WHAT IS YOUR ACTION OR MOVE?

(N)ORTH, (E)AST, (S)OUTH, (W)EST
(U)P, (M)AP, (G)OLD
? U




YOU WALK UP THE STAIRWAY
THE ENCHANTED KEY . . . OPENS THE LOCK
YOU FOUND YOUR WAY . . .
 . . . OUT OF THE DUNGEON OF HTAM

YOU HAVE ACQUIRED  5600  GOLD PIECES

GAME RATING IS  919

YOU TOOK  166  TURNS TO FIND THE WAY OUT,
AND ANSWERED  28  QUESTIONS CORRECTLY.

ANOTHER GAME?
ENTER '1'-YES  '0'-NO
?
```

Fig. 6-1—cont. The Dungeon of Htam sample run.

1. If you reach the East Wall you cannot pass through.
2. If you enter a North-South corridor (through a secret door), East movement is not allowed.

South Movement

Entering an S allows you to move South. You may not move South under the following conditions:

1. If you reach the South Wall you cannot pass through.
2. If you enter an East-West corridor (through a secret door), South movement is not allowed.

West Movement

Entering a W allows you to move West. You may not move West under the following conditions:

1. If you reach the West Wall you cannot pass through.
2. If you enter a North-South corridor (through a secret door), West movement is not allowed.

Up Movement

Entering a U, when you are at a stairway and have found the Enchanted Key, allows you to go up to the next level. If you haven't found the key, or you are not at a stairway, you cannot go up the stairway. To find the Enchanted Key, you must answer a random number of math questions correctly, for each level. There is a different key for each level.

Map Display

Entering an M, when you have found a Map, will display the map for that level. Each level has a different map, and they may be found when encountering thieves. The 64 chamber dungeon is displayed using the following symbols:

1. M = Math monster
2. O = Empty chamber
3. ? = Unknown contents (either a thief or a trap door)
4. UP = Stairway up
5. NS = North-South corridor (entered through secret doors)
6. EW = East-West corridor (entered through secret doors)
7. P1 = Your location in the dungeon

See Fig. 6-2 for a sample Map.

A question mark (?) indicates either a Thief or a Trap Door. There is no way of knowing what the contents is, unless you enter the chamber. If you encounter a Thief, you either surprise him and

```
THE DUNGEON OF HTAM  *** MAP LEVEL  2 ***

M   UP  0   EW  0   NS  M   0
EW  M   0   ?   M   M   ?   ?
UP  0   EW  ?   NS  EW  0   ?
M   0   NS  ?   P1  ?   NS  0
UP  M   M   NS  M   ?   ?   0
M   EW  0   M   NS  M   ?   M
0   0   NS  EW  0   M   M   M
0   0   EW  EW  0   M   NS  M

RICK THE GREAT,  WHAT IS YOUR ACTION OR MOVE?

(N)ORTH, (E)AST, (S)OUTH, (W)EST
(U)P, (M)AP, (G)OLD
? S
```

Fig. 6-2. Sample map.

he drops some of his gold pieces, or he surprises you and steals some of your gold pieces. This is randomly determined, but it's in favor of the Thief.

If you activate a Trap Door, you can either fall through, or catch yourself from falling. If you fall through, you will lose most of your gold pieces. There is a 50 percent chance that you will fall through. If you are at level 2, then you will fall into a deep pit. If you are at level 1, then you will fall through to level 2.

Gold Pieces Left

Entering a G will display the number of gold pieces you have with you. You will start out with 1000, and you can gain or lose gold during your trip. But if you lose all your gold pieces, you will lose the game.

GAME RATING

After you complete the game, a game rating is displayed, along with the number of gold pieces acquired, the number of math questions answered correctly, and the number of turns taken. The rating is a number from approximately −500 to +1000, depending upon the above statistics. The higher the rating number, the better the rating. A negative number indicates a poor rating.

Program 6-1. The Dungeon of Htam Program Listing, Level II, 16K

```
100 CLS:CLEAR 500
110 PRINT"THE DUNGEON OF HTAM"
120 PRINT"TRS-80 LEVEL II"
130 PRINT"COPYRIGHT (C) 1980 BY HOWARD BERENBON"
140 PRINT
150 PRINT"AN EDUCATIONAL MATH DUNGEON"
160 GOSUB440
170 GOSUB440
180 CLS:DIMA(9,9,2)
190 PRINT"YOU WILL BE TELEPORTED TO . . . "
200 PRINT
210 PRINT"THE DUNGEON OF HTAM"
220 PRINT
230 RANDOM
240 MA=0:CA=0:G=1000:M1=1:K=0
250 PRINT"ENTER YOUR CHARACTERS NAME?"
260 INPUTA$
270 GOSUB440
280 PRINT:PRINT"YOU CARRY 1000 GOLD PIECES WITH YOU"
290 PRINT:GOSUB440:PRINTA$;" . . . YOU ARE ON YOUR WAY"
300 GOSUB440
310 GOSUB480
320 CLS
330 PRINT"YOU HAVE ARRIVED AT . . . ."
340 PRINT
350 PRINT"THE DUNGEON OF HTAM . . . LEVEL 2"
360 PRINT
370 PRINT"YOU WILL ENCOUNTER MONSTERS AND"
380 PRINT"THIEVES, AND GOLD . . . BUT WATCH"
390 PRINT"YOUR STEP  . . . . . ."
400 PRINT"TRAP DOORS CAN BE COSTLY . . . ."
410 FORAB=1TO2000
420 NEXTAB
430 GOTO1010
440 REM DELAY
450 FOR Z2=1TO400
460 NEXTZ2
470 RETURN
480 REM SET UP 2 LEVEL DUNGEON
490 FORX=1TO8
500 FORY=1TO8
510 FORZ=1TO2
520 A(X,Y,Z)=RND(7)
530 NEXTZ
540 NEXTY
550 NEXTX
```

Program 6-1—cont. The Dungeon of Htam Program Listing, Level II, 16K

```
560 REM TRAP DOORS #8, MIN-1, MAX-3
570 H=RND(3)
580 FORA=1TO2
590 FORN=1TOH
600 X=RND(8)
610 Y=RND(8)
620 A(X,Y,A)=8
630 NEXTN
640 NEXTA
650 REM STAIRWAYS #9, MIN-3, MAX-6
660 S=RND(4)+2
670 FORA=1TO2
680 FORN=1TOS
690 X=RND(8)
700 Y=RND(8)
710 A(X,Y,A)=9
720 NEXTN
730 NEXTA
740 RETURN
750 REM STAIRWAY
760 L1=L1-1
770 PRINT"YOU WALK UP THE STAIRWAY"
780 GOSUB440
790 PRINT"THE ENCHANTED KEY . . . OPENS THE LOCK"
800 GOSUB440
810 IFL1=0THEN870
820 MA=0:K=0:K4=RND(4)+4
830 PRINT:CB=CA+K4
840 PRINT"YOU ARE AT . . . . . LEVEL 1"
850 GOSUB440:GOSUB440
860 GOTO1070
870 PRINT"YOU FOUND YOUR WAY . . . "
880 PRINT" . . . OUT OF THE DUNGEON OF HTAM"
890 PRINT
900 PRINT"YOU HAVE ACQUIRED ";G;" GOLD PIECES"
910 GOSUB930
920 GOTO1910
930 GG=G+100:REM RATING
940 R=INT((GG*CA-7000+1)/M1)
950 PRINT
960 PRINT"GAME RATING IS ";R
970 PRINT:IFG<=0THEN4300
980 PRINT"YOU TOOK ";M1;" TURNS TO FIND THE WAY OUT,"
990 PRINT"AND ANSWERED ";CA;" QUESTIONS CORRECTLY."
1000 RETURN
1010 REM SET UP 1ST MOVE
1020 C=RND(8)
1030 D=RND(8)
1040 A(C,D,2)=1
1050 L1=2
1060 K4=RND(4)+4
```

Program 6-1—cont. The Dungeon of Htam Program Listing, Level II, 16K

```
1070 REM PLAYER MOVE ROUTINE
1080 CLS
1090 A=A(C,D,L1)
1100 GOSUB440
1110 ON A GOSUB 2220,2280,2340,2340,2390,2700,2750,2800,3080
1120 PRINT
1130 IFG<=0THEN1820
1140 PRINTA$;",  WHAT IS YOUR ACTION OR MOVE?"
1150 PRINT
1160 PRINT"(N)ORTH, (E)AST, (S)OUTH, (W)EST"
1170 PRINT"(U)P, (M)AP, (G)OLD"
1180 INPUTM1$
1190 M1=M1+1:IFK=0ANDM1>=140/L1THEN4210
1200 IFM1$="N"THEN1290
1210 IFM1$="E"THEN1340
1220 IFM1$="S"THEN1390
1230 IFM1$="W"THEN1440
1240 IFM1$="U"THEN1490
1250 IFM1$="M"THEN1610
1260 IFM1$="G"THEN1670
1270 PRINT
1280 GOTO1120
1290 REM NORTH MOVEMENT
1300 IFA=7THEN1710
1310 IF(D-1)=0THEN1980
1320 D=D-1
1330 GOTO1070
1340 REM EAST MOVEMENT
1350 IFA=6THEN1770
1360 IF(C+1)=9THEN2030
1370 C=C+1
1380 GOTO1070
1390 REM SOUTH MOVEMENT
1400 IFA=7THEN1710
1410 IF(D+1)=9THEN2050
1420 D=D+1
1430 GOTO1070
1440 REM WEST MOVEMENT
1450 IFA=6THEN1770
1460 IF(C-1)=0THEN2070
1470 C=C-1
1480 GOTO1070
1490 CLS:REM STAIRWAY UP
1500 IFA<>9THEN1580
1510 IFK=1THEN750
1520 PRINT
1530 PRINT"YOU CANNOT GO UP THE STAIRWAY"
1540 PRINT"YOU DON'T HAVE THE KEY"
1550 GOSUB440
1560 PRINT
1570 GOTO1120
```

Program 6-1—cont. The Dungeon of Htam Program Listing, Level II, 16K

```
1580 PRINT"YOU ARE NOT AT A STAIRWAY"
1590 GOSUB440
1600 GOTO 1120
1610 CLS:REM MAP
1620 IF MA=1THEN2090
1630 PRINT"YOU DON'T HAVE THE MAP"
1640 PRINT
1650 GOSUB440
1660 GOTO1120
1670 REM GOLD PIECES
1680 CLS:PRINT"YOU HAVE ";G;" GOLD PIECES WITH YOU"
1690 PRINT
1700 GOTO 1120
1710 REM EW CORRIDOR
1720 PRINT
1730 CLS:PRINT"YOU ARE IN AN EAST-WEST CORRIDOR"
1740 PRINT"YOU CAN ONLY GO EAST OR WEST"
1750 PRINT
1760 GOTO1120
1770 REM NS CORRIDOR
1780 PRINT
1790 CLS:PRINT"YOU ARE IN A NORTH-SOUTH CORRIDOR"
1800 PRINT"YOU CAN ONLY GO NORTH OR SOUTH"
1810 GOTO1750
1820 REM GOLD ZERO
1830 GOSUB440:GOSUB440
1840 PRINT
1850 PRINT"YOU LOST ALL YOUR GOLD AND YOU WERE"
1860 PRINT" . . . UNABLE TO MEET THE DEMANDS OF"
1870 PRINT" . . . THE DUNGEON OF HTAM."
1880 PRINT:PRINT
1890 PRINT"BETTER LUCK NEXT TIME"
1900 GOSUB 930
1910 PRINT
1920 PRINT"ANOTHER GAME?"
1930 PRINT"ENTER '1'-YES  '0'-NO"
1940 INPUTAA
1950 IFAA<>1THEN1970
1960 CLS:GOTO210
1970 END
1980 CLS:PRINT"YOU ARE AT THE NORTH WALL"
1990 PRINT"YOU CANNOT PASS THROUGH"
2000 PRINT
2010 PRINT"TRY ANOTHER DIRECTION?"
2020 GOTO 1120
2030 CLS:PRINT"YOU ARE AT THE EAST WALL"
2040 GOTO1990
2050 CLS:PRINT"YOU ARE AT THE SOUTH WALL"
2060 GOTO1990
2070 CLS:PRINT"YOU ARE AT THE WEST WALL"
2080 GOTO1990
```

Program 6-1—cont. The Dungeon of Htam Program Listing, Level II, 16K

```
2090 REM DISPLAY MAP
2100 CLS
2110 PRINT"THE DUNGEON OF HTAM  *** MAP LEVEL ";L1;"***"
2120 PRINT
2130 FORQ=1TO8
2140 FORN=1TO8
2150 IFC=N AND D=Q THEN PRINT"P1  ";:GOTO2180
2160 S1=A(N,Q,L1)
2170 ON S1 GOSUB 3120,3120,3140,3140,3160,3180,3200,3220,3230
2180 NEXTN
2190 PRINT
2200 NEXTQ
2210 GOTO1120
2220 REM EMPTY ROOM
2230 PRINT
2240 PRINT"YOU ARE IN A COLD AND DARK"
2250 PRINT" . . . . . EMPTY CHAMBER"
2260 PRINT
2270 RETURN
2280 REM EMPTY ROOM 2
2290 PRINT
2300 PRINT"YOU ARE IN A DAMP AND MISTY"
2310 PRINT". . . . . EMPTY CHAMBER"
2320 PRINT
2330 RETURN
2340 CLS:GOSUB4160
2350 M4=RND(4)
2360 ON M4 GOSUB 3250,3380,3550,3680
2370 PRINT
2380 RETURN
2390 CLS:PRINT"THERE IS A THIEF IN THIS CHAMBER"
2400 A(C,D,L1)=2
2410 GOSUB440
2420 G4=RND(350/L1)
2430 Y=RND(8)
2440 IFY<=3THEN2610
2450 PRINT
2460 PRINT". . . . . HE SURPISES YOU."
2470 GOSUB440
2480 PRINT"AS HE QUICKLY PASSES BY YOU HE"
2490 PRINT"SNATCHES . . . ";G4;" GOLD PIECES":PRINT
2500 G=G-G4
2510 REM LOOK FOR MAP
2520 IFMA=1THEN RETURN
2530 MA=RND(4):IFMA<=2THENMA=1
2540 IF MA=1THEN2570
2550 RETURN
2560 GOSUB440
2570 PRINT"YOU SEARCH THE CHAMBER AND"
2580 GOSUB440
2590 PRINT"YOU . . . . . FIND A MAP"
```

Program 6-1—cont. The Dungeon of Htam Program Listing, Level II, 16K

```
2600 RETURN
2610 PRINT"YOU SURPRISED THE THIEF . . . ."
2620 GOSUB440
2630 PRINT"AS HE RUNS OUT HE DROPS . . . ."
2640 PRINT" . . . ";G4;" GOLD PIECES."
2650 PRINT"YOU PICK UP THE GOLD PIECES":G=G+G4
2660 PRINT:IFMA=1THENRETURN
2670 MA=RND(4):IFMA<=2THENMA=1
2680 IFMA=1THEN2570
2690 RETURN
2700 CLS:REM NORTH SOUTH CORRIDOR
2710 PRINT
2720 GOSUB4350:PRINT". . . ENTER A NORTH-SOUTH CORRIDOR"
2730 PRINT:GOSUB4330
2740 RETURN
2750 CLS:REM EAST WEST CORRIDOR
2760 PRINT
2770 GOSUB4350:PRINT" . . . ENTER AN EAST-WEST CORRIDOR"
2780 PRINT
2790 RETURN
2800 REM TRAP DOOR
2810 PRINT"YOU ACTIVATED A . . . TRAP DOOR"
2820 GOSUB440
2830 TD=RND(4)
2840 IFTD>=3THEN2890
2850 PRINT
2860 PRINT"BUT . . . YOU CAUGHT YOURSELF"
2870 PRINT"FROM FALLING"
2880 RETURN
2890 IFL1=2THEN3000
2900 L1=L1+1:PRINT:K=1
2910 PRINT"YOU FELL THRU TO LEVEL 2 . . . AND"
2920 G=100
2930 GOSUB440
2940 PRINT
2950 PRINT"YOU . . . . . LOST"
2960 PRINT"MOST OF YOUR GOLD PIECES":PRINT
2970 PRINT"YOU HAVE . . ";G;" GOLD PIECES LEFT"
2980 PRINT"BUT . . . YOU STILL HAVE YOUR KEY"
2990 RETURN
3000 PRINT"YOU FELL INTO A DEEP . . . PIT"
3010 GOSUB440
3020 PRINT"YOU'RE LUCKY . . . . "
3030 PRINT"YOU DIDN'T GET HURT"
3040 PRINT
3050 GOSUB440
3060 PRINT"BUT IN CLIMBING OUT . . ."
3070 GOTO4250
3080 PRINT"YOU ARE AT A STAIRWAY"
3090 PRINT" . . . . . GOING UP"
3100 PRINT
```

Program 6-1—cont. The Dungeon of Htam Program Listing, Level II, 16K

```
3110 RETURN
3120 PRINT"O   ";
3130 RETURN
3140 PRINT"M   ";
3150 RETURN
3160 PRINT"?   ";
3170 RETURN
3180 PRINT"NS  ";
3190 RETURN
3200 PRINT"EW  ";
3210 RETURN
3220 GOTO3160
3230 PRINT"UP  ";
3240 RETURN
3250 REM ADD
3260 PRINT"HALT *** I AM DDA"
3270 GOSUB 3810
3280 GOSUB 3860
3290 PRINTX;"   +   ";Y;"   =   ";
3300 Z=X+Y
3310 INPUTA1
3320 IFA1=ZTHEN3360
3330 REM LOSE GOLD
3340 GOSUB4020
3350 RETURN
3360 GOSUB3920
3370 RETURN
3380 REM SUB
3390 PRINT"STOP *** I AM BUS"
3400 GOSUB3810
3410 GOSUB3860
3420 PRINTX;"   -   ";Y;"   =   ";
3430 Z=X-Y
3440 INPUTA1
3450 IFA1=ZTHEN3480
3460 GOSUB4020
3470 RETURN
3480 GOSUB3920
3490 RETURN
3500 GOSUB 480
3510 H=1:O=9:W=8
3520 B=0:E=5:R=14
3530 C=0:PR=0
3540 GOTO1010
3550 REM MULT
3560 PRINT"HALT *** I AM LUM"
3570 GOSUB3810
3580 GOSUB3860
3590 PRINTX;"   X   ";Y;"   =   ";
3600 Z=X*Y
3610 INPUTA1
```

Program 6-1—cont. The Dungeon of Htam Program Listing, Level II, 16K

```
3620 IFA1=ZTHEN3660
3630 REM LOSE GOLD
3640 GOSUB4020
3650 RETURN
3660 GOSUB3920
3670 RETURN
3680 REM DIV
3690 PRINT"STOP *** I AM VID"
3700 GOSUB3810
3710 GOSUB3860
3720 PRINTX*Y;"   /   ";Y;"   =   ";
3730 Z=X
3740 INPUTA1
3750 IFA1=ZTHEN3790
3760 REM LOSE GOLD
3770 GOSUB4020
3780 RETURN
3790 GOSUB3920
3800 RETURN
3810 PRINT
3820 PRINT"YOU MAY NOT PASS THRU UNTIL"
3830 PRINT"YOU ANSWER THIS MATH QUESTION."
3840 PRINT
3850 RETURN
3860 REM RANDOM ROUTINE
3870 X=RND(30/L1)
3880 Y=RND(30/L1)
3890 PRINT"WHAT IS . . ."
3900 GOSUB 440
3910 RETURN
3920 PRINT"CORRECT"
3930 G4=RND(400/L1)+25
3940 G=G+G4
3950 GOSUB 440
3960 PRINT"YOU WIN ";G4;" GOLD PIECES"
3970 A(C,D,L1)=1
3980 CA=CA+1:IFK=1THENRETURN
3990 IFCA=K4THEN4110
4000 IFL1=1THEN4230
4010 RETURN
4020 PRINT
4030 PRINT"INCORRECT"
4040 PRINT"THE CORRECT ANSWER IS ";Z
4050 PRINT
4060 G4=RND(350/L1)
4070 G=G-G4
4080 GOSUB440
4090 PRINT"YOU LOSE ";G4;" GOLD PIECES"
4100 RETURN
4110 GOSUB440
4120 K=1
```

Program 6-1—cont. The Dungeon of Htam Program Listing, Level II, 16K

```
4130 PRINT:PRINT"YOU HAVE FOUND THE ENCHANTED KEY . . ."
4140 GOSUB440
4150 RETURN
4160 PRINT"YOU DISTURBED A MONSTER IN THIS CHAMBER"
4170 GOSUB440
4180 PRINT"AND HE SPEAKS . . . . . .":PRINT
4190 GOSUB440
4200 RETURN
4210 GOSUB4120
4220 GOTO1200
4230 IFCA=CBTHEN4110
4240 RETURN
4250 G=100:GOSUB440:PRINT
4260 PRINT"YOU . . . . . DROPPED"
4270 PRINT"MOST OF YOUR GOLD PIECES."
4280 PRINT"YOU HAVE . .";G;" GOLD PIECES LEFT"
4290 RETURN
4300 PRINT"YOU ANSWERED ";CA;" QUESTIONS CORRECTLY"
4310 PRINT" . . . . . IN ";M1;" TURNS."
4320 RETURN
4330 PRINT"THE DOOR CLOSES AND LOCKS BEHIND YOU":GOSUB440
4340 RETURN
4350 PRINT"YOU OPEN A SECRET DOOR AND . . . .":GOSUB440
4360 RETURN
```

CHAPTER 7

Language Flash Cards

Flash cards are an important educational tool for learning a variety of subjects. An excellent application of the home computer is its use as a language flash card generator. This chapter describes 4 different language flash card programs, written in BASIC, for your microcomputer. They

```
FRENCH-ENGLISH FLASH CARDS
TRS-80 VERSION
COPYRIGHT (C) 1980 BY HOWARD BERENBON

BEGINNING AT LINE 2000, ENTER YOUR LIST OF
FLASH CARDS IN THE FORM OF DATA STATEMENTS. ALTERNATE
BETWEEN FRENCH AND ENGLISH; OR USE THE WORDS GIVEN.

THE PROGRAM WILL FLASH THE FRENCH OR ENGLISH WORD,
AND EXPECT YOUR ENTRY OF ITS EQUIVALENT. BEFORE YOU
TAKE THE TEST YOU MAY REVIEW THE WORD LIST. THE CARDS
MAY BE IN FRENCH OR IN ENGLISH, AND YOU HAVE A CHOICE
OF THREE SPEEDS: SLOW, MODERATE, FAST.

ENTER '1' FOR FRENCH CARDS,  '2' FOR ENGLISH CARDS
? 1

ENTER SPEED: 1=SLOW  2=MODERATE  3=FAST
? 2


REVIEW THE WORD LIST?  1=YES   0=NO
? 0

ENTER A '1' TO BEGIN
? 1


CARD # 1
****************
*              *
*              *
*   PLUS       *
*              *
*              *
****************


CARD # 1
ENTER ANSWER, IN ENGLISH
? MORE
CORRECT

FRENCH 'PLUS' = ENGLISH 'MORE'

ENTER A '1' TO CONTINUE
? 1


CARD # 2
****************
*              *
*              *
*   REPOS      *
*              *
*              *
****************


CARD # 2
ENTER ANSWER, IN ENGLISH
? REST
CORRECT

FRENCH 'REPOS' = ENGLISH 'REST'

ENTER A '1' TO CONTINUE
? 1


CARD # 3
****************
*              *
*              *
*   RUE        *
*              *
*              *
****************


CARD # 3
ENTER ANSWER, IN ENGLISH
? STREET
CORRECT

FRENCH 'RUE' = ENGLISH 'STREET'

ENTER A '1' TO CONTINUE
? 1


PRESS 'ENTER' TO DISPLAY SCORE
?
YOUR SCORE IS  25  CORRECT OUT OF 25
THAT'S  100 % CORRECT
READY
>
```

Fig. 7-1. Language flash cards sample run.

are French, Spanish, Italian, and German flash cards. See Program 7-1 through 7-4 for the French, Spanish, Italian, and German flash card programs, respectively.

THE PROGRAM

Each program will flash 25 language cards, with a choice of three different speeds, and either foreign entry, or English entry.

The words are stored in DATA statements, beginning at line 2000. You can use the words given, or select your own list. Alternate between the foreign word and its English equivalent.

After you run the program, it requests entry of the type of card to be flashed. Enter a 1 for foreign cards, or 2 for English cards. Then enter the speed; 1 for slow, 2 for moderate, or 3 for fast. Finally, you can review the word list before starting the test. Enter a 1 for YES or a 0 for NO.

THE TEST

Enter a 1 to begin the test. A card will be flashed on the screen. Now enter the correct word. The program will check your entry, and print CORRECT or INCORRECT, then print the correct answer. Enter a 1 to continue. After all 25 cards are displayed, it prints your point score, out of 25, and the percent correct. See Fig. 7-1 for a sample run.

Program 7-1. French Flash Cards Program Listing, Level II

```
100 PRINT"FRENCH-ENGLISH FLASH CARDS"
110 PRINT"TRS-80 VERSION"
120 PRINT"COPYRIGHT (C) 1980 BY HOWARD BERENBON"
130 PRINT
140 PRINT"BEGINNING AT LINE 2000, ENTER YOUR LIST OF"
150 PRINT"FLASH CARDS IN THE FORM OF DATA STATEMENTS. ALTERNATE"
160 PRINT"BETWEEN FRENCH AND ENGLISH; OR USE THE WORDS GIVEN."
170 PRINT
180 PRINT"THE PROGRAM WILL FLASH THE FRENCH OR ENGLISH WORD,"
190 PRINT"AND EXPECT YOUR ENTRY OF ITS EQUIVALENT. BEFORE YOU"
200 PRINT"TAKE THE TEST YOU MAY REVIEW THE WORD LIST. THE CARDS"
210 PRINT"MAY BE IN FRENCH OR IN ENGLISH, AND YOU HAVE A CHOICE"
220 PRINT"OF THREE SPEEDS: SLOW, MODERATE, FAST."
230 PRINT
240 PRINT"ENTER '1' FOR FRENCH CARDS,  '2' FOR ENGLISH CARDS"
250 INPUT J
260 GOSUB 970
270 PRINT"ENTER SPEED: 1=SLOW  2=MODERATE  3=FAST"
280 INPUT S
290 GOSUB 400
300 PRINT"REVIEW THE WORD LIST?  1=YES   0=NO"
310 INPUT A
320 IF A<>1 THEN 340
330 GOSUB 490
340 CLS
350 PRINT"ENTER A '1' TO BEGIN"
360 INPUT A
370 GOSUB 600
380 GOSUB 820
390 END
400 IF S=1 THEN 430
410 IF S=2 THEN 450
420 IF S=3 THEN 470
430 X=800
440 RETURN
450 X=350
460 RETURN
470 X=150
480 RETURN
490 FOR C=1 TO 25
500 CLS
510 PRINT"ENGLISH","FRENCH","CARD #";C
520 PRINT
530 READ A$,B$
540 PRINT B$,A$
550 FOR T=1 TO 400
```

Program 7-1—cont. French Flash Cards Program Listing, Level II

