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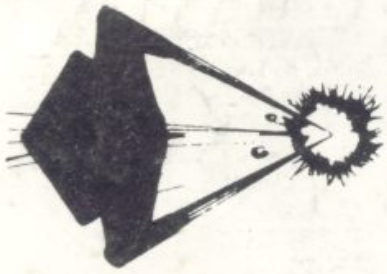

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ZX-81 16K

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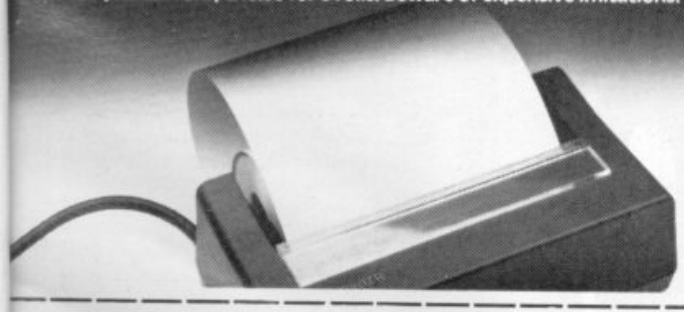

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SU4

```
    1 REM SURROUND BY J.WINCHESTE
R
    5 LET SX=0
    6 LET SB=0
    7 LET O=PEEK 16396+256*PEEK 1
6397
   10 POKE 16418,0
   20 PRINT AT 0,0;"■++++++++++++
++++++++++++++++"
   30 FOR P=1 TO 22
   40 PRINT "■
              +"
   50 NEXT P
   60 PRINT ;"++++++++++++++++++■
+++++++++++++"
   70 PRINT AT 2,2;STR$ SX;AT 2,2
8;STR$ SB
   80 LET X=12
   90 LET Y=3
  100 LET B=12
  110 LET C=28
  120 LET X1=0
  130 LET Y1=1
  140 LET B1=0
  145 LET C1=-1
  150 IF PEEK (O+1+Y+33*X)<>0 THE
N GOTO 400
  160 IF PEEK (O+1+C+33*B)<>0 THE
N GOTO 300
  170 PRINT AT X,Y;"■";AT B,C;"▒"
  180 LET A=PEEK 16421
  185 IF A=238 OR A=222 OR A=190
OR A=254 OR A=126 THEN LET X1=1
  190 IF A=247 OR A=231 OR A=215
OR A=183 OR A=119 THEN LET X1=-1
  200 IF X1<>0 THEN LET Y1=0
  210 IF A=235 OR A=251 OR A=219
OR A=187 OR A=125 THEN LET Y1=1
  215 IF A=237 OR A=221 OR A=253
OR A=189 OR A=125 THEN LET Y1=-1
  220 IF Y1<>0 THEN LET X1=0
  230 IF A=231 OR A=239 OR A=235
OR A=237 OR A=238 THEN LET B1=-1
  235 IF A=119 OR A=123 OR A=125
OR A=126 OR A=127 THEN LET B1=1
  240 IF B1<>0 THEN LET C1=0
  245 IF A=215 OR A=219 OR A=223
OR A=221 OR A=222 THEN LET C1=1
  250 IF A=183 OR A=187 OR A=189
OR A=191 OR A=190 THEN LET C1=-1
  260 IF C1<>0 THEN LET B1=0
  270 LET X=X+X1
  280 LET Y=Y+Y1
  290 LET B=B+B1
  293 LET C=C+C1
  295 GOTO 150
  300 LET SX=SX+1
  310 IF SX<15 THEN GOTO 7
  320 STOP
  400 LET SB=SB+1
  410 IF SB<15 THEN GOTO 7
```

SURROUND

YOU WILL probably recognise **Surround** as soon as you RUN it. It is a version of a fairly standard routine in which you are required to surround your adversary before he can surround you. Both players are in continuous motion and are not allowed to cross their tracks or those of their opponent, or to hit the boundary or the score display.

What will surprise you is the way in which the ZX-81 can recognise two keys when pressed simultaneously. That is not possible using INKEY$ and is achieved by utilising address 16421. This contains a number which changes as groups of keys are pressed. Lines 185 to 260 translate the number into a series of possible moves.

Black uses keys 1-5 to move up, Z-V to move down, Q-T for right and A-G for left. Grey uses the keys 6-0 for up, Y-P for right, B-M for down, and H-NEWLINE for left. After a crash the other player scores one; the winner is the first to reach 15.

The routine enabling two players to participate can obviously be used in many graphics games. J Winchester of London W13, submitted the program for the16K ZX-81.

SINCE WE loaded **Bio-rhythms** we have not been able to see the TV screen for interested parties. Everyone in the office is becoming a bio-rhythm bore.

The program requires your date of birth and the current date and then displays a neat chart of the month, with curves for the physical, mental and emotional cycles.

Your physical state varies over a 23-day cycle and relates to your endurance, strength and aggressiveness. The emotional cycle lasts 28 days and governs anger, moodiness and optimism/pessimism. Mentally, you oscillate between Einstein and ape over a 33-day cycle.

The program was submitted by R Clark, of Saltash, Cornwall.

```
  1 RESTORE
  2 PRINT AT 0,0;"                BIO-R
HYTHM
 10 INPUT "Enter Date Of Birth"
;"Day ";a;"   Month ";b;"   Year
";c
 20 INPUT "Enter Date Now ";,;"M
onth ";d;"   Year ";e
 25 CLS
 30 LET t=INT (((e-c)*365.25)+(
(d-b)*30.35)-a)
 800 FOR r=0 TO 255
 810 PLOT r,10
 815 IF r=INT (r/8)*8 THEN FOR u
=10 TO 20: PLOT r,u: NEXT u
 820 NEXT r
 830 PRINT AT 21,0;"1st      10th
    20th      30th"
 840 PRINT AT 0,0; INK 1;"physic
al   "; INK 2;"mental   "; INK 4;"
emotional"
 900 FOR r=1 TO 3
 905 READ u
 910 LET l=2*PI*(t-(INT (t/u)*u)
)/u
 920 LET k=2*PI*(33-u)*.03
1000 FOR a=l TO k+l+(2*PI) STEP
.1
1010 PLOT INK ((1 AND u=23)+(2 A
ND u=28)+(4 AND u=33)); (a-l)*(35
-28+u),90+5*SIN a*60
1020 NEXT a
1030 NEXT r
1040 DATA 23,28,33
1050 INPUT "Another Go ? ";a$: I
F a$(1)="y" THEN GO TO 1
```

BIO-RHYTHMS

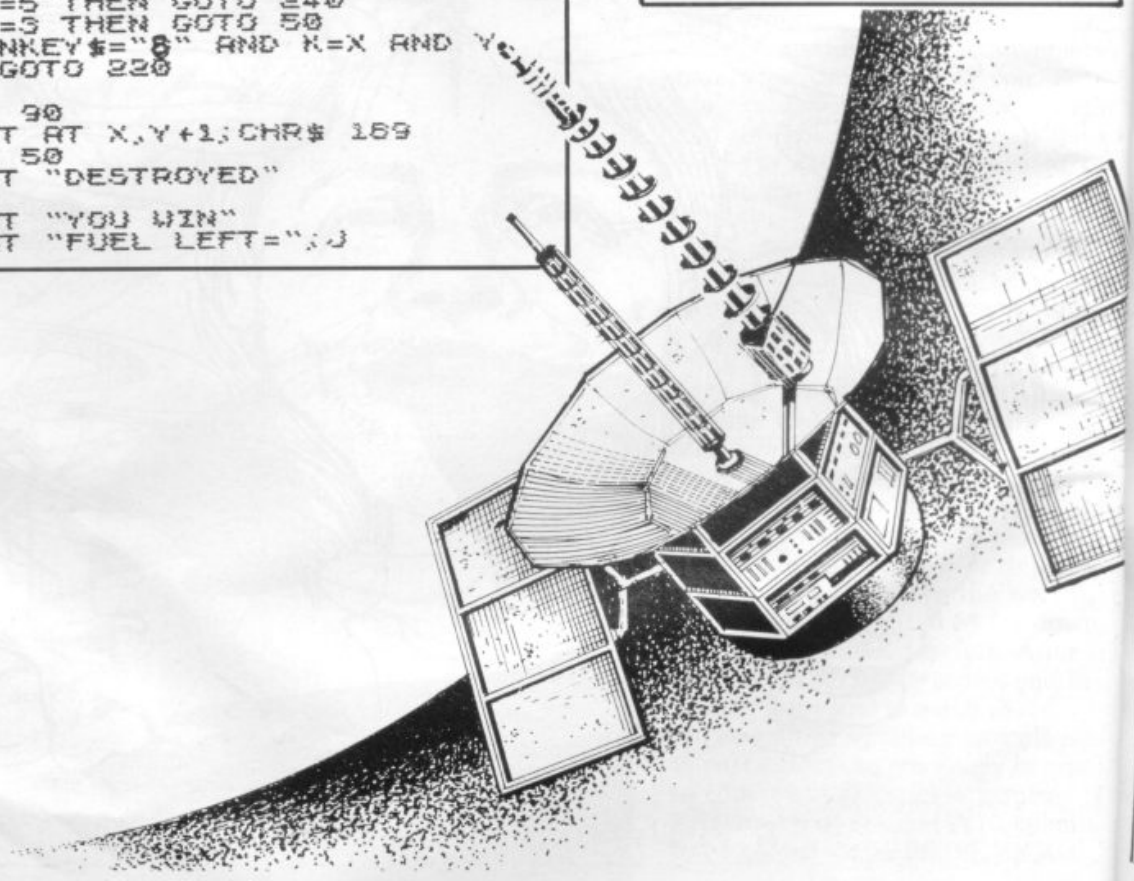
LASER CANNON

```
  10 LET A=0
  20 LET J=200
  30 LET K=10
  40 LET G=0
  50 LET X=INT (RND*18)+2
  60 LET A=A+1
  70 IF A=21 THEN GOTO 260
  80 LET Y=30
  90 PRINT AT K,0;CHR$ 130;CHR$
128;AT X,Y;"X"
 100 IF J<0 THEN GOTO 150
 110 IF INKEY$="7" THEN LET K=K-
1
 120 IF INKEY$="6" THEN LET K=K+
1
 130 IF INKEY$="8" THEN PRINT AT
 K,2;"**********"
 140 IF INKEY$>"5" THEN LET J=J-
1
 150 LET Y=Y-1.5
 160 IF Y=3 THEN LET G=G+1
 170 IF G=5 THEN GOTO 240
 180 IF Y=3 THEN GOTO 50
 190 IF INKEY$="8" AND K=X AND Y<
21 THEN GOTO 220
 200 CLS
 210 GOTO 90
 220 PRINT AT X,Y+1;CHR$ 169
 230 GOTO 50
 240 PRINT "DESTROYED"
 250 STOP
 260 PRINT "YOU WIN"
 270 PRINT "FUEL LEFT=";J
```

WE DO NOT often print **Space Invaders** games but because this is so neat and because if fits on to a 1K machine we decided to give the old routine another airing.

"A fleet of 20 'X' ships is attacking you," writes C J Barnatt of Worcester. "You must destroy at least 15 of them or be destroyed."

The cursor arrows move you up and down and the 8 fires your laser. Every time you move or fire you use one fuel unit out of 200. If you destroy all the 'X' ships, the amount of fuel remaining is displayed.



KNIGHT'S MOVE

KNIGHT'S MOVE uses the movement pattern of the Knight in chess to try to cover every space in a square. The program asks where you wish to start on the board, giving the vertical co-ordinate first, and then marks the moves as you make your way round the board.

There is a check routine to make sure you cannot cheat by making an incorrect move or land more than once on the same square. When no more squares can be visited, enter Ø as the number for the next square.

Press NEW LINE to replay the game or any other key and NEW LINE to end the game.

The graphics in line 20 are the capital I reversed with two reversed dashes, shifted J, between each. In line 3Ø the dashes are replaced by reversed spaces.

Knight's Move was sent by K M Godolphin, of Camborne, Cornwall, and needs 16K RAM.

```
 10 DIM B(8,8)
 20 LET A$="[illegible]"
 30 LET B$="[illegible]"
 40 CLS
 50 FAST
 60 PRINT TAB 6;"1  2  3  4  5
6  7  8"
 70 PRINT TAB 5;A$
 80 FOR L=1 TO 8
 90 PRINT TAB 3;L;" ";B$;TAB 5;
A$
100 NEXT L
110 FOR L=1 TO 8
120 FOR C=1 TO 8
130 LET B(L,C)=0
140 NEXT C
150 NEXT L
160 LET M=0
170 SLOW
180 PRINT AT 20,0;"WHERE DO YOU
180 PRINT AT 20,0;"WHERE DO YOU
WISH TO BEGIN"
190 INPUT C$
200 GOSUB 410
210 IF L=9 THEN GOTO 180
220 LET M=M+1
230 PRINT AT L*2,C*3+3;M
240 IF M<10 THEN PRINT AT L*2,C
*3+4;" "
250 LET L1=L
260 LET C1=C
270 LET B(L,C)=1
280 IF M<64 THEN GOTO 310
290 PRINT AT 20,0;"CONGRATULATI
ONS"
300 GOTO 490
310 PRINT AT 19,0;" 10 SPACES "
320 PRINT AT 20,0;"WHERE DO YOU
WISH TO GO NEXT"
330 INPUT C$
340 IF C$="Ø" THEN GOTO 490
350 GOSUB 410
360 IF L=9 THEN GOTO 320
370 IF L=L1-2 OR L=L1+2 AND C=C
1-1 OR C=C1+1 THEN GOTO 220
380 IF L=L1-1 OR L=L1+1 AND C=C
1-2 OR C=C1+2 THEN GOTO 220
390 PRINT AT 19,0;"IMPOSSIBLE"
400 GOTO 320
410 PRINT AT 20,0;" 28 SPACES
"
420 IF LEN C$<>2 THEN GOTO 470
430 LET L=VAL C$(1)
440 LET C=VAL C$(2)
450 IF L<1 OR L>8 OR C<1 OR C>8
THEN GOTO 460
452 IF B(L,C)=1 THEN GOTO 460
454 RETURN
460 LET L=9
470 PRINT AT 19,0;"IMPOSSIBLE"
480 RETURN
490 PRINT AT 21,0;"NL TO REPLAY
"
480 RETURN
490 PRINT AT 21,0;"NL TO REPLAY
"
500 INPUT C$
510 IF C$="" THEN GOTO 40
```

TWO GERMAN readers have sent an excellent game, inspired by a trip across the Channel on the way to a holiday in England.

You are the manager of a ferry company. You have a working capital of £200,000 and your job is to double it. Running costs are steadily depleting your resources, but you make a profit of £150,000 on every trip.

As our two readers noticed, the Channel is extremely crowded and one of the major hazards you face is the frequent collisions which return you immediately to your point of departure. Only a steady hand on the tiller—that is, keys 5 to 8—can save your time and money.

A great game, which has fascinated half the office for days. Take care, or you will, as our German readers have phrased it, "have to declare the bankrupt".

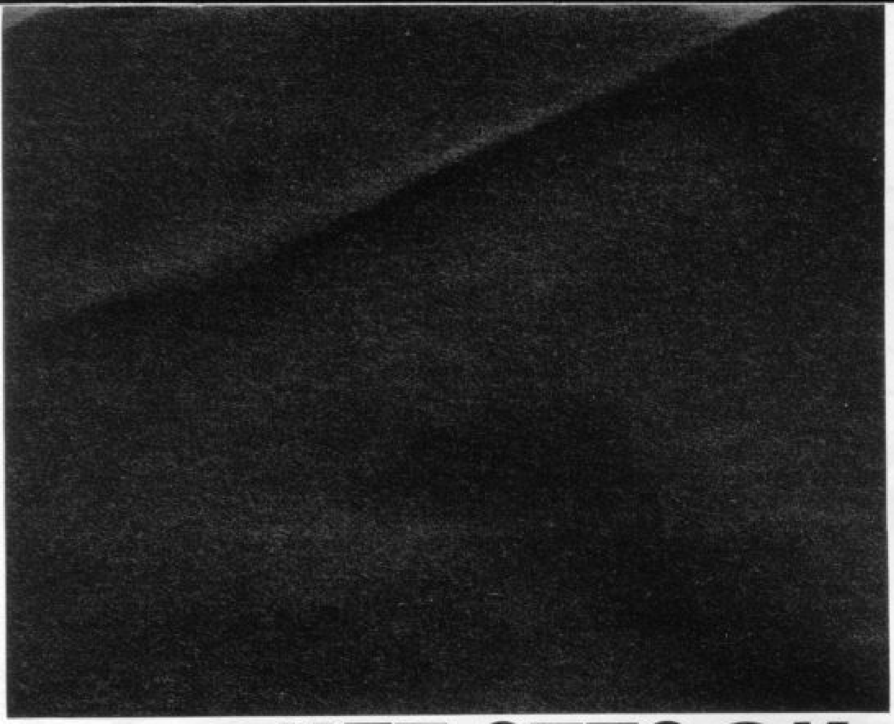
Channel Crossing was sent in by Bjoern and Henrik Wolter of Hanover.

CHANNEL

```
   1 CLS
   2 DIM A$(6,32)
   3 LET A=17
   4 LET B=22
   5 GOSUB 2005
   7 LET WORCAP=200000
   8 GOSUB 4000
   9 PRINT AT 0,0;"WORKING CAPITAL = £ ";WORCAP
  10 PRINT AT 21,0;"EACH CROSSING = £ 150000 PROFIT"
  11 LET H$="D"
  12 LET N1=-1
  14 LET N2=-1
  16 SLOW
  20 LET X=0
  30 GOSUB 1020
  40 GOSUB 2023
  48 GOSUB 1500
  50 IF SL=2 THEN GOTO 60
  51 FOR N=1 TO 15
  52 NEXT N
  53 GOTO 70
  60 GOSUB 2050
  70 GOSUB 1500
  80 LET WORCAP=WORCAP-3000
  95 PRINT AT 0,20;WORCAP;"  "
 100 IF WORCAP<=0 THEN GOTO 130
 110 GOSUB 1500
 120 IF WORCAP<400000 THEN GOTO 40
 130 IF WORCAP<=0 THEN PRINT AT 1,14;"GAME OVER";AT 2,14;"YOUR FERRY COMPANY";AT 3,14;"HAS TO DECLARE THE";AT 4,14;"BANKRUPT     "
 140 IF WORCAP>=400000 THEN PRINT AT 2,15;"GAME OVER";AT 3,15;"YOU ARE A SMART";AT 4,15;"BUSINESSMAN"
 145 PRINT AT 17,0;"FOR A NEW GAME "
 147 PRINT AT 18,0;"PRESS       0     "
 150 GOSUB 2023
 155 GOSUB 2050
 160 IF INKEY$="0" THEN GOTO 1
 170 GOTO 150
1020 PRINT AT 1,0;"------CALAIS -------------------"
1030 PRINT AT 2,7;"█    █"
1040 PRINT AT 3,7;"█    █"
1050 PRINT AT 4,7;"▓    ▓"
1060 PRINT AT 19,0;"-------------------DOVER -------"
1090 PRINT AT 18,20;"▓    ▓"
2009 LET A$(3)="            ($$$)   ($$$)         ($$$)"
2011 LET A$(4)="(£££)                 (£££)    (£££)    "
2013 LET A$(5)="          (000000)  (▓▓)        (▓▓▓▓▓)"
2015 LET A$(6)="         (XX)        (==)    (00)       (▓▓)     "
2017 RETURN
2023 LET N1=N1+1
2024 FOR Z=1 TO 5 STEP 2
2025 PRINT AT 2*Z+3,N1;A$(Z)(1 TO (32-N1));AT 2*Z+3,0;A$(Z)((32-N1+1) TO 32)
2027 NEXT Z
2030 IF N1=31 THEN LET N1=-1
2032 GOSUB 1210
2035 RETURN
2050 LET N2=N2+1
2060 FOR Z=2 TO 6 STEP 2
2070 PRINT AT 2*Z+3,0;A$(Z)(1+N2 TO 32);AT 2*Z+3,31-N2;A$(Z)(1 TO N2+1)
2080 NEXT Z
2090 IF N2=31 THEN LET N2=-1
2095 GOSUB 1210
2100 RETURN
2230 FOR M=1 TO 6
2231 PRINT AT A,B-2;"CRASH"
2239 FOR K=1 TO 5
2240 NEXT K
2241 POKE 16437,255
2242 PRINT AT A,B-2;"     "
2243 NEXT M
2245 PRINT AT A+1,B;"  "
2250 IF H$="C" THEN LET A=2
2251 IF H$="C" THEN LET B=9
2260 IF H$="D" THEN LET A=17
2261 IF H$="D" THEN LET B=22
2265 GOSUB 1020
2270 RETURN
2330 FOR M=1 TO 6
2331 PRINT AT A+1,B-2;"CRASH"
2339 FOR K=1 TO 5
2340 NEXT K
2341 POKE 16437,255
2342 PRINT AT A+1,B-2;"     "
```

CROSSING

```
2343 NEXT M
2345 PRINT AT A,B;" "
2350 IF H$="C" THEN LET A=2
2351 IF H$="C" THEN LET B=9
2360 IF H$="D" THEN LET A=17
2361 IF H$="D" THEN LET B=22
2365 GOSUB 1020
2370 RETURN
4000 PRINT "YOU ARE THE MANAGER
OF A FERRY  COMPANY AND YOU HAVE
 TO INCREASEYOUR WORKING CAPITAL
."
4010 PRINT
4020 PRINT "EACH FERRYING-OVER B
RINGS YOU A PROFIT OF £ 150000."
4030 PRINT
4040 PRINT "AFTER A CRASH YOU AR
E PUT BACK  INTO YOUR STARTING H
ARBOUR."
4050 PRINT
4060 PRINT "THE STANDING CHARGES
 ARE        PERMANENTLY ABSORBIN
G YOUR      WORKING CAPITAL."
4070 PRINT
4080 PRINT "THE GAME HAS FINISHE
D, WHEN YOU HAVE EITHER LOST YOU
R WHOLE     WORKING CAPITAL OR W
HEN YOU HAVEDOUBLED IT."
4090 PRINT
4100 PRINT "THE FERRY IS MOVED B
Y THE KEYS:  ""5"","6"","7"" OR
""8""."
4110 PRINT "PRESS NEW LINE TO ST
ART."
4120 INPUT S$
4130 CLS
4132 PRINT AT 8,1;"INPUT SKILL L
EVEL (1 OR 2)"
4134 INPUT SL
4135 IF SL<>1 AND SL<>2 THEN GOT
O 4134
4138 CLS
4140 RETURN
1100 PRINT AT 17,20;"▒    ▒"
1105 PRINT AT 16,20;"▒    ▒"
1110 PRINT AT A,B;CHR$ 137;AT A+
1,B;CHR$ 138
1120 RETURN
1210 PRINT AT A,B;
1220 LET FERRY=PEEK (PEEK 16398+
256*PEEK 16399)
1225 IF FERRY=137 OR FERRY=0 THE
N GOTO 1300
1230 GOSUB 2230
1300 PRINT AT A+1,B;
1320 LET FERRY=PEEK (PEEK 16398+
256*PEEK 16399)
1325 IF FERRY=138 OR FERRY=0 THE
N GOTO 1400
1330 GOSUB 2330
1400 PRINT AT A,B;CHR$ 137;AT A+
1,B;CHR$ 138
1405 RETURN
1500 LET U$=INKEY$
1510 IF U$<>"5" AND U$<>"6" AND
U$<>"7" AND U$<>"8" THEN RETURN
1520 PRINT AT A,B;" ";AT A+1,B;"
 "
1530 IF U$="8" THEN LET B=B+1
1540 IF U$="5" THEN LET B=B-1
1550 IF U$="7" THEN LET A=A-1
1560 IF U$="6" THEN LET A=A+1
1570 IF B<2 THEN LET B=2
1580 IF B>29 THEN LET B=29
1590 PRINT AT A,B;
1600 IF PEEK (PEEK 16398+256*PEE
K 16399)<>0 THEN LET X=1
1610 PRINT AT A+1,B;
1620 IF PEEK (PEEK 16398+256*PEE
K 16399)<>0 THEN LET X=2
1630 PRINT AT A,B;CHR$ 137;AT A+
1,B;CHR$ 138
1640 IF X=1 THEN GOSUB 2230
1650 IF X=2 THEN GOSUB 2330
1651 LET X=0
1653 IF (H$="C" AND A>=17 AND B>
20 AND B<24) OR (H$="D" AND A<=2
 AND B>7 AND B<11) THEN GOSUB 17
50
1655 RETURN
1750 LET WORCAP=WORCAP+150000
1752 PRINT AT 0,20;WORCAP;"  "
1755 IF H$="C" THEN GOTO 1770
1760 LET H$="C"
1765 GOTO 1800
1770 LET H$="D"
1800 RETURN
2005 LET A$(1)="  (▒▒▒▒▒)     (OO)
   (==)    (XX)   "
2007 LET A$(2)="(▒▒▒▒▒▒)       (▒▒▒)
    (OOOOOO)   "
```



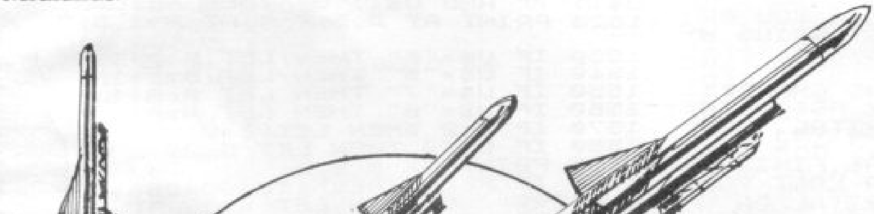
ROCKET ATTACK

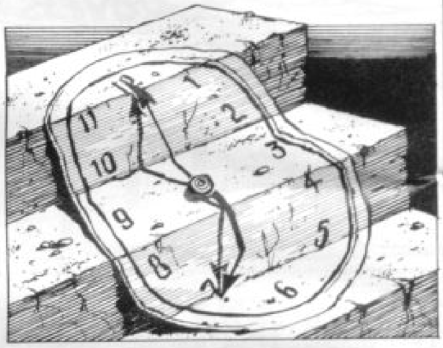
IN *Rocket Attack* for 1K machines the player is in control of a guided missile launcher defending the shores from air attack. A rocket launcher is situated at the bottom left-hand corner of the screen, while enemy planes approach at random height from the right.

To fire, the P key is used and, when depressed, a rocket is launched, rising at 45 degrees. The rocket will continue its advance only as the key is depressed, so there is a measure of control over its progress. Aircraft can be destroyed either by scoring a direct hit or by leaving the rocket in the path of the aircraft.

Rocket Attack was submitted by D E Healey of Coseley, West Midlands.

```
  10 LET A = PI / PI
  20 LET B = PI - PI
  30 LET S = B
  40 LET T = 20
 100 LET C = 19
 120 LET E = 29
 130 LET D = A
 160 PRINT AT 21,B;""
 170 PRINT AT 20,B;"■"
 180 LET Y = INT ( RND * 15) + 4
 185 PRINT AT Y,E;"<= "
 190 IF INKEY$ = "P" THEN PRINT
AT C,D; "■"
 200 IF Y = C AND E = D THEN GOT
O 400
 210 PRINT AT C,D;" "
 220 IF INKEY$ = "P" THEN LET C
=C - A
 230 IF INKEY$= "P" THEN LET D =
D + A
 240 IF C=4 THEN GOTO 410
 250 LET E=E-A
 260 IF E=B THEN GOTO 410
 270 GOTO 185
 400 LET S=S+A
 410 CLS
 420 LET T=T-A
 430 IF T<>B THEN GOTO 100
 440 PRINT AT 10,11;"GAME OVER"
 450 PRINT AT 12,11;"SCORE  = ";
S
```





CLOCK

CLOCK uses a FOR and NEXT loop in which to keep the time rather than the more conventional PAUSE statement, resulting in a clearer screen display.

Running in slow mode, the program does not include seconds and, because of zero suppression, the time entered as 10.09 will appear as 10.9.

According to author Chris Hutchin of Cirencester the clock is accurate to a few seconds a day. To start, type the usual RUN and, when prompted, put in the hour and then the minutes. Use BREAK to get out of the program. It will run on 1K machines.

```
   4 LET L=1
   5 PRINT "HOUR ?"
  10 INPUT H
  15 PRINT "MINUTE ?"
  20 INPUT M
  25 CLS
  35 IF M=60 THEN GOTO 100
  39 PRINT AT 10,10;H;":";M
  50 LET M=M+L
  60 FOR F=L TO 2732
  70 NEXT F
  80 GOTO 30
 100 LET M=0
 105 LET H=H+L
 110 IF H>12 THEN LET H=L
 120 CLS
 130 GOTO 39
```

SHARP SHOOTER

AN ESPECIALLY pleasing display is the strong point of the **Sharp Shooter** program from Paul Naylor of Tyldesley, Greater Manchester.

You are the black-hatted villain confronting a posse of lily-livered bounty hunters. An inverted O represents the deputy badge on their trembling chests. You are armed with a Colt ten-shooter (what?) which you fire with the P key. When the gun is fired the outlaw falls into a very effective crouching position.

Manoeuvre the cowpoke up with key 1 and down with A. (1K ZX-81).

```
    1 LET N=PI/PI
    2 LET D=VAL "29"
    3 LET A=5
    4 LET H=SIN PI
    5 LET S=H
    6 LET T=INT (RND*VAL "17")+N
    7 LET M=INT (RND*INT PI)
    8 IF M=N AND T>N THEN LET T=T
-N
    9 IF M=VAL "2" AND T<VAL "18"
 THEN LET T=T+N
   10 CLS
   20 PRINT AT T,SIN PI;"▒";AT A,
D;" ▄▄ ";AT A+N,D+N;"▒▒▒";AT A+VAL
"2",D;"▄▄▄▄";AT A+INT PI,D;"▄▄▄▄";
AT A+VAL "4",D;"▄▄"
   30 IF INKEY$<>"P" THEN GOTO VA
L "120"
   40 PRINT AT A+N,D-N;"▄";AT A+V
AL "2",D;"▄▄";AT A+INT PI,D;"▄▄
";AT A+VAL "4",D-N;"▄▄"
   50 FOR F=VAL "26" TO SIN PI ST
EP -N
   60 PRINT AT A+N,F;" "
   70 NEXT F
   80 LET S=S+N
   90 IF A+N=T THEN LET H=H+N
  100 IF S=VAL "10" THEN GOTO VAL
 "150"
  110 IF A+N=T THEN GOTO VAL "6"
  120 IF INKEY$="1" AND A>SIN PI
THEN LET A=A-N
  130 IF INKEY$="A" AND A<VAL "17
" THEN LET A=A+N
  140 GOTO VAL "7"
  150 PRINT AT A+N,SIN PI;" HITS
";H
```

HANGMAN

GILL of Westerham, Kent has produced a game of **Hangman** which can be played on the ZX-80. The program, as written, contains a set of 12 six-letter words which it chooses at random and the player has to guess it, losing one life out of 10 each time an incorrect guess is made.

If the player guesses correctly, the screen shows: "Well done, that is it". If you run out of lives it says. "You are dead".

The line of words can include a total of about 70 letters, so that other combinations, such as 14 words of five letters each, can be used. If other groups are used it is necessary to change line 5. If the case of 14 words of five letters it would read
5 LET A = RND ((14) – 1)*5.

```
5 LET A = RND ((12) – 1)×6
10 DIM L (6)
15 LET A$ = "LETTER NORMAL BATTLE
VISION MUTINY BARREL VOYAGE
RETURN DEVOID MUTTON BOTTOM
REFORM"
20 IF A = Ø THEN GO TO 30
25 GOSUB 200
30 FOR G = 1 TO 10
35 PRINT "INPUT YOUR GUESS"
40 PRINT
45 INPUT G$Y
50 CLS
55 LET T = Ø
60 PRINT "YOU,VE GOT "; 10 – G; " LIVES
LEFT"
65 PRINT
70 FOR B = 1 TO 6
75 IF CODE (B$) = CODE (G$) THEN LET L (B)
= CODE (G$)
80 IF L (B) > 0 THEN PRINT CHR$ (L(B)); " ";
(space)
85 IF L(B) = 0 THEN PRINT "—"; " ";
90 IF L(B) > 0 THEN LET T = T + 1
95 LET B$ = TL$ (B$)
100 NEXT B
105 GOSUB 200
110 IF T = 6 THEN GOTO 400
115 PRINT
120 NEXT G
130 GOSUB 200
135 CLS
140 PRINT "YOURE DEAD"
145 PRINT
150 PRINT "IT WAS";
155 FOR B = 1 TO 6
160 PRINT CHR$ (CODE(B$));
165 LET B$ = TL$ (B$)
170 NEXT B
175 GOTO 420
200 LET B$ = A$
205 FOR B = 1 TO A
210 LET B$ = TL$ (B$)
215 NEXT B
220 RETURN
400 PRINT
410 PRINT "WELL DONE, THAT,S IT"
420 POKE 16421, 24
```

A$ contains 12 words each six letters long. Any words can be substituted so long as they are all the same length. Words of, say, five letters long can be used, when A$ can be 14 words long—A$ can contain about 70 letters. Line 5 should then be changed to:
5 LET A = RND ((14) – 1)×5

PAINTPAD

```
  10 REM "paintpad"
  20 LET c=0: DIM g(99): DIM x(9
9): DIM y(99): LET x=1: LET y=1
  30 LET u=255: FOR n=1 TO 99
  40 PRINT AT 0,0;"ARROWKEYS MOV
E MARKER": PRINT "ALSO 3=SW 4=NW
9=NE 0=SE": PRINT "P TO FIX A P
OINT": PRINT "H TO HOME IN ON 1s
t POINT": PRINT "x,y  Point No."
  50 PLOT OVER 1;x,y: LET j=CODE
 INKEY$-48: IF j=56 THEN LET x=x
(1): LET y=y(1): GO TO 100
  60 IF INKEY$="" THEN PRINT AT
5,0;x;" ";y;"  ";n-1;"  "
  70 LET y=y+(j=7 OR j=9 OR j=4)
-(j=6 OR j=3 OR j=0): LET x=x+(j
=8 OR j=0 OR j=9)-(j=5 OR j=3 OR
 j=4): LET x=x-(x=u+1)+(x=c-1):
LET y=y-(y=176)+(y=-1): PLOT x,y
  80 IF j=64 THEN GO TO 100
  90 GO TO 50
 100 LET x(n)=x: LET y(n)=y
 110 PLOT x+(n=1),y: IF n=1 THEN
 LET s=0: LET c=x: GO TO 180
 120 LET a=x(n-1): LET b=y(n-1)
 130 IF s=0 AND x<a THEN LET z=a
: LET s=1
 140 IF s=1 THEN LET u=x
 150 DRAW a-x,b-y: IF x-a=0 THEN
 GO TO 170
 160 LET g(n-1)=(y-b)/(x-a)
 170 IF x=x(1) AND y=y(1) THEN L
ET d=n-1: LET n=99: LET h=1
 180 IF INKEY$="p" THEN GO TO 18
0
 190 NEXT n: LET L=z-x(1): CLS
 200 FOR n=0 TO L: LET t=x(1)+n
 210 IF t=x(d) THEN LET d=d-1: G
O TO 210
 220 IF t=x(h+1) THEN LET h=h+1:
 GO TO 220
 230 LET r=INT (g(h)*(t-x(h))):
PLOT t,y(h)+r: DRAW 0,y(d)+INT (
-g(d)*(x(d)-t))-y(h)-r: NEXT n:
PAUSE 0: GO TO 20
```

THE AUTHOR of **Paintpad** was prompted to compose it when he noticed that the Spectrum had no PAINT—or FILL—command. The user can draw the outline of a shape and then cause that outline to be filled-in. As it stands, the program can handle a shape with up to 99 vertices but that limit can be changed by altering the number 99 in lines 20, 30 and 170.

The cursor can be moved in any of eight directions; its position is recorded on-screen and fixed with P. A line is then drawn to the last P. When the shape is complete it is filled with H.

If CLS in line 190 and PAUSE O in line 230 are omitted a cumulative shape can be built-up in successive runs, as it re-sets itself at the end of each run.

With the two commands in, the instructions at the top of the screen will be removed before the shape is filled. That is convenient if the filled shape is to be stored as a SCREENS.

Submitted by John McKeown of Upminster, Essex.

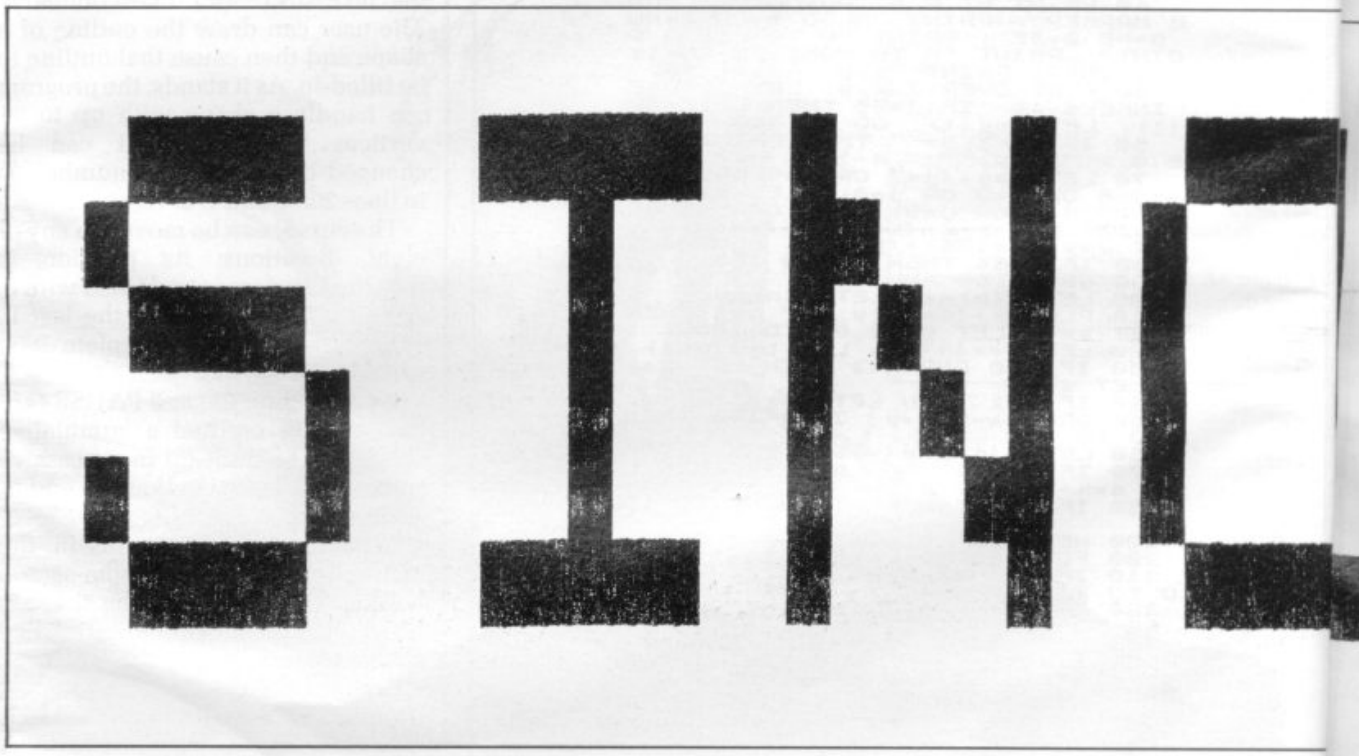
ZX BA

IF YOU are wondering what to do with your printer why not try *ZX Banners* which will print out banners of as many letters as you want each three inches high. Letters are printed sideways, so the length of a banner is restricted only by the amount of paper in the printer.

While letters and graphics will work, functions will not. The width of a letter can be changed by altering line 910—e.g., by inserting FOR F=1 to 4 would double the width.

ZX Banners was sent by Christopher Holt, of Gravesend, Kent.

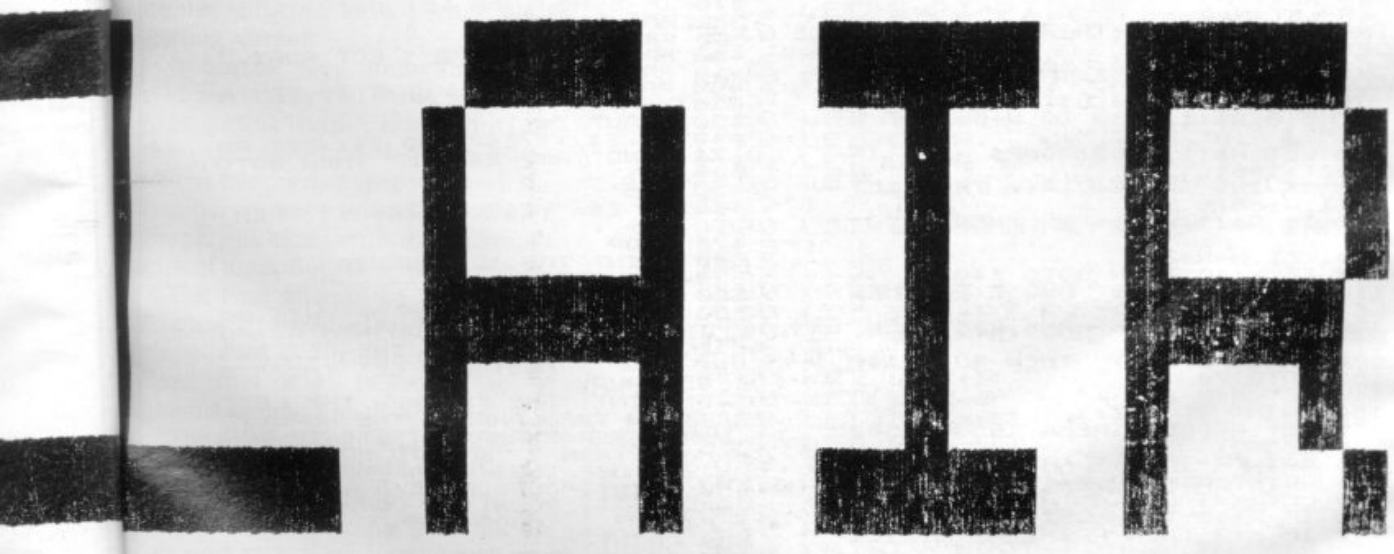
```
    1 REM "BANNERS"
   10 DIM D$(64)
   20 INPUT M$
   30 FAST
   40 FOR C=1 TO LEN M$
   50 LET A$=M$(C)
   60 IF CODE A$>63 THEN LET A$=C
HR$ (CODE M$(C)-128)
   65 FOR N=0 TO 7
   70 LET Z=PEEK (7680+N+8*CODE A
$)
   80 FOR X=1 TO 8
   90 LET Z=Z/2
  100 IF Z<>INT Z THEN GOTO 500
  110 LET D$(N*8+X)="0"
  115 IF CODE M$(C)>63 THEN LET D
$(N*8+X)="1"
  120 IF N*8+X=64 THEN GOSUB 900
  130 LET Z=INT Z
  140 NEXT X
  150 NEXT N
  160 NEXT C
  170 SLOW
  180 GOTO 1010
  500 LET D$(N*8+X)="1"
```



NNERS

```
  505 IF CODE M$(C)>63 THEN LET D
$(N*8+X)="0"
  510 GOTO 120
  900 FOR P=8 TO 1 STEP -1
  910 FOR F=1 TO 2
  920 FOR E=7 TO 0 STEP -1
  930 IF D$(E*8+P)="1" THEN LPRIN
T "■■■■■■";
  940 IF D$(E*8+P)="0" THEN LPRIN
T "  ";
  950 NEXT E
  960 NEXT F
  970 NEXT P
  980 RETURN
 1000 SAVE "BANNER■"
 1010 CLS
 1020 PRINT TAB 8;"■X BANNERS■"
 1030 PRINT TAB 8;"**********"
 1040 PRINT ,,;"■HIS PROGRAM WILL
  PRINT ON THE   ■X ■RINTER■ LETTER
S AND SYMBOLS   3"" HIGH IN THE F
ORM OF BANNERS"
 1050 PRINT ,,;"■HE LENGHT OF THE
  BANNER IS UP   TO YOU. ENTER BEL
OW AND PRESS   NEW LINE"
 1060 PRINT ,,;"■ETTERS AND GRAPH
ICS WILL WORK   FUNCTIONS WILL NO
T"
 1090 GOTO 10

  EXAMPLES OF THE PRINT ARE
ENCLOSED
THE WIDTH OF THE LETTER CAN BE
ALLTERED BY CHANGING LINE 910
EG. 910 FOR F=1 TO 4
WOULD DOUBLE THE WIDTH
```



SHOOTING RANGE

A VERY frustrating game has been sent by Christopher Wysocki, of Swindon, Wiltshire. It is called **Shooting Range** and involves firing at a range of constantly-changing letters.

The letters have values ranging from one for A to 26 for Z and the aim is to achieve as high a score as possible. A time-limit is imposed by a grey square which travels along the row of letters and the game ends if it is not shot down before reaching the end of the rows.

It is a simple program and because of that the movement of the bullets from the gun is slow and only one shot can be fired at a time. That makes it difficult to hit the grey square, as you have to anticipate its position in good time.

Throughout testing, our reviewer found it impossible to hit the grey square but still managed a high score of 314.

The gun is moved to the right and left by the cursor keys and the upward cursor, key 7, is used for firing. Graphics notes:
Line 70, a shifted Q with a space on either side and shifted 3 with a space on either side; the grey square is a shifted H and the double quotes throughout have a space between them except for line 580.

```
  1 REM "GUNNER"
  2 GOTO 500
  5 LET HS=0
  8 LET H=19
 10 DIM A$(1,6000)
 15 LET X=0
 20 FOR N=1 TO 65 STEP 2
 30 LET A$(1,N)=CHR$ (INT (RND*
26)+166)
 40 NEXT N
 45 LET N=2
 50 LET Z=0
 55 LET S=0
 60 PRINT AT 0,0;"SCORE","HIGH-
SCORE";AT 1,0;S,HS
 70 PRINT AT 3,0;A$(1,N TO N+31
);AT S,0;A$(1,N+33 TO N+65);AT 2
1,Z;" ■ ";AT 20,Z;" ▪ "
 80 LET A$(1,N+65)=CHR$ (INT (R
ND*26)+166)
 90 IF INT (RND*40)=10 THEN LET
 A$(1,N+65)="▒"
 95 IF A$(1,N+1)="▒" THEN GOTO
350
100 LET N=N+2
105 IF X<>0 THEN GOTO 140
110 IF INKEY$="8" AND Z<28 THEN
 LET Z=Z+1
120 IF INKEY$="5" AND Z>1 THEN
LET Z=Z-1
130 IF INKEY$="7" THEN GOTO 140
135 GOTO 70
140 LET H=H-2
150 PRINT AT H,Z+1;
155 LET R=PEEK (PEEK 16398+256*
PEEK 16399)
156 PRINT "."
160 PRINT AT H+2,Z+1;" "
170 LET X=1
180 IF R<>0 THEN GOTO 250
190 IF H<3 THEN PRINT AT H,Z+1;
""
200 IF H<3 THEN LET X=0
210 GOTO 70
250 IF R-165<0 THEN LET R=165
255 LET S=S+(R-165)
260 LET X=0
270 PRINT AT 1,0;S
280 IF H=3 THEN LET A$(1,N+(Z-1
))=" "
290 IF H=5 THEN LET A$(1,N+(32+
Z))=" "
300 LET H=19
310 GOTO 70
350 CLS
360 PRINT "SCORE","HIGH-SCORE"
370 IF S>HS THEN LET HS=S
380 PRINT S,HS
390 PRINT
400 PRINT "THE ""▒"" GOT AWAY."
410 PRINT
420 PRINT "DO YOU WANT TO TRY A
GAIN(Y/N)?"
430 INPUT Z$
440 IF Z$<>"YES" AND Z$<>"Y" AN
D Z$<>"NO" AND Z$<>"N" THEN GOTO
 430
450 CLS
460 IF Z$="YES" OR Z$="Y" THEN
GOTO 5
470 STOP
500 PRINT TAB 12;"GUNNER"
510 PRINT TAB 12;"------"
520 PRINT
530 PRINT "THE POINT OF THIS GA
ME IS TO GETAS MANY POINTS AS PO
SSIBLE BY    SHOOTING THE LETTERS
 BUT YOU     MUST NOT LET THE ""▒
"" GET AWAY."
540 PRINT "THE FURTHER THE LETT
ER IS IN THEALPHABET THE MORE IT
S WORTH FOR EXAMPLE ""▪"" IS WOR
TH MORE THAN  ""▪"".TO MOVE THE
GUN YOU USE THE"
550 PRINT "CURSOR KEYS AND THE
UPWARD      POINTING CURSOR KEY
TO FIRE.",,,"GOOD LUCK"
560 PRINT
570 PRINT "HIT ANY KEY TO CONTI
NUE."
580 IF INKEY$="" THEN GOTO 580
590 CLS
600 GOTO 5
```

TREASURE HUNTER

TREASURE HUNTER is a clever little game in which a hunter, denoted by an asterisk, has to find treasure which is hidden at a random position on the screen. The only assistance given to the hunter is that he is told when he is getting warmer.

It can be very annoying when, whichever way you move, you seem to be getting warmer but cannot find the exact location of the treasure. When the correct spot is found, the number of steps taken is shown on the screen, along with the program's idea of the optimum number.

The first attempt by the *Sinclair Programs* reviewer resulted in 453 steps taken against an optimum of five. That later improved to 84 against an optimum of 30.