```
560 NEXT T
570 NEXT C
580 RESTORE
590 RETURN
600 IF J=2 THEN 1140
610 W=0
620 CLS
630 FOR F=1 TO 25
640 READ A$
650 READ B$
660 PRINT"CARD #";F
670 PRINT"****************"
680 PRINT"*              *"
690 PRINT"*              *"
700 PRINT"*";TAB(4);A$;TAB(13)"*"
710 PRINT"*              *"
720 PRINT"*              *"
730 PRINT"****************"
740 GOSUB 1040
750 INPUT C$
760 IF C$=B$ THEN 920
770 PRINT
780 PRINT"INCORRECT"
790 GOSUB 850
800 NEXT F
810 RETURN
820 PRINT"YOUR SCORE IS ";W;" CORRECT OUT OF 25"
830 PRINT"THAT'S ";W*4;"% CORRECT"
840 RETURN
850 PRINT"FRENCH '";A$;"' = ENGLISH '";B$;"'"
860 IF F=25 THEN 1100
870 PRINT
880 PRINT"ENTER A '1' TO CONTINUE"
890 INPUT A
900 CLS
910 RETURN
920 W=W+1
930 PRINT"CORRECT"
940 PRINT
950 GOSUB 850
960 GOTO 800
970 REM SET UP TYPE OF CARD INPUT REQUEST
980 IF J=2 THEN 1020
990 J=1
1000 L$=" ENGLISH"
1010 RETURN
1020 L$=" FRENCH"
1030 RETURN
1040 FOR A=1 TO X
1050 NEXT A
1060 CLS
```

Program 7-1--cont. French Flash Cards Program Listing, Level II

```
1070 PRINT"CARD #";F
1080 PRINT"ENTER ANSWER, IN";L$
1090 RETURN
1100 PRINT
1110 PRINT"PRESS 'ENTER' TO DISPLAY SCORE"
1120 INPUT A
1130 RETURN
1140 W=0
1150 CLS
1160 FOR F=1 TO 25
1170 READ A$
1180 READ B$
1190 PRINT"CARD #";F
1200 PRINT"**************"
1210 PRINT"*            *"
1220 PRINT"*            *"
1230 PRINT"*";TAB(4);B$;TAB(13)"*"
1240 PRINT"*            *"
1250 PRINT"*            *"
1260 PRINT"**************"
1270 GOSUB 1040
1280 INPUT C$
1290 IF C$=A$ THEN 1350
1300 PRINT
1310 PRINT"INCORRECT"
1320 GOSUB 850
1330 NEXT F
1340 RETURN
1350 W=W+1
1360 PRINT"CORRECT"
1370 PRINT
1380 GOSUB 850
1390 GOTO 1330
1980 REM ENTER THE DATA, ALTERNATE BETWEEN FRENCH AND ENGLISH WORDS
1990 REM 25 FRENCH AND 25 ENGLISH
2000 DATA "PLUS","MORE","REPOS","REST","RUE","STREET","SALE","DIRTY"
2010 DATA "VIN","WINE","PLUTOT","RATHER","VERRE","GLASS","TOUT","ALL"
2020 DATA "SEL","SALT","TACHE","SPOT","VELO","BICYCLE","MONTRE","WATCH"
2030 DATA "ICI","HERE","FRANCAIS","FRENCH","HAUT","HIGH","ENFANT","CHILD"
2040 DATA "FAIM","HUNGER","AMI","FRIEND","CENT","HUNDRED","BRAS","ARM"
2050 DATA "CHAMBRE","ROOM","GARCON","BOY","LAIT","MILK"
2060 DATA "GRAND","BIG","FLEUR","FLOWER"
```

Program 7-2. Spanish Flash Cards Program Listing, Level II

```
100 PRINT"SPANISH-ENGLISH FLASH CARDS"
110 PRINT"TRS-80 VERSION"
120 PRINT"COPYRIGHT (C) 1980 BY HOWARD BERENBON"
130 PRINT
140 PRINT"BEGINNING AT LINE 2000, ENTER YOUR LIST OF"
150 PRINT"FLASH CARDS IN THE FORM OF DATA STATEMENTS. ALTERNATE"
160 PRINT"BETWEEN SPANISH AND ENGLISH; OR USE THE WORDS GIVEN."
170 PRINT
180 PRINT"THE PROGRAM WILL FLASH THE SPANISH OR ENGLISH WORD,"
190 PRINT"AND EXPECT YOUR ENTRY OF ITS EQUIVALENT. BEFORE YOU"
200 PRINT"TAKE THE TEST YOU MAY REVIEW THE WORD LIST. THE CARDS"
210 PRINT"MAY BE IN SPANISH OR IN ENGLISH, AND YOU HAVE A CHOICE"
220 PRINT"OF THREE SPEEDS: SLOW, MODERATE, FAST."
230 PRINT
240 PRINT"ENTER '1' FOR SPANISH CARDS,  '2' FOR ENGLISH CARDS"
250 INPUT J
260 GOSUB 970
270 PRINT"ENTER SPEED: 1=SLOW  2=MODERATE  3=FAST"
280 INPUT S
290 GOSUB 400
300 PRINT"REVIEW THE WORD LIST?  1=YES   0=NO"
310 INPUT A
320 IF A<>1 THEN 340
330 GOSUB 490
340 CLS
350 PRINT"ENTER A '1' TO BEGIN"
360 INPUT A
370 GOSUB 600
380 GOSUB 820
390 END
400 IF S=1 THEN 430
410 IF S=2 THEN 450
420 IF S=3 THEN 470
430 X=800
440 RETURN
450 X=350
460 RETURN
470 X=150
480 RETURN
490 FOR C=1 TO 25
500 CLS
510 PRINT"ENGLISH","SPANISH","CARD #";C
520 PRINT
530 READ A$,B$
540 PRINT B$,A$
550 FOR T=1 TO 400
```

Program 7-2—cont. Spanish Flash Cards Program Listing, Level II

```
560 NEXT T
570 NEXT C
580 RESTORE
590 RETURN
600 IF J=2 THEN 1140
610 W=0
620 CLS
630 FOR F=1 TO 25
640 READ A$
650 READ B$
660 PRINT"CARD #";F
670 PRINT"****************"
680 PRINT"*              *"
690 PRINT"*              *"
700 PRINT"*";TAB(4);A$;TAB(13)"*"
710 PRINT"*              *"
720 PRINT"*              *"
730 PRINT"****************"
740 GOSUB 1040
750 INPUT C$
760 IF C$=B$ THEN 920
770 PRINT
780 PRINT"INCORRECT"
790 GOSUB 850
800 NEXT F
810 RETURN
820 PRINT"YOUR SCORE IS ";W;" CORRECT OUT OF 25"
830 PRINT"THAT'S  ";W*4;"% CORRECT"
840 RETURN
850 PRINT"SPANISH  '";A$;"' = ENGLISH  '";B$;"'"
860 IF F=25 THEN 1100
870 PRINT
880 PRINT"ENTER A '1' TO CONTINUE"
890 INPUT A
900 CLS
910 RETURN
920 W=W+1
930 PRINT"CORRECT"
940 PRINT
950 GOSUB 850
960 GOTO 800
970 REM SET UP TYPE OF CARD INPUT REQUEST
980 IF J=2 THEN 1020
990 J=1
1000 L$=" ENGLISH"
1010 RETURN
1020 L$=" SPANISH"
1030 RETURN
1040 FOR A=1 TO X
1050 NEXT A
1060 CLS
```

Program 7-2—cont. Spanish Flash Cards Program Listing, Level II

```
1070 PRINT"CARD #";F
1080 PRINT"ENTER ANSWER, IN";L$
1090 RETURN
1100 PRINT
1110 PRINT"PRESS 'ENTER' TO DISPLAY SCORE"
1120 INPUT A
1130 RETURN
1140 W=0
1150 CLS
1160 FOR F=1 TO 25
1170 READ A$
1180 READ B$
1190 PRINT"CARD #";F
1200 PRINT"**************"
1210 PRINT"*            *"
1220 PRINT"*            *"
1230 PRINT"*";TAB(4);B$;TAB(13)"*"
1240 PRINT"*            *"
1250 PRINT"*            *"
1260 PRINT"**************"
1270 GOSUB 1040
1280 INPUT C$
1290 IF C$=A$ THEN 1350
1300 PRINT
1310 PRINT"INCORRECT"
1320 GOSUB 850
1330 NEXT F
1340 RETURN
1350 W=W+1
1360 PRINT"CORRECT"
1370 PRINT
1380 GOSUB 850
1390 GOTO 1330
1980 REM ENTER THE DATA, ALTERNATE BETWEEN SPANISH AND ENGLISH WORDS
1990 REM 25 SPANISH AND 25 ENGLISH
2000 DATA "ENVOLVER","INVOLVE","CANTARO","JAR","QUIETO","QUIET"
2010 DATA "CIMA","TOP","SEMANA","WEEK","TIRO","THROW","ESTADO","STATE"
2020 DATA "EMBARAZO","PUZZLE","CERCANO","NEAR","CRUZ","CROSS"
2030 DATA "VIGILIA","FAST","COMPRAR","BUY","PROMEDIO","AVERAGE"
2040 DATA "MAL","HARM","VIDRIO","GLASS","RESULTADO","ISSUE"
2050 DATA "PRONTO","QUICK","MAR","SEA","ENTONCES","THEN","VIDA","LIFE"
2060 DATA "PERDIDA","LOSS","LECHE","MILK","RED","NET"
2070 DATA "ORIGEN","ORIGIN","PLUMA","PEN"
```

Program 7-3. Italian Flash Cards Program Listing, Level II

```
100 PRINT"ITALIAN-ENGLISH FLASH CARDS"
110 PRINT"TRS-80 VERSION"
120 PRINT"COPYRIGHT (C) 1980 BY HOWARD BERENBON"
130 PRINT
140 PRINT"BEGINNING AT LINE 2000, ENTER YOUR LIST OF"
150 PRINT"FLASH CARDS IN THE FORM OF DATA STATEMENTS. ALTERNATE"
160 PRINT"BETWEEN ITALIAN AND ENGLISH; OR USE THE WORDS GIVEN."
170 PRINT
180 PRINT"THE PROGRAM WILL FLASH THE ITALIAN OR ENGLISH WORD,"
190 PRINT"AND EXPECT YOUR ENTRY OF ITS EQUIVALENT. BEFORE YOU"
200 PRINT"TAKE THE TEST YOU MAY REVIEW THE WORD LIST. THE CARDS"
210 PRINT"MAY BE IN ITALIAN OR IN ENGLISH, AND YOU HAVE A CHOICE"
220 PRINT"OF THREE SPEEDS: SLOW, MODERATE, FAST."
230 PRINT
240 PRINT"ENTER '1' FOR ITALIAN CARDS,  '2' FOR ENGLISH CARDS"
250 INPUT J
260 GOSUB 970
270 PRINT"ENTER SPEED: 1=SLOW  2=MODERATE  3=FAST"
280 INPUT S
290 GOSUB 400
300 PRINT"REVIEW THE WORD LIST?  1=YES   0=NO"
310 INPUT A
320 IF A<>1 THEN 340
330 GOSUB 490
340 CLS
350 PRINT"ENTER A '1' TO BEGIN"
360 INPUT A
370 GOSUB 600
380 GOSUB 820
390 END
400 IF S=1 THEN 430
410 IF S=2 THEN 450
420 IF S=3 THEN 470
430 X=800
440 RETURN
450 X=350
460 RETURN
470 X=150
480 RETURN
490 FOR C=1 TO 25
500 CLS
510 PRINT"ENGLISH","ITALIAN" ,"CARD #";C
520 PRINT
530 READ A$,B$
540 PRINT B$,A$
550 FOR T=1 TO 400
```

Program 7-3—cont. Italian Flash Cards Program Listing, Level II

```
560 NEXT T
570 NEXT C
580 RESTORE
590 RETURN
600 IF J=2 THEN 1140
610 W=0
620 CLS
630 FOR F=1 TO 25
640 READ A$
650 READ B$
660 PRINT"CARD #";F
670 PRINT"**************"
680 PRINT"*            *"
690 PRINT"*            *"
700 PRINT"*";TAB(4);A$;TAB(13)"*"
710 PRINT"*            *"
720 PRINT"*            *"
730 PRINT"**************"
740 GOSUB 1040
750 INPUT C$
760 IF C$=B$ THEN 920
770 PRINT
780 PRINT"INCORRECT"
790 GOSUB 850
800 NEXT F
810 RETURN
820 PRINT"YOUR SCORE IS ";W;" CORRECT OUT OF 25"
830 PRINT"THAT'S ";W*4;"% CORRECT"
840 RETURN
850 PRINT"ITALIAN  '";A$;"' = ENGLISH  '";B$;"'"
860 IF F=25 THEN 1100
870 PRINT
880 PRINT"ENTER A '1' TO CONTINUE"
890 INPUT A
900 CLS
910 RETURN
920 W=W+1
930 PRINT"CORRECT"
940 PRINT
950 GOSUB 850
960 GOTO 800
970 REM SET UP TYPE OF CARD INPUT REQUESTED
980 IF J=2 THEN 1020
990 J=1
1000 L$=" ENGLISH"
1010 RETURN
1020 L$=" ITALIAN"
1030 RETURN
1040 FOR A=1 TO X
1050 NEXT A
1060 CLS
```

Program 7-3—cont. Italian Flash Cards Program Listing, Level II

```
1070 PRINT"CARD #";F
1080 PRINT"ENTER ANSWER, IN";L$
1090 RETURN
1100 PRINT
1110 PRINT"PRESS 'ENTER' TO DISPLAY SCORE"
1120 INPUT A
1130 RETURN
1140 W=0
1150 CLS
1160 FOR F=1 TO 25
1170 READ A$
1180 READ B$
1190 PRINT"CARD #";F
1200 PRINT"**************"
1210 PRINT"*            *"
1220 PRINT"*            *"
1230 PRINT"*";TAB(4);B$;TAB(13)"*"
1240 PRINT"*            *"
1250 PRINT"*            *"
1260 PRINT"**************"
1270 GOSUB 1040
1280 INPUT C$
1290 IF C$=A$ THEN 1350
1300 PRINT
1310 PRINT"INCORRECT"
1320 GOSUB 850
1330 NEXT F
1340 RETURN
1350 W=W+1
1360 PRINT"CORRECT"
1370 PRINT
1380 GOSUB 850
1390 GOTO 1330
1980 REM ENTER THE DATA, ALTERNATE BETWEEN ITALIAN AND ENGLISH WORDS
1990 REM 25 ITALIAN AND 25 ENGLISH
2000 DATA "SPARO","SHOT","ACQUA","WATER","DOLORE","PAIN","CAMERA","ROOM"
2010 DATA "GITA","TRIP","UNITA","UNIT","PIOGGIA","RAIN","MARE","SEA"
2020 DATA "PROVA","TEST","ANSIETA","CONCERN","ANCORA","AGAIN"
2030 DATA "ERBA",GRASS","INDICE","INDEX","GIACCA","COAT"
2040 DATA "PASTO","MEAL","AGO","NEEDLE","PAIO","PAIR","QUIETO","QUIET"
2050 DATA "SENSO","SENSE","DIRETTO","THROUGH","SOTTO","UNDER"
2060 DATA "PIEDE","FOOT","PORTA","DOOR","NUBE","CLOUD","RESPIRO","BREATH"
```

Program 7-4. German Flash Cards Program Listing, Level II

```
100 PRINT"GERMAN-ENGLISH FLASH CARDS"
110 PRINT"TRS-80 VERSION"
120 PRINT"COPYRIGHT (C) 1980 BY HOWARD BERENBON"
130 PRINT
140 PRINT"BEGINNING AT LINE 2000, ENTER YOUR LIST OF"
150 PRINT"FLASH CARDS IN THE FORM OF DATA STATEMENTS. ALTERNATE"
160 PRINT"BETWEEN GERMAN AND ENGLISH; OR USE THE WORDS GIVEN."
170 PRINT
180 PRINT"THE PROGRAM WILL FLASH THE GERMAN OR ENGLISH WORD,"
190 PRINT"AND EXPECT YOUR ENTRY OF ITS EQUIVALENT. BEFORE YOU"
200 PRINT"TAKE THE TEST YOU MAY REVIEW THE WORD LIST. THE CARDS"
210 PRINT"MAY BE IN GERMAN OR IN ENGLISH, AND YOU HAVE A CHOICE"
220 PRINT"OF THREE SPEEDS: SLOW, MODERATE, FAST."
230 PRINT
240 PRINT"ENTER '1' FOR GERMAN CARDS,  '2' FOR ENGLISH CARDS"
250 INPUT J
260 GOSUB 970
270 PRINT"ENTER SPEED: 1=SLOW  2=MODERATE  3=FAST"
280 INPUT S
290 GOSUB 400
300 PRINT"REVIEW THE WORD LIST?  1=YES   0=NO"
310 INPUT A
320 IF A<>1 THEN 340
330 GOSUB 490
340 CLS
350 PRINT"ENTER A '1' TO BEGIN"
360 INPUT A
370 GOSUB 600
380 GOSUB 820
390 END
400 IF S=1 THEN 430
410 IF S=2 THEN 450
420 IF S=3 THEN 470
430 X=800
440 RETURN
450 X=350
460 RETURN
470 X=150
480 RETURN
490 FOR C=1 TO 25
500 CLS
510 PRINT"ENGLISH","GERMAN","CARD #";C
520 PRINT
530 READ A$,B$
540 PRINT B$,A$
550 FOR T=1 TO 400
```

Program 7-4—cont. German Flash Cards Program Listing, Level II

```
560 NEXT T
570 NEXT C
580 RESTORE
590 RETURN
600 IF J=2 THEN 1140
610 W=0
620 CLS
630 FOR F=1 TO 25
640 READ A$
650 READ B$
660 PRINT"CARD #";F
670 PRINT"****************"
680 PRINT"*              *"
690 PRINT"*              *"
700 PRINT"*";TAB(4);A$;TAB(13)"*"
710 PRINT"*              *"
720 PRINT"*              *"
730 PRINT"****************"
740 GOSUB 1040
750 INPUT C$
760 IF C$=B$ THEN 920
770 PRINT
780 PRINT"INCORRECT"
790 GOSUB 850
800 NEXT F
810 RETURN
820 PRINT"YOUR SCORE IS ";W;" CORRECT OUT OF 25"
830 PRINT"THAT'S  ";W*4;"% CORRECT"
840 RETURN
850 PRINT"GERMAN  '";A$;"' = ENGLISH  '";B$;"'"
860 IF F=25 THEN 1100
870 PRINT
880 PRINT"ENTER A '1' TO CONTINUE"
890 INPUT A
900 CLS
910 RETURN
920 W=W+1
930 PRINT"CORRECT"
940 PRINT
950 GOSUB 850
960 GOTO 800
970 REM SET UP TYPE OF CARD INPUT REQUEST
980 IF J=2 THEN 1020
990 J=1
1000 L$=" ENGLISH"
1010 RETURN
1020 L$=" GERMAN"
1030 RETURN
1040 FOR A=1 TO X
1050 NEXT A
1060 CLS
```

Program 7-4—cont. German Flash Cards Program Listing, Level II

```
1070 PRINT"CARD #";F
1080 PRINT"ENTER ANSWER, IN";L$
1090 RETURN
1100 PRINT
1110 PRINT"PRESS 'ENTER' TO DISPLAY SCORE"
1120 INPUT A
1130 RETURN
1140 W=0
1150 CLS
1160 FOR F=1 TO 25
1170 READ A$
1180 READ B$
1190 PRINT"CARD #";F
1200 PRINT"**************"
1210 PRINT"*            *"
1220 PRINT"*            *"
1230 PRINT"*";TAB(4);B$;TAB(13)"*"
1240 PRINT"*            *"
1250 PRINT"*            *"
1260 PRINT"**************"
1270 GOSUB 1040
1280 INPUT C$
1290 IF C$=A$ THEN 1350
1300 PRINT
1310 PRINT"INCORRECT"
1320 GOSUB 850
1330 NEXT F
1340 RETURN
1350 W=W+1
1360 PRINT"CORRECT"
1370 PRINT
1380 GOSUB 850
1390 GOTO 1330
1980 REM ENTER THE DATA, ALTERNATE BETWEEN GERMAN AND ENGLISH WORDS
1990 REM 25 GERMAN AND 25 ENGLISH
2000 DATA "MORGEN","TOMORROW","GLUCKLICH","HAPPY","KUNFTIG","FUTURE"
2010 DATA "NORD","NORTH","GENIESSEN","ENJOY","SCHLAG","KNOCK","PARFUM","PERFUME"
2020 DATA "VERNUNFT","REASON","STILLE","STILL","TRAUBE","GRAPE"
2030 DATA "BEKOMMEN","OBTAIN","STAUB","DUST","SCHLOSS","CASTLE"
2040 DATA "HERZ","HEART","FEDER","PEN","SEGEL","SAIL","HANDEL","TRADE"
2050 DATA "AUF","UP","SCHRITT","WALK","ANLEGEN","INVEST","EINTRETEN","ENTER"
2060 DATA "DUNKEL","DARK","BRUCH","BREAK","ERSCHEINEN","APPEAR","FAHNE","FLAG"
```

CHAPTER 8

The Word Board

Are you interested in educational applications, or in experimenting with new devices that can aid the handicapped? Then the Word Board is just the program for you. Using your microcomputer, you can turn your system into a language communicator.

WORD BOARD 1

The Word Board 1 accepts keyboard entry of individual letters, and displays single words assigned to each letter. See Program 8-1 for the program listing.

```
RUN
WORD BOARD 1
COPYRIGHT (C) 1980 BY HOWARD BERENBON

ACCEPTS CHARACTER INPUT (A TO Z, 0 TO 9)
AND PRINTS WORDS AND NUMBERS THAT
CORRESPOND TO THE ENTRY. ENTERING
AN '@' WILL SKIP 4 LINES.


ENTER CHARACTER?
? A

A
ENGLISH         FRENCH
-------         ------

APPLE           POMME

ENTER CHARACTER?
? B


B
ENGLISH         FRENCH
-------         ------

AIRPLANE        AVION

ENTER CHARACTER?
?
```

Fig. 8-1. Word board 1 sample run.

```
RUN
WORD BOARD 2
COPYRIGHT (C) 1980 BY HOWARD BERENBON

ACCEPTS CHARACTER INPUT (A TO Z, 0 TO 9)
AND PRINTS WORDS AND NUMBERS THAT
CORRESPOND TO THE ENTRY. ENTERING
AN '@' WILL SKIP 4 LINES.