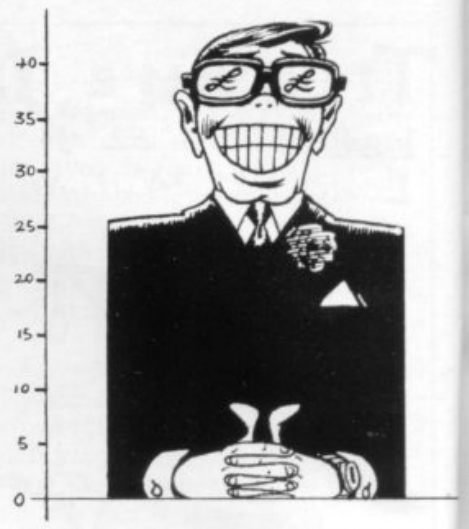
The hunter is moved by using the cursor keys but an added difficulty is that if you go to the edge of the screen you bounce back so that the left and right keys and the up and down keys can become reversed.

Treasure Hunter was sent by P Brown of Charlesworth, Derbyshire.

```
   10 REM TREASURE HUNT BY P AND
A BROWN
   20 LET P=PI/PI
   30 LET Q=PI-PI
   40 LET L=INT (RND*VAL "15")+VA
L "2"
   50 LET C=INT (RND*VAL "27")+VA
L "2"
   60 LET S=Q
   70 LET OP=P
   80 LET OQ=Q
   90 LET P=P+(INKEY$="6")-(INKEY
$="7")
  100 LET Q=Q+(INKEY$="8")-(INKEY
$="5")
  110 CLS
  120 PRINT AT P,Q;"*"
  130 LET S=S+PI/PI
  140 IF P=L AND Q=C THEN GOTO VA
L "210"
  150 LET D=L-P
  160 LET E=C-Q
  170 LET F=L-OP
  180 LET G=C-OQ
  190 IF ABS D+ABS E<ABS F+ABS G
THEN PRINT AT 0,0;"WARMER"
  200 GOTO VAL "70"
  210 PRINT AT L,C;"X"
  220 PRINT "LOOT FOUND IN ";S;"
STEPS"
  230 PRINT "OPTIMUM ";L+C-VAL "1
"
```

COMPOUND INTEREST

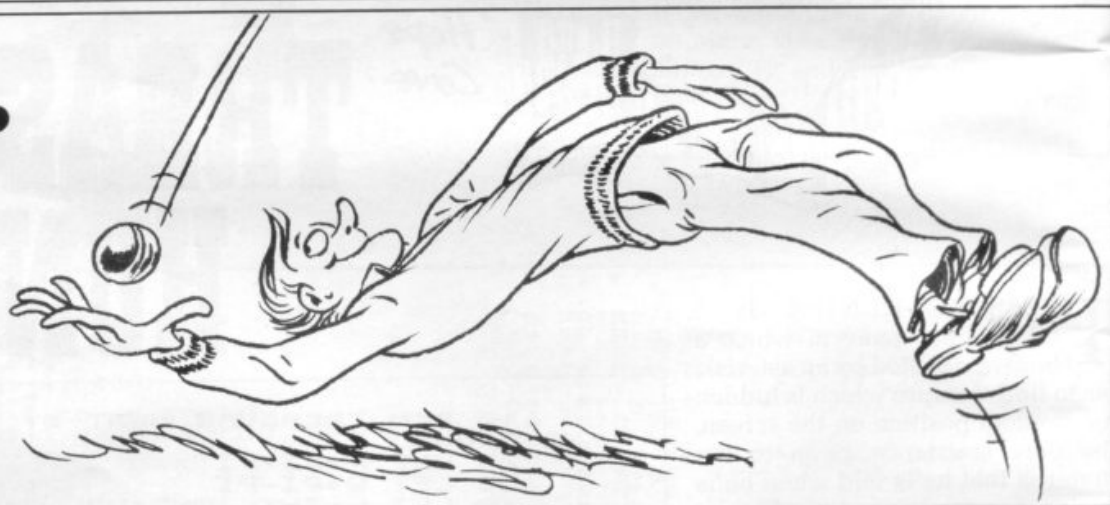
```
    5 CLS
   10 PRINT "ENTER PRINCIPLE IN P
OUNDS"
   20 INPUT P
   30 PRINT "ENTER TIME IN YEARS"
   40 INPUT T
   50 PRINT "ENTER RATE PER ANNUM
"
   60 INPUT R
   70 PRINT
   80 PRINT "ENTER ""SI"" FOR SIM
PLE INTEREST"
   85 PRINT
   90 PRINT "ENTER ""CI"" FOR COM
POUND INTEREST"
  100 INPUT A$
  105 CLS
  110 IF A$="SI" THEN GOTO 150
  120 LET I=P*((1+R/100)**T)-P
  130 GOTO 200
  150 LET I=(P*R*T)/100
  200 PRINT "INTEREST=£";I
  202 PRINT
  205 PRINT "TOTAL=£";I+P
  206 PRINT
  210 PRINT "IS THAT ALL?  Y OR N
"
  220 INPUT B$
  230 IF B$="N" THEN RUN
```



IF YOU detest having to work out compound interest, this program is for you. It works out the compound interest automatically once it has been told the principal, the rate of interest, and the number of years to be considered. It can also work out simple interest problems.

A short program, fitting into the 1K ZX-81, it was sent by Stephen Booth, of Barnsley, South Yorkshire. He said it is useful helping him with his homework.

OWZAT



A SIMPLE GAME based on the famous cricket dice game, **Owzat,** simulates a simple form of the complex summer game. Once running, it runs automatically through until a team of 10 has completed its innings and gives the total score. The game is repeated to find the score of the opponents.

One problem which readers might like to tackle is to find a way of removing Owzat and not out once an appeal has been turned down. Because of this it is not known when another appeal has been made until one is allowed and the next batsman's score is shown.

Owzat fits into 1K ZX-81 and was sent by Nick Gray of Burton-on-Trent, Staffordshire.

```
    3 LET T=0
    5 LET N=0
   10 FOR I=1 TO 10
   20 PRINT AT I+1,0;I;":  ";N;"(5
SPACES)TOTAL:  ";T
   30 LET S=INT (RND*6)+1
   40 IF S=5 THEN GOTO 100
   50 LET N=N+S
   60 LET T=T+S
   65 PRINT
   66 PRINT
   70 GOTO 20
   75 LET N=0
   80 NEXT I
   90 STOP
  100 PRINT "OWZAT"
  110 LET W=INT (RND*6)+1
  115 FOR Z=1 TO 50
  116 NEXT Z
  120 IF W=1 OR W=2 THEN PRINT "N
OT OUT"
  123 IF W=3 OR W=4 OR W=5 OR W=6
 THEN PRINT "OUT"
  125 IF W=1 OR W=2 THEN GOTO 20
  130 SCROLL
  131 SCROLL
  135 IF W=3 OR W=4 OR W=5 OR W=6
 THEN GOTO 75
```

ALIEN LORE

A GAME which links the bug-baiting type of program with a battle against alien invaders has been produced by Sanath Yogàsundrum of Ashton, Preston, Lancashire.

When the game begins, the player is asked for a skill level, A or P, which stand for amateur or professional. It is advisable to start on the amateur level while the player begins to understand this complex game.

A small grid is shown in the bottom left-hand corner of the screen in which there are four aliens, shown as X and $, with a soldier (*). The soldier has to dig a hole (O) and then lure the aliens into it, scoring 100 points for every X and 200 for every $.

The hole is dug by going into dig mode, pressing 2, and pressing the cursor key for which side of the soldier you wish to place the hole. The soldier can then be moved by pressing 01 to return to movement mode, and using the cursors in their normal directions.

A soldier can be killed either by falling into his own hole or being eaten by an alien. The game lasts for the lives of three soldiers, although an extra soldier can be gained by scoring more than 3,000.

Two other limitations are that only one hole can be dug at a time and a hole cannot be dug beneath an alien. Once an alien has fallen into a hole it is filled immediately and the game continues.

Even after playing for more than an hour at the amateur level, no-one at *Sinclair Programs* managed to score more than 1,300.

```
  1 LET BEST=0
  2 PRINT "SKILL LEVEL? (A/P)"
  3 INPUT A$
  5 CLS
 10 LET SO=2
 15 LET S=0
 20 PRINT """ EDCEC UP"""
 21 PRINT AT 14,15;"LEVEL:";A$
 22 PRINT AT 16,10;"HIGH SCORE:
";BEST
 23 PRINT AT 18,0;" ■ ■ ■ ■  YO
UR SCORE:";S
 30 PRINT AT 20,0;" ■ ■ ■ ■   S
PARE MEN:";SO
 40 LET X=17
 50 LET Y=0
 60 LET A=17
 70 LET B=8
 80 LET U=21
 90 LET V=4
100 LET G=1
110 LET HX=15
120 LET HY=0
130 LET C=17
140 LET D=4
150 LET E=19
160 LET F=2
165 LET GG=19
170 LET HH=6
195 PRINT AT U,V;"*"
200 PRINT AT X,Y;"$"
210 PRINT AT A,B;"$"
220 PRINT AT C,D;"X"
230 PRINT AT E,F;"X"
```

```
  240 PRINT AT GG,HH;"X"
  300 LET Q=141
  305 LET M=X
  310 LET N=Y
  320 GOSUB 2000
  322 LET W=345
  325 GOTO 6000
  335 LET X=M
  340 LET Y=N
  345 PRINT AT X,Y;"$"
  347 GOSUB 2430
  350 LET M=A
  360 LET N=B
  370 GOSUB 2000
  375 LET W=410
  380 GOTO 6000
  400 LET B=N
  405 LET A=M
  410 PRINT AT A,B;"$"
  415 GOSUB 2430
  417 LET Q=189
  420 LET M=C
  440 LET N=D
  460 GOSUB 2000
  470 LET W=510
  475 GOTO 6000
  500 LET D=N
  505 LET C=M
  510 PRINT AT C,D;"X"
  515 GOSUB 2430
  520 LET M=E
  540 LET N=F
  560 GOSUB 2000
  570 LET W=610
  580 GOTO 6000
  600 LET F=N
  605 LET E=M
  610 PRINT AT E,F;"X"
  615 GOSUB 2430
  620 LET M=GG
  640 LET N=HH
  660 GOSUB 2000
  670 LET W=710
  680 GOTO 6000
  700 LET HH=N
  705 LET GG=M
  710 PRINT AT GG,HH;"X"
  720 GOSUB 2430
  770 GOTO 300
2003  IF INKEY$="1" THEN LET G=1
2004  IF INKEY$="2" THEN LET G=2
2005  LET R=RND
2010  LET Z=RND
2020  PRINT AT M,N;" "
2090  IF M=18 OR M=20 OR N=V AND
A$="P" AND (N=0 OR N=2 OR N=4 OR
 N=6 OR N=8) THEN GOTO 2120
2100  IF R<=.5 OR M=U OR N=1 OR N
=3 OR N=5 OR N=7 THEN GOTO 2300
2120  IF M=21 OR U<M AND A$="P" T
HEN LET Z=.7
2122  IF M=17 OR U>M AND A$="P" T
HEN LET Z=.5
2125  IF Z<=.5 THEN LET M=M+1
2140  IF Z>.5 THEN LET M=M-1
2160  GOTO 2340
2300  IF N=0 OR N<V THEN LET Z=.5
2305  IF N=8 OR N>V THEN LET Z=.7
2310  IF Z<=.5 THEN LET N=N+1
2320  IF Z>.5 AND N>0 THEN LET N=
N-1
2340  IF M=U AND N=V THEN GOTO 70
00
2400  IF INKEY$="2" THEN LET G=2
2410  IF INKEY$="1" THEN LET G=1
2420  RETURN
2430  IF INKEY$<>"5" AND INKEY$<>
"6" AND INKEY$<>"7" AND INKEY$<>
"8" THEN RETURN
2440  IF G=2 THEN GOTO 2590
2460  PRINT AT U,V;" "
2520  IF INKEY$="5" AND V>0 AND (
U=17 OR U=19 OR U=21) THEN LET V
2520  IF INKEY$="5" AND V>0 AND (
U=17 OR U=19 OR U=21) THEN LET V
=V-1
2540  IF INKEY$="8" AND V<8 AND (
U=17 OR U=19 OR U=21) THEN LET V
=V+1
2560  IF INKEY$="6" AND U<21 AND
(V=0 OR V=2 OR V=4 OR V=6 OR V=8
) THEN LET U=U+1
2580  IF INKEY$="7" AND U>17 AND
(V=0 OR V=2 OR V=4 OR V=6 OR V=8
) THEN LET U=U-1
2585  GOTO 3005
2590  PRINT AT HX,HY;" "
2597  IF INKEY$="5" AND V>0 AND (
U=21 OR U=19 OR U=17) THEN GOTO
2700
2600  IF INKEY$="8" AND V<8 AND (
U=21 OR U=19 OR U=17) THEN GOTO
2750
2620  IF INKEY$="6" AND U<21 AND
(V=0 OR V=2 OR V=4 OR V=6 OR V=8
2620  IF INKEY$="6" AND U<21 AND
(V=0 OR V=2 OR V=4 OR V=6 OR V=8
) THEN GOTO 2800
2640  IF INKEY$="7" AND U>17 AND
(V=0 OR V=2 OR V=4 OR V=6 OR V=8
) THEN GOTO 2850
2660  GOTO 3005
2700  LET HX=U
2710  LET HY=V-1
2720  GOTO 3000
2750  LET HX=U
2760  LET HY=V+1
2770  GOTO 3000
2800  LET HX=U+1
2810  LET HY=V
2820  GOTO 3000
2850  LET HX=U-1
2860  LET HY=V
3000  IF HX=X AND HY=Y OR HX=A AN
D HY=B OR HX=C AND HY=D OR HX=E
AND HY=F OR HX=GG AND HY=HH THEN
 LET HX=15
3003  IF HX<>15 THEN PRINT AT HX,
HY;"O"
3020  IF HX=U AND HY=V OR U=X AND
 V=Y OR U=A AND V=B OR U=C AND V
=D OR U=E AND V=F OR U=GG AND V=
HH THEN GOTO 7000
3030  PRINT AT U,V;"*"
3040  RETURN
6000  IF M=X AND N=Y OR M=A AND N
=B OR M=C AND N=D OR M=E AND N=F
 OR M=GG AND N=HH THEN GOTO W
6005  IF M=HX AND N=HY THEN GOTO
6020
6010  GOTO W-10
6020  IF Q=141 THEN LET S=S+100
6035  LET S=S+100
6040  PRINT AT M,N;CHR$ Q
6044  IF S/3000=INT (S/3000) OR (
S-100)/3000=INT ((S-100)/3000) T
HEN LET SO=SO+1
6045  PRINT AT 18,21;S
6047  PRINT AT 20,21;SO
6050  LET HX=15
6060  GOTO W-10
7000  PRINT AT U,V;"■"
7010  LET SO=SO-1
7030  PAUSE 100
7032  IF SO=-1 THEN GOTO 8000
7035  CLS
7040  GOTO 20
8000  FOR N=0 TO 21
8010  SCROLL
8020  NEXT N
8030  IF S>BEST THEN LET BEST=S
8040  PRINT AT 0,0;"GAME OVER, AL
L YOUR MEN ARE DEAD"
8050  GOTO 2
```

SKY SHOOT

SKY SHOOT for the Spectrum is a kind of target shoot against the clock.

You have four targets—which you must destroy in an unreasonably short time.

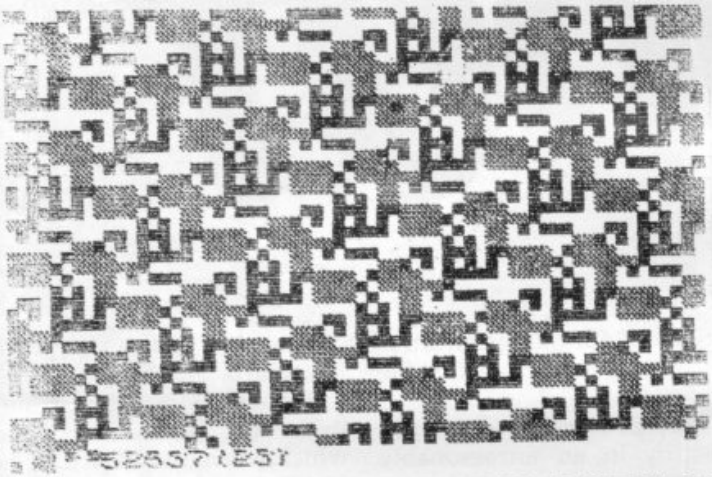
Move left with 1, right with q and fire with 0.

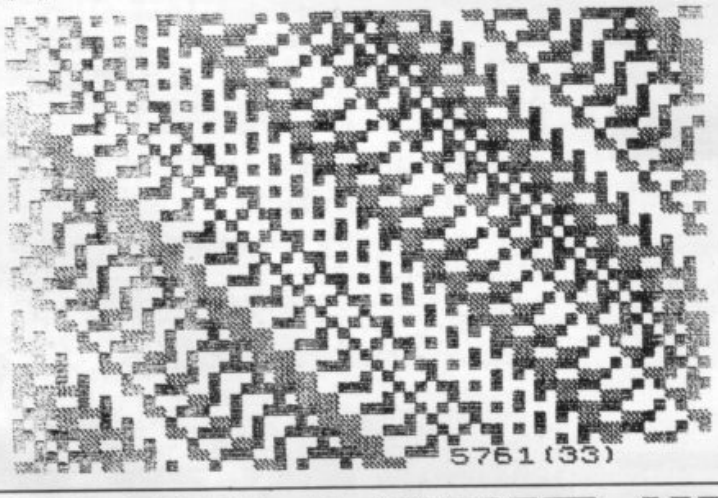
A challenging game from David Price of Glenfields, Caerphilly, which proved too difficult for your fast-fingered reviewer.

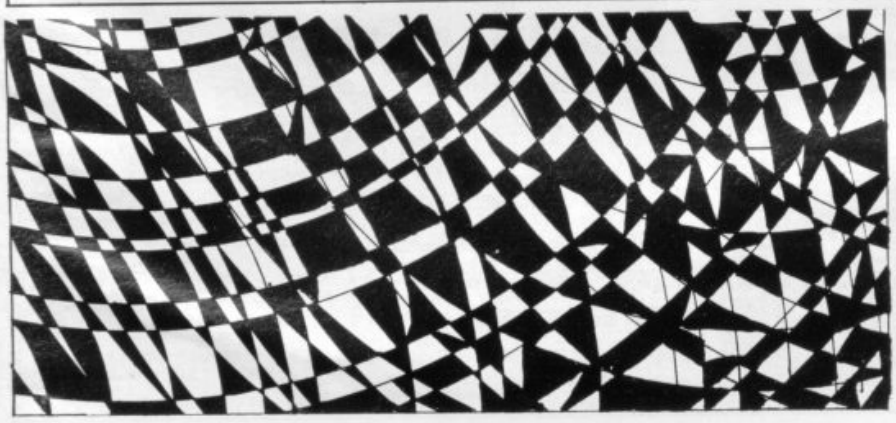
```
   1 CLS : BORDER 4: BEEP .25,3:
 BEEP .5,4: BEEP .25,3: PRINT IN
K 2;"[illegible]";AT 1,0;"[illegible]SHOOT[illegible]";AT 2,0;"[illegible]"
   2 PRINT AT 6,0; INK 0;"Use [illegible]
to move right","Use [illegible] to move le
ft","Use [illegible] to fire"
   3 PRINT AT 16,1;"PRESS ANY KE
Y TO START"
   4 PAUSE 0
   5 CLS
   9 BORDER 1
  10 LET s=10: LET g=0: LET a=1
  30 LET b=q: LET c=5: LET d=3
  50 LET e=d+d: LET f=e+e: LET g
=f+e: LET h=g+e
  70 LET i=17: LET j=q: LET y=a
 190 CLS
 195 PRINT AT 4,b; INK 2;"[illegible]"
 200 PRINT AT c,e;"*";AT c,f;"+"
;AT c,g;"*";AT c,h;"+"
 210 PRINT AT g+a,b; INK 3;"[illegible]"
 220 PRINT AT g,s;" [illegible] "
 230 PRINT AT i,s+a;"."
 240 PRINT AT i,s+a;" "
 242 LET y=y+1
 244 IF i=c AND s+a=e OR i=c AND
 s+a=f OR i=c AND s+a=g OR i=c A
ND s+a=h THEN LET j=j+1
 245 IF i=c AND s+a=e THEN PRINT
 INK 1;AT c,e;"[illegible]": BEEP .25,1
 246 IF i=c AND s+a=f THEN PRINT
 INK 1;AT c,f;"[illegible]": BEEP .25,1
 247 IF i=c AND s+a=g THEN PRINT
 INK 1;AT c,g;"[illegible]": BEEP .25,1
 248 IF i=c AND s+a=h THEN PRINT
 INK 1;AT c,h;"[illegible]": BEEP .25,1
 250 IF i=c THEN GO TO 350
 255 IF j=4 THEN GO TO 1000
 256 IF s>=27 THEN LET s=27
 257 IF s<=0 THEN LET s=0
 260 IF INKEY$="q" THEN LET s=s-
a
 270 IF INKEY$="1" THEN LET s=s+
a
 280 IF INKEY$="0" THEN LET i=i-
a
 290 IF y>=95 THEN GO TO 2000
 300 GO TO 210
 350 LET q=q+1
 400 PRINT AT 21,0;"You have tak
en ";q;"shots"
 402 PRINT AT 2,0; INK 0;"[illegible]";y
 404 LET i=17
 405 FOR w=1 TO 20
 406 NEXT w
 407 GO TO 210
1000 BORDER 2: PAPER 7: CLS
1001 PRINT AT 1,0; INK 1;"[illegible]"
1005 PRINT AT 3,0; INK 2;"[illegible]";y
1010 PRINT AT 5,0; INK 1;"[illegible]";q;AT 10,b; INK 0;"Anot
her try? (y/n)"
1020 INPUT a$
1030 IF a$="y" OR a$="Y" THEN GO
 TO 5
1035 STOP
2000 PAUSE 100: CLS
2002 PRINT AT 5,0; INK 1;"[illegible]";q;"[illegible]"
2004 PRINT AT 7,0; INK 0;"[illegible]";"[illegible]";j
2005 PRINT AT 16,0; INK 1;"[illegible]"
2010 INPUT a$
2020 IF a$="y" OR a$="Y" THEN GO
 TO 5
```

UNIVERSAL PATTERNER

```
  10 DIM A(33)
  15 SLOW
  20 PRINT "RANDOM PATTERN ? (Y
OR N)"
  30 INPUT A$
  40 CLS
  50 IF NOT A$="Y" THEN GOTO 200
  60 LET L=INT (RND*33)+1
  70 LET X=INT (RND*65535)+1
  80 RAND X
  85 FAST
  90 FOR J=1 TO L
 100 LET A(J)=INT (RND*10)+1
 110 NEXT J
 120 FOR J=1 TO 660/L
 130 FOR K=1 TO L
 140 PRINT CHR$ A(K);
 150 NEXT K
 160 NEXT J
 170 PRINT X;"(";L;")"
 180 STOP
 200 PRINT "PATTERN NUMBER ?"
 210 INPUT X
 220 CLS
 230 PRINT "STRING LENGTH ?"
 240 INPUT L
 250 CLS
 260 GOTO 80
```







UNIVERSAL PATTERNER i
for 16K ZX-81 users and pro
duces patterns at random
Author W. S. Hearn, of Ilford, Essex
states that more than two millio
designs can be printed on the screen.

Each pattern has a number an
string length printed at the bottom
so can be recalled and adjusted usin
those numbers. Answer N for N
when asked if a random pattern i
required and then input th
numbers.

BOMB

THE IDEA of *Bomb* is to blow up undefined enemies, represented by an inverse space. Your bomb moves across the top of the screen and pressing any key will release it. Only one bomb can be in the air at any time, limiting the attraction of the game, but it will run on 1K machines.

For those with slow mode the PAUSE and POKE may be removed by deleting lines 100 and 110. *Bomb* was submitted by David Goodup.

```
    5 LET B$="(PEEK (PEEK 16398+2
56*PEEK 16399))=128"
    6 LET C=VAL "0"
    7 LET D=C
    8 LET S=C
   10 LET K=VAL "9.5"
   20 FOR X=VAL "1" TO VAL "5"
   30 CLS
   40 FOR A=VAL "1" TO VAL "5"
   50 PRINT AT VAL "9",RND*VAL "3
1";"■"
   60 NEXT A
   70 LET B=RND*K
   80 FOR A=VAL "0" TO VAL "30"
   90 PRINT AT B,A;">"
  100 PAUSE VAL "50"
  110 POKE VAL "16437",VAL "255"
  120 LET D=D*(C<K)+A*(NOT SGN D
AND INKEY$<>"")
  130 LET C=(C+VAL "1")*SGN D+B*(
NOT SGN D)
  140 PRINT AT C-VAL "1",D;" ";AT
C,D;
  150 LET S=S+VAL B$
  160 LET D=D*(C<K)
  170 PRINT CHR$ (VAL "23"*SGN D)
;AT B,A;" "
  180 NEXT A
  190 NEXT X
  200 PRINT S;" POINTS"
```

DIGGE

```
  5 REM ************************
 10 REM * SPECTRUM GOLD DIGGER*
 15 REM * © S.LATHROPE DEC'82 *
 20 REM ************************
 25 GO SUB 900: GO SUB 990
 30 GO SUB 100
 35 GO SUB 200
 40 GO SUB 400
 45 GO SUB 300
 55 IF INKEY$="0" THEN GO SUB 5
00
 60 IF a=c AND b=d THEN PAUSE 3
00: GO TO 25
 80 GO TO 40
 90 INK 7: PAPER 0: BORDER 0: C
LS
 100 FOR f=5 TO 17 STEP 3: PRINT
 AT f,0; INK 2;"▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒
▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒": PRINT AT f+1,
0; INK 2;"▒": NEXT f
 110 DATA 2,4,5,7,5,16,5,24,8,2,
8,19,8,29,11,5,11,10,11,19,14,10
,14,25
 120 PRINT AT 0,0; INK 2;"▒▒▒▒▒▒
▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒
";AT 1,0;"▒▒    ▒▒";AT 2,0;"▒▒▒▒▒▒
▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒
"
 130 RESTORE 110: FOR q=1 TO 11:
 READ a,b: PRINT AT a,b; INK 4;"
#";AT a-1,b;"#";AT a+1,b;"#";AT
a+2,b;"#": NEXT q
 140 PRINT AT 1,1; INK 6;"♣♣♣"
 150 INK 2: PLOT 0,0: DRAW 255,0
: DRAW 0,175: DRAW -255,0: DRAW
0,-175: PLOT 1,1: DRAW 253,0: DR
AW 0,173: DRAW -253,0: DRAW 0,-1
73: INK 7
 160 PRINT AT 2,10; INK 2;"ZX GO
LD DIGGER"
 190 RETURN
 200 REM *** VARIABLES ****
 210 LET a=16: LET b=15
 220 PRINT AT a,b; OVER 1; INK 4
;"☀"
 230 LET c=4: LET d=15
 240 PRINT AT c,d; OVER 1; INK 4
;"☻"
 250 LET ca=0: LET s=1
 260 LET o$="▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮
▮▮": LET ox=20
 290 RETURN
 300 REM *** MOVE MAN *****
 310 PRINT AT a,b; OVER 1; INK 4
;"☀"
 330 LET b=b+(INKEY$="8" AND ATT
R (a,b+1)<>2)-(INKEY$="5" AND AT
TR (a,b-1)<>2)
 350 LET a=a+(INKEY$="6" AND ATT
R (a+1,b)=4)-(INKEY$="7" AND ATT
R (a-1,b)=4)
 380 PRINT AT a,b; OVER 1; INK 4
;"☀"
 390 RETURN
 400 REM *** MOVE BEAST *****
 405 LET ox=ox-.1: GO SUB 800
 410 PRINT AT c,d; OVER 1; INK 4
;"☻"
 430 LET d=d+(d<b AND ATTR (c,d+
1)<>2)-(d>b AND ATTR (c,d-1)<>2)
 450 LET c=c+(c<a AND ATTR (c+1,
d)=4)-(c>a AND ATTR (c-1,d)=4)
 460 GO TO 480
 470 LET d=d+(d<15)-(d>=15)
 480 PRINT AT c,d; OVER 1; INK 4
;"☻"
 483 IF a=16 AND b=1 AND ca=1 TH
EN GO SUB 750
 485 IF ATTR (c+1,d)=6 THEN GO S
UB 600
 487 IF a=1 AND b=4 AND ca=0 THE
N GO SUB 700
 490 RETURN
 500 REM *** DIG HOLE ****
 505 IF a>14 THEN RETURN
 510 PRINT AT a,b; OVER 1; INK 4
;"☀"
 520 PRINT AT a+1,b; INK 6;" ";A
T a+2,b;" "
 530 LET b=b+1
 540 PRINT AT a,b; OVER 1; INK 4
;"☀"
 590 RETURN
 600 REM *** BEAST DROP ****
 610 PRINT AT c,d; OVER 1; INK 1
;"☻"
 620 LET c=c+1
 630 PRINT AT c,d; OVER 1; INK 1
;"☻"
 640 IF ATTR (c+1,d)<>2 THEN GO
TO 610
 690 RETURN
 700 REM *** CARRY GOLD ****
 710 PRINT AT 1,10; INK 2; PAPER
 7; FLASH 1;"♣ CARRYING ♣"
 720 LET ca=1
 740 RETURN
 750 LET s=s+1
 760 LET ca=0: PRINT AT 18,s; IN
K 6;"♣"
 770 PRINT AT 1,10;"
"
 790 RETURN
 800 REM *** OXYGEN GAUGE *****
 810 IF ox<=0 THEN PAUSE 300: GO
 TO 25
 840 PRINT AT 19,1; INK 2;"OXYGE
N:"; PAPER 3; INK 5;o$( TO ox);
PAPER 0;"
 890 RETURN
 900 REM **** START *****
 910 PAPER 4: CLS : PAPER 0
 920 PRINT AT 10,9; PAPER 7; FLA
SH 1; INK 4;"PUSH ANY KEY"
 930 PRINT AT 5,10; PAPER 7; INK
 4;"GOLD DIGGER"
 940 IF INKEY$="" THEN GO TO 940
 950 CLS
 980 RETURN
 990 RESTORE 1000: FOR q=1 TO 5:
 READ q$: FOR n=0 TO 7: READ r:
POKE USR q$+n,r: NEXT n: NEXT q
1000 DATA "a",187,187,0,221,221,
0,238,238
1010 DATA "b",24,60,24,60,90,24,
36,66
1020 DATA "c",126,153,187,255,12
6,24,36,66
1030 DATA "d",30,12,62,127,127,1
27,126,60
1050 DATA "h",66,66,255,66,66,66
,255,66
1090 RETURN
```

DIGGER is an excellent arcade-style game for the 16K Spectrum. It is based on an already popular routine and requires you to take your user-defined man up several ladders to the treasure chamber on the top floor.

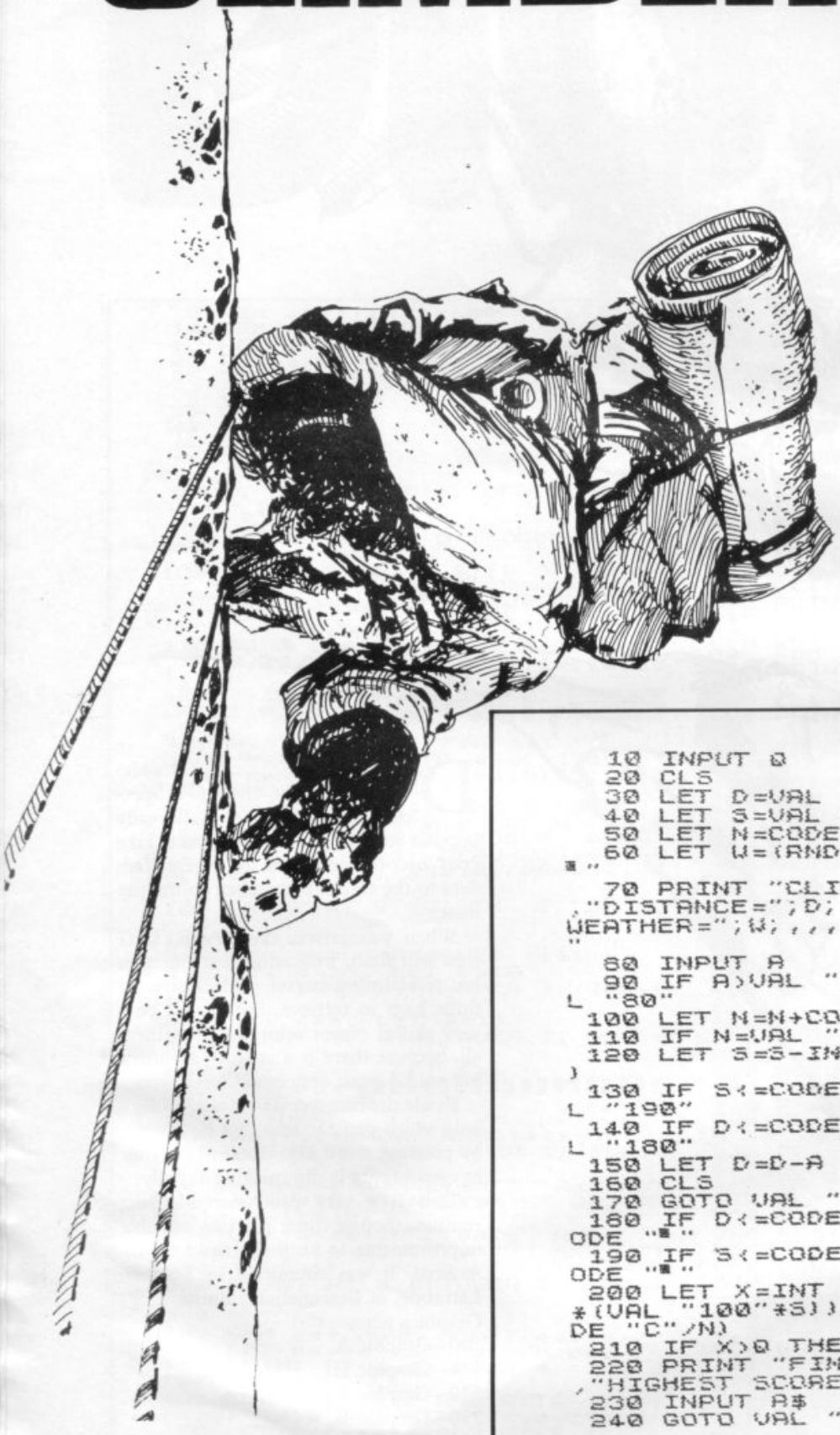
When you arrive, the CARRYING sign will flash, indicating that the man has picked up a bag of gold. There are three bags to retrieve, but it will be a very skilful player who can grab them all, because there is a snag — a hungry but stupid beast concerned to eat you.

Evade the monster if you can, or dig a hole which you can leap, but he cannot, by pressing the 0 key. Meanwhile your oxygen supply is diminishing rapidly.

This is a very professional-looking routine, though there are two possible improvements to keep the tinkerers interested. It was submitted by Stephen Lathrope, of Beaconsfield, Bucks.

Graphics notes:
100—Graphic A.
130—Graphic H.
140—Graphic D.
220—Graphic B.
240—Graphic C.
260—Graphic shifted 5.

CLIMBER



YOUR AIM is to climb a 1,000-metre mountain in 10 days. If you fail to finish in the allotted time or run out of supplies, the trip is cancelled and abandoned. Bad weather may hinder your progress.

When the program is run, an input mode will await the highest previous score—enter O on your first run. The display will then show the climbing day, distance to the summit, number of supply units from 75 to zero, and the weather on a scale of awfulness up to 10.

As group leader you must enter the distance you wish to travel on that day, the maximum being 300 metres. Remember that you will use more supplies in bad-weather climbing and that in the worst conditions it may be advisable to stay in the tent.

When the distance reaches O, enter zero to obtain your final score. That is dependent on the number of supply units and days expended; David Stewart of Darlington, who submitted the program, reports that his best result is 251. The program runs on a 1K ZX-81. Graphics notes: 50,100, 180 & 190—graphic shifted 1, 60—graphic shifted 2, grapnic shifted 1.

```
  10 INPUT Q
  20 CLS
  30 LET D=VAL "1000"
  40 LET S=VAL "75"
  50 LET N=CODE "■"
  60 LET W=(RND*CODE "■")+CODE "
■"
  70 PRINT "CLIMBING DAY ";N;,,,
,"DISTANCE=";D;,,"SUPPLY=";S;,,,
WEATHER=";W;,,,,"ENTER DISTANCE?
"
  80 INPUT A
  90 IF A>VAL "300" THEN GOTO VA
L "80"
 100 LET N=N+CODE "■"
 110 IF N=VAL "11" THEN STOP
 120 LET S=S-INT ((A*W)/CODE "C"
)
 130 IF S<=CODE " " THEN GOTO VA
L "190"
 140 IF D<=CODE " " THEN GOTO VA
L "180"
 150 LET D=D-A
 160 CLS
 170 GOTO VAL "60"
 180 IF D<=CODE " " THEN LET D=C
ODE "■"
 190 IF S<=CODE " " THEN LET S=C
ODE "■"
 200 LET X=INT (((((VAL "1000"/D)
*(VAL "100"*S))/VAL "100000")*CO
DE "C"/N)
 210 IF X>0 THEN LET Q=X
 220 PRINT "FINAL SCORE= ";X;,,,
,"HIGHEST SCORE= ";Q
 230 INPUT A$
 240 GOTO VAL "20"
```

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galaxy's rubbish. Childs play. HUH!
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But they didn't say I'd have to stop and control not just one but two or even more
pods. Then prod them, push them, toward that black hole, and oh, it's so very, ve
and so lonely, so empty.
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towards me, against me, at me. And I'm alone. No way out, nowhere to hide, on
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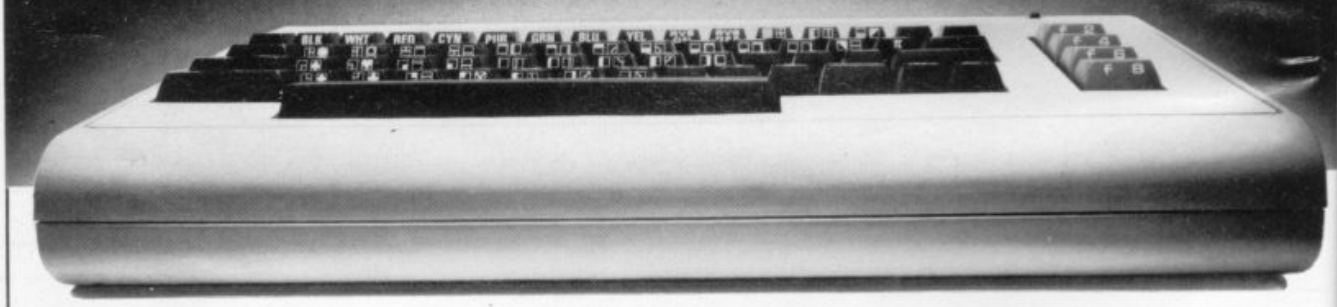
BSP 1

It may repel extra-terrestrials, but can it switch on the light in the loo?



If you're getting bored playing games and running simple programs Electronics and Computing Monthly can show you how to put a lot of fun back into your micro. With the addition of some easy-to-build electronic circuits, your computer could drive much more than a TV screen.

Like your Scalextric or train set. It could control the lights in your house, the central heating system, talk to the budgie while you're out and water the houseplants while you're away.

And you can build all these things yourself-the simple circuits for pennies rather than pounds. Each month Electronics and Computing magazine shows you how to expand your micro and gives you new ideas for computer fun. Project by project we add another dimension to your computer.

In the latest issue we show you how to build an infra-red remote controller for your micro and what 'dialogue programming' is all about.

All you need is a hot soldering iron and a cool 75p.

WHERE ELECTRONICS AND COMPUTING INTERFACE

TRUE OR FALSE

WE FEEL that many of the education games sent to us ignore the crucial place of good graphics in the interest of the young learner.

True or False is a program for teaching multiplication. The authors, Neil Pick and Rae Bryant of Harrogate, obviously worked hard to accompany the didactics with a lively display and a line in cheery patter.

The operator has a very limited time in which to judge the displayed arithmetic as true or false and to input 7 or 5 accordingly. Error or delay will advance a decrepit-looking automobile further and further towards a brick wall. There are three levels of difficulty and a running score for every correct answer. Graphics notes:

24—Inverse space, graphic 7, inverse space.

100—Graphic F, graphic G.

670—Inverse GOOD.

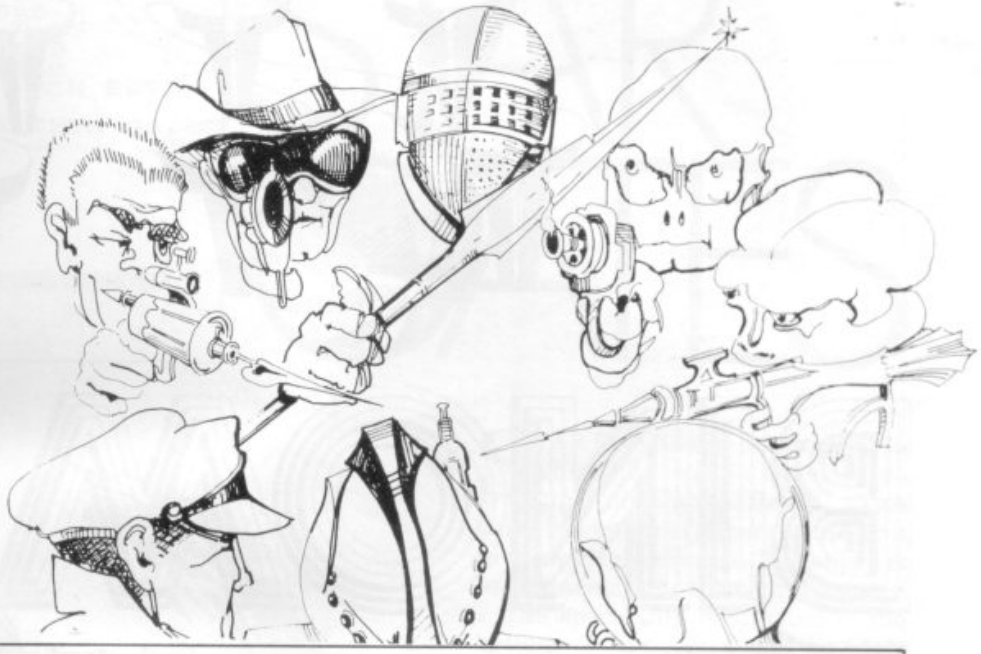
680—Inverse BYE.

```
  1 REM "TF" BY L.BRYANT AND N.
PICK
  2 LET R=0
  3 PRINT "
    "
  4 PRINT
  5 LET R=R+1
  6 IF R=9 THEN GOTO 8
  7 GOTO 3
  8 PRINT AT 0,0;"
OR FALSE ~~~~~~~~~~"
  9 PRINT AT 3,0;"THE GAME BEGI
NS WITH A CAR,A "
  10 PRINT "
HT ON SUN"
  11 PRINT "BEING DISPLAYED ON T
HE SCREEN."
  12 PRINT "
ETHER THE"
  13 PRINT "GIVEN ANSWER IS TRUE
 OR FALSE."
  14 PRINT "
 ADDED TO"
  15 PRINT "YOUR SCORE.IF,HOWEVE
R,YOU ARE "
  16 PRINT "
REACHED IT."
  17 PRINT "DOOM.TO PLAY,USE KEY
 ""5"" FOR"
  18 PRINT "
 TRUE."
  19 PRINT "GOOD LUCK .(YOULL NE
ED IT)"
  20 PRINT "
END"
```

```
  21 PRINT "DIFFICULTY?  (1-3)"
  22 INPUT P
  23 LET O=0
  24 PRINT AT 19,0;"
  25 PRINT AT 20,0;"
  26 PRINT AT 21,0;"0   0"
  27 PRINT AT 15,0;"
     "
  28 IF O=26 THEN GOTO 38
  29 PRINT AT 19,0;"    "
  30 PRINT AT 20,0;"    "
  31 PRINT AT 21,0;"    "
  32 LET O=O+1
  33 IF O<26 THEN PRINT AT 17,5;
"DONT PRESS YET."
  34 IF O<26 THEN PRINT AT 18,0;
"--------------------------------
-"
  35 IF O=26 THEN PRINT AT 17,0;
"
 "
  36 IF O=26 THEN PRINT AT 17,5;
"PRESS NOW."
  37 GOTO 24
  38 PAUSE 4E4
  39 CLS
  40 PRINT AT 7,11;"
  41 PRINT AT 12,11;"3..";
  42 PAUSE 45
  43 PRINT "2..";
  44 PAUSE 45
  45 PRINT "1.."
  46 PAUSE 45
```


```
  47 CLS
  48 PRINT AT 6,5;"
"
  49 PRINT AT 7,5;"
"
  50 PRINT AT 8,5;"
"
  51 PRINT AT 9,5;"
"
  52 PRINT AT 10,5;"
"
  53 PRINT AT 11,5;"
"
  54 PRINT AT 12,5;"
"
  55 PRINT AT 13,5;"
"
  56 PRINT AT 14,5;"
"
  57 PAUSE 100
  58 CLS
  59 LET S=1
  60 LET A=0
  61 FAST
  62 PRINT AT 5,0;"
"
  63 PRINT AT 11,0;"
"
  64 FOR U=5 TO 21
  65 PRINT AT U,24;"
"
  66 NEXT U
  67 FOR 0=11 TO 21
  68 PRINT AT 0,17;"
"
  69 NEXT 0
  70 IF A+3=21 THEN PRINT AT 15,
0;"QUICK TURN,"
  71 IF A+3=21 THEN PRINT AT 16,
0;"YOUR GOING OFF"
  72 IF A+3=21 THEN PRINT AT 17,
0;"THE ROAD."
  73 IF A+3>21 THEN PRINT AT 18,
0;"OH,NO.YOURE GOING"
  74 IF A+3>21 THEN PRINT AT 19,
0;"TO CRASH."
  75 FOR I=0 TO 20
  76 PRINT AT 8,I;","
  77 NEXT I
  78 FOR J=8 TO 21
  79 PRINT AT J,20;","
  80 NEXT J
  81 SLOW
  96 PRINT AT 7,A;"
"
  97 PRINT AT 8,A;"
"
  98 PRINT AT 9,A;"0  0"
  99 FOR C=6 TO 9
 100 PRINT AT C,27;"
"
 110 NEXT C
 120 IF A+3=27 THEN GOTO 300
 130 LET D=INT (RND*(P*10))+1
 135 IF P=2 AND D<=10 OR P=3 AND
D<=20 THEN GOTO 130
 140 LET E=INT (RND*(P*10))+1
 145 IF P=2 AND E<=10 OR P=3 AND
E<=20 THEN GOTO 140
 150 LET F=INT (RND*2)
 155 PRINT AT 0,10;"
"
 156 PRINT AT 1,10;"
";AT 1,24;"
"
 157 PRINT AT 2,10;"
"
 160 PRINT AT 1,11;D;" X ";E;"="
;D*E+F;
 170 IF P=1 THEN PAUSE 50
 172 IF P=2 THEN PAUSE 100
 175 IF P=3 THEN PAUSE 150
 180 LET A$=INKEY$
 200 IF A$="5" AND F=1 OR A$="7"
AND F=0 THEN GOTO 230
 210 LET A=A+3
 215 PAUSE 25
 217 CLS
 220 GOTO 61
 230 PRINT AT 0,0;"SCORE=";S
 240 LET S=S+1
 250 PAUSE 50
 260 CLS
 270 GOTO 61
 300 PAUSE 50
 301 CLS
 302 LET V=0
 303 PRINT "
"
 304 IF V=21 THEN GOTO 320
 305 LET V=V+1
 306 GOTO 303
 310 CLS
 314 FOR I=1 TO 21
 315 PRINT "
"
 316 NEXT I
 320 PRINT AT 9,6;"
"
 330 PRINT AT 10,6;"
"
 340 PRINT AT 11,6;"
"
 350 PRINT AT 12,6;"
"
 360 PRINT AT 13,6;"
"
 365 PRINT "
"
 370 PAUSE 100
 380 CLS
 390 LET T=0
 400 PRINT "
"
 410 LET T=T+1
 420 IF T=22 THEN GOTO 440
 430 GOTO 400
 440 PRINT AT 0,0;"YOU HAVE CRAS
HED,YOUR SCORE IS "
 449 FOR X=0 TO 15
 450 LET K=INT (RND*30)
 460 LET W=INT (RND*20)
 470 IF W<=1 THEN GOTO 460
 480 PRINT AT W,K;"";S-1;""
 490 NEXT X
 500 PAUSE 50
 510 CLS
 520 LET N=26
 530 PRINT AT 11,N;"
"
 540 PRINT AT 12,N;"
"
 550 PRINT AT 13,N;" 0   0"
 560 IF N=0 THEN GOTO 600
 570 LET N=N-2
 575 CLS
 580 GOTO 530
 600 PRINT AT 12,N;"AGAIN?"
 610 INPUT A$
 620 IF A$="YES" THEN GOTO 39
 630 PAUSE 50
 640 CLS
 650 PRINT AT 7,0;"WELL,I HOPE Y
OU HAVE ENJOYED "
 660 PRINT "YOUR GAME."
 661 PRINT "(PRESS A KEY.)"
 662 PAUSE 4E4
 663 CLS
 670 PRINT AT 10,13;"BYE"
 675 PAUSE 100
 680 PRINT AT 10,13;"BYE"
```

CLOCKMAN



CLOCKMAN is a very quick reaction-type game for the 16K Spectrum. It is so-called because your enemies appear in a circle around the screen as if on the face of a clock. Your gun, at screen centre, is rotated with keys 5 and 8 and fired with 1.

Men stay on the screen for a shorter time after every hit, so hitting more than 40 out of 50 is very good. Fifty out of 50 is impossible. You can adjust the difficulty of the program by altering the length of the BEEP in line 180.