MAY BE USED AS A HELP TO THE HANDICAPPED
? Q


Q
                I
? F
                WANT
? V
                TO
? B
                EAT
? @


R
                DO
? S
                YOU
? T
                GO
? V
                TO
? B
                EAT
? @


L
                OKAY
?
```

Fig. 8-2. Word board 2 sample run.

The program may be used to aid in language instruction, by assigning English words to each of the 26 keys. For the English word covering a key, its French equivalent can be displayed. It allows the French word to be displayed, when the English word is depressed. See Fig. 8-1 for a sample run. The words are printed towards the center of the screen, after the ENTER key is depressed. It's a handy aid for the language student, to help in memorizing foreign vocabulary words. A French vocabulary is given in Table 8-1. After the 26 words are learned, the student can test his memory by covering the keytops, and typing through the list for review.

Table 8-1. French Vocabulary Words

Key	French	English
A	pomme	apple
B	avion	airplane
C	tasse	cup
D	vache	cow
E	veston	coat
F	chien	dog
G	main	hand
H	soleil	sun
I	livre	book
J	lune	moon
K	oreille	ear
L	nuage	cloud
M	peigne	comb
N	yeux	eyes
O	glace	ice
P	etoile	star
Q	cuillere	spoon
R	chaise	chair
S	cheval	horse
T	crayon	pencil
U	lampe	lamp
V	oiseau	bird
W	poissen	fish
X	velo	bicycle
Y	chat	cat
Z	chapeau	hat
1	un	one
2	deux	two
3	trois	three
4	quatre	four
5	cinq	five
6	six	six
7	sept	seven
8	huit	eight
9	neuf	nine
0	zero	zero
@	(skip 4 lines)	

Variations

A variation of Word Board 1 is to place small pictures on the keytops, and have their foreign meanings displayed when depressed. Program lines 600 through 1630 hold the French words in PRINT statements. An additional 10 keys, 0 through 9, are used to access their equivalent French numbers. The @ sign is used to skip 4 lines.

After the 26 words are mastered a different vocabulary set can be entered. Also, any language can be substituted in place of French used in the program.

You may also place the foreign meanings of the words on the keytops, and have their English equivalents displayed. Have the student read a word on the keytop, and recite the English meaning, then depress that key to find the correct answer.

The program can be used as a computer dictionary. The meaning of words, assigned to each key, can be displayed in sentence form.

WORD BOARD 2

Word Board 2 is used as a language communicator for the handicapped. See Program 8-2 for the program listing. A speech handicapped person may communicate with a limited vocabulary of 26 essential words, and numbers 0 through 9. Each key is assigned a different word. See Table 8-2 for the keyboard layout. Only two movements are required; typing a key covered by the word, and depressing ENTER. Sentences may be formed to call for a person's basic needs, as eating and sleeping. See Fig. 8-2 for a sample run. Alternately, sentences may be assigned certain keys to display one's needs. Example: "I am hungry, when do we eat?". Of course, this sentence won't fit on the keytop, so the handicapped person will have to choose from a list of special keys, with assigned sentences.

Table 8-2. Keyboard Layout for Limited Vocabulary

Key	Word	Key	Word	Key	Word
A	he	N	time	Z	she
B	eat	O	yes	1	1
C	like	P	no	2	2
D	are	Q	I	3	3
E	is	R	do	4	4
F	want	S	you	5	5
G	drink	T	go	6	6
H	speak	U	here	7	7
I	please	V	to	8	8
J	happy	W	it	9	9
L	okay	X	am	0	0
M	not	y	sleep	@	skip 4 lines

APPLICATIONS

Apply the Word Board at home. Expand on Word Board 1 for your educational needs. Develop a more detailed language study program, with several lists of vocabulary. Use it to increase your English vocabulary, by accessing and learning the meanings of 10 new words a week.

You may or may not have an application for Word Board 2. But you can find organizations, in your area, that help the handicapped. Demonstrate the program. This application may be useful to them. Considering that a home computer may be less expensive than other devices used to aid the handicapped, it may be within their budget to buy one or two.

Program 8-1. Word Board 1 Program Listing, Level II

```
100 PRINT"WORD BOARD 1"
110 PRINT"COPYRIGHT (C) 1980 BY HOWARD BERENBON"
120 PRINT
130 PRINT"ACCEPTS CHARACTER INPUT (A TO Z, 0 TO 9)"
140 PRINT"AND PRINTS WORDS AND NUMBERS THAT"
150 PRINT"CORRESPOND TO THE ENTRY. ENTERING"
160 PRINT"AN '@' WILL SKIP 4 LINES."
170 PRINT
180 PRINT
190 GOSUB 1750
200 INPUT A$
210 IFA$="A" THEN 590
220 IFA$="B" THEN 620
230 IFA$="C" THEN 650
240 IFA$="D" THEN 680
250 IFA$="E" THEN 710
260 IFA$="F" THEN 740
270 IFA$="G" THEN 770
280 IFA$="H" THEN 800
290 IFA$="I" THEN 830
300 IFA$="J" THEN 860
310 IFA$="K" THEN 890
320 IFA$="L" THEN 920
330 IFA$="M" THEN 950
340 IFA$="N" THEN 980
350 IFA$="O" THEN 1010
360 IFA$="P" THEN 1040
370 IFA$="Q" THEN 1070
380 IFA$="R" THEN 1100
390 IFA$="S" THEN 1130
400 IFA$="T" THEN 1160
410 IFA$="U" THEN 1190
420 IFA$="V" THEN 1220
430 IFA$="W" THEN 1250
440 IFA$="X" THEN 1280
450 IFA$="Y" THEN 1310
460 IFA$="Z" THEN 1340
470 IFA$="1" THEN 1370
480 IFA$="2" THEN 1400
490 IFA$="3" THEN 1430
500 IFA$="4" THEN 1460
510 IFA$="5" THEN 1490
520 IFA$="6" THEN 1520
530 IFA$="7" THEN 1550
540 IFA$="8" THEN 1580
550 IFA$="9" THEN 1610
```

Program 8-1—cont. Word Board 1 Program Listing, Level II

```
560 IFA$="0" THEN 1640
570 IF A$="@" THEN 1670
580 GOTO 190
590 GOSUB 1710
600 PRINT"APPLE","POMME"
610 GOTO 190
620 GOSUB 1710
630 PRINT"AIRPLANE","AVION"
640 GOTO 190
650 GOSUB 1710
660 PRINT"CUP","TASSE"
670 GOTO 190
680 GOSUB 1710
690 PRINT"COW","VACHE"
700 GOTO 190
710 GOSUB 1710
720 PRINT"COAT","VESTON"
730 GOTO 190
740 GOSUB 1710
750 PRINT"DOG","CHIEN"
760 GOTO 190
770 GOSUB 1710
780 PRINT"HAND","MAIN"
790 GOTO 190
800 GOSUB 1710
810 PRINT"SUN","SOLEIL"
820 GOTO 190
830 GOSUB 1710
840 PRINT"BOOK","LIVRE"
850 GOTO 190
860 GOSUB 1710
870 PRINT"MOON","LUNE"
880 GOTO 190
890 GOSUB 1710
900 PRINT"EAR","OREILLE"
910 GOTO 190
920 GOSUB 1710
930 PRINT"CLOUD","NAUGE"
940 GOTO 190
950 GOSUB 1710
960 PRINT"COMB","PEIGNE"
970 GOTO 190
980 GOSUB 1710
990 PRINT"EYES","YEUX"
1000 GOTO 190
1010 GOSUB 1710
1020 PRINT"ICE","GLACE"
1030 GOTO 190
1040 GOSUB 1710
1050 PRINT"STAR","ETOILE"
1060 GOTO 190
```

Program 8-1—cont. Word Board 1 Program Listing, Level II

```
1070 GOSUB 1710
1080 PRINT"SPOON","CUILLERE"
1090 GOTO 190
1100 GOSUB 1710
1110 PRINT"CHAIR","CHAISE"
1120 GOTO 190
1130 GOSUB 1710
1140 PRINT"HORSE","CHEVAL"
1150 GOTO 190
1160 GOSUB 1710
1170 PRINT"PENCIL","CRAYON"
1180 GOTO 190
1190 GOSUB 1710
1200 PRINT"LAMP","LAMPE"
1210 GOTO 190
1220 GOSUB 1710
1230 PRINT"BIRD","OISEAU"
1240 GOTO 190
1250 GOSUB 1710
1260 PRINT"FISH","POISSEN"
1270 GOTO 190
1280 GOSUB 1710
1290 PRINT"BICYCLE","VELO"
1300 GOTO 190
1310 GOSUB 1710
1320 PRINT"CAT","CHAT"
1330 GOTO 190
1340 GOSUB 1710
1350 PRINT"HAT","CHAPEAU"
1360 GOTO 190
1370 GOSUB 1710
1380 PRINT"ONE","UN"
1390 GOTO 190
1400 GOSUB 1710
1410 PRINT"TWO","DEUX"
1420 GOTO 190
1430 GOSUB 1710
1440 PRINT"THREE","TROIS"
1450 GOTO 190
1460 GOSUB 1710
1470 PRINT"FOUR","QUATRE"
1480 GOTO 190
1490 GOSUB 1710
1500 PRINT"FIVE","CINQ"
1510 GOTO 190
1520 GOSUB 1710
1530 PRINT"SIX","SIX"
1540 GOTO 190
1550 GOSUB 1710
1560 PRINT"SEVEN","SEPT"
1570 GOTO 190
```

Program 8-1—cont. Word Board 1 Program Listing, Level II

```
1580 GOSUB 1710
1590 PRINT"EIGHT","HUIT"
1600 GOTO 190
1610 GOSUB 1710
1620 PRINT"NINE","NEUF"
1630 GOTO 190
1640 GOSUB 1710
1650 PRINT"ZERO","ZERO"
1660 GOTO 190
1670 FOR A=1 TO 4
1680 PRINT
1690 NEXT A
1700 GOTO 190
1710 PRINT"ENGLISH","FRENCH"
1720 PRINT"-------","------"
1730 PRINT
1740 RETURN
1750 PRINT
1760 PRINT
1770 PRINT"ENTER CHARACTER?"
1780 RETURN
```

Program 8-2. Word Board 2 Program Listing, Level II

```
100 PRINT"WORD BOARD 2"
110 PRINT"COPYRIGHT (C) 1980 BY HOWARD BERENBON"
120 PRINT
130 PRINT"ACCEPTS CHARACTER INPUT (A TO Z, 0 TO 9)"
140 PRINT"AND PRINTS WORDS AND NUMBERS THAT"
150 PRINT"CORRESPOND TO THE ENTRY. ENTERING"
160 PRINT"AN '@' WILL SKIP 4 LINES."
170 PRINT
180 PRINT"MAY BE USED AS A HELP TO THE HANDICAPPED"
190 INPUT A$
200 IFA$="A" THEN 580
210 IFA$="B" THEN 600
220 IFA$="C" THEN 620
230 IFA$="D" THEN 640
240 IFA$="E" THEN 660
250 IFA$="F" THEN 680
260 IFA$="G" THEN 700
270 IFA$="H" THEN 720
280 IFA$="I" THEN 740
290 IFA$="J" THEN 760
300 IFA$="K" THEN 780
310 IFA$="L" THEN 800
320 IFA$="M" THEN 820
330 IFA$="N" THEN 840
340 IFA$="O" THEN 860
350 IFA$="P" THEN 880
360 IFA$="Q" THEN 900
370 IFA$="R" THEN 920
380 IFA$="S" THEN 940
390 IFA$="T" THEN 960
400 IFA$="U" THEN 980
410 IFA$="V" THEN 1000
420 IFA$="W" THEN 1020
430 IFA$="X" THEN 1040
440 IFA$="Y" THEN 1060
450 IFA$="Z" THEN 1080
460 IFA$="1" THEN 1100
470 IFA$="2" THEN 1120
480 IFA$="3" THEN 1140
490 IFA$="4" THEN 1160
500 IFA$="5" THEN 1180
510 IFA$="6" THEN 1200
520 IFA$="7" THEN 1220
530 IFA$="8" THEN 1240
540 IFA$="9" THEN 1260
550 IFA$="0" THEN 1280
```

Program 8-2—cont. Word Board 2 Program Listing, Level II

```
560 IF A$="@" THEN 1300
570 GOTO 190
580 PRINTTAB(20)"HE"
590 GOTO 190
600 PRINTTAB(20)"EAT"
610 GOTO 190
620 PRINTTAB(20)"LIKE"
630 GOTO 190
640 PRINTTAB(20)"ARE"
650 GOTO 190
660 PRINTTAB(20)"IS"
670 GOTO 190
680 PRINTTAB(20)"WANT"
690 GOTO 190
700 PRINTTAB(20)"DRINK"
710 GOTO 190
720 PRINTTAB(20)"SPEAK"
730 GOTO 190
740 PRINTTAB(20)"PLEASE"
750 GOTO 190
760 PRINTTAB(20)"HAPPY"
770 GOTO 190
780 PRINTTAB(20)"THANK YOU"
790 GOTO 190
800 PRINTTAB(20)"OKAY"
810 GOTO 190
820 PRINTTAB(20)"NOT"
830 GOTO 190
840 PRINTTAB(20)"TIME"
850 GOTO 190
860 PRINTTAB(20)"YES"
870 GOTO 190
880 PRINTTAB(20)"NO"
890 GOTO 190
900 PRINTTAB(20)"I"
910 GOTO 190
920 PRINTTAB(20)"DO"
930 GOTO 190
940 PRINTTAB(20)"YOU"
950 GOTO 190
960 PRINTTAB(20)"GO"
970 GOTO 190
980 PRINTTAB(20)"HERE"
990 GOTO 190
1000 PRINTTAB(20)"TO"
1010 GOTO 190
1020 PRINTTAB(20)"IT"
1030 GOTO 190
1040 PRINTTAB(20)"AM"
1050 GOTO 190
1060 PRINTTAB(20)"SLEEP"
```

Program 8-2—cont. Word Board 2 Program Listing, Level II

```
1070 GOTO 190
1080 PRINTTAB(20)"SHE"
1090 GOTO 190
1100 PRINTTAB(20)"1"
1110 GOTO 190
1120 PRINTTAB(20)"2"
1130 GOTO 190
1140 PRINTTAB(20)"3"
1150 GOTO 190
1160 PRINTTAB(20)"4"
1170 GOTO 190
1180 PRINTTAB(20)"5"
1190 GOTO 190
1200 PRINTTAB(20)"6"
1210 GOTO 190
1220 PRINTTAB(20)"7"
1230 GOTO 190
1240 PRINTTAB(20)"8"
1250 GOTO 190
1260 PRINTTAB(20)"9"
1270 GOTO 190
1280 PRINTTAB(20)"0"
1290 GOTO 190
1300 FOR A=1 TO 4
1310 PRINT
1320 NEXT A
1330 GOTO 190
```

CHAPTER 9

Memory Challenger

The Memory Challenger is a game used to test your memory and concentration. It's written in BASIC, for your microcomputer. See Program 9-1 for the program listing.

The program generates and displays random numbers of different lengths. There are three different levels of play. Enter a 1 for easy, 2 for medium difficulty, and 3 for most difficult.

THE PROGRAM

Enter a 1 to begin. The numbers are flashed at the center of the screen. Enter the number that was flashed. Each time you enter an answer, the program checks the entry, and prints CORRECT or INCORRECT. Then it displays the correct answer, and the number of correct entries out of the number of tries so far. Now you may change the difficulty level and continue, continue at the same level, or end the game. If you decide to stop playing, then it displays your final percent score. See Fig. 9-1 for a sample run.

Modifications

The program is written for Level II BASIC. But it may be modified to RUN in a Level I system. Change lines 340 and 390 from PRINT @ to PRINT AT. Level I BASIC doesn't recognize the @ sign, for the PRINT AT statement.

```
RUN
TRS-80 MEMORY CHALLENGER
COPYRIGHT (C) 1979 BY HOWARD BERENBON

THIS PROGRAM GENERATES AND DISPLAYS RANDOM NUMBERS
OF DIFFERENT LENGTHS. YOU MUST ENTER THE NUMBER THAT
IS FLASHED ON THE SCREEN.

ENTER DIFFICULTY LEVEL:
1=EASY
2=MEDIUM DIFFICULTY
3=MOST DIFFICULT
?

ENTER '1' TO BEGIN
? 1
                          GET READY
                            40035

                       DIFFICULTY LEVEL  2
ENTER NUMBER
? 40035
THE ANSWER IS  40035

CORRECT
YOU HAVE  1  CORRECT OUT OF  3  TRIES

TRY AGAIN?
1 = YES & SAME DIFFICULTY-**GET READY**
2 = YES & CHANGE DIFFICULTY
0 = NO
?
```

Fig. 9-1. Memory challenger sample run.

Program 9-1. Memory Challenger Program Listing, Level II

```
100 PRINT"TRS-80 MEMORY CHALLENGER"
110 PRINT"COPYRIGHT (C) 1979 BY HOWARD BERENBON"
120 PRINT
130 PRINT"THIS PROGRAM GENERATES AND DISPLAYS RANDOM NUMBERS"
140 PRINT"OF DIFFERENT LENGTHS. YOU MUST ENTER THE NUMBER THAT"
150 PRINT"IS FLASHED ON THE SCREEN."
160 PRINT
170 Z=0
180 W=0
190 PRINT"ENTER DIFFICULTY LEVEL:"
200 PRINT"1=EASY"
210 PRINT"2=MEDIUM DIFFICULTY"
220 PRINT"3=MOST DIFFICULT"
230 INPUT A
240 CLS
250 IF A=1 THEN 550
260 IF A=2 THEN 590
270 IF A=3 THEN 630
280 GOTO 190
290 CLS
300 PRINT"ENTER '1' TO BEGIN"
310 INPUT B
320 Y=3986
330 CLS
340 PRINT @ 217,"GET READY"
350 FOR D=1 TO 200
360 NEXT D
370 X=RND(Y)*F
380 CLS
390 PRINT @ 474,X
400 GOSUB 670
410 CLS
420 PRINT TAB(20)"DIFFICULTY LEVEL ";A
430 PRINT"ENTER NUMBER"
440 Z=Z+1
450 INPUT C
460 PRINT"THE ANSWER IS ";X
470 PRINT
480 IF X=C THEN 520
490 PRINT"INCORRECT"
500 PRINT"YOU HAVE ";W;" CORRECT OUT OF ";Z;" TRIES"
510 GOTO 720
520 PRINT"CORRECT"
530 W=W+1
540 GOTO 500
550 G=90
```

Program 9-1—cont. Memory Challenger Program Listing, Level II

```
560 F=1
570 N=RND(300)
580 GOTO 300
590 N=RND(200)
600 G=35
610 F=15
620 GOTO 300
630 N=RND(100)
640 G=45
650 F=158
660 GOTO 300
670 FOR E=1 TO G+N
680 NEXT E
690 RETURN
700 PRINT"YOUR FINAL SCORE IS ";W/Z*(100);" PERCENT"
710 END
720 PRINT
730 PRINT"TRY AGAIN?"
740 PRINT"1 = YES & SAME DIFFICULTY-**GET READY**"
750 PRINT"2 = YES & CHANGE DIFFICULTY"
760 PRINT"0 = NO"
770 INPUT D
780 IF D=1 THEN 330
790 IF D=2 THEN 190
800 IF D=0 THEN 700
810 GOTO 720
```

CHAPTER 10

Visual Perception Test

The Visual Perception Test is a game used to check your visual perception. It's written in BASIC for your microcomputer. See Program 10-1 for the program listing.

The program randomly displays 5 different symbols (= + < > *) at random locations, for a random period of time. You have 25 tries to enter the correct symbol, as it's flashed on the screen. This

```
RUN
TRS-80 LEVEL II VISUAL PERCEPTION TEST
COPYRIGHT (C) 1980 BY HOWARD BERENBON

IT RANDOMLY DISPLAYS 5 SYMBOLS FOR A RANDOM PERIOD
FROM .2 TO 3 SEC. YOU HAVE 25 TRIES, WITH THE COMPUTER
KEEPING TRACK OF YOUR SCORE.
THE SYMBOLS ARE:  =  +  <  >  *

ENTER DIFFICULTY LEVEL
1=EASY
2=MEDIUM DIFFICULTY
3=MOST DIFFICULT
? 1


ENTER '1' TO BEGIN
GET READY
? 1

                                        *

TRIAL  1   DIFFICULTY LEVEL  1

ENTER THE SYMBOL # FOR EACH TRIAL
1 FOR '='  2 FOR '+'  3 FOR '<'
4 FOR '>'  5 FOR '*'  0 FOR DON'T KNOW
? 5



TRIAL  2   DIFFICULTY LEVEL  1

ENTER THE SYMBOL # FOR EACH TRIAL
1 FOR '='  2 FOR '+'  3 FOR '<'
4 FOR '>'  5 FOR '*'  0 FOR DON'T KNOW
? 4

                                        >

TRIAL  24   DIFFICULTY LEVEL  1

ENTER THE SYMBOL # FOR EACH TRIAL
1 FOR '='  2 FOR '+'  3 FOR '<'
4 FOR '>'  5 FOR '*'  0 FOR DON'T KNOW
? 3

TRIAL  25   DIFFICULTY LEVEL  1                 =

ENTER THE SYMBOL # FOR EACH TRIAL
1 FOR '='  2 FOR '+'  3 FOR '<'
4 FOR '>'  5 FOR '*'  0 FOR DON'T KNOW
? 1

YOUR VISUAL PERCEPTION SCORE IS  25  OUT OF 25
THAT'S  100  % CORRECT

YOU HAVE COMPLETED  1  TEST(S)

              % SCORE
TEST  1          100

DO YOU WISH ANOTHER TEST
ENTER '1' FOR YES, '0' FOR NO
? 0
```

Fig. 10-1. Visual perception test sample run.

could be from 0.2 second to 3 seconds. See Fig. 10-1 for a sample run.

THE TEST

Begin the program by entering the difficulty level. You have three to choose from. Enter 1 for easy, 2 for medium difficulty, and 3 for most difficult. Now you must pay attention, and enter a 1 to begin. A symbol will be displayed on the screen, then you enter the number (1-5) that corresponds to the symbol: 1 for =; 2 for +; 3 for <; 4 for >; and 5 for *. Continue for 25 tries. When you're finished with the test, you may continue with another and change the difficulty level, or end the game.

When you end the game, your percent score for each test is displayed. Finally, an average score is given.

Modifications

The program is for Level II BASIC. If you own a Level I system, the test may be modified for that BASIC. Level II uses an @ sign for PRINT @, while Level I uses AT for PRINT AT. Change program lines 580, 600, 620, 640, and 660 from PRINT @ to PRINT AT, for Level I systems.

Also, Level I BASIC does not recognize the DIM statement in line 180. Delete that line.

Program 10-1. Visual Perception Test Program Listing, Level II

```
100 PRINT"TRS-80 LEVEL II VISUAL PERCEPTION TEST"
110 PRINT"COPYRIGHT (C) 1980 BY HOWARD BERENBON"
120 PRINT
130 PRINT"IT RANDOMLY DISPLAYS 5 SYMBOLS FOR A RANDOM PERIOD"
140 PRINT"FROM .2 TO 3 SEC. YOU HAVE 25 TRIES, WITH THE COMPUTER"
150 PRINT"KEEPING TRACK OF YOUR SCORE."
160 PRINT"THE SYMBOLS ARE:  =  +  <  >  *"
170 PRINT
180 DIM A(100)
190 W=0
200 G=1
210 GOSUB 890
220 CLS
230 PRINT"ENTER '1' TO BEGIN"
240 W=0
250 PRINT"GET READY"
260 INPUT F
270 FOR B=1 TO 25
280 CLS
290 Y=17
300 REM GENERATE RANDOM NUMBERS
310 N=RND(R)
320 X=RND(900)
330 GOSUB 560
340 FOR A=1 TO Y+N
350 NEXT A
360 CLS
370 PRINT"TRIAL ";B;"  DIFFICULTY LEVEL ";H
380 PRINT
390 GOSUB 690
400 NEXT B
410 PRINT"YOUR VISUAL PERCEPTION SCORE IS ";W;" OUT OF 25"
420 PRINT"THAT'S ";W*4;" % CORRECT"
430 GOSUB 780
440 PRINT"DO YOU WISH ANOTHER TEST"
450 PRINT"ENTER '1' FOR YES, '0' FOR NO"
460 INPUT C
470 IF C=1 THEN 210
480 PRINT"YOUR AVERAGE SCORE OUT OF ";G-1;" TEST(S)"
490 G=G-1
500 B=A(1)
510 FOR X=1 TO G
520 B=A(X+1)+B
530 NEXT X
540 PRINT"IS ";B/G;"%"
550 END
```

Program 10-1—cont. Visual Perception Test Program Listing, Level II

```
560 Z=RND(5)
570 ON Z GOTO 590,610,630,650,670
580 GOTO 560
590 PRINT @ X,"="
600 RETURN
610 PRINT @ X,"+"
620 RETURN
630 PRINT @ X,"<"
640 RETURN
650 PRINT @ X,">"
660 RETURN
670 PRINT @ X,"*"
680 RETURN
690 PRINT "ENTER THE SYMBOL # FOR EACH TRIAL"
700 PRINT"1 FOR '='  2 FOR '+'  3 FOR '<'"
710 PRINT"4 FOR '>'  5 FOR '*'  0 FOR DON'T KNOW"
720 INPUT T
730 CLS
740 IF T=Z THEN 760
750 RETURN
760 W=W+1
770 RETURN
780 PRINT
790 A(G)=W*4
800 PRINT"YOU HAVE COMPLETED ";G;" TEST(S)"
810 PRINT
820 PRINT TAB(14)"% SCORE"
830 FOR X=1 TO G
840 PRINT"TEST ";X,A(X)
850 NEXT X
860 G=G+1
870 PRINT
880 RETURN
890 PRINT"ENTER DIFFICULTY LEVEL"
900 PRINT"1=EASY"
910 PRINT"2=MEDIUM DIFFICULTY"
920 PRINT"3=MOST DIFFICULT"
930 INPUT H
940 IF H=1 THEN 980
950 IF H=2 THEN 1000
960 IF H=3 THEN 1020
970 GOTO 890
980 R=300
990 RETURN
1000 R=200
1010 RETURN
1020 R=100
1030 RETURN
```

CHAPTER 11

Constellation 10

Here's an educational program for teachers, students, and scientists, or for anyone interested in astronomy. It displays 10 common constellations, and gives a multiple choice exam on the constellations. See Program 11-1 for the program listing.

After you run the program, you may choose to review the constellations by entering a 1. To take the test, enter a 0. In the review mode, entering any number from 1 to 10 will display a constellation. They are displayed using asterisks (*), with their names printed at the top of the screen.

THE TEST

After reviewing the 10th constellation, enter a 0 to take the test. The test consists of 10 multiple choice questions. A constellation is displayed without identification, with 4 possible answers. Enter the number (1-4) that corresponds to the displayed constellation. If your answer is correct, then CORRECT will be displayed. The program will advance to the next question. After the 10 questions are answered, a list of points per question is displayed, with your percent score below. See Fig. 11-1 for a sample run.

MODIFICATIONS

The program may be modified for other constellation configurations. Of course, the test part of the program must be changed to accommodate the new constellations.

ONE LAST NOTE

After reviewing the constellations, a few times, you'll be surprised how much you've learned. So the next time you look up into the night sky, you'll recognize Cassiopeia, easily.

```
RUN
CONSTELLATION 10:TRS-80
COPYRIGHT (C) 1980 BY HOWARD BERENBON

THIS PROGRAM DISPLAYS 10 CONSTELLATIONS AND
GIVES A MULTIPLE CHOICE TEST.

1-REVIEW, 0-TEST? 1



CASSIOPEIA
            *
                           *
     *              *
                                  *

ENTER #1-10
?




LYNX
       *
       *
                   *

ENTER #1-10
?




CAMELOPARDALIS
                  *


                            *
                 *     *

ENTER #1-10
?

LYRA
                          *
                      *
                 *

                    *
               *
```

```
ENTER #1-10
?