Sent by Arthur Douglas, of London E4. Graphics notes:
70, 80 etc—k.
1000, 1010 etc—j, a, b.

```
   20 GO SUB 9000
   30 LET go=0: LET sc=0
   40 LET q=100: LET j=144
   50 LET d=0: LET c=0
   60 PRINT AT d,c;CHR$ 32: LET g
o=go+1
   70 LET k=INT (RND*8+1)
   80 IF k=1 THEN LET d=10: LET c
=5
   90 IF k=2 THEN LET d=3: LET c=
8
  100 IF k=3 THEN LET d=0: LET c=
15
  110 IF k=4 THEN LET d=3: LET c=
22
  120 IF k=5 THEN LET d=10: LET c
=25
  130 IF k=6 THEN LET d=17: LET c
=22
  140 IF k=7 THEN LET d=20: LET c
=15
  150 IF k=8 THEN LET d=17: LET c
=8
  160 PRINT INK 1;AT d,c;CHR$ 152
  170 FOR x=1 TO q
  180 BEEP 0.01,5
  190 PRINT INK 2;AT 10,15;CHR$ j
  200 IF INKEY$="8" THEN LET j=j+
1: IF j=152 THEN LET j=144
  210 IF INKEY$="5" THEN LET j=j-
1: IF j=143 THEN LET j=151
  220 IF INKEY$="1" THEN GO SUB 1
000
  230 NEXT x
  240 IF go=50 THEN GO TO 260
  250 GO TO 60
  260 PRINT AT 19,0;"you have sco
red ";sc;" out of 50"
  270 PRINT AT 20,0;"Hit ""y"" fo
r another go,or ""n"" to stop"
  280 IF INKEY$<>"y" AND INKEY$<>
"n" THEN GO TO 280
  290 IF INKEY$="n" THEN STOP
  300 RUN
1000 IF j=144 THEN LET a=-84: LE
T b=0
1010 IF j=145 THEN LET a=-60: LE
T b=60
1020 IF j=146 THEN LET a=0: LET
b=83
1030 IF j=147 THEN LET a=60: LET
 b=60
1040 IF j=148 THEN LET a=84: LET
 b=0
1050 IF j=149 THEN LET a=60: LET
 b=-60
1060 IF j=150 THEN LET a=0: LET
b=-84
1070 IF j=151 THEN LET a=-60: LE
T b=-60
1080 PLOT 124,92: DRAW INK 4;a,b
1090 IF k=j-143 THEN PRINT AT d,
c;"*": BEEP 0.1,k*2: PLOT 124,92
: DRAW OVER 1;a,b: LET sc=sc+1:
LET q=q-2: GO TO 60
1100 PAUSE k*2: PLOT 124,92: DRA
W OVER 1;a,b
1110 RETURN
9000 FOR j=144 TO 152: FOR k=0 T
O 7
9010 READ udg: POKE USR CHR$ j+k
,udg
9020 NEXT k: NEXT j
9030 DATA 2,13,50,196,196,50,13,
3
9040 DATA 192,176,76,67,44,40,16
,16
9050 DATA 24,24,36,36,66,90,165,
195
9060 DATA 3,13,50,194,52,20,8,8
9070 DATA 192,176,76,34,34,76,17
6,192
9080 DATA 8,8,20,52,194,50,13,3
9090 DATA 195,165,90,66,36,36,24
,24
9100 DATA 16,16,40,44,67,76,176,
192
9110 DATA 24,60,90,129,24,36,66,
129
9120 RETURN
9999 SAVE "clockmen" LINE 10
```

BINOMIAL DISTRIBUTION

BINOMIAL DISTRIBUTION might be the first of a new style of program. It was submitted by P R Scott, of Goldalming, Surrey, who believes that there are many fundamental scientific principles which could profitably be illustrated on Sinclair machines.

This program for the 16K ZX-81 serves to illustrate the principle of binomial distribution. The display shows a ball falling through a triangular matrix of pegs. When the ball hits one of the pegs it rebounds to the left or right, entirely at random.

Its final position is recorded and a further ball produced. The distribution of final positions is the binomial distribution, familiar to most O level mathematics candidates. You may not know that this characteristi pattern is also of importance in spe tral intensities and polym conformations.

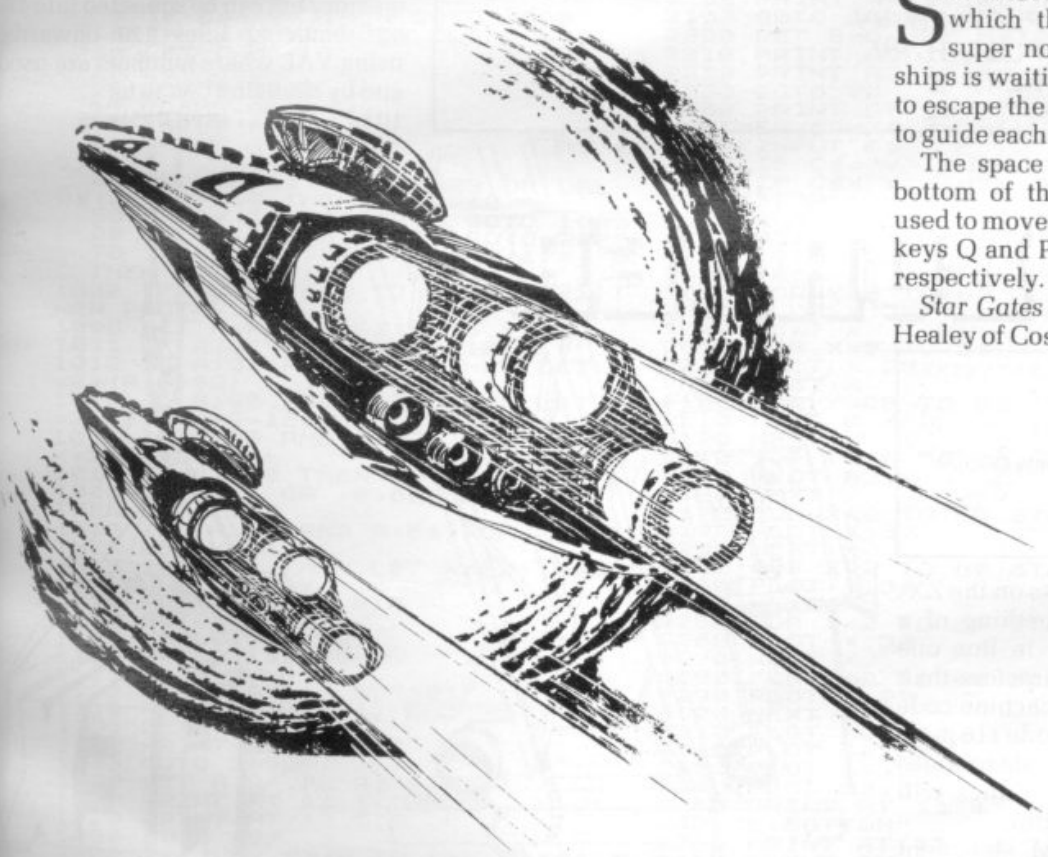
An excellent program, likely prove of immediate use to teache and students of mathematic Graphics notes:

120—Minus, Four spaces, minus a so on.

```
   10 DIM A(7)
   20 FOR X=1 TO 7
   30 LET A(X)=0
   40 NEXT X
   50 PRINT AT 0,5;"BINOMIAL DIST
RIBUTION"
   60 PRINT AT 5,15;"▘"
   70 PRINT AT 7,14;"▙▖"
   80 PRINT AT 9,13;"▙▄▖"
   90 PRINT AT 11,12;"▙▄▄▖"
  100 PRINT AT 13,11;"▙▄▄▄▖"
  110 PRINT AT 15,10;"▙▄▄▄▄▖
"
  120 PRINT AT 17,9;"-  -  -
-"
  130 PRINT AT 18,11;"-  -  -"
  200 PRINT AT 3,15;"O"
  210 LET X=15
  220 LET Y=3
  230 LET XP=X
  240 GOSUB 400
  250 IF Y=16 THEN GOTO 490
  260 LET R=RND
  270 IF R<0.5 THEN LET X=X+1
  280 IF R>=0.5 THEN LET X=X-1
  290 GOSUB 400
  300 GOTO 230
  400 PRINT AT Y,XP;" "
  410 LET Y=Y+1
  420 PRINT AT Y,X;"O"
  430 RETURN
  490 PRINT AT 16,X;" "
  500 LET Z=(X-7)/2
  510 LET A(Z)=A(Z)+1
  520 LET P=17
  530 IF Z/2=INT (Z/2) THEN LET P
=18
  540 LET Q=X
  550 IF A(Z)>=10 THEN LET Q=Q-1
  560 PRINT AT P,Q;A(Z)
  570 IF A(Z)=50 THEN INPUT Z$
  580 GOTO 200
```

```
 10 LET A=PI/PI
 20 LET B=PI-PI
 30 LET R=B
 40 LET V=600
 50 LET S=20
 60 LET T=15
 70 LET Y=15
 80 CLS
 90 LET X=INT (RND*25)
100 PRINT AT Y,X;"■■■■■"
110 PRINT AT S,T;" ■ "
120 PRINT AT S+A,T+A;"■■■"
130 LET V=V-A
140 IF INKEY$="Q" THEN LET T=T-
A
150 IF INKEY$="P" THEN LET T=T+
A
160 IF INKEY$="1" THEN LET S=S-
A
170 IF T<B THEN LET S=S-A
180 IF T>25 THEN LET T=25
190 IF V=B THEN GOTO 500
200 IF S=B THEN GOTO 350
210 IF T=X AND S=Y-A THEN GOTO
300
220 IF S=Y-A AND T<>X THEN GOTO
50
230 GOTO 110
300 LET Y=Y-5
310 GOTO 80
350 LET R=R+A
360 GOTO 50
500 CLS
510 PRINT AT 10,11;"GAME OVER"
520 PRINT AT 12,11;R
```

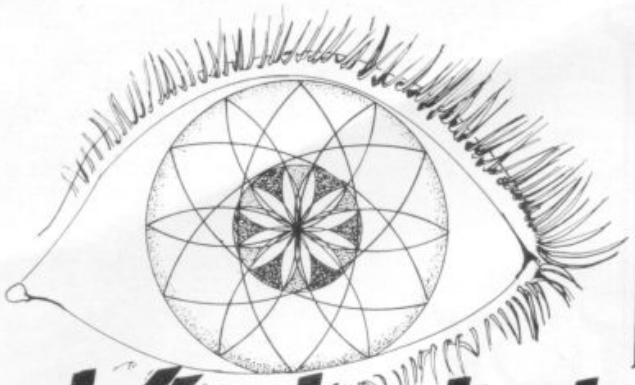
STAR GATES



STAR GATES is a 1K program in which the sun is about to go super nova and a fleet of space ships is waiting to depart from Earth to escape the holocaust. The object is to guide each ship through star gates.

The space ship is situated at the bottom of the screen and key 1 is used to move vertically upwards and keys Q and P to move left and right respectively.

Star Gates was submitted by D E Healey of Coseley, West Midlands.



```
 120 POKE 16418,0
 130 PRINT AT 23,0;"TYPE C  TO R
UN,Z TO COPY DESIGN"
 140 IF INKEY$="" THEN GOTO 140
 150 IF INKEY$="Z" THEN GOTO 180
 160 IF INKEY$="C" THEN RUN
 170 GOTO 140
 180~PRINT AT 23,0;"(32 SPACES)"
 190 COPY
 200 GOTO 130
```

Kaleidoscope

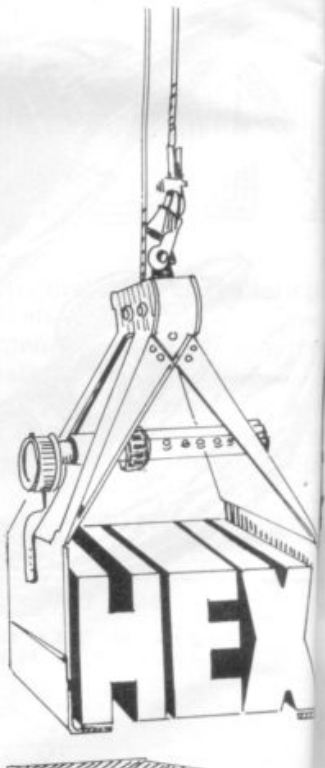
```
 10 LET N=INT (RND*250)+200
 20 FOR A=1 TO N
 30 LET V=INT (RND*22)
 40 LET H=INT (RND*32,
 50 'LET RV=21+(22-V)
 60 LET RH=31+(32-H)
 70 PLOT H,V
 80 PLOT RH,V
 90 PLOT RH,RV
100 PLOT H,RV
110 NEXT A
```

THE AUTHOR of **Kaleidoscope** Matthew Calveley, of Lytham Lancs, claims amazing results with this ZX-81 program. It will generate a random number of dots a random points on the bottom left o the screen and then re-create tha pattern on the other quarters of th screen. All the patterns created wil be symmetrical.

Kaleidoscope occupies 1.2K o memory but can be squeezed into 1K by removing lines 120 onwards using VAL where numbers are used and by changing line *10 to:*
10 LET N = INT (RND*25) + 25.

HEXLOADER

```
 1 REMXXXXXXXXXXXXXXXXXXXXXX
10 LET I=16427   15 INPUT AS
20 IF AS="S" THEN STOP
30 PRINT AS;"**";
40 POKE I, 16*(CODE (AS)-28)+CODE
(TLS (AS))-28
50 LET I=I+1
60 GOTO 15
```

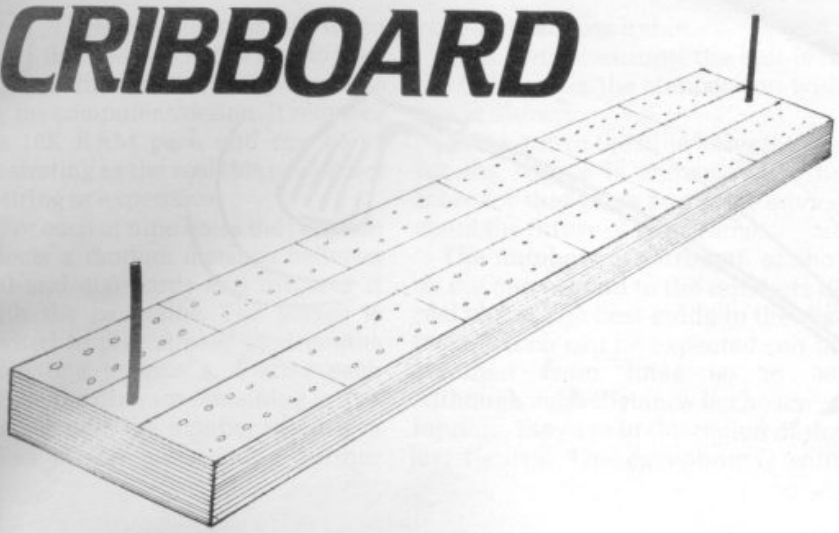


HEXLOADER works on the ZX-80, which is something of a rarity. The REM in line one must contain more characters than there are bytes in the machine code program. The number code 118 must not be used in machine code routines or all kinds of strange things will start to happen to the listing.

To remove the REM statement from line one, POKE 16403, 10. This program will help many people who still own a ZX-80 to obtain more power from it using machine code. Machine code programming is something which has not been entered into any great depth with the ZX-80.

The **Hexloader** was sent by A Goodright of Sutton, Surrey.

CRIBBOARD



CRIBBOARD, as the name suggests, is a scoring system to use while playing cribbage. A board is displayed on which the state of the game is shown by the blanked-out hole on the board and the numerical total is shown. The result in the number of games is also given.

When run, the players are asked if they are playing a bust or no-bust game and the game is recorded as required. A maximum score of 29 is allowed on each turn and the impossible figure of 19 cannot be entered. The score is entered by giving the letter of the player, followed by his score.

The program was sent by M J Bennett of Jeddah, Saudi Arabia. It requires the 16K RAM pack.

```
   1 REM CRIBBOARD
   2 REM EACH PLAYER ENTERS HIS
LETTER (A OR B), FOLLOWED BY HIS
SCORE, FOLLOWED BY NEWLINE.
   3 REM AN ENTRY GREATER THAN
29 WILL NOT BE ACCEPTED.
   4 REM THE FIRST PLAYER TO
SCORE 121 OR MORE IS THE WINNER.
   5 PRINT "DO YOU WANT TO FINIS
H ON      EXACTLY 121? IF YES
PRESS ""Y""    ELSE PRESS ""NEWLI
NE""."
   6 INPUT B$
   7 IF B$="Y" THEN GOTO 4000
   8 IF B$<>"Y" THEN CLS
  10 LET C=0
  15 LET D=0
  20 GOSUB 9000
  30 GOSUB 9500
  40 INPUT A$
  41 PRINT AT 15,4;"          ";AT 1
5,21;"  "
  45 IF VAL A$(2 TO )>29 OR VAL
A$(2 TO )=19 THEN GOTO 40
  50 IF A$(1)="A" THEN GOTO 1000
  60 IF A$(1)="B" THEN GOTO 2000
  70 IF A$(1)<>"A" AND A$(1)<>"B
" THEN GOTO 40
1000 IF (VAL A$(2 TO )+A)<=121 T
HEN PLOT X,Y
1005 LET A=A+VAL A$(2 TO )
1011 IF A<31 THEN GOTO 1020
1012 IF A>30 AND A<61 THEN LET X
=2+(A*2-62)
1013 IF A>60 AND A<91 THEN LET X
=2+ABS (A*2-180)
1014 IF A>90 AND A<121 THEN LET
X=2+(A*2-182)
1015 IF A>120 THEN GOTO 1100
1020 IF A<31 OR (A>60 AND A<91)
THEN LET Y=37
1030 IF (A>30 AND A<61) OR A>90
THEN LET Y=34
1055 IF A<31 THEN LET X=62-(A*2)
1060 UNPLOT X,Y
1070 PRINT AT 13,5;A
1080 GOTO 40
1100 UNPLOT 62,36
1110 UNPLOT 62,35
1111 PLOT X,Y
1120 PRINT AT 13,5;"121"
1130 PRINT AT 15,4;"WINNER"
1131 LET C=C+1
1132 PRINT AT 17,5;C
1133 GOTO 3000
1200 LET A=A-VAL A$(2 TO )
1210 PRINT AT 15,5;"BUST"
1220 PRINT AT 13,5;A
1230 GOTO 40
2000 IF (VAL A$(2 TO )+B)<=121 T
HEN PLOT V,W
2005 LET B=B+VAL A$(2 TO )
2011 IF B<31 THEN GOTO 2020
2012 IF B>30 AND B<61 THEN LET V
=2+(B*2-62)
2013 IF B>60 AND B<91 THEN LET V
=2+ABS (B*2-180)
2014 IF B>90 AND B<121 THEN LET
V=2+(B*2-182)
2015 IF B>120 THEN GOTO 2100
2020 IF B<31 OR (B>60 AND B<91)
THEN LET W=27
2030 IF (B>30 AND B<61) OR B>90
THEN LET W=30
2055 IF B<31 THEN LET V=62-(B*2)
2060 UNPLOT V,W
2070 PRINT AT 13,23;B
2080 GOTO 40
2100 UNPLOT 62,29
2110 UNPLOT 62,28
2111 PLOT V,W
2120 PRINT AT 13,23;"121"
2130 PRINT AT 15,21;"WINNER"
2131 LET D=D+1
2132 PRINT AT 17,23;D
2133 GOTO 3000
2200 LET B=B-VAL A$(2 TO )
2210 PRINT AT 15,22;"BUST"
2220 PRINT AT 13,23;B
2230 GOTO 40
3000 PRINT AT 20,0;"DO YOU WANT
ANOTHER GAME? (Y/N)"
3003 INPUT C$
3006 IF C$="Y" THEN CLS
3010 IF C$="Y" THEN GOTO 20
3020 STOP
4000 CLS
4010 LET E=1
4020 GOTO 10
9000 FAST
9010 FOR X=0 TO 63
9030 PLOT X,39
9040 NEXT X
9050 FOR X=0 TO 63
9070 PLOT X,25
9080 NEXT X
9100 FOR Y=26 TO 38
9110 PLOT 0,Y
9120 NEXT Y
9140 FOR Y=26 TO 38
9150 PLOT 63,Y
9160 NEXT Y
9170 FOR X=2 TO 60 STEP 2
9190 PLOT X,37
9200 NEXT X
9210 FOR X=2 TO 60 STEP 2
9230 PLOT X,34
9240 NEXT X
9250 FOR X=2 TO 60 STEP 2
9260 PLOT X,30
9270 NEXT X
9280 FOR X=2 TO 60 STEP 2
9290 PLOT X,27
9300 NEXT X
9310 PLOT 62,36
9320 PLOT 62,35
9330 PLOT 62,29
9340 PLOT 62,28
9350 PRINT AT 11,4;"A=TOP";AT 11
,20;"B=BOTTOM"
9360 PRINT AT 13,12;"<SCORE>"
9365 PRINT AT 17,12;"<GAMES>"
9370 SLOW
9380 RETURN
9500 LET A=0
9510 LET B=0
9515 LET V=60
9516 LET W=27
9517 LET X=60
9518 LET Y=37
9520 PRINT AT 13,5;A;AT 13,23;B
9525 PRINT AT 17,5;C;AT 17,23;D
9530 RETURN
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         1982
```

```
  10 LET T=0
  15 LET M=0
  20 LET A=1
  25 IF A=10 THEN GOTO 600
  30 LET D=(INT (RND*200)+200
  40 LET B=0
  45 PRINT
  50 PRINT "HOLE NO. ";A;" "
YARDS"
  55 GOSUB 800
  56 PRINT
  57 PRINT "PAR ";P
  58 LET M=M+P
  60 PRINT
  70 PRINT "PLAY YOUR STROKE,
ENGTH 1 TO 9"
  80 INPUT J
  83 CLS
  85 LET B=B+1
  87 LET T=T+1
  90 IF J=1 THEN LET K=1
  91 IF J=2 THEN LET K=INT (R
3)+2
  92 IF J=3 THEN LET K=INT (R
2)+4
  93 IF J=4 THEN LET K=INT (R
3)+8
  94 IF J=5 THEN LET K=INT (R
4)+22
  95 IF J=6 THEN LET K=INT (R
5)+46
  96 IF J=7 THEN LET K=INT (R
8)+96
  97 IF J=8 THEN LET K=INT (R
```

ON THE RARE occasions when the weather is too bad to play **Golf,** fanatics may care to try the computer version. It requires the 16K RAM pack and can be as frustrating as the real thing—but not so tiring or expensive.

For each of nine holes the program selects a random distance between 200 and 400 yards and displays it with the par value. The player is invited to play strokes at strengths from one to nine and after each stroke the distance remaining is displayed, with the number of strokes taken at the hole, and a further request to choose a shot.

That continues until the ball is in the hole, when the comparison with par is shown.

At the end of the nine holes the par for the course is shown, with the score for that game and some advice about the future of your game.

The numbers for strength of shot do not correspond to the numbers of real clubs. The best guide to the distance which can be expected can be obtained from lines 90 to 98. Although each distance is chosen at random, they are in the region of the last figures. The exception is shot one, which always moves the ball one yard.

That random element is the cause of the frustration, particularly when the ball is less than four yards from the hole. The choice must always be between taking the safe method and playing a series of one-yard shots, and the two, which can give two, three or four yards.

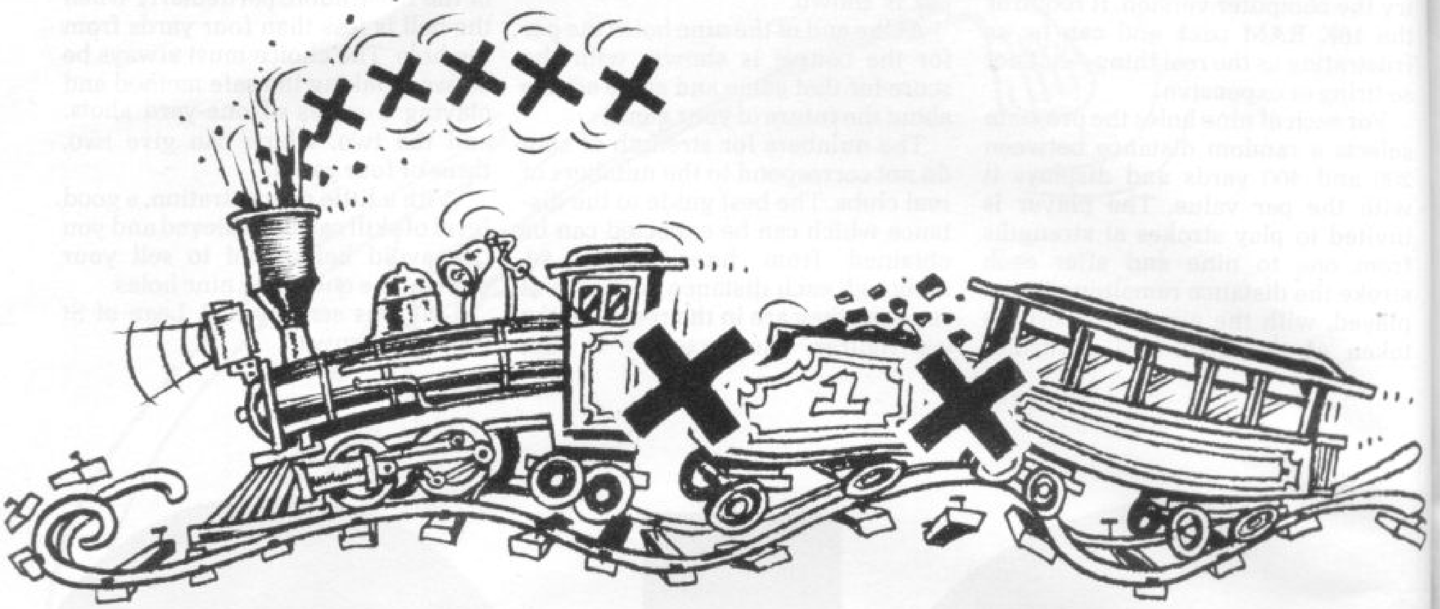
With a little concentration, a good level of skill can be achieved and you can avoid being told to sell your clubs at the end of the nine holes.