CYGNUS
                     *
                                 *
                         *
                *
                             *
                                 *
                                    *
1-REVIEW, 0-TEST? 0



MULTIPLE CHOICE TEST
ENTER CORRECT ANSWER (#1-4)

1)
            *
                          *
     *               *
                                  *
(1) LEO
(2) BOOTES
(3) CASSIOPEIA
(4) LYNX
(1-4)? 3


CORRECT
2)
                  *


                           *
                 *     *
(1) PROCYON
(2) CAMELOPARDALIS
(3) CEPHEUS
(4) ORION
(1-4)? 2

CORRECT

POINTS PER QUESTION

1= 10    2= 10    3= 10    4= 10    5= 10
6= 10    7= 10    8= 10    9= 10    10= 10

YOUR SCORE IS  10  CORRECT OUT OF 10.
THAT'S  100  PERCENT CORRECT
READY
>
```

Fig. 11-1. Constellation 10 sample run.

Program 11-1. Constellation 10 Program Listing

```
100 PRINT"CONSTELLATION 10:TRS-80"
110 PRINT"COPYRIGHT (C) 1980 BY HOWARD BERENBON"
120 PRINT
130 PRINT"THIS PROGRAM DISPLAYS 10 CONSTELLATIONS AND"
140 PRINT"GIVES A MULTIPLE CHOICE TEST."
150 PRINT
160 FORI=1TO10
170 A(I)=0
180 NEXTI
190 INPUT"1-REVIEW, 0-TEST";A
200 IFA=0THEN1180
210 PRINT
220 PRINT"ENTER #1-10"
230 INPUTB
240 CLS
250 ONBGOTO980,1000,1020,1040,1060,1080,1100,1120,1140,1160
260 PRINT"URSA MAJOR"
270 PRINTTAB(32)"*"
280 PRINT
290 PRINTTAB(6)"*";TAB(13)"*";TAB(21)"*";TAB(34)"*"
300 PRINT"*";TAB(26)"*"
310 RETURN
320 PRINT"CASSIOPEIA"
330 PRINTTAB(12)"*"
340 PRINTTAB(26)"*"
350 PRINTTAB(5)"*";TAB(20)"*"
360 PRINTTAB(33)"*"
370 RETURN
380 PRINT"LYNX"
390 PRINTTAB(7)"*"
400 PRINTTAB(7)"*"
410 PRINTTAB(19)"*"
420 RETURN
430 PRINT"CAMELOPARDALIS"
440 PRINTTAB(18)"*"
450 PRINT
460 PRINT
470 PRINTTAB(27)"*"
480 PRINTTAB(17)"*";TAB(23)"*"
490 RETURN
500 PRINT"ANDROMEDA"
510 PRINTTAB(19)"*"
520 PRINT
530 PRINTTAB(9)"*"
540 PRINTTAB(22)"*"
550 PRINTTAB(18)"*";TAB(26)"*"
```

Program 11-1—cont. Constellation 10 Program Listing

```
560 PRINTTAB(26)"*";TAB(34)"*"
570 RETURN
580 PRINT"GEMINI"
590 PRINTTAB(10)"*";TAB(17)"*"
600 PRINT
610 PRINT
620 PRINTTAB(9)"*"
630 PRINTTAB(10)"*";TAB(17)"*"
640 PRINT
650 PRINTTAB(9)"*";TAB(18)"*"
660 PRINTTAB(4)"*";TAB(21)"*"
670 RETURN
680 PRINT"CANIS MINOR"
690 PRINTTAB(25)"*"
700 PRINT
710 PRINT
720 PRINTTAB(11)"*"
730 RETURN
740 PRINT"LYRA"
750 PRINTTAB(25)"*"
760 PRINTTAB(21)"*"
770 PRINTTAB(16)"*"
780 PRINT
790 PRINTTAB(19)"*"
800 PRINTTAB(14)"*"
810 RETURN
820 PRINT"BOOTES"
830 PRINTTAB(14)"*"
840 PRINT
850 PRINTTAB(8)"*";TAB(36)"*"
860 PRINTTAB(28)"*"
870 PRINTTAB(15)"*"
880 RETURN
890 PRINT"CYGNUS"
900 PRINTTAB(20)"*"
910 PRINTTAB(32)"*"
920 PRINTTAB(24)"*"
930 PRINTTAB(15)"*"
940 PRINTTAB(29)"*"
950 PRINTTAB(32)"*"
960 PRINTTAB(35)"*"
970 RETURN
980 GOSUB260
990 GOTO210
1000 GOSUB320
1010 GOTO210
1020 GOSUB380
1030 GOTO210
1040 GOSUB430
1050 GOTO210
1060 GOSUB500
```

Program 11-1—cont. Constellation 10 Program Listing

```
1070 GOTO210
1080 GOSUB580
1090 GOTO210
1100 GOSUB680
1110 GOTO210
1120 GOSUB740
1130 GOTO210
1140 GOSUB820
1150 GOTO210
1160 GOSUB890
1170 GOTO190
1180 CLS:F=0
1190 PRINT"MULTIPLE CHOICE TEST"
1200 PRINT"ENTER CORRECT ANSWER (#1-4)"
1210 PRINT
1220 PRINT"1)"
1230 GOSUB330
1240 PRINT"(1) LEO"
1250 PRINT"(2) BOOTES"
1260 PRINT"(3) CASSIOPEIA"
1270 PRINT"(4) LYNX"
1280 GOSUB2240
1290 IF C<>3 THEN 1310
1300 GOSUB2210:A(1)=10
1310 PRINT"2)"
1320 GOSUB440
1330 PRINT"(1) PROCYON"
1340 PRINT"(2) CAMELOPARDALIS"
1350 PRINT"(3) CEPHEUS"
1360 PRINT"(4) ORION"
1370 GOSUB2240
1380 IFC<>2 THEN 1400
1390 GOSUB 2210:A(2)=10
1400 PRINT"3)"
1410 GOSUB830
1420 PRINT"(1) BOOTES"
1430 PRINT"(2) AURIGA"
1440 PRINT"(3) GEMINI"
1450 PRINT"(4) HYDRA"
1460 GOSUB2240
1470 IF C<>1 THEN 1490
1480 GOSUB2210:A(3)=10
1490 PRINT"4)"
1500 GOSUB510
1510 PRINT"(1) ANDROMEDA"
1520 PRINT"(2) CRUX"
1530 PRINT"(3) CANOPUS"
1540 PRINT"(4) DRACO"
1550 GOSUB2240
1560 IFC<>1 THEN 1580
1570 GOSUB2210:A(4)=10
```

Program 11-1—cont. Constellation 10 Program Listing

```
1580 PRINT"5)"
1590 GOSUB270
1600 PRINT"(1) AURIGA"
1610 PRINT"(2) LYNX"
1620 PRINT"(3) URSA MAJOR"
1630 PRINT"(4) LEPUS"
1640 GOSUB2240
1650 IFC<>3 THEN 1670
1660 GOSUB2210:A(5)=10
1670 PRINT"6)"
1680 GOSUB590
1690 PRINT"(1) LEO"
1700 PRINT"(2) CYGNUS"
1710 PRINT"(3) CORONA BOREALIS"
1720 PRINT"(4) GEMINI"
1730 GOSUB2240
1740 IFC<>4 THEN 1760
1750 GOSUB2210:A(6)=10
1760 PRINT"7)"
1770 GOSUB750
1780 PRINT"(1) LYRA"
1790 PRINT"(2) LEO"
1800 PRINT"(3) ORION"
1810 PRINT"(4) CETUS"
1820 GOSUB2240
1830 IFC<>1 THEN 1850
1840 GOSUB2210:A(7)=10
1850 PRINT"8)"
1860 GOSUB690
1870 PRINT"(1) CRUX"
1880 PRINT"(2) CETUS"
1890 PRINT"(3) DRACO"
1900 PRINT"(4) CANIS MINOR"
1910 GOSUB2240
1920 IFC<>4 THEN 1940
1930 GOSUB2210:A(8)=10
1940 PRINT"9)"
1950 GOSUB390
1960 PRINT"(1) CRUX"
1970 PRINT"(2) URSA MAJOR"
1980 PRINT"(3) LYNX"
1990 PRINT"(4) VIRGO"
2000 GOSUB2240
2010 IFC<>3 THEN 2030
2020 GOSUB2210:A(9)=10
2030 PRINT"10)"
2040 GOSUB900
2050 PRINT"(1) PERSEUS"
2060 PRINT"(2) LEPUS"
2070 PRINT"(3) CYGNUS"
2080 PRINT"(4) ORION"
```

Program 11-1—cont. Constellation 10 Program Listing

```
2090 GOSUB2240
2100 IFC<>3 THEN 2120
2110 GOSUB2210:A(10)=10
2120 PRINT
2130 PRINT"POINTS PER QUESTION"
2140 PRINT
2150 PRINT"1=";A(1);"  2=";A(2);"  3=";A(3);"  4=";A(4);"  5=";A(5)
2160 PRINT"6=";A(6);"  7=";A(7);"  8=";A(8);"  9=";A(9);"  10=";A(10)
2170 PRINT
2180 PRINT"YOUR SCORE IS ";P/10;" CORRECT OUT OF 10."
2190 PRINT"THAT'S ";P;" PERCENT CORRECT"
2200 END
2210 P=P+10
2220 PRINT"CORRECT"
2230 RETURN
2240 PRINT"(1-4)";
2250 INPUT C
2260 CLS
2270 RETURN
```

CHAPTER 12

The Sun

The Sun is an educational program describing the star at the center of our solar system. It lists important information about the sun, and gives a 10 question, TRUE/FALSE, test. It's written in BASIC for your microcomputer. See Program 12-1 for the program listing.

THE TEST

After reviewing the information, a TRUE/FALSE test may be taken. Enter a 1 to take the test. To enter an answer, enter a 1 for TRUE or a 0 for FALSE. If your answer is correct, then CORRECT will be displayed. After all 10 questions are answered, the number of correct points per question, and your percent score, will be displayed. See Fig. 12-1 for a sample run.

```
>RUN
THE SUN-ASTRONOMY LESSON II
COPYRIGHT (C) 1979 BY HOWARD BERENBON

THE SUN
                *          *
          *                     *
       *                           *
      *                              *
      --------- 864,400 MILES ---------
      *                               *
       *                             *
         *                         *
                *          *
ENTER '1' TO CONTINUE
?


THE SUN IS AN AVERAGE SIZE STAR IN OUR GALAXY. ITS MASS
IS 2.2 X 10 TO THE 27TH TONS. IT IS COMPLETELY GASEOUS.
SUNLIGHT ORIGINATES FROM THE PHOTOSPHERE, A BOUNDRY THAT
EXISTS BETWEEN THE SUN AND ITS ATMOSPHERE. THE REVERSING
LAYER, THE CHROMOSPHERE, AND THE CORONA ARE THE THREE LAYERS
OF THE SUNS ATMOSPHERE.
-+-*-+--+-*-+--+-*
    CORONA
------------------
 CHROMOSPHERE
::::::::::::::::::-REVERSING LAYER-TOP, PHOTOSPHERE-BOTTOM
THE SUN

ENTER '1' TO CONTINUE
?




THE DENSITY IS .25 THAT OF THE EARTH, AND SURFACE GRAVITY
IS 28 TIMES THAT OF THE EARTH.
THE PHOTOSPHERE IS A SHELL ABOUT 150 MILES THICK FROM WHICH
LIGHT IS EMITTED. THE BRIGHTNESS IS NOT UNIFORM, BUT
SPECKLED OR GRANULATED WITH DIAMETERS HUNDREDS OF MILES
LONG, AND CONSTANTLY CHANGING.
'SUNSPOTS' ARE GIGANTIC AREAS ON THE SUN THAT APPEAR DARK
COMPARED TO OTHER AREAS. THEY CAN LAST FROM 4 DAYS (AVERAGE)
TO MORE THAN 100 DAYS. THEY CAUSE AN INCREASE IN THE
MAGNETIC FIELD, BY MANY THOUSANDS, IN THE AREA OF THE SUNSPOT.

ENTER '1' TO CONTINUE
?


'FACULAE' ARE SMALL TORCHES ABOVE THE SURFACE OF THE PHOTO-
SPHERE. THEY PRECEDE THE APPEARANCE OF SUNSPOTS AND LAST
FROM 2 WEEKS TO MONTHS AFTER A SUNSPOT.
THE TEMPERATURE AT THE 'REVERSING LAYER', AT THE BASE OF THE
SUN, IS 7500 DEGREES A.
'PROMINENCES' ARE ROSE-COLORED FEATHERY FLAMES FROM THE SUN.
THEY FORM NEAR SUNSPOTS.
'CHROMOSPHERIC FLARES' CAUSE RADIO FADEOUTS, FROM STRONG
ULTRAVIOLET RADIATION EMITTED BY THESE FLARES.

ENTER '1' TO CONTINUE
?
```

Fig. 12-1. The sun sample run.

```
THE 'CORONA' IS THE OUTER LAYER OF THE SUNS ATMOSPHERE. IT
IS VISIBLE TO THE NAKED EYE DURING AN ECLIPSE. IT HAS HIGH
TEMPERATURES OF 1,000,000 DEGREES A.

ENTER '1'-TEST, '2'-REVIEW
? 1


10 QUESTION 'TRUE' OR 'FALSE' TEST

1) THE DIAMETER OF THE SUN IS 864,400 MILES

ENTER '1'-TRUE, '0'-FALSE
? 1



CORRECT

2) SUNSPOTS ARE BRIGHT SPOTS ON THE SUN

ENTER '1'-TRUE, '0'-FALSE
? 0


CORRECT


POINTS PER QUESTION

1= 10   2= 10   3= 10   4= 10   5= 10
6= 10   7= 10   8= 10   9= 10   10= 10

YOUR SCORE IS  10  CORRECT OUT OF 10.
THAT'S  100  PERCENT CORRECT
READY
>
```

Fig. 12-1—cont. The sun sample run.

Program 12-1. The Sun Program Listing

```
100 DIM A(10)
110 FORA=1TO10
120 A(A)=0
130 NEXTA
140 PRINT"THE SUN-ASTRONOMY LESSON II"
150 PRINT"COPYRIGHT (C) 1979 BY HOWARD BERENBON"
160 PRINT
170 PRINT"THE SUN"
180 PRINTTAB(16)"*";TAB(27)"*"
190 PRINTTAB(10)"*";TAB(32)"*"
200 PRINTTAB(7)"*";TAB(35)"*"
210 PRINTTAB(6)"*";TAB(37)"*"
220 PRINT "       ---------- 864,400 MILES ----------"
230 PRINTTAB(6)"*";TAB(38)"*"
240 PRINTTAB(7)"*";TAB(37)"*"
250 PRINTTAB(9)"*";TAB(35)"*"
260 PRINTTAB(16)"*";TAB(27)"*"
270 GOSUB1320
280 INPUTA:IFA<>1THEN270
290 PRINT"THE SUN IS AN AVERAGE SIZE STAR IN OUR GALAXY. ITS MASS"
300 PRINT"IS 2.2 X 10 TO THE 27TH TONS. IT IS COMPLETELY GASEOUS."
310 PRINT"SUNLIGHT ORIGINATES FROM THE PHOTOSPHERE, A BOUNDRY THAT"
320 PRINT"EXISTS BETWEEN THE SUN AND ITS ATMOSPHERE. THE REVERSING"
330 PRINT"LAYER, THE CHROMOSPHERE, AND THE CORONA ARE THE THREE LAYERS"
340 PRINT"OF THE SUNS ATMOSPHERE."
350 PRINT"-+-*-+--+-*-+--+-*"
360 PRINT"    CORONA"
370 PRINT"------------------"
380 PRINT" CHROMOSPHERE"
390 PRINT":::::::::::::::::-REVERSING LAYER-TOP, PHOTOSPHERE-BOTTOM"
400 PRINT"THE SUN"
410 PRINT:GOSUB1320
420 INPUTA:IFA<>1THEN410
430 PRINT"THE DENSITY IS .25 THAT OF THE EARTH, AND SURFACE GRAVITY"
440 PRINT"IS 28 TIMES THAT OF THE EARTH."
450 PRINT"THE PHOTOSPHERE IS A SHELL ABOUT 150 MILES THICK FROM WHICH"
460 PRINT"LIGHT IS EMITTED. THE BRIGHTNESS IS NOT UNIFORM, BUT"
470 PRINT"SPECKLED OR GRANULATED WITH DIAMETERS HUNDREDS OF MILES"
480 PRINT"LONG, AND CONSTANTLY CHANGING."
490 PRINT"'SUNSPOTS' ARE GIGANTIC AREAS ON THE SUN THAT APPEAR DARK"
500 PRINT"COMPARED TO OTHER AREAS. THEY CAN LAST FROM 4 DAYS (AVERAGE)"
510 PRINT"TO MORE THAN 100 DAYS. THEY CAUSE AN INCREASE IN THE"
520 PRINT"MAGNETIC FIELD, BY MANY THOUSANDS, IN THE AREA OF THE SUNSPOT."
530 PRINT:GOSUB1320
540 INPUTA:IFA<>1 THEN 530
550 PRINT"'FACULAE' ARE SMALL TORCHES ABOVE THE SURFACE OF THE PHOTO-"
```

Program 12-1—cont. The Sun Program Listing

```
560 PRINT"SPHERE. THEY PRECEDE THE APPEARANCE OF SUNSPOTS AND LAST"
570 PRINT"FROM 2 WEEKS TO MONTHS AFTER A SUNSPOT."
580 PRINT"THE TEMPERATURE AT THE 'REVERSING LAYER', AT THE BASE OF THE"
590 PRINT"SUN, IS 7500 DEGREES A."
600 PRINT"'PROMINENCES' ARE ROSE-COLORED FEATHERY FLAMES FROM THE SUN."
610 PRINT"THEY FORM NEAR SUNSPOTS."
620 PRINT"'CHROMOSPHERIC FLARES' CAUSE RADIO FADEOUTS, FROM STRONG"
630 PRINT"ULTRAVIOLET RADIATION EMITTED BY THESE FLARES."
640 PRINT:GOSUB1320
650 INPUTA:IFA<>1THEN640
660 PRINT"THE 'CORONA' IS THE OUTER LAYER OF THE SUNS ATMOSPHERE. IT"
670 PRINT"IS VISIBLE TO THE NAKED EYE DURING AN ECLIPSE. IT HAS HIGH"
680 PRINT"TEMPERATURES OF 1,000,000 DEGREES A."
690 PRINT
700 PRINT"ENTER '1'-TEST, '2'-REVIEW"
710 INPUTA:IFA=1THEN730
720 IFA<>1THEN110
730 PRINT"10 QUESTION 'TRUE' OR 'FALSE' TEST"
740 P=0:PRINT
750 PRINT"1) THE DIAMETER OF THE SUN IS 864,400 MILES"
760 GOSUB1240
770 IFC<>1 THEN 790
780 GOSUB1270:A(1)=10
790 PRINT"2) SUNSPOTS ARE BRIGHT SPOTS ON THE SUN"
800 GOSUB1240
810 IFC<>0 THEN 830
820 GOSUB1270:A(2)=10
830 PRINT"3) THE SOLAR ATMOSPHERE CONSISTS OF 3 LAYERS:"
840 PRINT"REVERSING LAYER, CHROMOSPHERE, CORONA"
850 GOSUB1240
860 IFC<>1 THEN 880
870 GOSUB1270:A(3)=10
880 PRINT"4) THE SUN IS AN AVERAGE SIZE STAR IN OUR GALAXY"
890 GOSUB1240
900 IFC<>1 THEN 920
910 GOSUB1270:A(4)=10
920 PRINT"5) FACULAE ARE SMALL TORCHES ABOVE THE PHOTOSPHERE"
930 GOSUB1240
940 IFC<>1 THEN 960
950 GOSUB1270:A(5)=10
960 PRINT"6) PROMINENCES ARE BLUE COLORED FLAMES FROM THE SUN"
970 GOSUB1240
980 IFC<>0 THEN 1000
990 GOSUB1270:A(6)=10
1000 PRINT"7) THE SUN IS COMPLETELY GASEOUS"
1010 GOSUB1240
1020 IFC<>1 THEN 1040
1030 GOSUB1270:A(7)=10
1040 PRINT"8) AS SUNSPOTS GROW THEIR MAGNETIC FIELDS DECREASE"
1050 GOSUB1240
1060 IFC<>0 THEN 1080
```

Program 12-1—cont. The Sun Program Listing

```
1070 GOSUB1270:A(8)=10
1080 PRINT"9) RADIO FADEOUTS ARE CAUSED BY INFRARED RADIATION"
1090 GOSUB1240
1100 IFC<>0 THEN 1120
1110 GOSUB1270:A(9)=10
1120 PRINT"10) CHROMOSPHERIC FLARES EMIT ULTRAVIOLET RADIATION"
1130 GOSUB1240
1140 IFC<>1 THEN 1160
1150 GOSUB1270:A(10)=10
1160 PRINT
1170 PRINT"POINTS PER QUESTION":PRINT
1180 PRINT"1=";A(1);"  2=";A(2);"  3=";A(3);"  4=";A(4);"  5=";A(5)
1190 PRINT"6=";A(6);"  7=";A(7);"  8=";A(8);"  9=";A(9);"  10=";A(10)
1200 PRINT
1210 PRINT"YOUR SCORE IS ";P/10;" CORRECT OUT OF 10."
1220 PRINT"THAT'S ";P;" PERCENT CORRECT"
1230 END
1240 PRINT:PRINT"ENTER '1'-TRUE, '0'-FALSE"
1250 INPUTC
1260 RETURN
1270 P=P+10
1280 PRINT
1290 PRINT"CORRECT"
1300 PRINT
1310 RETURN
1320 PRINT"ENTER '1' TO CONTINUE"
1330 RETURN
```

CHAPTER 13

Math 4

Math 4 is an educational program that gives 4 different 10-question math tests. It's written in BASIC for your microcomputer. See Program 13-1 for the program listing.

THE PROGRAM

The program begins by requesting entry of the difficulty level. Enter

1. Easy
2. Moderate
3. Most Difficult

Then enter your choice of the 4 subjects:

1. Addition
2. Subtraction
3. Multiplication
4. Division

Each test generates random problems, and no two tests will be alike. Enter the number (1-4) of the desired test. You have two tries to enter the correct answer, then the program advances to the next problem. Your answer is checked, then CORRECT or INCORRECT is displayed. After you complete all 10 questions, your score is displayed. You may then select another test, or end the program. See Fig. 13-1 for a sample run.

THE MATH PROBLEMS

The program generates random values for X and Y with program lines 280 and 290. The maximum value is determined by the difficulty level. At the most difficult level, X and Y will not exceed 100.

```
RUN
MATH 4: TRS-80
COPYRIGHT (C) 1980 BY HOWARD BERENBON

THIS IS A MATH TEST PROGRAM WITH
FOUR DIFFERENT 10-QUESTION TESTS.
YOU HAVE 2 TRIES PER QUESTION.

ENTER DIFFICULTY LEVEL

1) EASY
2) MODERATE
3) MOST DIFFICULT
? 1

                    MATH 4

ENTER THE DESIRED TEST NUMBER

1) ADDITION
2) SUBTRACTION
3) MULTIPLICATION
4) DIVISION
? 1

                    ADDITION TEST
PROBLEM  1
TRIAL  1

 1    +    7    =   ? 8
CORRECT

                    ADDITION TEST
PROBLEM  2
TRIAL  1

 5    +    6    =   ? 11
CORRECT
```

Fig. 13-1. Math 4 sample run.

Program 13-1. Math 4 Program Listing

```
100 PRINT"MATH 4: TRS-80"
110 PRINT"COPYRIGHT (C) 1980 BY HOWARD BERENBON"
120 PRINT
130 PRINT"THIS IS A MATH TEST PROGRAM WITH"
140 PRINT"FOUR DIFFERENT 10-QUESTION TESTS."
150 PRINT"YOU HAVE 2 TRIES PER QUESTION."
160 PRINT:GOSUB 1200
170 CLS:PRINTTAB(18)"MATH 4"
180 PRINT
190 PRINT"ENTER THE DESIRED TEST NUMBER"
200 PRINT
210 PRINT"1) ADDITION"
220 PRINT"2) SUBTRACTION"
230 PRINT"3) MULTIPLICATION"
240 PRINT"4) DIVISION"
250 INPUT A
260 ON A GOTO 400,690,850,1010
270 GOTO 190
280 X=RND(D)
290 Y=RND(D)
300 PRINT
310 RETURN
320 PRINT"PROBLEM ";A
330 PRINT"TRIAL ";T
340 PRINT
350 RETURN
360 PRINT"INCORRECT"
370 GOSUB 1170
380 PRINT
390 RETURN
400 S=0
410 FORA=1TO10
420 T=1
430 GOSUB 280
440 CLS:PRINTTAB(18)"ADDITION TEST"
450 GOSUB 320
460 PRINTX;"   +   ";Y;"   =   ";
470 INPUT B
480 IFB=X+Y THEN 570
490 T=T+1
500 GOSUB 360
510 IF T=3 THEN 530
520 GOTO 440
530 PRINT"THE CORRECT ANSWER IS ";X+Y
540 GOSUB 1170
550 NEXT A
```

Program 13-1—cont. Math 4 Program Listing

```
560 GOTO 610
570 PRINT"CORRECT"
580 GOSUB 1170
590 S=S+1
600 GOTO 550
610 PRINT
620 PRINT"YOU HAVE ";S;" CORRECT OUT OF 10"
630 PRINT"THAT'S A SCORE OF ";S*10;" %"
640 PRINT
650 PRINT"ENTER A '1' TO CONTINUE TESTING"
660 INPUT A
670 IF A=1 THEN 160
680 END
690 S=0
700 FORA=1TO10
710 T=1
720 GOSUB 280
730 CLS:PRINTTAB(18)"SUBTRACTION TEST"
740 GOSUB 320
750 PRINTX;"   -   ";Y;"  =  ";
760 INPUT B
770 IF B=X-Y THEN 570
780 T=T+1
790 GOSUB 360
800 IF T=3 THEN 820
810 GOTO 730
820 PRINT"THE CORRECT ANSWER IS ";X-Y
830 GOSUB 1170
840 GOTO 550
850 S=0
860 FORA=1TO10
870 T=1
880 GOSUB 280
890 CLS:PRINTTAB(18)"MULTIPLICATION TEST"
900 GOSUB 320
910 PRINT X;"   X   ";Y;"  =  ";
920 INPUT B
930 IF B=X*Y THEN 570
940 T=T+1
950 GOSUB 360
960 IF T=3 THEN 980
970 GOTO 890
980 PRINT"THE CORRECT ANSWER IS ";X*Y
990 GOSUB 1170
1000 GOTO 550
1010 S=0
1020 FORA=1TO10
1030 T=1
1040 GOSUB 280
1050 CLS:PRINTTAB(18)"DIVISION TEST"
1060 GOSUB 320
```

Program 13-1—cont. Math 4 Program Listing

```
1070 PRINT X*Y;"  /  ";Y;"  =  ";
1080 INPUT B
1090 IF B=X THEN 570
1100 T=T+1
1110 GOSUB 360
1120 IF T=3 THEN 1140
1130 GOTO 1050
1140 PRINT"THE CORRECT ANSWER IS ";X
1150 GOSUB 1170
1160 GOTO 550
1170 FOR P=1TO 400
1180 NEXT P
1190 RETURN
1200 PRINT"ENTER DIFFICULTY LEVEL"
1210 PRINT
1220 PRINT"1) EASY"
1230 PRINT"2) MODERATE"
1240 PRINT"3) MOST DIFFICULT"
1250 INPUT E
1260 ON E GOTO 1280,1290,1300
1270 GOTO 1200
1280 D=10:RETURN
1290 D=20:RETURN
1300 D=100:RETURN
```

CHAPTER 14

The Reading Pacer

Here's a program that will help you increase your reading speed. It's called The Reading Pacer, and it's written in BASIC for your microcomputer. See Program 14-1 for the program listing.

THE PROGRAM

The program displays one line of text at a variable speed, from approximately 0.3 second to 3 seconds. It can display lines of text up to 1200 words per minute. Each line is printed at the center of the screen.

After you RUN the program, enter a speed value from 1 to 10. Your slowest speed is accessed with a 1, and the quickest with a 10. Then enter a 1 to begin. See Fig. 14-1 for a sample run.

DATA STORAGE

The lines of text are stored in DATA statements beginning with program line 1000. Any number of DATA statements may be used, just enter one line of text per statement. The last line must be DATA "END".

USE

Start the pacer at the slowest speed, then gradually increase the speed. Change the text, then start the pacer at about half your fastest speed. You should notice an increase in your reading speed and comprehension.

```
RUN
THE READING PACER
TRS-80 LEVEL II
COPYRIGHT (C) 1979 BY HOWARD BERENSON

ENTER TEXT AS DATA STATEMENTS STARTING AT
LINE 1000.

THE READING PACER WILL DISPLAY LINES OF
TEXT UP TO 1200 WORDS PER MINUTE.