Golf was sent by R A Lean of St Austell, Cornwall.

GOLF

```
)+145
 98 IF J=9 THEN LET K=INT (RND*
1)+195
 99 IF D=K THEN GOSUB 500
100 IF D=0 THEN GOTO 25
101 IF D<K THEN GOTO 105
102 IF D>K THEN GOSUB 400
103 IF D>0 THEN GOTO 60
105 GOSUB 300
106 IF D>0 THEN GOTO 60
300 LET D=(K-D)
305 IF D=1 THEN PRINT "YOU ARE
NE YARD PAST THE HOLE"
310 IF D>1 THEN PRINT "YOU ARE
;D;" YARDS PAST THE HOLE"
311 PRINT
312 IF B=1 THEN PRINT "ONE STRO
E PLAYED"
313 IF B>1 THEN PRINT B;" STROK
S PLAYED"
320 RETURN
400 LET D=(D-K)
405 IF D=1 THEN PRINT "YOU ARE
NE YARD FROM THE HOLE"
410 IF D>1 THEN PRINT "YOU ARE
;D;" YARDS FROM THE HOLE"
411 PRINT
412 IF B=1 THEN PRINT "ONE STRO
E PLAYED"
413 IF B>1 THEN PRINT B;" STROK
S PLAYED"
420 RETURN
```

```
500 LET D=(D-K)
505 IF (P-B)=1 THEN PRINT "HOLE
D FOR A BIRDIE"
510 IF B>P THEN PRINT "HOLED, "
;B-P;" OVER PAR"
520 IF P=B THEN PRINT "HOLED AT
PAR"
530 IF P-B=2 THEN PRINT "HOLED
FOR AN EAGLE"
540 IF P-B=3 THEN PRINT "HOLED
FOR AN ALBATROSS"
550 PAUSE 50
560 POKE 16437,255
570 LET A=A+1
580 RETURN
600 CLS
610 PRINT "SCORE FOR THE COURSE
";T
615 PRINT
620 PRINT "PAR FOR THIS COURSE
";M
625 PRINT
626 PRINT
700 IF T<=M THEN PRINT "SEE YOU
AT GLENEAGLES NEXT YEAR"
710 IF (T-M)<=10 THEN PRINT "KE
EP PRACTISING"
720 IF (T-M)>10 THEN PRINT "SEL
L YOUR CLUBS"
730 STOP
800 IF D>=200 AND D<=275 THEN L
ET P=3
810 IF D>275 AND D<=350 THEN LE
T P=4
820 IF D>350 THEN LET P=5
830 RETURN
```



MULTIPLICATION TRAIN

A GOOD, simple game for testing a variety of abilities with multiplication sums has been sent by James Hurrell, of Knutsford, Cheshire. The aim is to take a train to the end of a track by giving the correct answers to multiplication problems given at random.

The program makes good use of the random function to produce different problems and it contains alternative levels of difficulty.

To start the game, press RUN and NEWLINE; the player is asked which level of difficulty is wanted, either one or two. A problem is then shown to which the player gives an answer. If correct, a train moves along a track with a puff of smoke from its funnel.

When the train reaches the end of the track, a buffer appears with "Well done".

Alternative difficulties can be obtained by changing the lines 50 to 80.

To help with the graphics in line 100 they are, all shifted, keys R, 3, unshifted space, 8 and unshifted space; in line 110 they are 8, three spaces, and 5; and in line 120 R, E, space, R, E. In line 130 there are 14 dashes.

```
  10 LET Y=10
  20 LET X=0
  30 PRINT AT 3,0;"SKILL 1 OR 2?
"
  40 INPUT A$
  50 LET A=INT (RND*20)
  60 LET B=INT (RND*20)
  70 LET C=INT (RND*10)
  80 LET D=INT (RND*10)
  90 CLS
 100 PRINT AT Y,X;"▀▖ ▌"
 110 PRINT AT Y+1,X;"▌   ▐"
 120 PRINT AT Y+2,X;"▀▀ ▀▀"
 130 PRINT AT 13,0;"--------------
--"
 140 PRINT AT 0,0;"GET TO THE EN
D"
 150 IF A$="1" THEN PRINT AT 5,0
;A;"*";B
 160 IF A$="2" THEN PRINT AT 5,0
;C;"*";D
 170 LET H=A*B
 180 LET K=C*D
 190 INPUT Z
 200 IF A$="1" AND Z=H THEN GOTO
250
 210 IF A$="2" AND Z=K THEN GOTO
250
 220 PRINT AT 15,0;"WRONG"
 230 PAUSE 100
 240 GOTO 50
 250 PRINT AT 9,X+2;"▒▄"
 260 LET X=X+1
 270 IF X<10 THEN GOTO 300
 275 PRINT AT 12,15;"▌"
 280 PRINT AT 13,15;"▌ WELL DONE
"
 290 STOP
 300 PAUSE 150
 310 GOTO 50
```

BOMB RUN

```
   2 CLS
   3 LET A=CODE " "
   4 LET B=CODE "▒"
   5 LET C=CODE "▘ "
   6 LET D=B
   7 LET E=D+C
   8 LET F=CODE "<"
   9 GOSUB CODE "/"
  10 FOR N=0 TO CODE "*"
  11 PRINT AT E-C,N-C;""
  12 PRINT AT E,N;" "
  13 PRINT AT B,N;"▙"
  14 IF INKEY$="7" THEN LET B=B-
C
  15 IF B<D THEN PRINT AT B+C,N;
" "
  16 IF INKEY$="0" THEN LET A=C
  17 IF A=C THEN LET E=E+.43
  18 PRINT AT E,N+C;"-"
  19 IF E>CODE ":" AND E<CODE "?
" AND N=CODE "=" THEN PRINT TAB
CODE ">";"BANG"
  20 IF B<D AND A<C THEN PRINT "
SHOT DOWN"
  21 IF N=CODE "(" AND B>N-D THE
N PRINT "CRASH"
  22 NEXT N
  23 RUN
  24 PRINT AT CODE "▛",F;")";TAB
 F;"▀▀";TAB F;"▓▓"
  25 PRINT TAB CODE ";";"▒▒▒▒▒▒▒
▒"
  26 PRINT AT CODE ":",CODE "=";
"O"
  27 PRINT "▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒
▒"
  28 RETURN
```

YOUR MISSION is to fly at wave-top height and launch your bomb with the Ø key at a submarine hiding in a cave. After releasing your bomb you must climb steeply with the 7 key to avoid the cliffs above. Do not climb too soon, as there is a cliff-top radar station capable of arranging your instant destruction.

The composer of the program, Andrew Kelcey of Bewdley, Worcestershire, says that removing line 20 to 27 will enable it to be fitted into an unexpanded ZX-81. He has obviously limited the complexity of the graphics and, though pleasing, they are in our opinion capable of improvement. You might also try to devise a scoring line. Graphics notes:

13—Graphic shifted 2, graphic shifted W.
19—Inverse BANG.
20—Inverse SHOT DOWN.
21—Inverse CRASH.
24—Graphic shifted E; two graphic shifted Rs, graphic shifted E; graphic shifted 8, two graphic shifted 5s.
25—Eight graphic shifted As.
27—Twenty-five graphic shifted As.

TREASURE HUNT is a game of almost arcade quality. You are in a system of 21 underground caves filled with monsters and poisonous fungoids. The aim is to collect treasure, by running over the asterisks, and deposit it in Cave O. You cannot carry more than five bags of treasure at a time and even one will slow your progress.

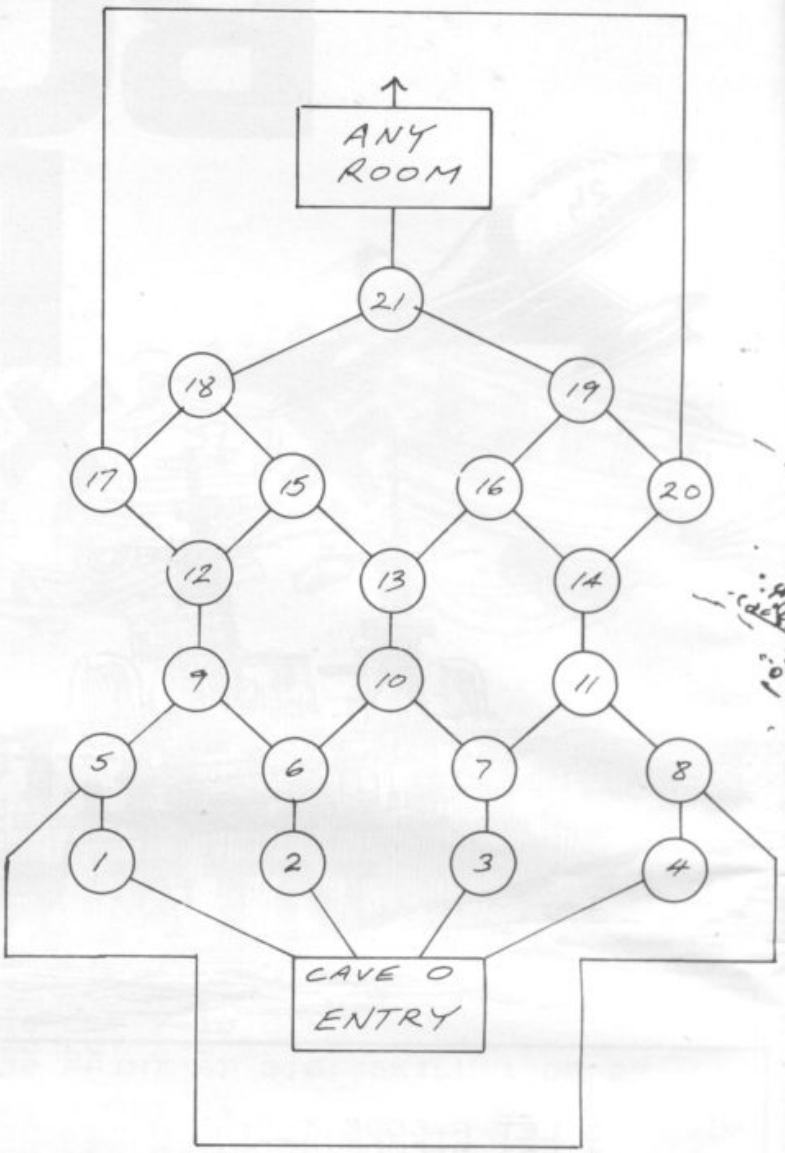
The display is of the current cave—see the illustration. You are able to move around with the cursor keys and the exits are represented by the areas of graphic A at the top and bottom of the screen. It is not possible to return to the previous cavern.

To protect yourself against monsters and to clear a path through the fungoids you can loose an arrow, with F followed by the appropriate cursor key. Remember, though, that new arrows are obtainable only in the entrance cave in exchange for captured treasure.

In Cave 21 there is a hoard of treasure guarded by a growing serpent which will attempt to seal-off exits. Shooting a hole in it is usually only a temporary measure, unless you also shoot at something else, in which case the serpent will attach itself to the other target.

The score is calculated by Monsters killed × 5; + treasure captured × 10; = arrows bought × 4. Reincarnation is granted if you score more than 50 between deaths.

A fine program, to be typed and taped, from Paul Sherwood of Hartlepool, Cleveland. 16K ZX-81.



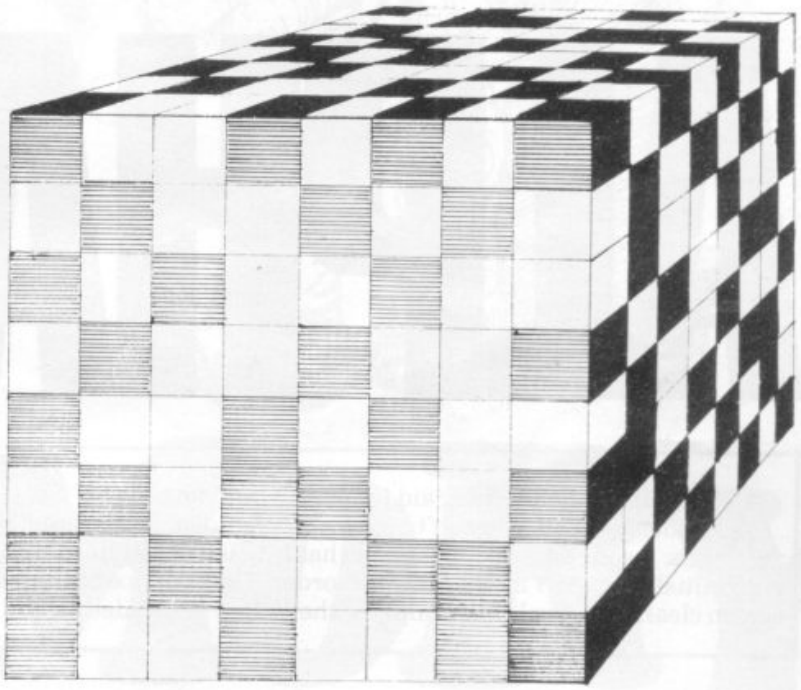

```
    5 DIM D(3,2)
    7 DIM T(20)
    8 LET Z$="YOU ARE IN THE ENTR
ANCE HALL"
   10 LET LR=0
   11 LET C$="                "
   13 LET C$=C$+"        "
   15 LET C$=C$+"                "
   20 LET ARR=5
   25 FOR I=1 TO 20
   30 LET T(I)=1
   35 NEXT I
   37 LET PS=0
   40 LET S=0
   55 LET Q=PEEK 16396+256*PEEK 1
6397+1
   60 LET TR=0
   65 RAND
   68 LET NOW=INT (RND*5000)
   70 LET B$="9BE9AF9DG9CHAHIBIJ"
   72 LET B$=B$+"CJKDEKEFLFGMGHN"
   74 LET B$=B$+"IOOJOPKPTLMRMNS"
   76 LET B$=B$+"LRTOOUPTUNOS9RS"
   80 LET R1=0
   82 LET R2=0
   84 LET R3=0
   95 GOTO 1300
  150 CLS
  160 REM CAVE PLOT
  162 RAND (PR*10+NOW)
  165 FOR I=0 TO 20
  170 LET IY=RND*16+2
  175 LET IX=RND*27+2
  180 PRINT AT IY,IX;"■";
  185 IF RND>.5 THEN PRINT AT IY-
1,IX-1;CHR$ (128+RND*2);
  190 PRINT AT IY,IX+1;"▄";
  195 PRINT AT IY+1,IX;CHR$ (128+
RND*2);
  200 IF RND>.6 THEN PRINT AT IY+
1,IX+1;CHR$ 130;
  205 PRINT AT I,0;"■";AT I,31;"■
";
  210 NEXT I
  212 PRINT AT 0,1;C$;AT 20,1;C$;
  214 PRINT AT 0,17;R1;AT 20,17;R
2;
  215 LET N=11
  220 LET M=1
  222 IF T(PR)=1 THEN PRINT AT IY
,IX+1;"*";
  224 LET T(PR)=0
  225 REM DEMON PLOT
  230 LET DEM=INT (RND*4)
  235 FOR I=1 TO DEM
  240 LET D(I,1)=INT (RND*19+1)
  245 LET D(I,2)=INT (RND*30+1)
  250 PRINT AT D(I,1),D(I,2);"M";
  255 NEXT I
  265 REM HERO RUN
  275 PRINT AT N,M;"X";
  280 IF INKEY$<>"F" THEN GOTO 30
0
  285 IF ARR=0 THEN GOTO 300
  290 LET ARR=ARR-1
  295 GOSUB 1000
  298 PRINT AT 21,0;"ARROWS:";ARR
;
  300 LET N1=N
  305 LET M1=M
  310 LET M=M+(1 AND INKEY$="8")-
(1 AND INKEY$="5")
  315 LET N=N+(1 AND INKEY$="6")-
(1 AND INKEY$="7")
  320 LET Q1=PEEK (Q+33*N+M)
  325 IF Q1>62 THEN GOTO 2000
  330 IF Q1=23 AND TR<50 THEN LET
 TR=TR+10
  335 IF Q1=8 THEN GOTO 800
```

Treasure Hunt

```
 338 IF ABS (10-N)=10 THEN GOTO
2000
 339 IF PR=21 THEN GOTO 355
 340 IF DEM=0 AND RND<.03 THEN L
ET DEM=1
 342 IF RND<.3+TR/200 THEN GOSUB
 1200
 345 PRINT AT N1,M1;" ";
 350 GOTO 265
 355 GOSUB 3000
 360 GOTO 345
 800 REM ROOM SWITCH
 805 CLS
 810 LET LR=PR
 812 IF PR<>21 THEN GOTO 815
 813 LET PR=INT (RND*19+1)
 814 GOTO 825
 815 IF N=0 THEN LET PR=R1
 820 IF N=20 THEN LET PR=R2
 822 IF PR=0 THEN GOTO 1505
 825 PRINT AT 3,2;"YOU ARE IN TH
E TUNNEL"
 830 PRINT AT 5,2;"BETWEEN ";LR;
" AND ";PR
 835 PRINT AT 8,2;"YOU HAVE ";AR
R;" ARROWS";
 840 PRINT AT 11,2;"YOUR SCORE I
S ";TR+S
 915 IF PR=21 THEN GOTO 2050
 920 LET R$=B$(PR*3-2)
 925 LET R1=CODE (R$)-37
 930 LET R$=B$(PR*3-1)
 935 LET R2=CODE (R$)-37
 940 LET R$=B$(PR*3)
 945 LET R3=CODE (R$)-37
 960 IF R1=LR THEN LET R1=R3
 965 IF R2=LR THEN LET R2=R3
 970 GOTO 150
1000 REM FIRE
1003 IF PR=21 THEN GOSUB 3000
1005 IF RND<.5 THEN GOSUB 1200
1010 LET F$=INKEY$
1015 IF F$="" OR F$="F" THEN GOT
O 1000
1020 LET Y1=N
1025 LET X1=M
1030 LET MY=0+(1 AND F$="6")-(1
AND F$="7")
1035 LET MX=0+(1 AND F$="8")-(1
AND F$="5")
1040 LET X1=X1+MX
1045 LET Y1=Y1+MY
1050 IF ABS (15-X1)=15 OR ABS (1
0-Y1)=10 THEN GOTO 1125
1053 IF PEEK (0+33*Y1+X1)<>0 THE
N GOTO 1070
1055 PRINT AT Y1,X1;"+";
1060 PRINT AT Y1,X1;" ";
1065 GOTO 1040
1070 LET DHIT=DEM
1075 FOR I=1 TO DHIT
1080 LET Y=D(I,1)
1085 LET X=D(I,2)
1090 IF X<>X1 OR Y<>Y1 THEN GOTO
 1115
1095 PRINT AT Y1,X1;"■";
1098 LET S=S+5
1100 LET D(I,1)=D(DEM,1)
1105 LET D(I,2)=D(DEM,2)
1110 LET DEM=DEM-1
1115 NEXT I
1117 IF PR=21 THEN LET FX=X1
1118 IF PR=21 THEN LET FY=Y1
1120 PRINT AT Y1,X1;" ";
1125 RETURN
1200 REM DEMON RUN
1201 FOR I=1 TO DEM
1205 LET X=D(I,2)
```

```
1210 LET Y=D(I,1)
1215 PRINT AT Y,X;" ";
1220 LET Y=Y+SGN (N-Y)
1225 LET X=X+SGN (M-X)
1235 PRINT AT Y,X;"■";
1238 IF X=M AND Y=N THEN GOTO 20
00

1240 LET D(I,1)=Y
1245 LET D(I,2)=X
1250 NEXT I
1255 RETURN
1295 REM START
1300 PRINT "    THIS IS TREASURE-
HUNT"''''''
1305 PRINT "  YOU ARE IN A NETWO
RK OF CAVES.''
1310 PRINT "YOU ARE LOOKING FOR
GOLD."'''
1315 PRINT "IF YOU ARE CAREFUL Y
OU MAY REACH"''
1320 PRINT "THE TREASURE ROOM, B
UT BEWARE:"''
1325 PRINT "THERE ARE MONSTERS W
HICH WILL"''
1330 PRINT "EAT YOU: EVEN TO TOU
CH THE ROCKS"''
1335 PRINT "MEANS INSTANT DEATH.
"''''
1340 PRINT Z$,''
1342 PRINT "CHOOSE CAVE 1,2,3 OR
 4?"''
1345 INPUT PR
1350 IF PR<1 OR PR>4 THEN GOTO 1
345
1360 LET LR=0
1500 GOTO 915
1505 PRINT Z$,''
1510 PRINT "YOUR TREASURE IS SAF
E HERE.''''
1515 PRINT "YOUR SCORE IS ";S+TR
''''
1518 PRINT TAB 0;"YOU HAVE ";ARR
;" ARROWS."''''
1520 PRINT TAB 0;"ARE YOU GOING
BACK IN?''''
1525 INPUT F$
1530 IF F$="NO" THEN PRINT "YOU
SCORED ";S+TR
1535 IF F$="NO" THEN STOP
1540 LET S=S+TR
1545 LET TR=0
1550 PRINT "HOW MANY ARROWS DO Y
OU WANT?"''''
1560 PRINT "THEY ARE 4 POINTS EA
CH"''''
1570 INPUT F
1580 IF F*4>S THEN GOTO 1650
1590 LET S=S-F*4
1600 LET ARR=ARR+F
1610 GOTO 1342
1650 CLS
1655 PRINT "  YOU CANT AFFORD TH
EM"''''
1660 GOTO 1550
2000 REM DEATH OF A HERO
2005 CLS
2010 PRINT AT 5,1;"UNFORTUNATELY
 YOU HAVE PERISHED"
2015 PRINT AT 8,1;"YOU SCORED:";
S+TR
2018 PRINT
2019 PRINT
2020 IF S+TR<50+PS THEN STOP
2025 LET S=S-15
2028 LET PS=S+TR
2029 PRINT "YOU PLAYED WELL:",,,
2030 PRINT "I SHALL DEDUCT 15",,,
2031 PRINT
2032 PRINT "FOR DAMAGE TO THE BO
DY";

2033 PRINT
2034 PRINT
2035 PRINT "YOU MAY CONTINUE";
2036 FOR I=1 TO 50
2037 NEXT I
2038 CLS
2040 GOTO 1505
2045 REM TREASURE ROOM
2050 PRINT AT 0,0;
2052 CLS
2055 FOR I=-10 TO 10
2058 LET AI=ABS I
2060 PRINT TAB 0;C$( TO AI);
2065 PRINT TAB (30-AI);C$( TO AI
)
2070 NEXT I
2075 PRINT AT 0,10;C$( TO 10)
2080 PRINT AT 20,10;C$( TO 10)
2085 PRINT AT 10,0;"■";TAB 29;"■
"
2086 LET DEM=1
2087 LET OW=INT (RND*4)
2090 FOR I=1 TO OW+1
2095 PRINT AT 12+I,12+(RND*2);"*
**";
2100 NEXT I
2105 LET N=10
2106 LET MY=-1
2107 LET MX=0
2108 LET K=18
2109 LET J=7
2110 LET M=2
2111 LET FX=J
2112 LET FY=K
2115 GOTO 265
2999 REM "TRAP"
3000 IF PEEK (0+33*(K+MY)+J+MX) =
0 THEN GOTO 3015
3002 LET AD=MY
3005 IF AD=0 THEN LET MY=MX
3006 IF AD=0 THEN LET MX=0
3007 IF AD<>0 THEN LET MY=0
3008 IF AD<>0 THEN LET MX=0-AD
3015 LET J=J+MX
3020 LET K=K+MY
3025 PRINT AT K,J;"▚";
3030 IF RND>.5 THEN PRINT AT FY,
FX;"▚"
3032 IF RND<.25 THEN GOSUB 1200
3035 RETURN
```

GRAPHIC GENERATOR



TO EASE the problem of generating graphics on the Spectrum, Mark Bateman of Wolverhampton, worked out this program.

When run it displays a square measuring eight by eight. The program is user-friendly, giving full instructions to obtain the necessary design.