ENTER LINE SPEED-FROM 1 TO 10
ENTRY OF '10' IS THE QUICKEST,
'1' IS THE SLOWEST
? 4

ENTER '1' TO BEGIN
? 1




THE READING PACER CAN HELP INCREASE









END

DO YOU WISH TO TRY AGAIN?
ENTER '1'-YES,  '0'-NO
? 1
```

Fig. 14-1. The reading pacer sample run.

Program 14-1. The Reading Pacer Program Listing, Level II

```
100 PRINT"THE READING PACER"
110 PRINT"TRS-80 LEVEL II"
120 PRINT"COPYRIGHT (C) 1979 BY HOWARD BERENBON"
130 PRINT
140 PRINT"ENTER TEXT AS DATA STATEMENTS STARTING AT"
150 PRINT"LINE 1000."
160 PRINT
170 PRINT"THE READING PACER WILL DISPLAY LINES OF"
180 PRINT"TEXT UP TO 1200 WORDS PER MINUTE."
190 PRINT
200 PRINT"ENTER LINE SPEED-FROM 1 TO 10"
210 PRINT"ENTRY OF '10' IS THE QUICKEST,"
220 PRINT"'1' IS THE SLOWEST"
230 INPUT A
240 GOSUB 430
250 CLS
260 PRINT"ENTER '1' TO BEGIN"
270 INPUT B
280 CLS
290 READ A$
300 PRINT @ 448,A$
310 IF A$="END" THEN 360
320 FOR C=1 TO F
330 NEXT C
340 CLS
350 GOTO 290
360 RESTORE
370 PRINT
380 PRINT"DO YOU WISH TO TRY AGAIN?"
390 PRINT"ENTER '1'-YES,  '0'-NO"
400 INPUT X
410 IF X=1 THEN 200
420 END
430 F=(5/A)*200
440 RETURN
1000 DATA "THE READING PACER CAN HELP INCREASE"
1010 DATA "YOUR READING SPEED. START WITH THE"
1020 DATA "SLOWEST SPEED BY ENTERING A '1',"
1030 DATA "AND GRADUALLY INCREASE THE SPEED"
1040 DATA "UNTIL YOU NOTICE YOUR READING"
1050 DATA "COMPREHENSION INCREASING. CHANGE"
1060 DATA "THE TEXT, THEN START THE PACER AT"
1070 DATA "ABOUT HALF YOUR FASTEST SPEED. YOU"
1080 DATA "SHOULD NOTICE AN INCREASE IN YOUR"
1090 DATA "READING SPEED AND COMPREHENSION."
1100 DATA "END"
```

CHAPTER 15

Spelling Test

The Spelling Test is an educational program that tests for the correct spelling of 20 vocabulary words. It's written in BASIC for your microcomputer. See Program 15-1 for the program listing.

THE PROGRAM

The program accepts entry of the correctly spelled word, after the incorrect spelling is displayed. You have two tries to enter the correct answer, then it advances to the next word. After each entry, it displays either CORRECT or INCORRECT. After all 20 words are displayed, it prints your total number correct and the percent score. See Fig. 15-1 for a sample run.

```
                SPELLING TEST

WORD #  1
TRIAL  1

PROGRAMING
? PROGRAMMING
CORRECT




                SPELLING TEST

WORD #  2
TRIAL  1

DICTIANERY
? DICTIONERY

INCORRECT
WORD #  2
TRIAL  2

DICTIANERY
?
```

Fig. 15-1. Spelling test sample run.

DATA STORAGE

The vocabulary words are stored in DATA statements beginning at program line 1000. You can use the words supplied or enter a new list. See Table 15-1 for the word list.

When entering new words, alternate between the correct spelling and incorrect spelling.

Table 15-1. Spelling Test Word List

Incorrect	Correct
programing	programming
dictianery	dictionary
performense	performance
investagate	investigate
satasfactery	satisfactory
inportant	important
signifacant	significant
simalar	similar
comand	command
necesary	necessary
constelation	constellation
busines	business
analise	analyze
dificult	difficult
challange	challenge
intellagant	intelligent
skillfull	skillful
imformation	information
obsurvation	observation
duplacait	duplicate

Program 15-1. Spelling Test Program Listing, Level II

```
100 PRINT"SPELLING TEST: TRS-80 LEVEL II"
110 PRINT"COPYRIGHT (C) 1980 BY HOWARD BERENBON"
120 PRINT
130 PRINT"THIS IS A SPELLING TEST PROGRAM."
140 PRINT"GIVEN ARE 20 INCORRECTLY SPELLED"
150 PRINT"WORDS; YOU HAVE 2 TRIES TO"
160 PRINT"ENTER EACH CORRECT SPELLING."
170 PRINT
180 PRINT"THE WORDS ARE STORED IN DATA STATEMENTS"
190 PRINT"BEGINNING AT LINE 1000. ALTERNATE BETWEEN"
200 PRINT"THE CORRECT AND INCORRECT SPELLINGS."
210 PRINT
220 PRINT"ENTER A '1' TO BEGIN"
230 INPUT A
240 S=0
250 FOR A=1TO20
260 READ A$,B$
270 T=1
280 CLS
290 GOSUB 560
300 PRINT"WORD # ";A
310 PRINT"TRIAL ";T
320 PRINT
330 PRINT B$
340 INPUT C$
350 IF C$=A$ THEN 480
360 T=T+1
370 IF T=3 THEN 410
380 PRINT
390 PRINT"INCORRECT"
400 GOTO 300
410 CLS
420 PRINT"INCORRECT"
430 PRINT"THE CORRECT SPELLING IS '";A$;"'"
440 FOR H=1 TO 1320
450 NEXT H
460 NEXT A
470 GOTO 510
480 PRINT"CORRECT"
490 S=S+1
500 GOTO 440
510 PRINT
520 GOSUB 560
530 PRINT"YOU HAVE ";S;" CORRECT OUT OF 20 WORDS."
540 PRINT"THAT'S A SCORE OF ";S*5;" PERCENT."
550 END
```

Program 15-1—cont. Spelling Test Program Listing, Level II

```
560 PRINT TAB(15)"SPELLING TEST"
570 PRINT
580 RETURN
980 REM ENTER THE WORDS, ALTERNATING WITH THE CORRECT
990 REM AND INCORRECT WORD, AS SEEN BELOW.
1000 DATA "PROGRAMMING","PROGRAMING","DICTIONARY","DICTIANERY"
1010 DATA "PERFORMANCE","PERFORMENSE","INVESTIGATE","INVESTAGATE"
1020 DATA "SATISFACTORY","SATASFACTERY","IMPORTANT","INPORTANT"
1030 DATA "SIGNIFICANT","SIGNIFACANT","SIMILAR","SIMALAR"
1040 DATA "COMMAND","COMAND","NECESSARY","NECESARY"
1050 DATA "CONSTELLATION","CONSTELATION","BUSINESS","BUSINES"
1060 DATA "ANALYZE","ANALISE","DIFFICULT","DIFICULT"
1070 DATA "CHALLENGE","CHALLANGE","INTELLIGENT","INTELLAGANT"
1080 DATA "SKILLFUL","SKILLFULL","INFORMATION","IMFORMATION"
1090 DATA "OBSERVATION","OBSURVATION","DUPLICATE","DUPLACAIT"
```

SECTION III

Business and Investment

The business and investment use of the home computer is an important one. In the past, the small business could not afford the use of a computer. Now with the low price of the home computer, under $1000, it's easily affordable. A fully equipped business system can cost from $3000 to $4000 including a printer, dual disks, and enough RAM memory for inventory and pay roll, etc.

This section includes a loan amortization program, that prints a payment schedule for a given loan amount, interest rate, and monthly payment; the house buying guide program can help the investor choose a house for investment; and a depreciation program will list a schedule for business depreciation.

CHAPTER 16

The House Buying Guide

Here's an interesting program for the potential home investor, or investment group. It's the house buying guide, used for screening houses that may be of interest to you. It's written in BASIC, and will run on your microcomputer.

The program is a 16 question, questionnaire, with each answer assigned a point value. See Program 16-1 for the program listing. Before beginning the questionnaire, the program requires a "yes" answer to the following preliminary questions:

1. Does the house have all utilities? (gas, water, etc.)
2. Is there gas heat?
3. Are the roads paved?
4. Is the down payment and initial cost within your budget?

If any of the preliminary questions are answered "no," then the house is not acceptable. A house that passed the screening will go on to the questionnaire. See Fig. 16-1 for a sample run.

USE

The questionnaire was designed to assist the investor in finding a reliable house, for maximum profitability and resale value.

A point score of 36 points or more is a positive recommendation to invest in the house. The house will have all the qualifications for a profit making investment, either for renting and/or selling at some future date.

Questions 14 through 16 pertain to profitability of your investment. Question 14 requires entry of the monthly rent that you will charge. Question 15 requests a monthly cash flow value, calculated by the following formula:

$$\text{Monthly Cash Flow} = \frac{(\text{yr rent}) - (\text{yr insurance} + \text{yr tax} + \text{yr water})}{12}$$

Finally, question 16 requests the percent profit, calculated by the following formula:

$$\text{Percent Profit} = \frac{(\text{yr cash flow} + \text{yr principal})}{(\text{down payment} + \text{initial costs})}$$

If you intend to use the questionnaire for screening a house, without the intention of renting, then questions 14 through 16 must be answered with a set point value. To adjust the point count for an accurate recommendation, give these questions 4 points each.

```
RUN
THE HOUSE BUYING GUIDE
COPYRIGHT (C) 1979 BY HOWARD BERENBON

PRELIMINARY SCREENING

A
DOES THE HOUSE HAVE ALL UTILITIES?
ENTER '1'=YES,  '0'=NO
? 1



B
IS THERE GAS HEAT?
ENTER '1'=YES,  '0'=NO
? 1

C
ARE THE ROADS PAVED?
ENTER '1'=YES,  '0'=NO
? 1

D
IS THE DOWN PAYMENT AND INITIAL
COST WITHIN YOUR BUDGET?
ENTER '1'=YES,  '0'=NO
? 1



THE HOUSE HAS PASSED THE PRELIMINARY SCREENING

BEGIN QUESTIONNAIRE

#1
GENERAL CONDITION?
POOR    =1
AVERAGE=2
GOOD    =3
EXCELLENT=4
ENTER POINT VALUE
? 3



#2
STRUCTURE?
ALUMINUM=1
BRICK   =2
ENTER POINT VALUE
? 2
POINTS SO FAR=  5


#3
FAMILY ROOM?
YES=1,  NO=0
ENTER POINT VALUE
? 1


POINTS SO FAR=  10
```

```
#6
LOCATION? (RATING FROM 0 TO 5)
ZERO=0          THREE=6
ONE=2           FOUR=8
TWO=4           FIVE=10
ENTER POINT VALUE
? 8



8
POINTS SO FAR=  18


#7
IMMEDIATE NEIGHBORHOOD?
POOR    =1
AVERAGE=2
GOOD    =3
EXCELLENT=4
ENTER POINT VALUE
?

#9
BATHS?
1 1/2 BATHS=1   2 1/2 BATHS=3
2 BATHS    =2   3 BATHS    =4
ENTER POINT VALUE
? 2
POINTS SO FAR=  28


#10
BASEMENT?
YES=1, NO=0
ENTER POINT VALUE
? 1


POINTS SO FAR=  32


#13
AGE?
1 TO 5 YRS=3
6 TO 10 YRS=2
11 TO 15 YRS=1
16 OR GREATER=0
ENTER POINT VALUE
? 1



POINTS SO FAR=  45


THE HOUSE IS ACCEPTABLE

TOTAL POINTS=  45
READY
>
```

Fig. 16-1. The house buying guide sample run.

Program 16-1. House Buying Guide Program Listing

```
100 PRINT"THE HOUSE BUYING GUIDE"
110 PRINT"COPYRIGHT (C) 1979 BY HOWARD BERENBON"
120 PRINT
130 P=0
140 PRINT"PRELIMINARY SCREENING"
150 PRINT
160 PRINT"A"
170 PRINT"DOES THE HOUSE HAVE ALL UTILITIES?"
180 GOSUB 1480
190 PRINT"B"
200 PRINT"IS THERE GAS HEAT?"
210 GOSUB 1480
220 PRINT"C"
230 PRINT"ARE THE ROADS PAVED?"
240 GOSUB 1480
250 PRINT"D"
260 PRINT"IS THE DOWN PAYMENT AND INITIAL"
270 PRINT"COST WITHIN YOUR BUDGET?"
280 GOSUB 1480
290 PRINT"THE HOUSE HAS PASSED THE PRELIMINARY SCREENING"
300 PRINT
310 PRINT"BEGIN QUESTIONNAIRE"
320  PRINT
330 B=0
340 PRINT"#1"
350 PRINT"GENERAL CONDITION?"
360 PRINT"POOR   =1"
370 PRINT"AVERAGE=2"
380 PRINT"GOOD   =3"
390 PRINT"EXCELLENT=4"
400 GOSUB 1530
410 PRINT"#2"
420 PRINT"STRUCTURE?"
430 PRINT"ALUMINUM=1"
440 PRINT"BRICK   =2"
450 GOSUB 1530
460  PRINT"#3"
470 PRINT"FAMILY ROOM?"
480 PRINT"YES=1,  NO=0"
490 GOSUB 1530
500 PRINT"#4"
510 PRINT"GARAGE?"
520 PRINT"1 CAR   =1"
530 PRINT"1 1/2   =2"
540 PRINT"2 CAR   =3"
550 PRINT"2 1/2   =4"
```

Program 16-1—cont. House Buying Guide Program Listing

```
560 GOSUB 1530
570 PRINT"#5"
580 PRINT"BEDROOMS?"
590 PRINT"TWO=1","FOUR=3"
600 PRINT"THREE=2","FIVE=4"
610 GOSUB 1530
620 PRINT"#6"
630 PRINT"LOCATION? (RATING FROM 0 TO 5)"
640 PRINT"ZERO=0","THREE=6"
650 PRINT"ONE=2","FOUR=8"
660 PRINT"TWO=4","FIVE=10"
670 GOSUB 1530
680  PRINT"#7"
690  PRINT"IMMEDIATE NEIGHBORHOOD?"
700  PRINT"POOR   =1"
710  PRINT"AVERAGE=2"
720  PRINT"GOOD   =3"
730  PRINT"EXCELLENT=4"
740  GOSUB 1530
750  PRINT"#8"
760  PRINT"SQUARE FOOTAGE?"
770  PRINT"1000=1","1400=5","1800=9"
780  PRINT"1100=2","1500=6","1900=10"
790  PRINT"1200=3","1600=7","2000=11"
800  PRINT"1300=4","1700=8","2100=12"
810  GOSUB 1530
820  PRINT"#9"
830  PRINT"BATHS?"
840  PRINT"1 1/2 BATHS=1","2 1/2 BATHS=3"
850  PRINT"2 BATHS    =2","3 BATHS    =4"
860  GOSUB 1530
870  PRINT"#10"
880  PRINT"BASEMENT?"
890  PRINT"YES=1, NO=0"
900  GOSUB 1530
910  PRINT"#11"
920  PRINT"LOAN %?"
930  PRINT"LESS THAN 8%=5"
940  PRINT"8 TO 9%  =4"
950  PRINT"9 TO 10% =3"
960  PRINT"10 TO 11%=2"
970  PRINT"11 TO 12%=1"
980  GOSUB 1530
990  PRINT"#12"
1000  PRINT"LOAN TYPE?"
1010  PRINT"CONVENTIONAL=1"
1020  PRINT"LAND CONTRACT=2"
1030  PRINT"ASSUMPTION=3"
1040  GOSUB 1530
1050  PRINT"#13"
1060  PRINT"AGE?"
```

Program 16-1—cont. House Buying Guide Program Listing

```
1070  PRINT"1 TO 5 YRS=3"
1080  PRINT"6 TO 10 YRS=2"
1090  PRINT"11 TO 15 YRS=1"
1100  PRINT"16 OR GREATER=0"
1110  GOSUB 1530
1120  PRINT"#14"
1130  PRINT"AVERAGE MONTHLY RENT (RENT PROPERTY)?"
1140  PRINT"LESS THAN $251=1"
1150  PRINT"$300 TO 251=2"
1160  PRINT"$400 TO 301=3"
1170  PRINT"$401 TO 450=2"
1180  PRINT"GREATER THAN $450=1"
1190  GOSUB 1530
1200  PRINT"#15"
1210  PRINT"MONTHLY CASH FLOW="
1220  PRINT"((YR RENT)-(YR INSURANCE+YR TAX+YR WATER))/12"
1230  PRINT"$50 TO 100=1"
1240  PRINT"$101 TO 150=2"
1250  PRINT"$151 TO 200=3"
1260  PRINT"$201 TO 250=4"
1270  PRINT"$251 TO 300=5"
1280  PRINT"$301 TO 350=6"
1290  PRINT"$351 TO 400=7"
1300  PRINT"$401 TO 450=8"
1310  GOSUB 1530
1320  PRINT"#16"
1330  PRINT"PERCENT PROFIT="
1340  PRINT"(YR CASH FLOW+YR PRINCIPAL)/(DOWN PAYMENT+INITIAL COSTS)"
1350  PRINT"10%=2","13%=8"
1360  PRINT"11%=4","14%=10"
1370  PRINT"12%=6","15%=12"
1380  GOSUB 1530
1390  PRINT
1400  PRINT
1410  IF P>35 THEN 1440
1420  GOTO 1600
1430  END
1440  PRINT"THE HOUSE IS ACCEPTABLE"
1450  PRINT
1460  PRINT"TOTAL POINTS= ";P
1470  GOTO 1430
1480  PRINT"ENTER '1'=YES,  '0'=NO"
1490  INPUT A
1500  IF A=0 THEN 1600
1510  PRINT
1520  RETURN
1530  PRINT"ENTER POINT VALUE"
1540  INPUT B
1550  P=B+P
1560  PRINT"POINTS SO FAR= ";P
1570  PRINT
1580  PRINT
1590  RETURN
1600  PRINT"THE HOUSE IS NOT ACCEPTABLE"
1610  PRINT"NO FURTHER SCREENING IS REQUIRED"
1620  GOTO 1430
```

CHAPTER 17

Amortization Schedule

If you're in the market for a loan, then the amortization schedule can help you. The program generates a loan payment schedule given the principal, yearly interest rate, and monthly payment. It calculates and displays the balance, principal, interest, and cumulative interest for each month of the loan. It's written in BASIC for your microcomputer. See Program 17-1 for the program listing.

THE PROGRAM

After you run the program, enter the principal (the amount of the loan), the yearly interest (in

```
RUN
AMORTIZATION SCHEDULE
TRS-80 VERSION
COPYRIGHT (C) 1980 BY HOWARD BERENBON

THIS PROGRAM CALCULATES A MONTHLY LOAN PAYMENT
SCHEDULE. IT DISPLAYS THE PAYMENT, BALANCE, PRINCIPAL,
INTEREST, AND CUM. INTEREST FOR EACH MONTH OF THE LOAN.

ENTER THE PRINCIPAL (AMOUNT OF LOAN)
? 1000

ENTER THE YEARLY INTEREST RATE (%)
? 18


ENTER THE MONTHLY PAYMENT
? 140

ENTER '1' TO BEGIN
? 1

                AMORTIZATION SCHEDULE

PRINCIPAL=$ 1000                INTEREST= 18  %

MONTHLY PAYMENT=$ 140

MONTH  PAYMENT     BALANCE     PRINCIPAL     INTEREST    CUM. INT

 1     140         875         125           15          15
 2     140         748.13      126.87        13.13       28.13
 3     140         619.35      128.78        11.22       39.35
 4     140         488.64      130.71        9.29        48.64
 5     140         355.97      132.67        7.33        55.97
 6     140         221.31      134.66        5.34        61.31
 7     140         84.63       136.68        3.32        64.63
 8     85.9        0           84.63         1.27        65.9

TOTAL INTEREST= 65.9
READY
>
```

Fig. 17-1. Amortization schedule sample run.

percent), and the monthly payment. Then enter a 1 to display the schedule.

The program calculates the monthly interest from the principal, and subtracts that amount from the monthly payment, to give the current balance. This continues until the balance is less than the monthly payment, then the final month's data is calculated.

A time delay is included to aid in viewing the data. Each time a month's data is displayed, a 1.5 second delay is called. See program lines 500 and 510. This FOR-NEXT loop may be changed for different delay lengths, or eliminated altogether. See Fig. 17-1 for a sample run.

Program 17-1. Amortization Schedule Program Listing

```
100 PRINT"AMORTIZATION SCHEDULE"
110 PRINT"TRS-80 VERSION"
120 PRINT"COPYRIGHT (C) 1980 BY HOWARD BERENBON"
130 PRINT
140 PRINT"THIS PROGRAM CALCULATES A MONTHLY LOAN PAYMENT"
150 PRINT"SCHEDULE. IT DISPLAYS THE PAYMENT, BALANCE, PRINCIPAL,"
160 PRINT"INTEREST, AND CUM. INTEREST FOR EACH MONTH OF THE LOAN."
170 PRINT
180 PRINT"ENTER THE PRINCIPAL (AMOUNT OF LOAN)"
190 INPUT A
200 PRINT
210 PRINT"ENTER THE YEARLY INTEREST RATE (%)"
220 INPUT I
230 PRINT
240 PRINT"ENTER THE MONTHLY PAYMENT"
250 INPUT P
260 PRINT
270 PRINT"ENTER '1' TO BEGIN"
280 INPUT L
290 CLS
300 B=A
310 REM PRINT SCHEDULE
320 PRINT TAB(17)"AMORTIZATION SCHEDULE"
330 PRINT
340 PRINT"PRINCIPAL=$";B,"INTEREST=";I;" %"
350 PRINT"MONTHLY PAYMENT=$";P
360 PRINT
370 PRINT"MONTH  PAYMENT     BALANCE     PRINCIPAL     INTEREST   CUM. INT"
380 Y=1
390 R=0
400 IF A<=P THEN 680
410 GOSUB 530
420 PRINT Y;TAB(6);P;TAB(18);P2;TAB(30);P0;TAB(44);I2;TAB(55);R
430 GOSUB 500
440 Y=Y+1
450 IF P2=0 THEN 470
460 GOTO 400
470 PRINT
480 PRINT"TOTAL INTEREST=";R
490 END
500 FOR T=1 TO 495
510 NEXT T
520 RETURN
530 REM CALCULATE BALANCE AND INTEREST
540 I2=A*(I/100)
550 I2=I2/12
```

Program 17-1—cont. Amortization Schedule Program Listing

```
560 GOSUB 630
570 P2=A-(P-I2)
580 P0=P-I2
590 P2=INT(P2*100+.5)/100
600 A=P2
610 R=I2+R
620 RETURN
630 REM ROUND TO 2 DIGITS PASSED THE DECIMAL POINT
640 I3=I2*100
650 I4=INT(I3+.5)
660 I2=I4/100
670 RETURN
680 REM CALCULATE LAST PAYMENT
690 I2=P2*(I/100)
700 I2=I2/12
710 GOSUB 630
720 P0=P2
730 P=P2+I2
740 P2=0
750 R=I2+R
760 GOTO 420
```

CHAPTER 18

Depreciation Schedule

If you're in business and have equipment that you depreciate, then the depreciation schedule can help you. It calculates a 5 year depreciation schedule, using the "sum of the years" method. It's written in BASIC for your microcomputer. See Program 18-1 for the program listing.

THE PROGRAM

The program assumes that your equipment will last 5 years. The first year deduction is 5/15 times the total cost of the equipment. The second, third, fourth, and fifth year deduction is 4/15, 3/15, 2/15, and 1/15 times the cost, respectively.

After you run the program, enter the total amount for depreciation and the starting year. A schedule will then be displayed. See Fig. 18-1 for a sample run.

It does not take into account the "salvage" value of the equipment. It assumes there is no salvage value. But if your equipment has a value after the 5 years, then you must subtract that amount from the fifth year deduction.

Check with your accountant before you use this schedule. He may recommend another method of calculating depreciation, that is more suited to your type of business.

```
RUN
DEPRECIATION SCHEDULE
COPYRIGHT (C) 1979 BY HOWARD BERENSON

THIS PROGRAM WILL PRINT A 5 YEAR SCHEDULE
TO HELP YOU DEPRECIATE BUSINESS EQUIPMENT.
IT USES THE SUM OF THE YEARS METHOD.

ENTER THE TOTAL AMOUNT FOR DEPRECIATION.
? 2548

? 1980
          FIVE YEAR DEPRECIATION SCHEDULE
          USING THE SUM OF THE YEARS METHOD.

TOTAL AMOUNT FOR DEPRECIATION=$ 2548

YEAR #          DEPRECIATION    AMOUNT LEFT

 1980            840.84          1707.16
 1981            662.48          1044.68
 1982            509.6           535.08
 1983            331.24          203.84
 1984            203.84          0

READY
>
```

Fig. 18-1. Depreciation schedule sample run.

Program 18-1. Depreciation Schedule Program Listing

```
100 PRINT"DEPRECIATION SCHEDULE"
110 PRINT"COPYRIGHT (C) 1979 BY HOWARD BERENBON"
120 PRINT
130 PRINT"THIS PROGRAM WILL PRINT A 5 YEAR SCHEDULE"
140 PRINT"TO HELP YOU DEPRECIATE BUSINESS EQUIPMENT."
150 PRINT"IT USES THE SUM OF THE YEARS METHOD."
160 PRINT
170 PRINT"ENTER THE TOTAL AMOUNT FOR DEPRECIATION."
180 INPUT A
190 PRINT"ENTER THE STARTING YEAR OF DEPRECIATION"
200 INPUT Y
210 PRINT TAB(10)"FIVE YEAR DEPRECIATION SCHEDULE"
220 PRINT TAB(10)"USING THE SUM OF THE YEARS METHOD."
230 GOSUB 360
240 PRINT
250 PRINT"TOTAL AMOUNT FOR DEPRECIATION=$";A
260 PRINT
270 PRINT"YEAR #","DEPRECIATION","AMOUNT LEFT"
280 PRINT
290 PRINT Y,B*Q,Q-(B*Q)
300 PRINT Y+1,C*Q,Q-(H+I)
310 PRINT Y+2,D*Q,Q-(H+I+J)
320 PRINT Y+3,E*Q,Q-(H+I+J+K)
330 PRINT Y+4,Q-(H+I+J+K),S
340 PRINT
350 END
360 REM DATA FOR YEARS 1 THROUGH 5
370 Q=A
380 B=.33
390 C=.26
400 D=.2
410 E=.13
420 F=.07
430 H=B*Q
440 I=C*Q
450 J=D*Q
460 K=E*Q
470 L=F*Q
480 S=0
490 RETURN
```

SECTION IV

Home Applications

This section describes some useful home application programs including a home electric usage analysis program; a medical expense record program, to keep those expenses in order; a recipe amount calculator, to help out with cooking and baking; a diet program for the overweight or underweight person; a message taker that accepts and displays 6 separate messages; and finally, a gasoline mileage calculator for checking your car engine performance.

CHAPTER 19

Electric Energy Usage

Conservation is the key to reducing our energy consumption and costs, with the rising price and pending shortages of all types of energy. You can help out by using the electric energy usage program. It will indicate differences in electric usage from one year to another, so that you can see possible imbalances in usage, and correct them. The program is written in BASIC for your microcomputer, but it will run in most home computer BASICs without modification. See Program 19-1 for the program listing.

THE PROGRAM

The program requires that your yearly electric usage data be stored in DATA statements at program lines 1000 and 1010. The first DATA element in line 1000 must be the comparison year (base year) followed by 12 months of electric usage units, beginning with January of that year. Program line 1010 holds the data for the "recent" year. Example:

```
1000 DATA 1977,400,300,425,355,275,290,320,425,350,
          455,470,525
1010 DATA 1980,450,320,478,350,325,310,340,490,450,
          500,510,600
```

The "base" year can be any past year; possibly the year you moved into your house or apartment, or even the previous year. The "recent" year would be a full year's data for recent energy consumption. See Fig. 19-1 for a sample RUN.

The program prints the "base" year data including average units used per month, total units used, and the percent of total units used per month. Then it prints the "recent" year's data, with a comparison to the "base" year. It gives the difference between the two years, with monthly increase (+) or decrease (−) from the "base" year.

ANALYSIS

If there's a significant monthly increase in electric usage, pay close attention to those months. You may be using more energy than necessary. Check your insulation for possible air leaks. This can cause your furnace or air conditioner to work overtime and use more electricity than necessary.

Other increases may be due to neglect. Make sure that lights and electrical appliances are shut off when not needed. Alternately, you may have an appliance that is defective, and using more electricity than it should. Check that your appliances are in proper working order.

```
BASE YEAR  1977                    AV/MO=  382.5
TOTAL UNITS=  4590
MONTH            UNITS             % TOTAL
 1                400               8.71
 2                300               6.53
 3                425               9.25
 4                355               7.73
 5                275               5.99
 6                290               6.31
 7                320               6.97
 8                425               9.25
 9                350               7.62
 10               455               9.91
 11               470               10.23
 12               525               11.43
ENTER '1' FOR COMPARISON?


RECENT YEAR  1980                    AV/MO=  426.917
TOTAL UNITS=  5123    RECENT-BASE=  533
MO.   UNITS   % TOTAL   + OR - FROM BASE
 1     450     8.78       50
 2     320     6.24       20
 3     478     9.33       53
 4     350     6.83       -5
 5     325     6.34       50
 6     310     6.05       20
 7     340     6.63       20
 8     490     9.56       65
 9     450     8.78       100
 10    500     9.75       45
 11    510     9.95       40
 12    600     11.71      75
```

Fig. 19-1. Electric energy usage sample run.

Program 19-1. Electric Energy Usage Program Listing

```
100 DIM A(50)
110 PRINT"ELECTRIC ENERGY USAGE"
120 PRINT"COPYRIGHT (C) 1980 BY HOWARD BERENBON"
130 PRINT
140 PRINT"THIS PROGRAM WILL COMPARE AND DISPLAY"
150 PRINT"A 'BASE' YEAR AND 'RECENT' YEAR ELECTRIC"
160 PRINT"ENERGY USAGE, IN UNITS."
170 PRINT
180 PRINT"ENTER THE 'BASE' YEAR DATA AT LINE 1000,"
190 PRINT"AND THE 'RECENT' YEAR DATA AT LINE 1010."
200 PRINT
210 PRINT"ENTER A '1' TO DISPLAY"
220 PRINT"THE 'BASE' YEAR DATA"
230 INPUT A
240 B=0:R=0
250 READ P
260 FOR E=1TO12
270 READ C
280 A(E)=C
290 B=A(E)+B
300 NEXT E
310 READ T
320 FOR E=13TO24
330 READ C
340 A(E)=C
350 R=A(E)+R
360 NEXT E
370 PRINT"BASE YEAR ";P,"AV/MO= ";B/12
380 PRINT"TOTAL UNITS= ";B
390 PRINT"MONTH","UNITS","% TOTAL"
400 FOR A=1TO12
410 PRINT A,A(A),INT(A(A)/B*10000)/100
420 NEXT A
430 PRINT"ENTER '1' FOR COMPARISON";
440 INPUT A
450 PRINT
460 PRINT
470 PRINT"RECENT YEAR ";T,"AV/MO= ";R/12
480 PRINT"TOTAL UNITS= ";R;"   RECENT-BASE= ";R-B
490 PRINT"MO.   UNITS   % TOTAL   + OR - FROM BASE"
500 FOR A=13TO24
510 PRINT A-12;TAB(6);A(A);TAB(15);INT(A(A)/R*10000)/100;TAB(26);A(A)-A(A-12)
520 NEXT A
530 GOTO 530
980 REM ENTER 'BASE' YEAR ELECTRIC DATA IN LINE 1000
990 REM ENTER 'RECENT' YEAR ELECTRIC DATA IN LINE 1010
1000 DATA 1977,400,300,425,355,275,290,320,425,350,455,470,525
1010 DATA 1980,450,320,478,350,325,310,340,490,450,500,510,600
```

CHAPTER 20

Medical Expense Record

This program is used to display your medical expenses, with expense type, cost, and cumulative total. It's written in BASIC for your microcomputer. It should also run without modifications in most home computer BASICs. See Program 20-1 for the program listing.

THE PROGRAM

The data is entered using DATA statements beginning with program line 1000. Enter the type of expense and the cost, until all your yearly medical expenses are entered. The last DATA statement must be DATA "END".

After you run the program, enter the year of the record. Then enter a 1 to display your medical expense record. See Fig. 20-1 for a sample run.

```
MEDICAL EXPENSE RECORD: TRS-80 LEVEL II
COPYRIGHT (C) 1980 BY HOWARD BERENBON

USE THIS PROGRAM TO DISPLAY A RECORD OF YOUR
YEARLY MEDICAL EXPENSES.

ENTER THE TOTAL YEARLY EXPENSE DATA IN DATA STATEMENTS,
BEGINNING AT LINE 1000. ENTER IN THE FOLLOWING FORMAT:
1000 DATA DENTAL APP.,63,EYE EXAM,45,PHYSICAL,79
        (EXPENSE TYPE),(COST)
THE LAST DATA STATEMENT MUST READ, DATA END. SOME BASICS
REQUIRE QUOTES AROUND STRINGS IN DATA STATEMENTS,
ADD THEM WHERE REQUIRED.

ENTER YEAR OF RECORD
? 1980


ENTER '1' TO BEGIN
?


1
MEDICAL EXPENSE RECORD
YEAR  1980
NUMBER          EXPENSE TYPE    COST            CUM. TOTAL

 1              EYE EXAM         45              45
 2              DENTAL APP.      63              108
 3              PHYSICAL         79              187
 4              DENTAL APP.      25              212
 5              EMERGENCY        12.5            224.5
 6              DERMATOLOGIST    15              239.5
 7              BLOOD TEST       15              254.5
 8              THROAT EXAM      15              269.5
 9              DERMATOLOGIST    10.5            280
TOTAL MEDICAL EXPENSE FOR YEAR 1980 IS $ 280
```

Fig. 20-1. Medical expense record sample run.

Program 20-1. Medical Expense Record Program Listing, Level II

```
100 PRINT"MEDICAL EXPENSE RECORD: TRS-80 LEVEL II"
110 PRINT"COPYRIGHT (C) 1980 BY HOWARD BERENBON"
120 PRINT
130 PRINT"USE THIS PROGRAM TO DISPLAY A RECORD OF YOUR"
140 PRINT"YEARLY MEDICAL EXPENSES."
150 PRINT
160 PRINT"ENTER THE TOTAL YEARLY EXPENSE DATA IN DATA STATEMENTS,"
170 PRINT"BEGINNING AT LINE 1000. ENTER IN THE FOLLOWING FORMAT:"
180 PRINT"1000 DATA DENTAL APP.,63,EYE EXAM,45,PHYSICAL,79
190 PRINT"         (EXPENSE TYPE),(COST)"
200 PRINT"THE LAST DATA STATEMENT MUST READ, DATA END. SOME BASICS"
210 PRINT"REQUIRE QUOTES AROUND STRINGS IN DATA STATEMENTS,"
220 PRINT"ADD THEM WHERE REQUIRED."
230 PRINT
240 PRINT"ENTER YEAR OF RECORD"
250 INPUT A
260 PRINT
270 PRINT"ENTER '1' TO BEGIN"
280 INPUT B
290 PRINT"MEDICAL EXPENSE RECORD"
300 PRINT"YEAR ";A
310 PRINT
320 N=1
330 M1=0
340 PRINT"NUMBER","EXPENSE TYPE","COST","CUM. TOTAL"
350 PRINT
360 READ M$
370 IF M$="END" THEN 470
380 READ M
390 M1=M+M1
400 PRINT N,M$,M,M1
410 GOSUB 440
420 N=N+1
430 GOTO 360
440 FOR C=1 TO 300
450 NEXT C
460 RETURN
470 PRINT
480 PRINT"TOTAL MEDICAL EXPENSE FOR YEAR";A;"IS $";M1
490 END
900 REM ENTER MEDICAL EXPENSE DATA IN DATA STATEMENTS BEGINNING
910 REM WITH LINE 1000. FIRST ENTER THE TYPE OF EXPENSE THEN
920 REM THE COST. ALTERNATE BETWEEN TYPE AND COST UNTIL YOU
930 REM HAVE ENTERED  ALL YOUR EXPENSES. THE LAST DATA
940 REM STATEMENT MUST READ, DATA "END"
1000 DATA "EYE EXAM",45,"DENTAL APP.",63,"PHYSICAL",79
1010 DATA "DENTAL APP.",25,"EMERGENCY",12.50,"DERMATOLOGIST",15
1020 DATA "BLOOD TEST",15,"THROAT EXAM",15,"DERMATOLOGIST",10.50
1030 DATA "END"
```

CHAPTER 21

Recipe Amount Calculator

The recipe amount calculator is a program used to calculate the required amount of ingredients for the desired number of servings in a recipe. It's written in BASIC for your microcomputer. See Program 21-1 for the TRS-80 Level I program listing, and Program 21-2 for the Level II listing.

```
TRS-80 RECIPE AMOUNT CALCULATOR
LEVEL II BASIC
COPYRIGHT (C) 1980 BY HOWARD BERENBON

THIS PROGRAM CALCULATES THE REQUIRED AMOUNT
OF INGREDIENTS FOR THE NUMBER OF SERVINGS
IN A PARTICULAR RECIPE

ENTER THE RECIPE NAME
? IRISH COFFEE

ENTER THE NUMBER OF INGREDIENTS IN THE RECIPE
? 4

ENTER THE NUMBER OF SERVINGS ALLOWED
? 1


ENTER THE NUMBER OF SERVINGS REQUIRED
? 12

ENTER EACH INGREDIENT AMOUNT, AS GIVEN IN THE RECIPE.
THIS AMOUNT MUST BE IN A DECIMAL FORM (1  1/2=1.5).
INSERT A COMMA, THEN ENTER THE 'LABEL' OF THE INGREDIENT.
EXAMPLE:
1.5,TBL BUTTER

INGREDIENT # 1
? 1,JIGGER IRISH WHISKEY

INGREDIENT # 2
? 1,TEASPOON SUGAR


INGREDIENT # 3
? 1,CUP HOT COFFEE

INGREDIENT # 4
? 2,TBLS WHIPPED CREAM


RECIPE NAME: IRISH COFFEE
SERVINGS: 12

INGREDIENT #     AMOUNT          LABEL
 1                12             JIGGER IRISH WHISKEY
 2                12             TEASPOON SUGAR
 3                12             CUP HOT COFFEE
 4                24             TBLS WHIPPED CREAM
```

Fig. 21-1. Recipe amount calculator sample run.

THE PROGRAM

After you run the program, enter the recipe name and number of ingredients in the recipe. Then enter the number of servings allowed and the number of servings required for that recipe.

Level II

Enter each ingredient amount and its label. Insert a comma between the amount and the label. The amount must be in decimal form. Example: 1.5,TBL BUTTER is a correct entry for 1½ TBL BUTTER. When all of the ingredients are entered, the program will print a list of the converted amounts beginning with ingredient number 1. See Fig. 21-1 for a sample RUN.

Level I

The Level I version does not accept the entry of the ingredient label. To operate, enter the ingredient amount for all the ingredients in the recipe. The program will print a list of the converted amounts beginning with ingredient number 1.

Program 21-1. Recipe Amount Calculator Program Listing, Level I

```
100 PRINT"RECIPE AMOUNT CALCULATOR"
110 PRINT"TRS-80 LEVEL I VERSION"
120 PRINT"COPYRIGHT (C) 1980 BY HOWARD BERENBON"
130 PRINT
140 PRINT"THIS PROGRAM CALCULATES THE REQUIRED AMOUNT"
150 PRINT"OF INGREDIENTS FOR THE NUMBER OF SERVINGS"
160 PRINT"IN A PARTICULAR RECIPE"
170 PRINT
180 PRINT"ENTER THE RECIPE NAME"
190 INPUT A$
200 PRINT
210 PRINT"ENTER THE NUMBER OF INGREDIENTS IN THE RECIPE"
220 INPUT I
230 PRINT
240 PRINT"ENTER THE NUMBER OF SERVINGS ALLOWED"
250 INPUT A
260 PRINT
270 PRINT"ENTER THE NUMBER OF SERVINGS REQUIRED"
280 INPUT B
290 PRINT
300 DIM A(I)
310 PRINT"ENTER EACH INGREDIENT AMOUNT, AS GIVEN IN THE RECIPE."
320 PRINT"THIS AMOUNT MUST BE IN A DECIMAL FORM (1  1/2=1.5)."
330 PRINT
340 FORX=1 TO I
350 PRINT"INGREDIENT #";X
360 INPUT A(X)
370 NEXT X
380 PRINT
390 REM CALCULATE AND LIST INGREDIENT AMOUNTS
400 PRINT"RECIPE NAME:";A$
410 PRINT"SERVINGS:";B
420 PRINT
430 PRINT"INGREDIENT #","AMOUNT"
440 C=B/A
450 FOR X=1 TO I
460 PRINT X,C*A(X)
470 FOR T=1 TO 700
480 NEXT T
490 NEXT X
500 END
```

Program 21-2. Recipe Amount Calculator Program Listing, Level II

```
100 CLEAR 1000
110 PRINT"TRS-80 RECIPE AMOUNT CALCULATOR"
120 PRINT"LEVEL II BASIC"
130 PRINT"COPYRIGHT (C) 1980 BY HOWARD BERENBON"
140 PRINT
150 PRINT"THIS PROGRAM CALCULATES THE REQUIRED AMOUNT"
160 PRINT"OF INGREDIENTS FOR THE NUMBER OF SERVINGS"
170 PRINT"IN A PARTICULAR RECIPE"
180 PRINT
190 PRINT"ENTER THE RECIPE NAME"
200 INPUT R$
210 PRINT
220 PRINT"ENTER THE NUMBER OF INGREDIENTS IN THE RECIPE"
230 INPUT I
240 PRINT
250 PRINT"ENTER THE NUMBER OF SERVINGS ALLOWED"
260 INPUT A
270 PRINT
280 PRINT"ENTER THE NUMBER OF SERVINGS REQUIRED"
290 INPUT B
300 PRINT
310 DIM A$(I)
320 DIM A(I)
330 PRINT"ENTER EACH INGREDIENT AMOUNT, AS GIVEN IN THE RECIPE."
340 PRINT"THIS AMOUNT MUST BE IN A DECIMAL FORM (1  1/2=1.5)."
350 PRINT"INSERT A COMMA, THEN ENTER THE 'LABEL' OF THE INGREDIENT."
360 PRINT"EXAMPLE:"
370 PRINT"1.5,TBL BUTTER"
380 PRINT
390 FORX=1 TO I
400 PRINT"INGREDIENT #";X
410 INPUT A(X),A$(X)
420 NEXT X
430 PRINT
440 REM CALCULATE AND LIST INGREDIENT AMOUNTS
450 PRINT"RECIPE NAME: ";R$
460 PRINT"SERVINGS:";B
470 PRINT
480 PRINT"INGREDIENT #","AMOUNT","LABEL"
490 C=B/A
500 FOR X=1 TO I
510 PRINT X,C*A(X),A$(X)
520 FOR T=1 TO 400
530 NEXT T
540 NEXT X
550 END
```

CHAPTER 22

The Basic Diet

Are you noticing your waistline expand while you spend more and more time in front of your system? If so, it's probably due to a lack of exercise and improper diet. Now you can get help from the basic diet program. See Program 22-1 for the program listing.

The program will help you to your weight loss goal, or tell you if you're underweight. It will decide what your proper weight should be (within 5%), from the input of your current weight, height, and sex. It will determine the number of pounds you should lose to attain your goal. Then, a weight loss table is printed, derived from your input of the desired weekly weight loss. Finally, a daily calorie value is given (within 10%) to maintain your weight, after you reach your goal. A sample run is given in Fig. 22-1.

```
? 1

ENTER CURRENT WEIGHT (LBS)
? 152
ENTER HEIGHT (FT,IN)
? 5,8
ENTER SEX  1=MALE  2=FEMALE
? 1

YOUR CURRENT WEIGHT IS  152  LBS

YOUR PROPER WEIGHT SHOULD BE  150  LBS
YOUR WEIGHT LOSS GOAL IS  2  LBS

ENTER DESIRED WEEKLY WEIGHT LOSS IN LBS
? .5



          WEIGHT LOSS TABLE

CURRENT WEIGHT=  152  LBS
WEEK #          WEIGHT          TOTAL LOSS (LBS)
 1               151.5           .5
 2               151             1
 3               150.5           1.5
 4               150             2

YOU HAVE  4  WEEKS TO REACH  150  LBS
AFTER REACHING YOUR GOAL, YOU SHOULD
MAINTAIN YOUR WEIGHT WITH  1900  CALORIES
PER DAY (WITHIN 10%).

READY
>
```

Fig. 22-1. The basic diet sample run.

Table 22-1. 1100 Calorie Diet

Breakfast

1 egg with 1 teaspoon of margarine
1 piece of melba toast
Coffee or tea, with milk and sugar substitute
Tomato juice

Lunch

4 oz meat, fish, or chicken with 1 teaspoon of margarine
1 piece of melba toast
1 cup of salad with diet dressing
or
1 cup cooked vegetables
1 cup fresh fruit or ½ cup jello

Dinner

5 oz meat, fish, or chicken with 1 teaspoon of margarine
1 piece of melba toast
1 cup of salad with diet dressing
1 cup cooked vegetables
1 cup fresh fruit or ½ cup jello

Anytime Drinks

Coffee or tea, with milk and sugar substitute
Diet soda
Tomato juice
Skim milk

Food Between Meals		Condiments
Raw vegetables	Mustard	Catsup
Dill pickles	Relish	Horseradish
Diet gelatin	Onions	Herbs
Mushrooms	Spices	Soy sauces

THE DIET

A 1100 calorie diet is provided to help you lose weight. See Table 22-1 for the diet. A list of calorie and protein values for some of the more common foods is given in Table 22-2. Before following the diet, consult your physician for the go-ahead.

EXERCISE

Set up a plan of exercise. Daily running, walking, or bicycling will help burn off some of those unused calories; and it's good for you.

THE PROGRAM

The program is written in BASIC, and is compatible with most systems. It calculates an adult's weight, above the age of 25, using his or her height and sex. It also calculates a daily calorie value, for maintaining the proper weight. You may find that the calculated weight is less than expected. But this lower weight is healthier for you, unless your doctor says otherwise.

Table 22-2. Food Calorie List With Protein Values

	Portion	Calories	Protein (grams)
Meat, Fish, Eggs			
Meat, fish, poultry	3 oz cooked	245	23
Hot dog	1 medium	155	6
Ham	1 oz	80	6
Tuna	2 oz	115	16
Bacon	2 slices	100	5
Eggs	1 medium	80	6
Dairy			
Milk, whole	8 oz	160	9
Milk, skim	8 oz	90	9
Milk, chocolate	8 oz	190	9
Cheese, American or Swiss	1 oz	110	8
Cheese Food	1 oz	90	6
Cottage cheese	1 oz	30	4
Butter	1 tablespoon	100	–
Cream, light	2 tablespoons	60	1
Half-and-half	¼ cup	80	2
Ice cream, vanilla	½ cup	145	3
Main Dishes			
Spaghetti, Italian	1 cup, with cheese	260	9
Macaroni and cheese	¾ cup	350	14
Meat and vegetable stew	¾ cup	160	12
Bread			
Bread	1 slice	60	2
Biscuit	1 medium	140	3
Crackers	2 medium	35	1
Rye wafers	2 small	45	2

Table 22-2—cont

	Portion	Calories	Protein (grams)
Vegetables			
Green beans	4 oz cooked	15	1
Carrots	4 oz cooked	20	2
Green leafy	4 oz cooked	20	2
Peas	4 oz cooked	60	5
Corn	4 oz cooked	85	3
Potatoes	1 medium, cooked	80	2
Tossed salad	¾ cup, without dressing	30	2
Salad dressing	1 tablespoon	75	–
Fruits			
Orange	1	60	1
Melon	½	60	1
Peach	1	35	1
Strawberries	8 oz	55	1
Apple	1	70	–
Avocado	¼	90	1
Cooked fruits, lightly sweetened	4 oz	100	1
Fruit juice	4 oz	50	1
Cookies, Cakes, Candy			
Cookies, plain	2 small	120	1
Cupcakes, iced	1 medium	185	2
Brownies	1—2" × 2" × ¾"	140	2
Doughnut	1 medium	125	1
Cake, iced	medium piece	370	4
Cake, sponge	medium piece	115	3
Candy bar, chocolate	⅞ oz	130	2
Fudge	1" square	100	–
Marshmallows	1 average	25	–
Snacks			
Nuts, roasted	30 peanuts	165	6
Potato chips	10 medium	115	1
Popcorn, lightly buttered	½ cup	35	–
Pizza	1 medium piece	185	7
Hamburger and bun	1 medium	300	17
Hot dog and bun	1 medium	270	9
Drinks			
Milkshake, 5 oz milk, 2 scoops ice cream	1 medium	340	8
Malted milkshake	1 medium	300	13
Cocoa, with milk	1 cup	175	7
Eggnog	8 oz	290	15
Soda, cola	8 oz	95	–
Lemonade	10 oz	130	–
Beer, Wine, Liquor			
Beer	8 oz	114	–
Wine, red	4 oz	85	–
Gin, whisky, rum, vodka	1½ oz	107	–
Miscellaneous			
Jelly, honey, syrup	1 tablespoon	60	–
Chocolate sauce	2 tablespoons	90	1
Sugar, granulated	1 tablespoon	45	–

Program 22-1. The Basic Diet Program Listing

```
100 PRINT"THE BASIC DIET"
110 PRINT"COPYRIGHT (C) 1979 BY HOWARD BERENBON"
120 PRINT
130 PRINT"THIS PROGRAM CALCULATES YOUR PROPER WEIGHT"
140 PRINT"(WITHIN 5%) TO DETERMINE IF YOU HAVE A"
150 PRINT"POTENTIAL WEIGHT PROBLEM."
160 PRINT"IT THEN PRINTS THE NUMBER OF LBS YOU ARE"
170 PRINT"REQUIRED TO LOSE TO ATTAIN YOUR GOAL, AND "
180 PRINT"A WEIGHT LOSS TABLE WITH YOUR DESIRED"
190 PRINT"WEEKLY WEIGHT LOSS. FINALLY, A DAILY CALORIE"
200 PRINT"REQUIREMENT IS GIVEN TO HELP IN MAINTAINING"
210 PRINT"YOUR PROPER WEIGHT."
220 PRINT
230 PRINT"ENTER A '1' TO CONTINUE"
240 INPUT A
250 PRINT
260 PRINT"ENTER CURRENT WEIGHT (LBS)"
270 INPUT W
280 PRINT"ENTER HEIGHT (FT,IN)"
290 INPUT F,I
300 IF F<4 THEN 280
310 IF F>7 THEN 280
320 PRINT"ENTER SEX  1=MALE  2=FEMALE"
330 INPUT S
340 PRINT
350 REM CALCULATE WEIGHT
360 GOSUB 750
370 IF W2=W THEN 1050
380 W4=W-W2
390 IF W<W2 THEN 850
400 GOSUB 960
410 PRINT
420 GOSUB 930
430 PRINT"YOUR WEIGHT LOSS GOAL IS ";W4;" LBS"
440 PRINT
450 PRINT"ENTER DESIRED WEEKLY WEIGHT LOSS IN LBS"
460 INPUT A
470 N=1
480 PRINT
490 PRINT TAB(10)"WEIGHT LOSS TABLE"
500 PRINT
510 PRINT"CURRENT WEIGHT= ";W;" LBS"
520 PRINT"WEEK #","WEIGHT","TOTAL LOSS (LBS)"
530 V=A
540 W6=W
550 Y=W4/A
```

Program 22-1—cont. The Basic Diet Program Listing

```
560 IF Y>INT(Y) THEN Y=Y+1
570 FOR M=1TOY
580 IF(W6-A)<W2 THEN 1100
590 PRINT N,W6-A,V
600 V=V+A
610 W6=W6-A
620 N=N+1
630 FOR Q=1TO600
640 NEXT Q
650 NEXT M
660 PRINT
670 PRINT"YOU HAVE ";N-1;" WEEKS TO REACH ";W2;" LBS"
680 REM CALCULATE DAILY CALORIES
690 GOSUB 980
700 PRINT"AFTER REACHING YOUR GOAL, YOU SHOULD"
710 PRINT"MAINTAIN YOUR WEIGHT WITH ";Z;" CALORIES"
720 PRINT"PER DAY (WITHIN 10%)."
730 PRINT
740 END
750 REM CALCULATE WEIGHT FROM HEIGHT
760 I1=F*12
770 I2=I1+I
780 IF S=1 THEN 820
790 REM FEMALE WEIGHT
800 W2=95+((I2-59)*5)
810 RETURN
820 REM MALE WEIGHT
830 W2=110+((I2-60)*5)
840 RETURN
850 GOSUB 960
860 REM UNDERWEIGHT MESSAGE
870 PRINT
880 GOSUB 930
890 PRINT"YOU ARE UNDERWEIGHT BY ";W2-W;" LBS"
900 PRINT
910 GOSUB 980
920 GOTO 700
930 REM LIST WEIGHT GOAL
940 PRINT"YOUR PROPER WEIGHT SHOULD BE ";W2;" LBS"
950 RETURN
960 PRINT"YOUR CURRENT WEIGHT IS ";W;" LBS"
970 RETURN
980 IF S=1 THEN 1020
990 U=(W2-90)/5
1000 Z=1150+U*50
1010 RETURN
1020 X=(W2-100)/5
1030 Z=1400+X*50
1040 RETURN
1050 PRINT"YOU ARE AT THE PROPER WEIGHT OF ";W;" LBS"
1060 PRINT"NO WEIGHT LOSS IS REQUIRED"
1070 PRINT
1080 GOSUB 980
1090 GOTO 700
1100 A=W6-W2
1110 PRINT N,W2,W4
1120 GOTO 620
```

CHAPTER 23

Message Taker

The Message Taker is a program that accepts 6 messages to be displayed by your home computer. It's written in BASIC for your microcomputer. See Program 23-1 for the program listing.

THE PROGRAM

The program begins by displaying the commands. Enter an L to access the message list, or an E to enter a message.

Message Entry Mode

In the message entry mode you can enter 1 or all 6 messages. Enter the number of the message that you wish to enter or change. If there is an existing message under that message number, then the computer will indicate it. Then enter "who the message is from" and "who the message is directed to." Finally, enter the message from the keyboard. When entering, do not use the comma (,) or colon (:) otherwise errors will result. The program will accept a 250 character entry per message.

Message Access Mode

In the message access mode, a list of the 6 messages will be displayed. A '0' after the message number indicates empty and a '1' indicates full. Each message number includes "who the message is from" and "who the message is directed to." Enter the message number to display the message. See Fig. 23-1 for a sample run.