On finishing, the design it is printed in the top right-hand corner of the screen.

```
  1 REM GRAPHIC GENERATOR
  2 REM © Mark Bateman
 10 BORDER 4: PAPER 7: INK 0: C
LS
 20 PRINT AT 1,0;"USER DEFINED
GRAPHICS GENERATOR": INK 2;"
 30 PRINT AT 4,3;"You are only
allowed to define characters on
the letters a to u."
 40 INPUT "Which letter do you
want to use ";n$
 50 IF n$<"a" OR n$>"u" OR LEN
n$>1 THEN PRINT AT 3,0; FLASH 1;
"Error in input": GO TO 40
 60 CLS : PRINT AT 5,11;"123456
78"
 70 FOR x=1 TO 8
 80 PRINT AT 5+x,10;x
 90 FOR y=1 TO 8
100 PRINT AT 5+x,10+y; INK 6;"■
"
110 NEXT y
120 POKE USR n$+x-1,0
130 NEXT x
140 PRINT AT 15,1;"When a squar
e flashes hit 0 to  leave a spac
e. Hit any other"'" key to block
 in."'"      Enter 0  when charac
ter is  finished."
150 INPUT "Which row do you wis
h to work on";r$
160 IF r$<"0" OR r$>"8" OR LEN
r$>1 THEN INPUT "Input must be a
n integer between 0 and 8.";r$:
GO TO 160
170 LET r=VAL r$
180 IF r=0 THEN PAPER 7: PRINT
AT 2,1;" Finished character is
   ";CHR$ (CODE n$+47): GO TO 32
0
200 LET s=0
210 FOR y=1 TO 8
220 PRINT AT 5+r,10+y; FLASH 1;
PAPER 6;"■"
230 PAUSE 0
240 IF INKEY$="0" THEN PRINT AT
5+r,10+y; PAPER 6;" ": GO TO 29
0
250 PRINT AT 5+r,10+y; PAPER 6;
"■"
260 LET s=s+2↑(8-y)
290 NEXT y
300 POKE USR n$+r-1,s
310 GO TO 150
320 INPUT "To amend this charac
ter,input 0 otherwise any other
key.";d$
330 IF d$="0" THEN PRINT AT 2,1
;"Unamended": GO TO 150
340 INPUT "   Do you want to de
fine another character? (y or n)
";a$
345 IF a$="y" THEN GO TO 10
350 IF a$<>"n" THEN INPUT "Answ
er must be y or n";a$: GO TO 345
```

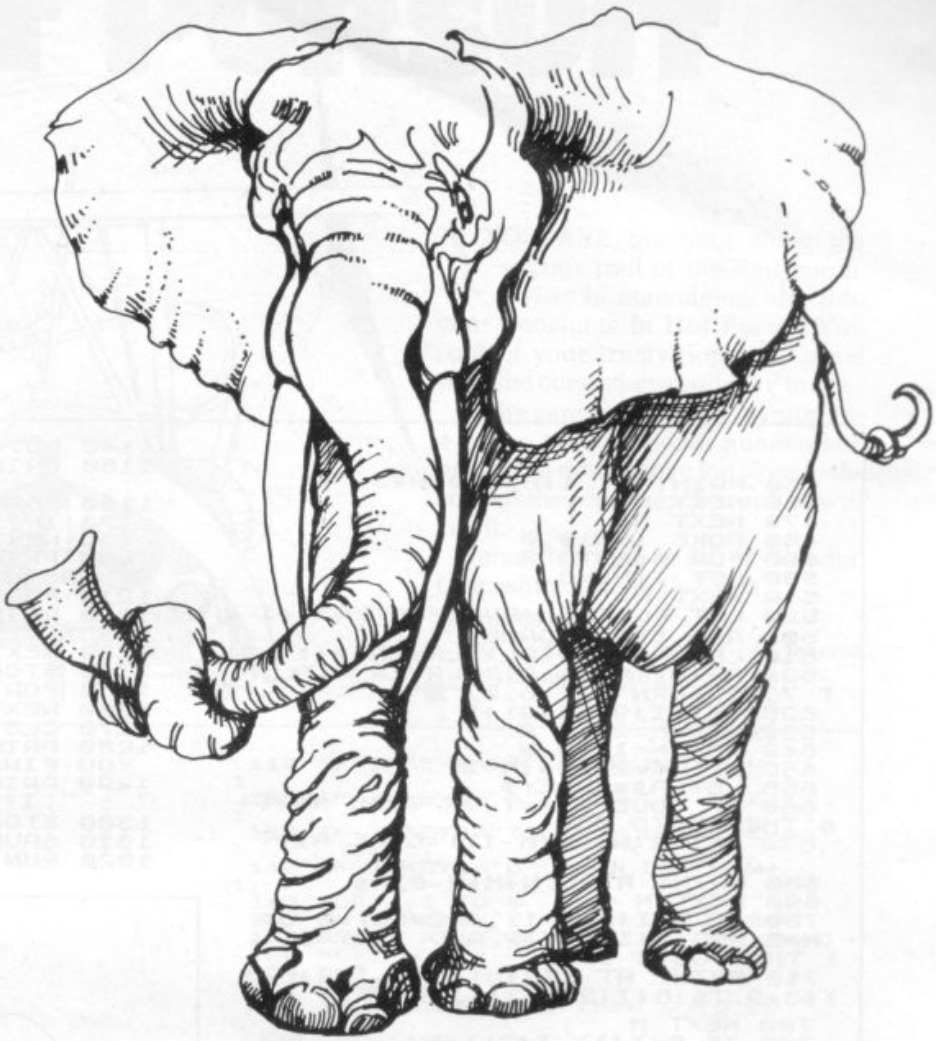
ALPHABET

ALPHABET is a teaching aid for students—so if you can't read this, read on. The program runs initially in FAST mode, then the screen clears and displays the alphabet in random order.

The student has a laser base and has to blast the letters in their correct order. The distance of the laser from the letters is decided by the level of difficulty selected and the laser is moved with the usual keys 5 and 8.

The program was sent by P Styles of Rotherham. It runs on an expanded ZX-81

```
    1 REM **A L P H A B E T**
    2 REM **P. STYLES  1982**
    3 CLS
    5 LET A=CODE "="
    7 LET B=CODE "▌"
    8 FAST
    9 LET R=38
   30 DIM C$(26)
   32 FOR Q=1 TO 26
   34 LET D$="ABCDEFGHIJKLMNOPQRS
TUVWXYZ"
   35 LET V=INT (RND*26)+1
   42 LET C$(Q)=D$(V)
   45 FOR W=1 TO Q-1
   48 IF C$(Q)=C$(W) THEN GOTO 34
   52 NEXT W
   53 NEXT Q
   54 SLOW
   55 FOR Z=1 TO 26
   56 PRINT AT 0,1+Z;C$(Z);
   57 NEXT Z
   58 PRINT AT 15,0;"ENTER LEVEL
1-19 (1=HARDEST)"
   59 INPUT M
   60 LET A=A-M
   61 PRINT AT 15,0;"
                    "
  100 LET A$="  ▄▀▄  "
  110 PRINT AT A,B;A$
  120 IF INKEY$="5" AND B>0 THEN
 LET B=B-PI/PI
  130 IF INKEY$="8" AND B<27 THEN
 LET B=B+PI/PI
  140 IF INKEY$="0" THEN GOTO 200
  150 GOTO 110
  200 FOR T=19-M TO 0 STEP -1
  210 PRINT AT T,B+2;"*"
  220 PRINT AT T,B+2;" "
  230 NEXT T
  232 LET Y=B+1
  233 IF C$(Y)<>CHR$ R THEN GOTO
400
  235 LET R=R+1
  250 PRINT AT 21,0;TAB Y;CHR$ (R
-1)
  260 IF R=64 THEN GOTO 320
  310 GOTO 110
  320 IF M>=5 THEN PRINT AT 15,0;
"NOW TRY IT AT A HARDER LEVEL"
  325 LET M=M-4
  330 FOR Q=21 TO 1 STEP -5
  340 FOR J=1 TO 26
  350 PRINT AT Q,J;C$(J)
  355 PRINT AT Q,J;" "
  360 NEXT J
  370 NEXT Q
  386 RUN
  387 LET B=CODE "  "
  400 PRINT AT 19,0;"YOU MISSED T
HE ";CHR$ (R);" YOU GOT ";R-38
  410 PRINT AT 21,0;"PRESS NEWLIN
E TO START AGAIN"
  420 IF INKEY$<>CHR$ 118 THEN GO
TO 420
  425 CLS
  430 LET A=CODE "="
  440 LET B=CODE "▌"
  450 GOTO 55
```



MEMORY

WE HAVE had total recall since we started playing **Memory.** It is a memory-testing routine for the 16K ZX-81 which invites you to try to recollect the positions of various symbols in a six by six grid.

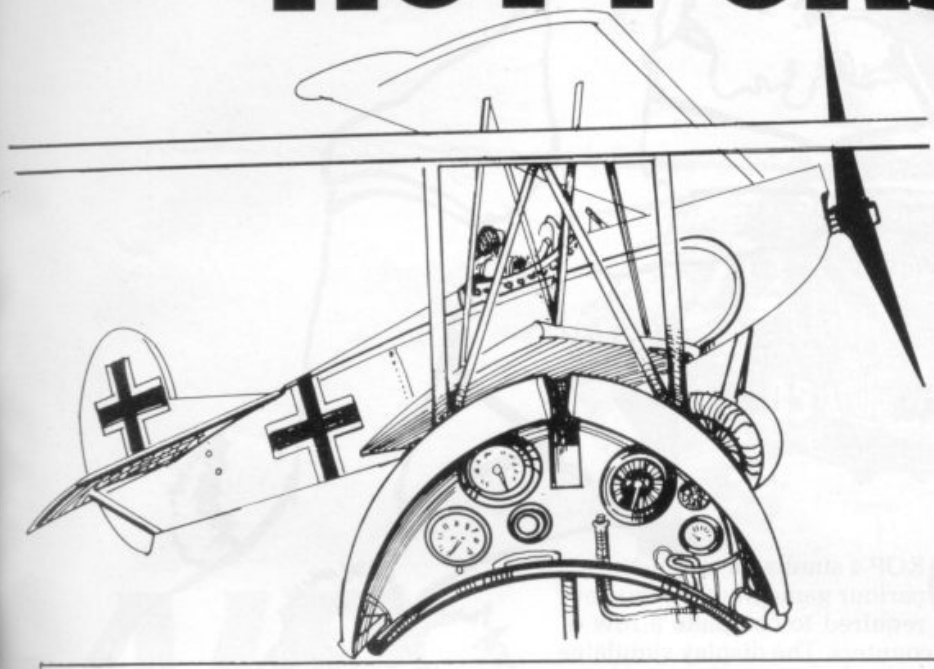
The program first displays the grid and the 36 characters enclosed in it. You have very few seconds in which to absorb the display and are then required to input the positions of matching pairs of the symbols. Up to four players can compete and a running score is kept of your successes.

Submitted by Jack Anderson, of Svenstrup, Denmark.

```
  30 DIM B(6,6)
  40 DIM I(18)
  50 DIM T$(18)
  60 PRINT "
  65 PRINT
  70 PRINT "THE IDEA OF THIS GAM
E IS TO"
  80 PRINT "IMPROVE YOUR MEMORY.
"
  90 PRINT "IN AN ATTEMPT TO FIN
D MATCHING"
 100 PRINT "PAIRS OF CHARACTERS,
 YOU ""TURN"""
 110 PRINT "TWO PIECES. IF THE T
WO PIECES"
 120 PRINT "MATCH, THEY ARE YOUR
S TO KEEP,"
 130 PRINT "AND YOU HAVE ANOTHER
 ""TURN"".."
 140 PRINT "OTHERWISE, THE NEXT
PLAYER HAS AGO."
 150 LET T$="$+=*?£/:0()"
 160 FOR N=1 TO 6
 170 FOR M=1 TO 6
 180 LET S=INT (RND*18+1)
 190 IF I(S)=2  THEN GOTO 180
 200 LET I(S)=I(S)+1
 210 LET B(N,M)=S
 220 NEXT M
 230 NEXT N
 240 PRINT '''''''"INPUT NUMBER
OF PLAYERS (MAX 4)"
 250 LET A$=INKEY$
 260 IF CODE A$<29 OR CODE A$>32
THEN GOTO 250
 270 LET PLAYERS=VAL A$
 280 CLS
 290 PRINT '''''
 300 PRINT "
 310 FOR N=1 TO 6
 320 PRINT "
 330 PRINT "          ";CHR$ (N+
156);"  ";CHR$ (
N+156)
 340 PRINT "
 350 NEXT N
 360 PRINT "
 370 FOR N=1 TO 6
 380 FOR M=1 TO 6
 390 PRINT AT 1+M*3,9+N*3;T$(B(N
,M))
 400 NEXT M
 410 NEXT N
 420 PAUSE 100
 430 FOR N=1  TO 6
 440 FOR M=1 TO 6
```

```
 450 PRINT AT 1+M*3,9+N*3;" "
 460 NEXT M
 470 NEXT N
 480 POKE 16418,0
 490 FOR N=1 TO 9
 500 LET I(N)=0
 510 NEXT N
 520 LET PL=INT (RND*PLAYERS)+1
 600 REM START GAME
 610 LET PL=PL+(PL>PLAYERS)*PLAYERS
 620 PRINT AT 4,0;"PLAYER ";PL;AT 7,0;"TURN";AT 8,0;"■"
 625 LET I(9)=I(9)+1
 630 FOR M=1 TO 2
 640 FOR N=1 TO 2
 650 LET T=28+9*(N=1)
 655 LET A$=INKEY$
 660 IF CODE A$<=T OR CODE A$>T+5 THEN GOTO 655
 670 LET I(N+2*(M-1))=CODE A$-T

 680 PRINT AT 8,N+M*2-2;A$
 690 NEXT N
 700 IF B(I(2*M-1),I(2*M))=0 OR (M=2 AND I(1)=I(3) AND I(2)=I(4)) THEN GOTO 950
 710 PRINT AT I(2*M)*3+1,I(2*M+1)*3+9;T$(B(I(2*M-1),I(2*M)))

 720 NEXT M
 730 IF B(I(1),I(2))=B(I(3),I(4)) THEN GOTO 800
 740 PRINT AT 10,0;"YOU MISSED";AT 11,0;"IT.....";AT 23,20;"HIT ANY KEY"
 750 IF INKEY$="" THEN GOTO 750
 760 PRINT AT 8,0;"      ";AT 10,0;"      ";AT 11,0;"      ";AT 23,20;"      ";AT I(2)*3+1,I(1)*3+9;" ";AT I(4)*3+1,I(3)*3+9;" "
 770 GOTO 600
 800 PRINT AT 10,0;"YOU GOT";AT 11,0;"IT.....";AT I(2)*3+1,I(1)*3+9;PL;AT I(4)*3+1,I(3)*3+9;PL
 810 LET B(I(1),I(2))=0
 820 LET B(I(3),I(4))=0
 830 LET I(4+PL)=I(4+PL)+1
 840 LET M=0
 850 FOR N=1 TO PLAYERS
 860 LET M=M+I(N+4)
 870 NEXT N
 880 IF M=18 THEN GOTO 1000
 890 PRINT AT 23,20;"HIT ANY KEY"
 900 IF INKEY$="" THEN GOTO 900
 910 PRINT AT 8,0;"      ";AT 10,0;"      ";AT 11,0;"      ";AT 23,20;"      "
 920 GOTO 620
 950 PRINT AT 8,2*M-1;"  "
 960 GOTO 640
1000 PRINT AT 12,0;"END OF";AT 13,0;"GAME....."
1005 IF PLAYERS=1 THEN GOTO 1250
1010 LET M=5
1020 FOR N=5 TO PLAYERS+4
1030 IF I(N)>I(M) THEN LET M=N
1040 NEXT N
1050 FOR N=5 TO PLAYERS+4
1060 IF I(N)=I(M) THEN LET I(N-4)=0
1065 NEXT N
1070 LET M=0
1080 FOR N=1 TO PLAYERS
1090 LET M=M+(I(N)=0)
1100 IF I(N)=0 THEN LET WIN=N
1105 NEXT N
1110 CLS
1120 IF M>1 THEN GOTO 1150
1130 PRINT "PLAYER ";WIN;" WINS."
1140 GOTO 1200
1150 PRINT "DRAW BETWEEN PLAYERS ";
1160 FOR N=1 TO PLAYERS
1170 IF I(N)=0 THEN PRINT N;" ";
1180 NEXT N
1200 PRINT AT 5,0;I(9);" ""TURNS"" WAS USED."
1210 FOR N=1 TO PLAYERS
1220 PRINT AT 6+N,0;"PLAYER ";N;" GOT ";I(N+4)
1230 NEXT N
1240 STOP
1250 FOR N=1 TO 20
1260 NEXT N
1270 CLS
1280 PRINT AT 3,3;"CONGRATULATIONS, YOU FINALLY MADE IT..."
1290 PRINT AT 5,3;"NUMBER OF ""TURNS"" : ";I(9)
1300 STOP
1310 SAVE "MEMOR■"
1320 RUN
```

HOT PURSUIT



YOU ARE bumping along the vapour trail of the Red Baron, trying to manouevre him into your gunsights in **Hot Pursuit.** You control your trusty Sopwith Camel with the cursor keys and hit P to fire.

If the game is too difficult alter the 4 in line 143 to a higher number and be careful not to move too close to the edge of the screen or the routine will crash.

Submitted by S Wild, of Oldham, Lancashire, for the 1k ZX-81.

Graphics notes:

300 – Graphic shifted A inverse asterisk, graphic shifted A.

```
  5 LET A$="▗▄▖"
 10 LET X=14
 20 LET Y=11
 25 LET B$="-+-"
 30 LET Z=5
 35 LET W=5
 40 LET E=0
 50 LET P=INT (RND*4)
 55 LET E=E+1
 57 IF X>23 THEN GOTO 70
 60 IF P=0 THEN LET X=X+1
 65 IF X<4 THEN GOTO 80
 70 IF P=1 THEN LET X=X-1
 75 IF Y>18 THEN GOTO 90
 80 IF P=2 THEN LET Y=Y+1
 85 IF Y<3 THEN GOTO 100
 90 IF P=3 THEN LET Y=Y-1
100 PRINT AT Y,X;A$
110 IF INKEY$="5" THEN LET W=W-
1
120 IF INKEY$="6" THEN LET Z=Z+
1
130 IF INKEY$="7" THEN LET Z=Z-
1
140 IF INKEY$="8" THEN LET W=W+
1
143 FOR J=1 TO 4
145 IF INKEY$="P" THEN GOTO 250
150 PRINT AT Z,W;B$
160 NEXT J
185 CLS
190 GOTO 50
250 IF Y=Z AND X=W THEN GOTO 30
0
260 GOTO 150
300 PRINT AT Y,X;"▗▄▖"
310 PRINT E
```

FRUIT GUARD

FRUIT GUARD is a game for the 1K ZX-81, submitted by C Regaud of London SW7. The object is for you (graphic shifted M) to fetch the fruit (graphic shifted U) and take it home (inverse H) by evading the monster (graphic shifted P).

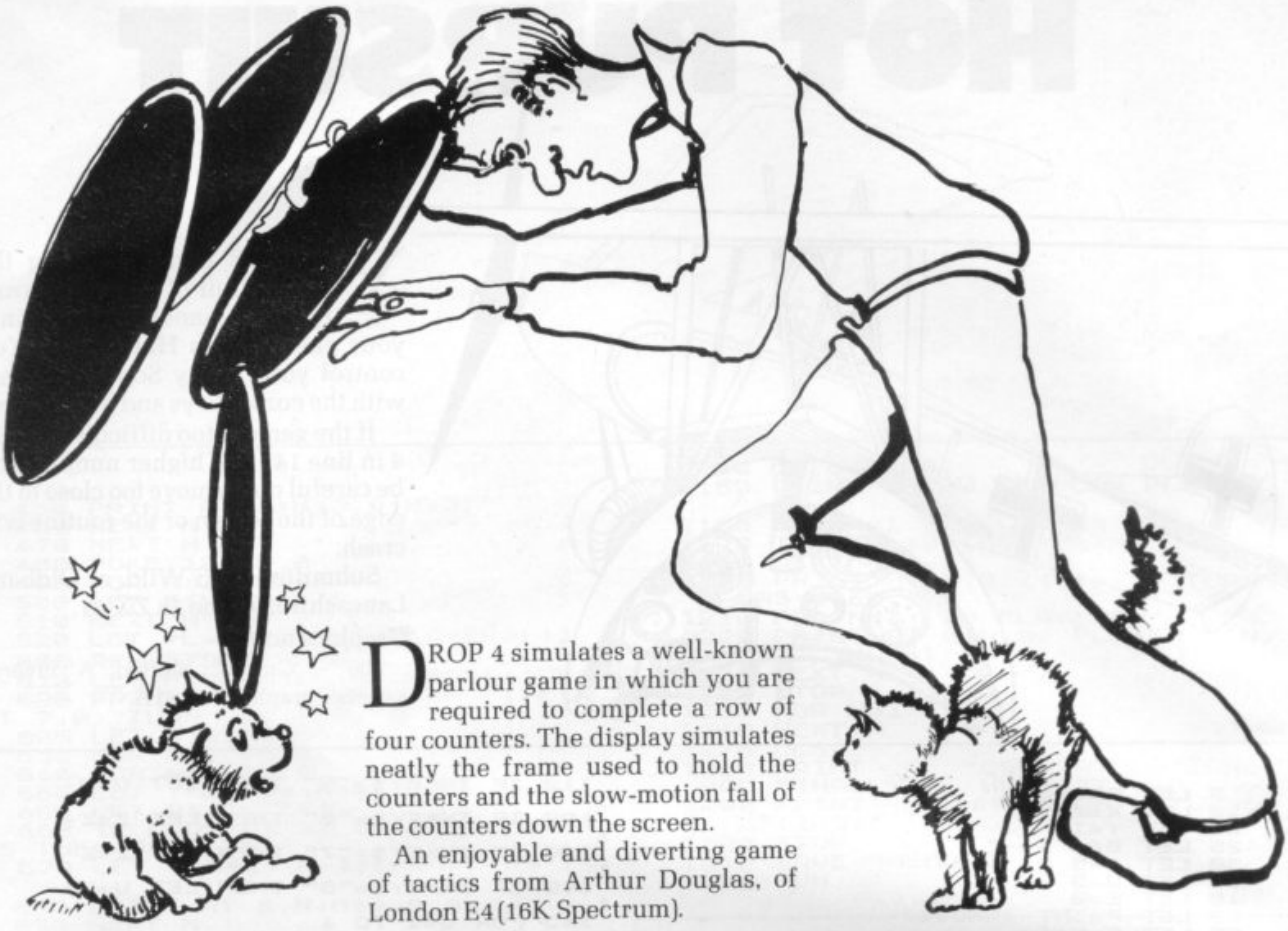
The best way to make sure you are munching instead of being munched is to keep to the sides, since you can use them to cross the screen but the monster cannot. It is fun but perhaps a little too easy.

Graphics notes:

60 – Graphic shifted U

70 – Graphic shifted M, graphic shifted P, inverse H.

```
  10 LET S=0
  20 LET A=12
  30 LET B=20
  40 LET C=7
  50 LET D=3
  60 LET A$="▒"
  70 PRINT AT A,B;"▒";AT C,D;"▒"
;AT 12,20;"▒";AT 7,8;A$
  80 LET A=A+(INKEY$="6")-(INKEY
$="7")
  90 LET B=B+(INKEY$="8")-(INKEY
$="5")
 100 LET C=C+(A>C)-(A<C)
 110 LET D=D+(B>D)-(B<D)
 120 IF A=0 THEN LET A=20
 130 IF A=21 THEN LET A=1
 140 IF B=0 THEN LET B=30
 150 IF B=31 THEN LET B=1
 160 CLS
 170 IF A=12 AND B=20 AND A$=""
THEN GOTO 210
 180 IF A=C AND B=D THEN PRINT A
T A,B;"MUNCH";AT 0,0;S;X
 190 IF A=7 AND B=8 THEN LET A$=
""
 200 GOTO 70
 210 LET S=S+1
 220 GOTO 60
```



DROP 4 simulates a well-known parlour game in which you are required to complete a row of four counters. The display simulates neatly the frame used to hold the counters and the slow-motion fall of the counters down the screen.

An enjoyable and diverting game of tactics from Arthur Douglas, of London E4 (16K Spectrum).