```
RUN
MESSAGE TAKER:TRS-80 LEVEL II
COPYRIGHT (C) 1980 BY HOWARD BERENBON

THIS PROGRAM ACCEPTS 6 MESSAGES AS DATA
STRINGS AND DISPLAYS EACH ON COMMAND.

COMMANDS:

ENTER 'L' TO DISPLAY A MESSAGE
ENTER 'E' TO ENTER/CHANGE A MESSAGE
? E


MESSAGE ENTRY MODE: ENTER/CHANGE

ENTER MESSAGE # (1-6)
ENTER '7' TO RETURN TO 'COMMAND'

? 1


MESSAGE #  1

MESSAGE 'FROM' (NAME)?
? RICK

MESSAGE 'TO' (NAME)?
? DAVID


MESSAGE # 1
ENTER MESSAGE (LIMIT TO 250 CHARACTERS)

? DAVID  I STOPPED BY EARLIER BUT YOU WEREN'T HOME. I'LL SEE YOU
 LATER FOR A 'GO' GAME. RICK . . . . .


MESSAGE ENTRY MODE: ENTER/CHANGE

ENTER MESSAGE # (1-6)
ENTER '7' TO RETURN TO 'COMMAND'

? 2


MESSAGE #  2

MESSAGE 'FROM' (NAME)?
? HOWARD

MESSAGE 'TO' (NAME)?
? DAVID


MESSAGE # 2
ENTER MESSAGE (LIMIT TO 250 CHARACTERS)

? DAVID  I'LL BE A LITTLE LATE TONIGHT. WILL YOU CALL RICK AND
BRUCE TO REMIND THEM OF THE 'DUNGEONS AND DRAGONS' GAME CALLED
FOR TONIGHT? I'VE ALREADY TALKED TO HARRY. THANKS . . . . . .
```

Fig. 23-1. Message taker sample run.

```
MESSAGE ACCESS MODE: LIST
(0 INDICATES EMPTY)

#                FROM            TO

 1    =    1      RICK            DAVID
 2    =    1      HOWARD          DAVID
 3    =    0
 4    =    0
 5    =    0
 6    =    0

ENTER # (1-6) TO DISPLAY MESSAGE
ENTER A '7' TO RETURN TO 'COMMAND'

? 1


MESSAGE #  1

FROM: RICK      TO: DAVID

DAVID  I STOPPED BY EARLIER BUT YOU WEREN'T HOME. I'LL SEE YOU
 LATER FOR A 'GO' GAME. RICK . . . .

ENTER # (1-6) TO DISPLAY MESSAGE
ENTER A '7' TO RETURN TO 'COMMAND'

? 2
```

Fig. 23-1—cont. Message taker sample run.

Program 23-1. Message Taker Program Listing, Level II

```
100 PRINT"MESSAGE TAKER:TRS-80 LEVEL II"
110 PRINT"COPYRIGHT (C) 1980 BY HOWARD BERENBON"
120 PRINT
130 PRINT"THIS PROGRAM ACCEPTS 6 MESSAGES AS DATA"
140 PRINT"STRINGS AND DISPLAYS EACH ON COMMAND."
150 CLEAR 1800
160 DIM A$(10),B$(10),C$(10),Z(10)
170 PRINT
180 PRINT"COMMANDS:"
190 PRINT
200 PRINT"ENTER 'L' TO DISPLAY A MESSAGE"
210 PRINT"ENTER 'E' TO ENTER/CHANGE A MESSAGE"
220 INPUT A$
230 IF A$="L" THEN 260
240 IF A$="E" THEN 460
250 GOTO 170
260 CLS
270 PRINT"MESSAGE ACCESS MODE: LIST"
280 PRINT"('0' INDICATES EMPTY-'1' FULL)"
290 PRINT
300 PRINT"#","FROM","TO"
310 PRINT
320 FOR A=1TO6
330 PRINT A;"  =  ";Z(A),A$(A),B$(A)
340 NEXT A
350 PRINT
360 PRINT"ENTER # (1-6) TO DISPLAY MESSAGE"
370 PRINT"ENTER A '7' TO RETURN TO 'COMMAND'"
380 PRINT
390 INPUT Z
400 IF Z=0 THEN 360
410 IF Z>6 THEN 170
420 GOSUB 790
430 PRINT
440 PRINT C$(Z)
450 GOTO 350
460 CLS
470 PRINT"MESSAGE ENTRY MODE: ENTER/CHANGE"
480 PRINT
490 PRINT"ENTER MESSAGE # (1-6)"
500 PRINT"ENTER '7' TO RETURN TO 'COMMAND'"
510 PRINT
520 INPUT Z
530 IFZ(Z)=0 THEN 610
540 PRINT"MESSAGE #";Z;" IS FILLED"
550 PRINT
```

Program 23-1—cont. Message Taker Program Listing, Level II

```
560 PRINT"DO YOU WISH TO CHANGE MESSAGE #";Z
570 PRINT"ENTER '1' YES OR '0' NO"
580 INPUT B
590 IF B=1 THEN 610
600 GOTO 460
610 IF Z=0 THEN 460
620 IF Z>6 THEN 170
630 CLS
640 PRINT
650 PRINT"MESSAGE # ";Z
660 PRINT
670 PRINT"MESSAGE 'FROM' (NAME)?"
680 INPUT A$(Z)
690 PRINT
700 PRINT"MESSAGE 'TO' (NAME)?"
710 INPUT B$(Z)
720 CLS
730 PRINT"MESSAGE #";Z
740 PRINT"ENTER MESSAGE (LIMIT TO 250 CHARACTERS)"
750 PRINT
760 INPUT C$(Z)
770 Z(Z)=1
780 GOTO 460
790 CLS
800 PRINT"MESSAGE # ";Z
810 PRINT
820 PRINT"FROM: ";A$(Z),"TO: ";B$(Z)
830 PRINT
840 RETURN
```

CHAPTER 24

Gas Mileage Calculator

A good way of checking the performance of your car engine is to periodically test its gas mileage. This program can help you out. It's written in BASIC for your microcomputer, but will run in most home computer BASICs. See Program 24-1 for the program listing.

THE PROGRAM

The program begins by accepting the EPA mileage value. If your engine has two values listed (for city and highway), then take an average before entering the value. This data will be used in determining the performance of your engine.

Next, enter the data for calculating mileage. Enter the odometer reading taken before filling your gas tank. Then, enter the mileage reading taken after the next fill up, and the number of gallons required for the fill up.

The program displays the mileage, from the data entered, and checks to see if your engine is meeting the EPA mileage value (within 10%). It will recommend a tune up, if your mileage is 10% below the EPA value. See Fig. 24-1 for a sample run.

```
RUN
GAS MILEAGE CALCULATOR
COPYRIGHT (C) 1980 BY HOWARD BERENBON

THIS PROGRAM CALCULATES GAS MILEAGE,
AND CHECKS YOUR ENGINES PERFORMANCE

ENTER THE EPA MILEAGE VALUE
? 19

ENTER ODOMETER MILEAGE BEFORE FILLING TANK
? 27059

ENTER ODOMETER MILEAGE AFTER NEXT FILL UP
? 27270



ENTER NO. OF GALLONS OF GAS REQUIRED FOR FILL UP
? 13

MILEAGE= 16.2308  MILES PER GALLON
THE EPA MILEAGE VALUE= 19


YOUR CAR ENGINE IS PERFORMING BELOW THE
EPA VALUE BY  2.76923  MILES PER GALLON.
HAVE YOUR ENGINE CHECKED.
IT MAY BE IN NEED OF A TUNE-UP.
READY
>
```

Fig. 24-1. Gas mileage calculator sample run.

Program 24-1. Gas Mileage Calculator Program Listing

```
100 PRINT"GAS MILEAGE CALCULATOR"
110 PRINT"COPYRIGHT (C) 1980 BY HOWARD BERENBON"
120 PRINT
130 PRINT"THIS PROGRAM CALCULATES GAS MILEAGE,"
140 PRINT"AND CHECKS YOUR ENGINES PERFORMANCE"
150 PRINT
160 PRINT"ENTER THE EPA MILEAGE VALUE"
170 INPUT E
180 PRINT
190 PRINT"ENTER ODOMETER MILEAGE BEFORE FILLING TANK"
200 INPUT M
210 PRINT
220 PRINT"ENTER ODOMETER MILEAGE AFTER NEXT FILL UP"
230 INPUT M1
240 PRINT
250 PRINT"ENTER NO. OF GALLONS OF GAS REQUIRED FOR FILL UP"
260 INPUT G
270 REM CALCULATE MILEAGE, AND CHECK PERFORMANCE"
280 S=(M1-M)/G
290 T=.90*E
300 PRINT
310 PRINT"MILEAGE=";S;" MILES PER GALLON"
320 PRINT"THE EPA MILEAGE VALUE=";E"
330 PRINT
340 IF S<T THEN 390
350 PRINT"YOUR MILEAGE IS CONSISTENT WITH THE"
360 PRINT"EPA VALUE (WITHIN 10%). YOUR CAR"
370 PRINT"ENGINE SHOULD BE PERFORMING WELL."
380 END
390 PRINT
400 PRINT"YOUR CAR ENGINE IS PERFORMING BELOW THE"
410 PRINT"EPA VALUE BY ";E-S;" MILES PER GALLON."
420 PRINT"HAVE YOUR ENGINE CHECKED."
430 PRINT"IT MAY BE IN NEED OF A TUNE-UP."
440 GOTO 380
```

SECTION V

Utilities

This section describes some programming techniques including random number generating, and BASIC time delays. There's a digital dice program for use with games, and finally, a hex to decimal conversion program.

CHAPTER 25

Generating Random Numbers

Random number generation is required for programming games and simulations. It's fairly straightforward to program random numbers in BASIC, using the RND statement. Here are some examples for generating random numbers with the TRS-80.

It's easy to program random number generation with the TRS-80. All that's required is using the following statement:

X = RND(Y)

where Y is the largest random number required, and X is the number generated each time the statement is used. To generate random numbers from 1 to 52, for a 52 card shuffle and draw, see Program 25-1 for the program listing. All card numbers are displayed as they appear in array B. Program line 1070 is used to generate the random numbers. Each time a number is generated the array A is checked to see if the number has already been chosen. If not, then the number is stored in array B. This continues until all 52 cards are drawn. Finally, lines 1120 through 1140 display the card numbers in the order that they were drawn. The program may be used as a subroutine when designing card games.

A sample run for the 52 card shuffle and draw program is seen in Fig. 25-1.

```
RUN
 8  33  18  28  51  43  7  10  52  3  16  46  21  45  5  31  20
 2  38  29  32  36  26  15  14  47  25  4  23  11  13  42  6
 39  48  22  17  12  37  44  19  30  41  35  24  34  50  49  9
 40  27  1
READY
>
```

Fig. 25-1. 52 Card shuffle and draw sample run.

Program 25-1. 52 Card Shuffle and Draw Program Listing

```
1000 REM TRS-80 LEVEL II 52 CARD SHUFFLE AND DRAW
1010 RANDOM
1020 DIM A(53),B(53)
1030 FORX=1TO52
1040 A(X)=X
1050 NEXTX
1060 FORY=1TO52
1070 X=RND(52)
1080 IFA(X)=0THEN1070
1090 A(X)=0
1100 B(Y)=X
1110 NEXTY
1120 FORA=1TO52
1130 PRINT B(A);
1140 NEXTA
1150 END
```

CHAPTER 26

BASIC Time Delays

Most of the programs described in Section I of this book use BASIC time delays to slow the computer from the world of microseconds to the world of seconds. This may be done with a machine language routine, as in the TRS-80 Level I Telephone Dialer, or in BASIC using the FOR-NEXT loop. The following is a FOR-NEXT loop that may be used to create any length delay:

```
1000 FOR A = 1 TO X
1010 NEXT A
```

where X is the number of times the computer runs through the loop, for the required delay.

The value of X is dependent upon the speed of the BASIC and the required delay length.

1 SECOND DELAY

A 1 second delay for the TRS-80 Level II requires X = 330. Level I is a bit faster, requiring X = 450. For a delay longer than 1 second, multiply X by the number of seconds required in the delay.

MILLISECOND DELAY

The 1 second delay program can be changed for shorter delay lengths. Divide X by 1000 and multiply by the required number of milliseconds for a millisecond delay. Let M equal the number of milliseconds. The following subroutine will create a 100 millisecond delay:

```
1000 M = 100
1010 FOR A = 1 TO X/1000 * M
1020 NEXT A
1030 RETURN
```

where X is the number of loops the BASIC requires for a delay of 1 second. Thus for Level II Basic, line 1010 is:

```
For A=1 TO 330/1000 * M
```

CHAPTER 27

Digital Dice

This program may be used as a subroutine in games. Each time it's run it generates the throw of a pair of six-sided dice. The program is written in BASIC for your microcomputer. See Program 27-1 for the program listing.

The dice are drawn using asterisks (*). See Fig. 27-1 for a sample run.

```
RUN
DIGITAL DICE: TRS-80
COPYRIGHT (C) 1980 BY HOWARD BERENBON

THIS PROGRAM GENERATES A RANDOM
THROW OF THE DICE.

ENTER A '1' TO THROW THE DICE
? 1


*******
*  3  *
*******


*******
*  6  *
*******

TOTAL DICE THROW =  9

ENTER A '1' TO THROW THE DICE
?
```

Fig. 27-1. Digital dice sample run.

Program 27-1. Digital Dice Program Listing

```
100 PRINT"DIGITAL DICE: TRS-80"
110 PRINT"COPYRIGHT (C) 1980 BY HOWARD BERENBON"
120 PRINT
130 PRINT"THIS PROGRAM GENERATES A RANDOM"
140 PRINT"THROW OF THE DICE."
150 PRINT
160 PRINT"ENTER A '1' TO THROW THE DICE"
170 INPUT A
180 IF A<>1 THEN 320
190 GOSUB 330
200 PRINT
210 PRINT"********"
220 PRINT"*";TAB(2);X;TAB(6)"*"
230 PRINT"********"
240 PRINT
250 PRINT
260 PRINT"********"
270 PRINT"*";TAB(2);Y;TAB(6)"*"
280 PRINT"********"
290 PRINT
300 PRINT"TOTAL DICE THROW = ";X+Y
310 GOTO 150
320 END
330 FOR A=1 TO 6
340 X=RND(6)
350 Y=RND(6)
360 NEXT A
370 FOR A=1 TO 330
380 NEXT A
390 RETURN
```

CHAPTER 28

Hex to Decimal and Decimal to Hex Conversions

Here's a base conversion program for the TRS-80 microcomputer. It's written in BASIC, and will run in any system with 4K BASIC or higher. The program converts a hex number (base 16) to decimal (base 10), and decimal to hex. See Program 28-1 for the program listing.

In the decimal to hex mode, you can enter any decimal number up to 65535 (that's hex FFFF). Its hex equivalent will be displayed.

In the hex to decimal mode, you must enter the hex number in the following format, with commas between the numbers, in the following format:

enter 3,5,15,13 if the hex number is 35FD

The numbers 10, 11, 12, 13, 14, and 15 are entered in place of the letters A, B, C, D, E, and F, respectively. Then its decimal equivalent will be displayed. See Fig. 28-1 for a sample run.

```
RUN
HEX TO DECIMAL AND DECIMAL TO HEX CONVERSIONS
COPYRIGHT (C) 1980 BY HOWARD BERENBON


CONVERSIONS
ENTER '1' FOR HEX TO DECIMAL
      '2' FOR DECIMAL TO HEX
? 1



ENTER HEX # UP TO (FFFF) 15,15,15,15
ENTER 0-9, AND A-F:
A=10  B=11  C=12  D=13  E=14  F=15
EXAMPLE: A41F IS ENTERED AS: 10,4,1,15

? 15,14,13,12
HEX  FEDC =  65244  DECIMAL

CONVERSIONS
ENTER '1' FOR HEX TO DECIMAL
      '2' FOR DECIMAL TO HEX
? 2


ENTER DECIMAL # UP TO 65535

? 65244
DECIMAL  65244  = FEDC HEX

CONVERSIONS
ENTER '1' FOR HEX TO DECIMAL
      '2' FOR DECIMAL TO HEX
?
```

Fig. 28-1. Hex to decimal and decimal to hex sample run.

Program 28-1. Hex to Decimal and Decimal to Hex Program Listing

```
100 PRINT"HEX TO DECIMAL AND DECIMAL TO HEX CONVERSIONS"
110 PRINT"COPYRIGHT (C) 1980 BY HOWARD BERENBON
120 PRINT
130 PRINT
140 PRINT"CONVERSIONS"
150 PRINT"ENTER '1' FOR HEX TO DECIMAL"
160 PRINTTAB(6)"'2' FOR DECIMAL TO HEX"
170 INPUTA
180 IF A=1 THEN 220
190 IF A=2 THEN 860
200 GOTO 130
210 PRINT
220 PRINT"ENTER HEX # UP TO (FFFF) 15,15,15,15"
230 PRINT"ENTER 0-9, AND A-F:"
240 PRINT"A=10  B=11  C=12  D=13  E=14  F=15"
250 PRINT"EXAMPLE: A41F IS ENTERED AS: 10,4,1,15"
260 PRINT
270 INPUT C,D,E,F
280 IF C>15 THEN 220
290 IF D>15 THEN 220
300 IF E>15 THEN 220
310 IF F>15 THEN 220
320 G=F*1
330 H=E*16
340 I=D*(16*16)
350 J=C*(16*16*16)
360 K=G+H+I+J
370 X=1
380 N=C
390 PRINT"HEX  ";
400 GOSUB 520
410 N=D
420 X=X+1
430 GOSUB 520
440 N=E
450 X=X+1
460 GOSUB 520
470 N=F
480 X=X+1
490 GOSUB 520
500 PRINT TAB(X+2);" = ";K;" DECIMAL"
510 GOTO130
520 IF N=0 THEN 540
530 ON N GOTO 560,580,600,620,640,660,680,700,720,740,760,780,800,820,840
540 PRINT TAB(X+1)"0";
550 RETURN
```

Program 28-1—cont. Hex to Decimal and Decimal to Hex Program Listing

```
560 PRINT TAB(X+1)"1";
570 RETURN
580 PRINT TAB(X+1)"2";
590 RETURN
600 PRINT TAB(X+1)"3";
610 RETURN
620 PRINT TAB(X+1)"4";
630 RETURN
640 PRINT TAB(X+1)"5";
650 RETURN
660 PRINT TAB(X+1)"6"
670 RETURN
680 PRINT TAB(X+1)"7";
690 RETURN
700 PRINT TAB(X+1)"8";
710 RETURN
720 PRINT TAB(X+1)"9";
730 RETURN
740 PRINT TAB(X+1)"A";
750 RETURN
760 PRINT TAB(X+1)"B";
770 RETURN
780 PRINT TAB(X+1)"C";
790 RETURN
800 PRINT TAB(X+1)"D";
810 RETURN
820 PRINT TAB(X+1)"E";
830 RETURN
840 PRINT TAB(X+1)"F";
850 RETURN
860 PRINT"ENTER DECIMAL # UP TO 65535"
870 PRINT
880 INPUT A
890 IF A>65535 THEN 860
900 W=0:G=0:Y=0:Z=0
910 W=INT(A)/16
920 G=INT(W)/16
930 Y=INT(G)/16
940 Z=INT(Y)/16
950 L=W-INT(W):C=L*16
960 O=G-INT(G):D=O*16
970 P=Y-INT(Y):E=P*16
980 M=Z-INT(Z):F=M*16
990 PRINT"DECIMAL ";A;" = ";
1000 X=1
1010 N=F
1020 GOSUB 520
1030 N=E:X=X+1
1040 GOSUB 520
1050 N=D:X=X+1
1060 GOSUB 520
1070 N=C:X=X+1
1080 GOSUB 520
1090 PRINT TAB(X+2)" HEX"
1100 GOTO130
```

SECTION VI

The Unusual

This section deals with the subject of fortune telling, with The Tarot Card Reader program. Not only is it unusual, but it's the longest program in the book. It requires almost 16K to run.

CHAPTER 29

The Tarot Card Reader

Are you open to the unusual? Do you believe that there are things in life that cannot be explained, yet have a profound effect on us? The positions of the planets may affect us, as astrologers believe. The moon has a tidal effect on the oceans and seas, causing their levels to change over a period of time.

In ancient times, picture cards were used to predict the future and explain the past. These cards, called The Tarot, are still used today. In fact, the modern deck of 52 cards is based on The Tarot.

The Tarot consists of 78 cards, with pictures and symbols. There are four suits:

1. Cups
2. Wands
3. Penticles
4. Swords

There are 14 cards per suit, plus 22 other cards called the Major Arcana. When any of the Major Arcana appear in a card layout, called a reading, their meaning has a greater influence than other cards in the reading.

The cards are numbered Ace through 10, and named Page, Knight, Queen, and King. Some of the names are different from the modern deck. It appears that the Jack has replaced the Page, and the Knight is gone from the modern deck.

THE PROGRAM

The Tarot Card Reader program is based on the ancient deck of 78 cards, used in fortune telling. It's written in BASIC for your microcomputer. See Program 29-1 for the program listing. It requires 16K to run.

Each card has two meanings, one for right side up and another for reversed. The meaning of each picture is stored in PRINT statements, beginning at line 1310. There are 156 meanings in all. Since the pictures are too detailed to draw graphically, their meanings are interpreted from the symbols and subjects, and listed briefly.

THE READING

The person who desires a prediction thinks of a question on any subject, or asks the question out loud. Ten cards are randomly selected, using the numbers from 1 through 78, and stored in the array A. If a duplicate number appears, then another card is drawn. The meanings are accessed using the ON GOSUB statements at lines 1110 and 1140.

Each card is dealt with a position meaning, as well as a face meaning. See Fig. 29-1 for the sample run. The first card drawn has the position number 1. Its position in the reading relates to the Atmosphere That Surrounds The Question. The second card drawn relates to the Opposing Forces. The meaning of each card is interpreted with its position meaning.

Press ENTER to draw each card. If the card is reversed, this will be indicated. Read the reversed meaning, just below the right-side-up meaning. After all 10 cards are drawn, you may review the reading by entering an R. Press ENTER to display each card. To start a new reading, enter an A. To end the program, enter an E.

ACCURACY

There is no guarantee that the readings will prove accurate. But if they appear to hold some truth, then you may be dealing with forces beyond your control, if not a coincidence.

```
THE TAROT CARD READER
COPYRIGHT (C) 1979 BY HOWARD BERENBON

THE TAROT READER WILL ATTEMPT TO PREDICT YOUR
FUTURE AND DETERMINE YOUR DESTINY USING THE 78 CARD
TAROT DECK. IT IS SIMILAR TO A MODERN DAY CARD DECK
EXCEPT IT HAS 1 EXTRA CARD PER SUIT AND 22 OTHER
CARDS CALLED THE MAJOR ARCANA.
THE MAJOR ARCANA ARE SAID TO BE SUGGESTIVE OF MAGIC
AND MYSTERY, WITH CARDS LIKE 'THE TOWER' AND 'THE WHEEL
OF FORTUNE'. THEY ARE NOT RELATED TO THE MODERN DAY CARDS.
PRESS ENTER TO CONTINUE?


                    THE TAROT CARD READER

THE TAROT READER WILL DEAL 10 CARDS FROM
THE DECK OF 78. 1ST YOU MUST THINK OF A QUESTION
TO ASK IT. THEN YOU  WILL BE ASKED TO SHUFFLE THE
DECK. THE CARDS WILL BE DEALT ONE AT A TIME.
EACH CARD HAS TWO MEANINGS, ONE FOR RIGHT-SIDE-UP
AND ANOTHER FOR REVERSED. THAT'S 156 POSSIBLE MEANINGS.
IN THE DECK, EACH CARD ALSO HAS A POSITION MEANING.
1ST THE POSITION MEANING WILL BE PRINTED, THEN THE
CARD MEANING. EVALUATE EACH CARD MEANING IN RELATION
TO YOUR QUESTION AND ITS POSITION IN THE DEAL.
PRESS ENTER TO CONTINUE?


                    POSITION MEANINGS

#1-ATMOSPHERE THAT SURROUNDS THE QUESTION
#2-OPPOSING FORCES
#3-BASIS OF THE MATTER
#4-INFLUENCE THAT IS JUST PASSING
#5-SOMETHING THAT MAY HAPPEN IN THE FUTURE
#6-THINGS THAT WILL COME TO PASS IN THE NEAR FUTURE
#7-NEGATIVE FEELINGS, THE QUERENT'S FEARS
#8-FAMILY OPINION
#9-HOPES AND IDEAS IN THE MATTER
#10-THE FINAL OUTCOME

THINK OF A QUESTION TO ASK

PRESS ENTER TO SHUFFLE THE CARDS?


NOW SHUFFLING

THE TAROT CARD READER

PRESS ENTER TO DRAW?




THE TAROT CARD READER
CARD # 1


#1-ATMOSPHERE THAT SURROUNDS THE QUESTION

3 OF SWORDS
TEARS, SEPARATION, QUARRELING
REVERSED-CONFUSION, LOSS, SORROW

THE TAROT CARD READER

PRESS ENTER TO DRAW?
```

Fig. 29-1. The Tarot card reader sample run.

```
THE TAROT CARD READER
CARD # 2


#2-OPPOSING FORCES

10 OF SWORDS
DISPAIR, RUIN, DEFEAT, TEARS, TROUBLE
REVERSED-SOME SUCCESS. COURAGE

THE TAROT CARD READER

PRESS ENTER TO DRAW?



THE TAROT CARD READER
CARD # 3


#3-BASIS OF THE MATTER

4 OF SWORDS
REST AFTER WAR, BANISHMENT, RELAXATION OF ANXIETY
REVERSED-RENEWED ACTIVITY, QUALIFIED SUCCESS, SOCIAL UNREST

THE TAROT CARD READER

PRESS ENTER TO DRAW?
```

Fig. 29-1—cont. The Tarot card reader sample run.

Program 29-1. The Tarot Card Reader Program Listing

```
100 GOTO330
110 RANDOM
120 FORA=1TO10
130 X=RND(78)
140 A(A)=X
150 NEXTA
160 REM TEST FOR DUPLICATES
170 X=1
180 FORP=2TO10
190 IFX=PTHEN210
200 IFA(X)=A(P)THEN290
210 NEXTP
220 X=X+1
230 IFX=11THEN260
240 GOTO180
250 X=X+1
260 REM GET CARD
270 REM CARDS DRAWN
280 RETURN
290 REM GET ANOTHER NUMBER
300 X=RND(78)
310 A(P)=X
320 GOTO170
330 XX=0:Q=1:CLS:PRINT"THE TAROT CARD READER"
340 PRINT"COPYRIGHT (C) 1979 BY HOWARD BERENBON"
350 PRINT
360 Z$="REVERSED-":W$=" OF WANDS":X$=" OF CUPS":Y$=" OF SWORDS":V$=" OF PENTACLE
S"
370 PRINT"THE TAROT READER WILL ATTEMPT TO PREDICT YOUR"
380 PRINT"FUTURE AND DETERMINE YOUR DESTINY USING THE 78 CARD"
390 PRINT"TAROT DECK. IT IS SIMILAR TO A MODERN DAY CARD DECK"
400 PRINT"EXCEPT IT HAS 1 EXTRA CARD PER SUIT AND 22 OTHER"
410 PRINT"CARDS CALLED THE MAJOR ARCANA."
420 PRINT"THE MAJOR ARCANA ARE SAID TO BE SUGGESTIVE OF MAGIC"
430 PRINT"AND MYSTERY, WITH CARDS LIKE 'THE TOWER' AND 'THE WHEEL"
440 PRINT"OF FORTUNE'. THEY ARE NOT RELATED TO THE MODERN DAY CARDS."
450 INPUT"PRESS ENTER TO CONTINUE";A$
460 GOTO590
470 CLS
480 PRINT"THE TAROT CARD READER"
490 REM
500 PRINT"CARD #";PP
510 PRINT:PRINT
520 IF XX=1 THEN1260
530 GOSUB4550
540 IF X=2 THEN560
550 RETURN
560 PRINT;Z$
570 PRINT
580 RETURN
590 CLS
```

Program 29-1—cont. The Tarot Card Reader Progam Listing

```
600 PRINTTAB(20)"THE TAROT CARD READER"
610 PRINT
620 PRINT"THE TAROT READER WILL DEAL 10 CARDS FROM"
630 PRINT"THE DECK OF 78. 1ST YOU MUST THINK OF A QUESTION"
640 PRINT"TO ASK IT. THEN YOU  WILL BE ASKED TO SHUFFLE THE"
650 PRINT"DECK. THE CARDS WILL BE DEALT ONE AT A TIME."
660 PRINT "EACH CARD HAS TWO MEANINGS, ONE FOR RIGHT-SIDE-UP"
670 PRINT"AND ANOTHER FOR REVERSED. THAT'S 156 POSSIBLE MEANINGS."
680 PRINT "IN THE DECK, EACH CARD ALSO HAS A POSITION MEANING."
690 PRINT"1ST THE POSITION MEANING WILL BE PRINTED, THEN THE"
700 PRINT"CARD MEANING. EVALUATE EACH CARD MEANING IN RELATION"
710 PRINT"TO YOUR QUESTION AND ITS POSITION IN THE DEAL."
720 INPUT"PRESS ENTER TO CONTINUE";C$
730 CLS
740 PRINTTAB(20)"POSITION MEANINGS"
750 GOTO4430
760 PRINT"#1-ATMOSPHERE THAT SURROUNDS THE QUESTION"
770 RETURN
780 PRINT"#2-OPPOSING FORCES"
790 RETURN
800 PRINT"#3-BASIS OF THE MATTER"
810 RETURN
820 PRINT"#4-INFLUENCE THAT IS JUST PASSING"
830 RETURN
840 PRINT"#5-SOMETHING THAT MAY HAPPEN IN THE FUTURE"
850 RETURN
860 PRINT"#6-THINGS THAT WILL COME TO PASS IN THE NEAR FUTURE"
870 RETURN
880 PRINT"#7-NEGATIVE FEELINGS, THE QUERENT'S FEARS"
890 RETURN
900 PRINT"#8-FAMILY OPINION"
910 RETURN
920 PRINT"#9-HOPES AND IDEAS IN THE MATTER"
930 RETURN
940 PRINT"#10-THE FINAL OUTCOME"
950 RETURN
960 PRINT
970 PRINT"THINK OF A QUESTION TO ASK"
980 PRINT
990 INPUT"PRESS ENTER TO SHUFFLE THE CARDS";C$
1000 CLS
1010 PRINT"NOW SHUFFLING"
1020 REM DRAW AND DISPLAY CARDS
1030 GOSUB110
1040 FORPP=1TO10
1050 PRINT:PRINT"THE TAROT CARD READER":PRINT
1060 INPUT"PRESS ENTER TO DRAW";D$
1070 GOSUB470
1080 ON PP GOSUB760  ,780 ,800 ,820 ,840 ,860 ,880 ,900 ,920 ,940
1090 PRINT
1100 IFA(PP)>39 THEN1140
```

Program 29-1—cont. The Tarot Card Reader Program Listing

```
1110 ON A(PP) GOSUB1310 ,1350,1390,1430,1470,1510,1550,1590,1630,1670,1710,1750,
1790,1830,1870,1910,1950,1990,2030,2070,2110,2150,2190,2230,2270,2310,2350,2390,
2430,2470,2510,2550,2590,2630,2670,2710,2750,2790,2830
1120 NEXT PP
1130 GOTO1160
1140 ON A(PP)-39 GOSUB2870 ,2910,2950,2990,3030,3070,3110,3150,3190,3230,3270,33
10,3350,3390,3430,3470,3510,3550,3590,3630,3670,3710,3750,3790,3830,3870,3910,39
50,3990,4030,4070,4110,4150,4190,4230,4270,4310,4350,4390
1150 NEXT PP
1160 BZ$=" ":PRINT:PRINT"ANOTHER READING-ENTER 'A'"
1170 PRINT"REPEAT LAST READING-ENTER 'R'"
1180 PRINT"END PROGRAM-ENTER 'E'"
1190 INPUT BZ$
1200 IF BZ$="A" THEN330
1210 IF BZ$="R" THEN1250
1220 IF BZ$="E" THEN1240
1230 GOTO1160
1240 END
1250 XX=1:Q=1:GOTO1040
1260 X=B(Q)
1270 IFX=2 THEN1290
1280 Q=Q+1:RETURN
1290 PRINT;Z$:PRINT:Q=Q+1
1300 RETURN
1310 PRINT"KEY 0-THE FOOL"
1320 PRINT"A DREAMER HAS THE DESIRE TO ACCOMPLISH A GREAT GOAL."
1330 PRINTZ$;"FOLLY, INDISCRETION, THOUGHTLESS ACTION"
1340 RETURN
1350 PRINT"KEY 1-THE MAGICIAN"
1360 PRINT"WILL, MASTERY, CREATIVE, ORGANIZER"
1370 PRINTZ$;"INDECISION, WEAK WILL, INEPTITUDE"
1380 RETURN
1390 PRINT"KEY 2-HIGH PRIESTESS"
1400 PRINT"HIDDEN INFLUENCES, UNREVEALED FUTURE"
1410 PRINTZ$;"CONCEIT, SENSUAL ENJOYMENT"
1420 RETURN
1430 PRINT"KEY 3-THE EMPRESS"
1440 PRINT"WEALTH, MARRIAGE, FERTILITY"
1450 PRINTZ$;"INFERTILITY, INACTION, LOSS OF POSSESSIONS"
1460 RETURN
1470 PRINT"KEY 4-THE EMPEROR"
1480 PRINT"LEADERSHIP,AUTHORITY,MENTAL ACTIVITY,DOMINATION"
1490 PRINTZ$;"LOSS OF CONTROL, INJURY IN BATTLE"
1500 RETURN
1510 PRINT"KEY 5-THE HIEROPHANT"
1520 PRINT"PREFER RELIGION, RITUAL, SOCIAL APPROVAL"
1530 PRINTZ$;"UNCONVENTIONALITY, INVENTOR, NEW IDEAS"
1540 RETURN
1550 PRINT"KEY 6-THE LOVERS"
1560 PRINT"CHOICE, TEMPTATION, ATTRACTION"
1570 PRINTZ$;"QUARRELS, INFIDELITY, POSSIBLE WRONG CHOICE"
1580 RETURN
1590 PRINT"KEY 7-THE CHARIOT"
1600 PRINT"TRIUMPH, SUCCESS"
1610 PRINTZ$;"RESTLESSNESS, DECADENT DESIRES"
```

Program 29-1—cont. The Tarot Card Reader Program Listing

```
1620 RETURN
1630 PRINT"KEY 8-STRENGTH"
1640 PRINT"SPIRITUAL POWER, LOVE TRIUMPHS"
1650 PRINTZ$;"DISCORD, ABUSE OF POWER"
1660 RETURN
1670 PRINT"KEY 9-THE HERMIT"
1680 PRINT"SILENT COUNSEL, PRUDENCE, DISCRETION"
1690 PRINTZ$;"IMMATURITY, FOOLISH VICES"
1700 RETURN
1710 PRINT"KEY 10-WHEEL OF FORTUNE"
1720 PRINT"SUCCESS, GOOD LUCK"
1730 PRINTZ$;"FAILURE, SETBACKS"
1740 RETURN
1750 PRINT"KEY 11-JUSTICE"
1760 PRINT"JUSTICE, BALANCE, EDUCATION"
1770 PRINTZ$;"INJUSTICE; INEQUALITY"
1780 RETURN
1790 PRINT"KEY 12-THE HANGED MAN"
1800 PRINT"WISDOM, SUSPENDED DECISIONS"
1810 PRINTZ$;"ARROGANCE, WASTED EFFORT"
1820 RETURN
1830 PRINT"KEY 13-DEATH"
1840 PRINT"TRANSFORMATION, CHANGE, DESTRUCTION & RENEWAL"
1850 PRINTZ$;"DISASTER, REVOLUTION, TEMPORARY STAGNATION"
1860 RETURN
1870 PRINT"KEY 14-TEMPERANCE"
1880 PRINT"ADAPTION, TEMPERING, HARMONY"
1890 PRINTZ$;"COMPETING INTERESTS, CORRUPTION, SEPARATION"
1900 RETURN
1910 PRINT"KEY 15-THE DEVIL"
1920 PRINT"BLACK MAGIC, DISCONTENT, DEPRESSION, ILLNESS"
1930 PRINTZ$;"THE BEGINNING OF SPIRITUAL UNDERSTANDING"
1940 RETURN
1950 PRINT"KEY 16-THE TOWER"
1960 PRINT"CHANGE, CONFLICT, CATASTROPHE"
1970 PRINTZ$;"THE GAIN OF FREEDOM AT GREAT COST, OPPRESSION"
1980 RETURN
1990 PRINT"KEY 17-THE STAR"
2000 PRINT"INSIGHT, INSPIRATION, HOPE, GOOD HEALTH"
2010 PRINTZ$;"PESSIMISM, STUBBORNNESS"
2020 RETURN
2030 PRINT"KEY 18-THE MOON"
2040 PRINT"INTUITION, IMAGINATION, DECEPTION"
2050 PRINTZ$;"STORMS WILL BE WEATHERED, PEACE AT A COST"
2060 RETURN
2070 PRINT"KEY 19-THE SUN"
2080 PRINT"HAPPINESS, SUCCESS, ATTAINMENT"
2090 PRINTZ$;"FUTURE PLANS CLOUDED"
2100 RETURN
2110 PRINT"KEY 20-JUDGMENT"
2120 PRINT"A LIFE WELL LIVED, AWAKENING, RENEWAL"
```

Program 29-1—cont. The Tarot Card Reader Program Listing

```
2130 PRINTZ$;"WEAKNESS, DISILLUSION, SEPARATION"
2140 RETURN
2150 PRINT"KEY 21-THE WORLD"
2160 PRINT"COMPLETION, REWARD, SUCCESS, TRAVEL, CHANGE OF  RESIDENCE"
2170 PRINTZ$;"SUCCESS YET TO BE WON, FEAR OF TRAVEL-CHANGE"
2180 RETURN
2190 PRINT"ACE";W$
2200 PRINT"BEGINNING OF AN ENTERPRISE, INVENTION, JOURNEY, OR FAMILY"
2210 PRINTZ$;"JOURNEY DEFERRED, CLOUDED JOY, FALSE STARTS"
2220 RETURN
2230 PRINT"2";W$
2240 PRINT"BOLDNESS, COURAGE, KINDNESS & GENEROSITY"
2250 PRINTZ$;"RESTLESSNESS, OBSTINACY, FEAR"
2260 RETURN
2270 PRINT"3";W$
2280 PRINT"REALIZATION OF HOPE, ESTABLISHED STRENGTH, WEALTH, POWER"
2290 PRINTZ$;"BEWARE OF HELP OFFERED. WEALTH MAY SLIP AWAY"
2300 RETURN
2310 PRINT"4";W$
2320 PRINT"PEACE, PROSPERITY, HARMONY, ROMANCE"
2330 PRINTZ$;"MEANING REMAINS THE SAME"
2340 RETURN
2350 PRINT"5";W$
2360 PRINT"STRIFE, COMPETITION, OBSTACLES, LAWSUIT"
2370 PRINTZ$;"GENEROSITY, VICTORY"
2380 RETURN
2390 PRINT"6";W$
2400 PRINT"GOOD NEWS, VICTORY AFTER STRIFE, PLEASURE, SUCCESS"
2410 PRINTZ$;"REWARDS ARE DELAYED, WATCH FOR ENEMY"
2420 RETURN
2430 PRINT"7";W$
2440 PRINT"VICTORY, SUCCESS"
2450 PRINTZ$;"IGNORANCE, PRETENSE, THREAT"
2460 RETURN
2470 PRINT"8";W$
2480 PRINT"GREAT HASTE, HOPE. MESSAGES, JOURNEY"
2490 PRINTZ$;"DELAY, STAGNATION, JEALOUSY"
2500 RETURN
2510 PRINT"9";W$
2520 PRINT"STRENGTH, POWER, HEALTH"
2530 PRINTZ$;"WEAKNESS, ILL HEALTH, OBSTACLES"
2540 RETURN
2550 PRINT"10";W$
2560 PRINT"POWER UNWISELY USED"
2570 PRINTZ$;"INTRIGUES, SEPARATION, EMIGRATION"
2580 RETURN
2590 PRINT"PAGE";W$
2600 PRINT"COURAGE, BEAUTY, DESIRES POWER, MESSENGER"
2610 PRINTZ$;"CRUEL, UNSTABLE, DOMINEERING, BAD NEWS"
2620 RETURN
2630 PRINT"KNIGHT";W$
```

Program 29-1—cont. The Tarot Card Reader Program Listing

```
2640 PRINT"A HASTY YOUNG MAN, DEPARTURE"
2650 PRINTZ$;"JEALOUS LOVER, DISCORD, FRUSTRATION"
2660 RETURN
2670 PRINT"QUEEN";W$
2680 PRINT"SHE HAS GREAT POWER, SUCCESS, KINDNESS"
2690 PRINTZ$;"DOMINEERING, OBSTINATE, REVENGEFUL"
2700 RETURN
2710 PRINT"KING";W$
2720 PRINT"HANDSOME & PASSIONATE, HONESTY, FRIENDLY"
2730 PRINTZ$;"INTOLERANT, PREJUDICED, SEVERE"
2740 RETURN
2750 PRINT"ACE";X$
2760 PRINT"GREAT LOVE, JOY, CONTENTMENT"
2770 PRINTZ$;"FALSE LOVE. CLOUDED JOY. INSTABILITY"
2780 RETURN
2790 PRINT"2";X$
2800 PRINT"HARMONY, FRIENDSHIP, LOVE AFFAIR"
2810 PRINTZ$;"FALSE LOVE, FOLLY, PASSION, MISUNDERSTANDING"
2820 RETURN
2830 PRINT"3";X$
2840 PRINT"SUCCESS, ABUNDANCE, PLEASURE, VICTORY"
2850 PRINTZ$;"PLEASURE TURNS TO PAIN, SUCCESS TO ASHES"
2860 RETURN
2870 PRINT"4";X$
2880 PRINT"STATIONARY, WEARINESS, DISSATISFACTION WITH SUCCESS"
2890 PRINTZ$;"AWAKENING, NEW GOALS, NEW AMBITION"
2900 RETURN
2910 PRINT"5";X$
2920 PRINT"DISAPPOINTMENT, SORROW, LOSS OF FRIENDSHIP, REGRET"
2930 PRINTZ$;"RETURN OF ENJOYMENT, A FRIEND OR LOVED ONE"
2940 RETURN
2950 PRINT"6";X$
2960 PRINT"HAPPINESS, ENJOYMENT, FROM THE PAST. NEW OPPORTUNITIES"
2970 PRINTZ$;"CLINGING TO THE PAST. WORTHLESS ASSOCIATES"
2980 RETURN
2990 PRINT"7";X$
3000 PRINT"DREAMS, IMAGINATION. FORCES SCATTERED. DECEPTION"
3010 PRINTZ$;"GOOD RESOLUTIONS, NEW DETERMINATION"
3020 RETURN
3030 PRINT"8";X$
3040 PRINT"SUCCESS ABANDONED. JOURNEYING. DISAPPOINTMENT IN LOVE"
3050 PRINTZ$;"JOY, A NEW LOVE"
3060 RETURN
3070 PRINT"9";X$
3080 PRINT"MATERIAL SUCCESS, SATISFACTION"
3090 PRINTZ$;"FALSE FREEDOM, DECEPTION OR ILLNESS"
3100 RETURN
3110 PRINT"10";X$
3120 PRINT"CONTENTMENT, HAPPINESS, SUCCESS, FRIENDSHIP"
3130 PRINTZ$;"LOSS OF FRIENDSHIP. BETRAYAL. WASTE"
3140 RETURN
```

Program 29-1—cont. The Tarot Card Reader Program Listing

```
3150 PRINT"PAGE";X$
3160 PRINT"ARTS. NEWS, A MESSAGE"
3170 PRINTZ$;"OBSTACLES, SEDUCTION. DECEPTION, UNPLEASENT NEWS"
3180 RETURN
3190 PRINT"KNIGHT";X$
3200 PRINT"PROPOSITION, INVITATION, MESSAGES"
3210 PRINTZ$;"SENSUAL, IDLE, UNTRUTHFUL"
3220 RETURN
3230 PRINT"QUEEN";X$
3240 PRINT"SUCCESS, HAPPINESS, PLEASURE"
3250 PRINTZ$;"DISHONESTY. IMMORALITY"
3260 RETURN
3270 PRINT"KING";X$
3280 PRINT"LIBERALITY, GENEROSITY, CREATIVE INTELLIGENCE"
3290 PRINTZ$;"FIERCE NATURE UNDER CALM EXTERIOR"
3300 RETURN
3310 PRINT"ACE";Y$
3320 PRINT"CONQUEST, POWER, ACTIVITY"
3330 PRINTZ$;"CONQUEST, DISASTER, OBSTACLES, LOSS"
3340 RETURN
3350 PRINT"2";Y$
3360 PRINT"TENSION. INDECISION. BALANCED FORCES, STALEMATE"
3370 PRINTZ$;"RELEASE. DISLOYALTY. MOVEMENT OF AFFAIRS"
3380 RETURN
3390 PRINT"3";Y$
3400 PRINT"TEARS, SEPARATION, QUARRELING"
3410 PRINTZ$;"CONFUSION, LOSS, SORROW"
3420 RETURN
3430 PRINT"4";Y$
3440 PRINT"REST AFTER WAR, BANISHMENT, RELAXATION OF ANXIETY"
3450 PRINTZ$;"RENEWED ACTIVITY, QUALIFIED SUCCESS, SOCIAL UNREST"
3460 RETURN
3470 PRINT"5";Y$
3480 PRINT"FAILURE, DEFEAT. DEGRADATION. UNFAIRNESS"
3490 PRINTZ$;"CHANCE OF LOSS. SORROW. WEAKNESS"
3500 RETURN
3510 PRINT"6";Y$
3520 PRINT"SUCCESS AFTER ANXIETIES. JOURNEY"
3530 PRINTZ$;"NO IMMEDIATE WAY OUT OF DIFFICULTIES"
3540 RETURN
3550 PRINT"7";Y$
3560 PRINT"UNSTABLE EFFORT, PARTIAL SUCCESS"
3570 PRINTZ$;"UNEXPECTED GOOD. SOUND ADVICE"
3580 RETURN
3590 PRINT"8";Y$
3600 PRINT"IMPRISONMENT, FEAR, BETRAYAL"
3610 PRINTZ$;"NEW BEGINNINGS, FREEDOM"
3620 RETURN
3630 PRINT"9";Y$
3640 PRINT"SUFFERING, LOSS, MISERY. OPRESSION. ILLNESS"
3650 PRINTZ$;"PATIENCE, UNSELFISHNESS. TIME HEALS"
```

Program 29-1—cont. The Tarot Card Reader Program Listing

```
3660 RETURN
3670 PRINT"10";Y$
3680 PRINT"DISPAIR, RUIN, DEFEAT, TEARS, TROUBLE"
3690 PRINTZ$;"SOME SUCCESS. COURAGE"
3700 RETURN
3710 PRINT"PAGE";Y$
3720 PRINT"MESSAGE, SPYING. GRACE, DEXTERITY"
3730 PRINTZ$;"FRIVOLITY AND CUNNING. UNEXPECTED"
3740 RETURN
3750 PRINT"KNIGHT";Y$
3760 PRINT"COMING OR GOING OF MISFORTUNE"
3770 PRINTZ$;"EXTRAVAGENCE. TYRANNY"
3780 RETURN
3790 PRINT"QUEEN";Y$
3800 PRINT"MOURNING, PRIVATION. KINDNESS. GRACEFULNESS"
3810 PRINTZ$;"UNRELIABILITY. GOSSIP. DECEIT. MALICE"
3820 RETURN
3830 PRINT"KING";Y$
3840 PRINT"POWER, STRENGTH, AUTHORITY"
3850 PRINTZ$;"DISTRUSTFUL. HARSH, PLOTTING, BARBARITY"
3860 RETURN
3870 PRINT"ACE";V$
3880 PRINT"WEALTH, MATERIAL GAIN, PROSPERITY, PLEASURE, BEAUTY"
3890 PRINTZ$;"MISERLINESS, GREED. A FALSE START"
3900 RETURN
3910 PRINT"2";V$
3920 PRINT"JUGGLE TWO SITUATIONS, GAIETY, HARMONY. NEWS, MESSAGES"
3930 PRINTZ$;"SIMULATED ENJOYMENT"
3940 RETURN
3950 PRINT"3";V$
3960 PRINT"MATERIAL INCREASE. MASTER CRAFTSMAN, SKILLED ARTIST"
3970 PRINTZ$;"LACK OF SKILL. IGNORANCE. SELFISHNESS"
3980 RETURN
3990 PRINT"4";V$
4000 PRINT"MATERIAL GAIN, SUCCESS, GIFTS, INHERITANCE, MISERLY"
4010 PRINTZ$;"PREJUDICE, SUSPICION, SETBACKS. SPENDTHRIFT"
4020 RETURN
4030 PRINT"5";V$
4040 PRINT"UNEMPLOYMENT, LOSS, LONELINESS, DESTITUTION"
4050 PRINTZ$;"CHARITY, NEW EMPLOYMENT, MONEY REGAINED"
4060 RETURN
4070 PRINT"6";V$
4080 PRINT"GAIN, GIFTS, INHERITANCE"
4090 PRINTZ$;"JEALOUS. BRIBES. BAD DEBTS"
4100 RETURN
4110 PRINT"7";V$
4120 PRINT"LOSS OF FORTUNE. PAUSE. DISAPPOINTMENT"
4130 PRINTZ$;"IMPATIENCE. LITTLE GAIN"
4140 RETURN
4150 PRINT"8";V$
4160 PRINT"LEARNING A TRADE OF PROFESSION. SKILL. EMPLOYMENT"
```

Program 29-1—cont. The Tarot Card Reader Program Listing

```
4170 PRINTZ$;"DANGER OF FAILURE. INTRIGUE. FALSE VANITY"
4180 RETURN
4190 PRINT"9";V$
4200 PRINT"SOLITARY ENJOYMENT. INHERITANCE. MATERIAL WELL BEING"
4210 PRINTZ$;"DANGER OF LOSS, OF HOME, FRIENDSHIP. CANCELLED PROJECT"
4220 RETURN
4230 PRINT"10";V$
4240 PRINT"RICHES, INHERITANCE. FAMILY MATTERS"
4250 PRINTZ$;"FAMILY MISFORTUNE, LOSS OF INHERITANCE"
4260 RETURN
4270 PRINT"PAGE";V$
4280 PRINT"REFLECTION, CAREFULNESS, GOOD MANAGEMENT"
4290 PRINTZ$;"DISSIPATION AND EXCESS. WASTEFULNESS, LUXURY"
4300 RETURN
4310 PRINT"KNIGHT";V$
4320 PRINT"UTILITY, SERVICEABLENESS, WORTHINESS"
4330 PRINTZ$;"STATIC, DULL, TIMID, IDLE, CARELESS"
4340 RETURN
4350 PRINT"QUEEN";V$
4360 PRINT"OPULENCE, SECURITY, TRUST. MOODY"
4370 PRINTZ$;"MISTRUST, SUSPICION, DEPENDENCE. CHANGEABLE"
4380 RETURN
4390 PRINT"KING";V$
4400 PRINT"STEADY TEMPERAMENT, SLOW TO ANGER. MONETARY SUCCESS"
4410 PRINTZ$;"STUPIDITY. THRIFTLESS. VICE"
4420 RETURN
4430 PRINT
4440 GOSUB760
4450 GOSUB780
4460 GOSUB800
4470 GOSUB820
4480 GOSUB840
4490 GOSUB860
4500 GOSUB880
4510 GOSUB900
4520 GOSUB920
4530 GOSUB940
4540 GOTO960
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NOTES

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HOWARD BERENBON is a graduate of Wayne State University with a Bachelor of Science in Electrical Engineering. He is currently employed in the automotive industry and spends much of his spare time developing new programs for microcomputers. His articles have appeared in many of the popular electronics and microcomputer publications.

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