DROP 4

```
 100 LET X=1: LET I$="XXX": INK
0: PAPER 7: CLS : DIM A(12,13)
 110 LET S$=CHR$ 144+CHR$ 145+CH
R$ 146
 120 LET T$=CHR$ 147+CHR$ 95+CHR
$ 148
 130 LET U$="                    "
 140 DATA 0,127,127,127,127,127,
127,127
 150 DATA 0,255,255,255,255,255,
255,255
 160 DATA 0,254,254,254,254,254,
254,254
 170 DATA 128,128,128,128,128,12
8,128,255
 180 DATA 1,1,1,1,1,1,1,255
 190 FOR J=144 TO 148: FOR K=0 T
O 7
 200 READ A: POKE USR CHR$ J+K,A
 210 NEXT K: NEXT J
 220 FOR J=2 TO 17 STEP 3
 230 FOR K=2 TO 26 STEP 4
 240 PRINT INK 6; PAPER 0;AT J,K
;S$
 250 PRINT PAPER 6;AT J+1,K;T$
 260 NEXT K: NEXT J
 270 PRINT INK 3;AT 0,3;"1   2
   3   4   5   6   7"
 280 PRINT INK 7; PAPER X;AT 20,
11;"PLAYER ";X
 290 INPUT "WHICH COLUMN [ 1 TO
7 ] ";A
 300 IF A<>INT A OR A>7 OR A<=0
THEN GO TO 290
 310 LET C=(A-1)*4+2
 320 IF ATTR (2,C)<>6 THEN PRINT
 FLASH 1;AT 21,7;"COLUMN ";A;" I
S FULL": GO TO 290
 330 PRINT AT 21,7;U$
 340 FOR J=0 TO 18
 350 LET Z=ATTR (J,C)
 360 PRINT AT J,C; PAPER X; INK
7;I$
 370 IF J=2 THEN PRINT INK 3;AT
J-2,C;CHR$ 32;A;CHR$ 32
 380 IF J>2 AND Z=6 THEN PRINT P
APER 6;AT J-2,C;T$
 390 IF J>2 AND Z=48 THEN PRINT
AT J-2,C;"  "
 400 IF J>2 AND Z=56 THEN PRINT
INK 6; PAPER 0;AT J-2,C;S$
 410 IF J=18 OR ATTR (J+2,C)=23
OR ATTR (J+2,C)=15 THEN BEEP 0.1
,-20: GO TO 440
 420 IF Z=48 THEN FOR P=1 TO 4:
BEEP 0.05,(20-2*J)+P: NEXT P
 430 NEXT J
 440 LET L=J/3+3: LET C=A+3
 450 LET A(L,C)=X
 460 FOR J=-3 TO 0
 470 IF A(L+J,C)=X AND A(L+J+1,C
)=X AND A(L+J+2,C)=X AND A(L+J+3
,C)=X THEN GO TO 550
 480 IF A(L,C+J)=X AND A(L,C+J+1
)=X AND A(L,C+J+2)=X AND A(L,C+J
+3)=X THEN GO TO 550
 490 IF A(L+J,C+J)=X AND A(L+J+1
,C+J+1)=X AND A(L+J+2,C+J+2)=X A
ND A(L+J+3,C+J+3)=X THEN GO TO 5
50
 500 IF A(L-J,C+J)=X AND A((L-J)
-1,C+J+1)=X AND A((L-J)-2,C+J+2)
=X AND A((L-J)-3,C+J+3)=X THEN G
O TO 550
 510 NEXT J
 520 LET I$="000": IF X=2 THEN L
ET I$="XXX"
 530 LET X=X+1: IF X=3 THEN LET
X=1
 540 GO TO 280
 550 PRINT OVER 1; FLASH 1;AT 20
,11;U$( TO 8)
 560 PRINT AT 20,9; FLASH 1; INK
X;"PLAYER ";(X);" WINS"
 570 INPUT "ANOTHER GAME ";A$: I
F A$(1)<>"y" THEN STOP
 580 PRINT AT 20,9;"
": GO TO 220
 590 PRINT AT 21,0;U$;AT 21,16;U
$
 600 DIM a(12,13): GO TO 220
9999 SAVE "drop four"
```

AIR SEA RESCUE

```
  10 LET L=VAL "10"
  20 LET C=VAL "20"
  30 LET A$=""
  40 FOR T=VAL "0" TO VAL "60"
  50 CLS
  55 LET D=INT (RND*4)+12
  60 PRINT AT 18,5;"------------
----";AT L-1,C-1;"--+--";AT L,C;
"▓▓▓▓*";AT L+1,C+1;"J";AT L+2,C+
1;A$
  70 IF A$="" THEN PRINT AT 18,D
;"O"
  90 IF INKEY$="7" AND L=VAL "16
" AND C=D-1 THEN LET A$="0"
 100 IF A$="0" AND L=VAL "9" THE
N GOTO 180
 110 IF L=VAL "18" THEN GOTO 160
 120 LET C=C+(INKEY$="8")-(INKEY
$="5")
 130 LET L=L+(INKEY$="6")-(INKEY
$="7")
 140 NEXT T
 150 PRINT "OUT OF FUEL"
 160 PRINT "CRASH"
 170 STOP
 180 PRINT "SAVED:";T
```

THE OBJECT of **Air Sea Rescue** is to rescue a sailor bobbing around below your helicopter. You must hook him to safety before you run out of fuel. You steer the whirly-bird with the usual cursor keys and you will crash if you get too close to the water.

A time is given for completing the rescue. Andrew Blackburn of North Hykeham, Lincoln, who submitted the program, reports his fastest time as 15. We did not manage anything better than 30. (1K ZX-81). Graphic notes:

60—Graphic F, inverse space, two graphics 7s.

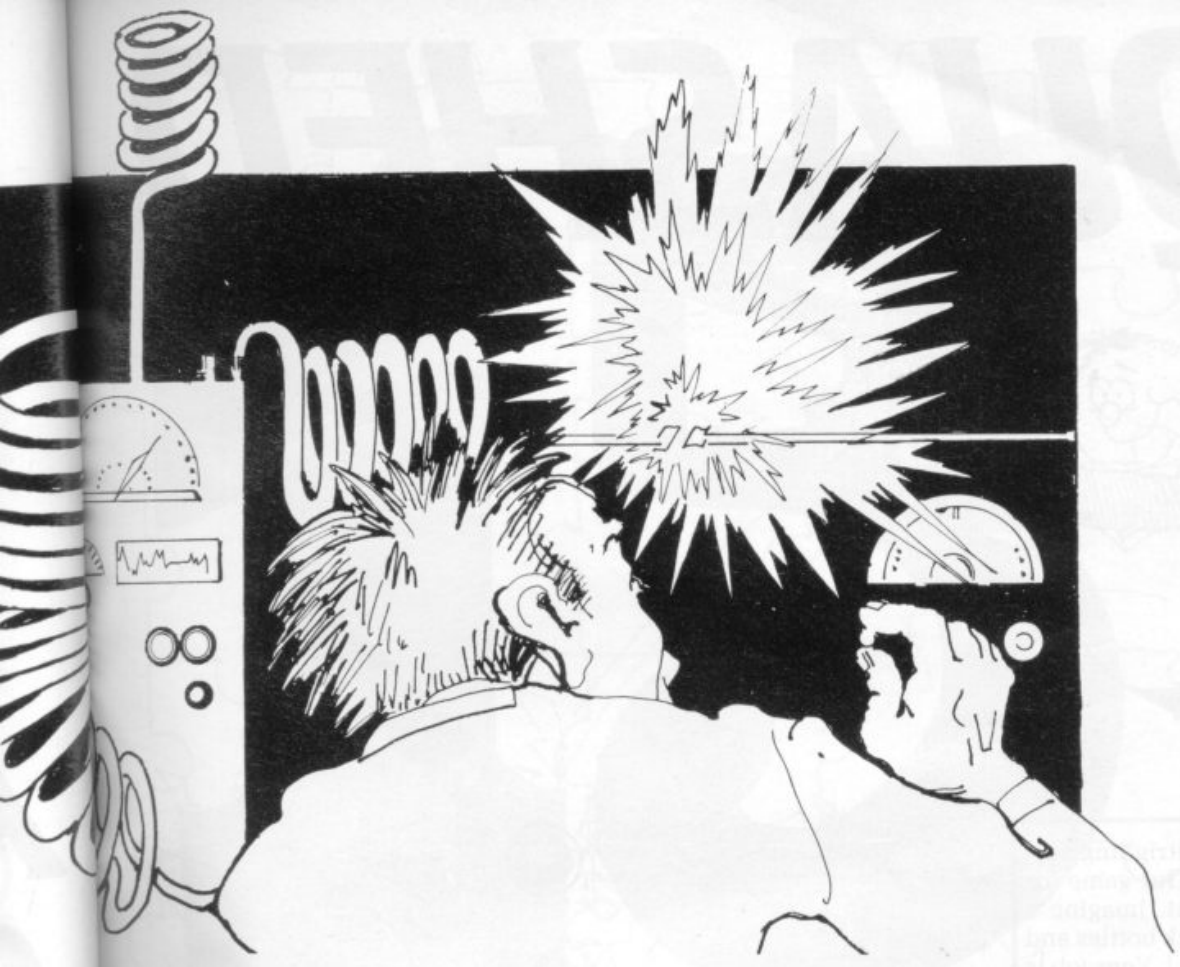
DO YOU teach physics or study it? **Physics** is a program for the 16K ZX-81 which tests you on some of the calculations necessary in basic electrical physics.

There are four topics in the listings but two of them are divided into subsections giving a total of seven types of problem. After each question you are told whether you are correct, incorrect or close enough and your score is displayed at the end of every section.

As each new topic is introduced every 1,000 lines, new sections could easily be included by changing the 5 in line 110 and by moving lines 4225-4270 to the end of the last topic.

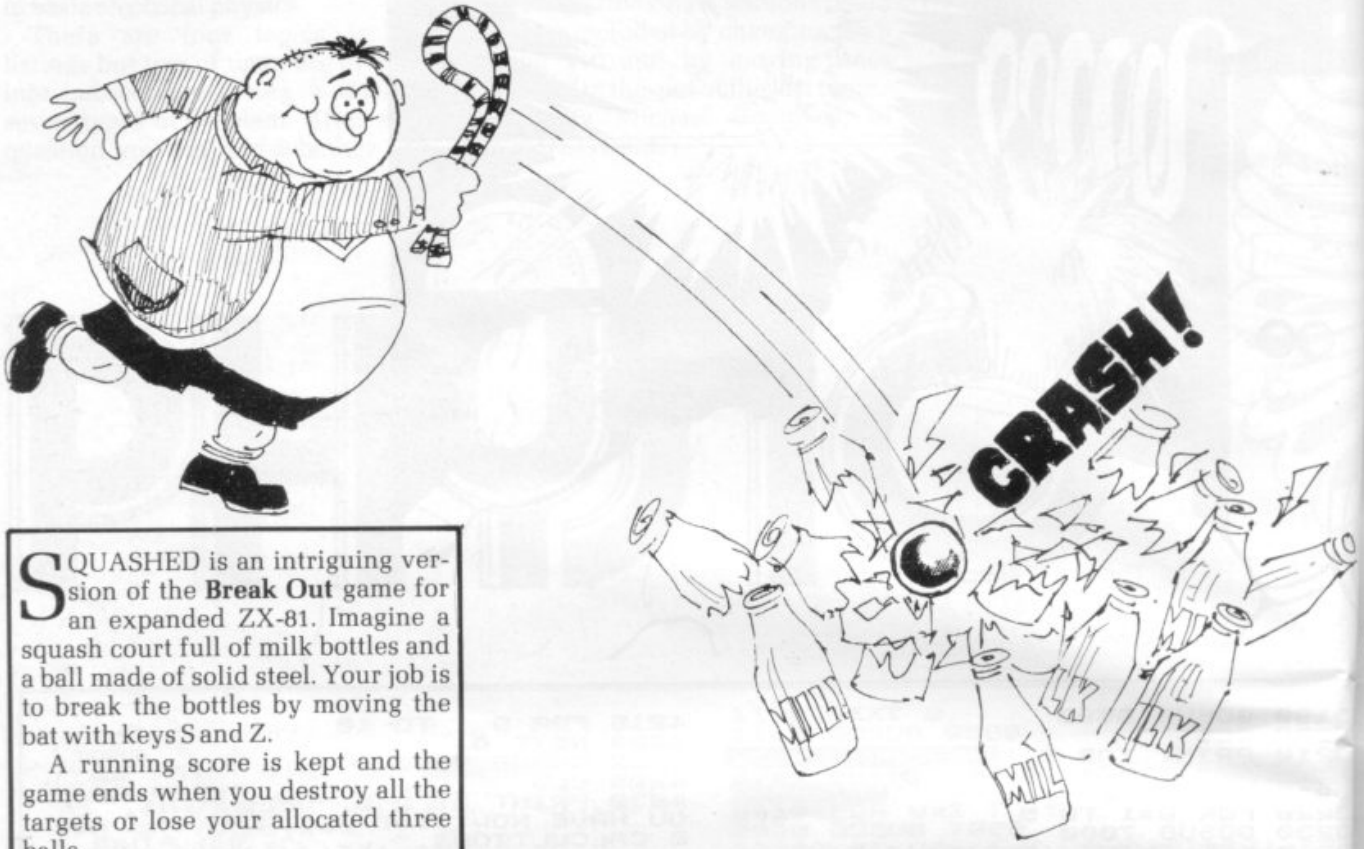
Sent by Michael Coombes, of Newport, Gwent.


```
  10 REM "PHYSICS"-M.COOMBES,AUG
.1982
  20 PRINT TAB 12;"PHYSICS"
  30 PRINT '''''"HELLO,WELCOME
TO ""PHYSICS"";AT 6,0;"PLEASE T
YPE IN YOUR NAME"
  40 INPUT N$
  50 PRINT '''''"WELL,";N$;",TH
E AIM OF THIS";TAB 0;"PROGRAM IS
 TO TEST YOU ON SOME  OF THE CAL
CULATIONS THAT YOU","WILL NEED T
O DO WHEN STUDYING","ELECTRICITY
."
  60 PRINT ,,"THE TOPICS ARE:",,
"CALCULATION OF TOTAL RESISTANCE
 COSTING OF ELECTRICITY","OHMS L
AW",,"POWER"
  70 POKE 16418,0
  80 PRINT AT 23,0;"PRESS NEWLIN
E"
  85 POKE 16418,2
  90 IF INKEY$="" THEN GOTO 90
 100 CLS
 105 LET TSC=0
 110 FOR F=1 TO 5
 115 LET SC=0
 117 CLS
 120 PRINT "TOPIC NUMBER ";F,,"
"''''
 130 GOSUB (F*1000)
 140 NEXT F
1000 PRINT "CALCULATION OF TOTAL
 RESISTANCE"
1015 FOR Q=1 TO 5
1017 GOSUB 7000
1020 PRINT AT 8,0;"THE FOLLOWING
 RESISTORS ARE","CONNECTED IN SE
RIES:"'''
1025 LET B=INT (RND*3)+2
1027 DIM O(B)
1028 LET ANS=0
1030 FOR G=1 TO B
1040 LET O(G)=INT (RND*5)+1
1045 LET ANS=ANS+O(G)
1050 NEXT G
1060 FOR G=1 TO B
1070 PRINT "   ";O(G);" OHMS"
1080 NEXT G
1090 PRINT '''"WHAT IS THE TOTA
L RESISTANCE?"
1100 INPUT T
1120 GOSUB 8000
1130 NEXT Q
1140 GOSUB 9500
1900 RETURN
2000 PRINT TAB 4;"COSTING OF ELE
CTRICITY"
2010 FOR Q=1 TO 5
2020 GOSUB 7000
2030 LET WA=(INT (RND*9)*10)+50
2032 LET P=INT (RND*4)+2
2035 LET H=INT (RND*5)+2
2040 PRINT AT 8,0;"WHAT IS THE C
OST OF RUNNING A",WA;" WATT APPL
IANCE,FOR ";H;" HOURS","AT ";P;"
 PENCE PER UNIT?"
2045 LET ANS=(WA/1000)*H*P
2050 INPUT T
2060 GOSUB 8000
2070 NEXT Q
2080 GOSUB 9500
2090 RETURN
3000 PRINT TAB 5;"THE OHMS LAW E
QUATION"
3010 FOR Q=1 TO 5
3020 GOSUB 7000
3030 LET R=INT (RND*9)+1
3040 LET I=INT (RND*5)+1
3042 IF R=8 THEN GOTO 3030
3050 PRINT AT 8,0;"WHAT IS THE V
OLTAGE ACROSS A",R;" OHM RESIST
R WHEN A CURRENT OF";I;" AMPS F
LOWS THROUGH IT?"
3060 INPUT T
3065 LET ANS=R*I
3070 GOSUB 8000
3080 NEXT Q
3085 GOSUB 9500
3086 CLS
3087 PRINT TAB 5;"THE OHMS LAW E
QUATION";TAB 5;"(PART 2)"
3088 LET SC=0
3090 FOR Q=1 TO 5
3100 GOSUB 7000
3110 LET R=INT (RND*9)+1
3120 IF R=8 THEN GOTO 3110
3130 LET V=INT (RND*19)+1
3135 IF R>4 THEN GOTO 3110
3140 PRINT AT 8,0;"WHAT CURRENT
FLOWS THROUGH A",R;" OHM RESIST
R,WITH ";V;" VOLTS","ACROSS IT?"
3150 LET ANS=V/R
3160 INPUT T
3170 GOSUB 8000
3180 NEXT Q
```



```
3190 GOSUB 9500
3200 CLS
3210 PRINT TAB 5;"THE OHMS LAW E
QUATION";TAB 5;"(PART 3)"
3215 LET SC=0
3220 FOR Q=1 TO 5
3230 GOSUB 7000
3240 LET I=INT (RND*6)+1
3250 LET V=INT (RND*10)+10
3260 LET ANS=V/I
3270 PRINT AT 8,0;"WHAT VALUE OF
 RESISTOR GIVES A","CURRENT OF "
;I;" AMPS WHEN ";V;" VOLTS ARE A
PPLIED ACROSS IT."
3280 INPUT T
3290 GOSUB 8000
3300 NEXT Q
3310 GOSUB 9500
3320 RETURN
4000 PRINT TAB 13;"POWER"
4010 FOR Q=1 TO 5
4020 GOSUB 7000
4030 LET I=INT (RND*5)+1
4040 LET V=INT (RND*20)+2
4050 LET ANS=V*I
4060 PRINT AT 8,0;"WHAT IS THE P
OWER OF A LIGHT","BULB IF ";I;"
AMPS FLOW THROUGH IT","WHEN THER
E ARE ";V;" VOLTS","ACROSS IT?"
4070 INPUT T
4080 GOSUB 8000
4090 NEXT Q
4100 GOSUB 7000
4102 GOSUB 9500
4105 CLS
4110 PRINT TAB 13;"POWER";TAB 12
;"(PART 2)"
4115 LET SC=0
4120 FOR P=1 TO 10
4125 NEXT P
4130 GOSUB 7000
4140 LET V=240
4150 LET I=INT ((RND*10)*10)+50
4160 LET ANS=I/V
4170 PRINT AT 8,0;"WHAT CURRENT
FLOWS THROUGH A",I;" WATT APPLIA
NCE WHEN WITH A","240 VOLT SUPPL
Y?"
4180 INPUT T
4190 GOSUB 8000
4200 NEXT Q
4210 GOSUB 7000
4215 FOR Q=1 TO 10
4220 NEXT Q
4222 GOSUB 9500
4225 CLS
4230 PRINT AT 2,0;"WELL,";N$;",Y
OU HAVE NOW";TAB 0;"TRIED ALL TH
E CALCULTIONS.",,,,,"YOUR FINAL
SCORE IS ";TSC
4240 PRINT ,,,,,,"DO YOU WISH TO
 START AGAIN?"
4250 IF INKEY$="Y" THEN GOTO 100
4260 IF INKEY$="N" THEN STOP
4270 GOTO 4250
7000 FOR A=8 TO 21
7010 PRINT AT A,0;"
                                "
7020 NEXT A
7030 RETURN
8000 IF T=ANS THEN PRINT ,,,,"WE
LL DONE ";N$;",";TAB 0;"THAT IS
CORRECT."
8005 IF T<>ANS AND INT ANS=INT T
 THEN PRINT ,,,,"CLOSE ENOUGH ";
N$;TAB 0;TAB 0;"THE EXACT ANSWER
 WAS ";ANS
8010 IF T=ANS OR INT ANS=INT T T
HEN LET SC=SC+1
8015 IF INT ANS=INT T THEN GOTO
8040
8020 IF T<>ANS THEN PRINT ,,"NO
";N$;" THAT IS WRONG.","THE ANSW
ER WAS ";ANS
8040 GOSUB 9000
8050 RETURN
9000 FOR P=1 TO 20
9010 NEXT P
9020 RETURN
9500 CLS
9505 PRINT "YOUR SCORE FOR THIS
SECTION IS",SC;" OUT OF ";Q-1
9510 LET TSC=TSC+SC
9520 PRINT ,,,,,,"YOUR TOTAL SCO
RE SO FAR IS ";TSC
9530 FOR Y=1 TO 3
9540 GOSUB 9000
9550 NEXT Y
9552 FOR P=1 TO 5
9554 SCROLL
9556 NEXT P
9560 RETURN
9900 SAVE "PHYSICS"
9910 RUN
```

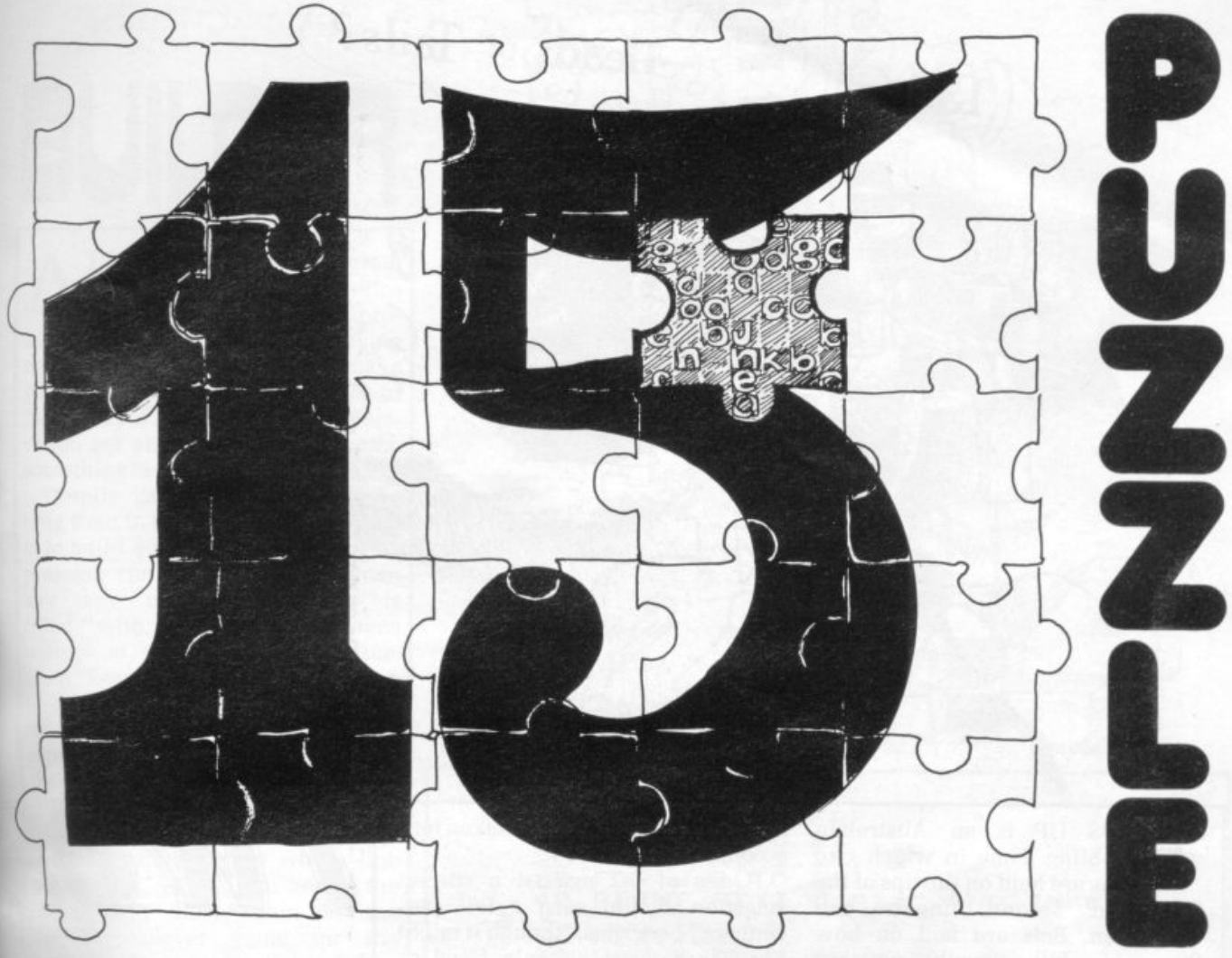
SQUASHED



SQUASHED is an intriguing version of the **Break Out** game for an expanded ZX-81. Imagine a squash court full of milk bottles and a ball made of solid steel. Your job is to break the bottles by moving the bat with keys S and Z.

A running score is kept and the game ends when you destroy all the targets or lose your allocated three balls.

```
   20 REM (C) PER GRØNBORG, 1982
   30 REM RESET HI-SCORE BY EN-
TERING "POKE 16514,0"
   40 LET BALLS=3
   45 LET HI=PEEK 16514
   50 LET BT=9
   55 LET BB=11
   75 LET Y1=SGN (RND-0.5)
   80 LET K=0
   85 LET B=0
   90 LET P=PEEK 16396+256*PEEK 1
6397+1
  100 FAST
  105 CLS
  110 FOR T=0 TO 30
  120 PRINT AT 0,T;"■"
  130 PRINT AT 20,T;"■"
  140 IF T<20 THEN PRINT AT T,0;"
■"
  150 NEXT T
  160 FOR T=2 TO 18 STEP 2
  170 FOR I=1 TO 21 STEP 2
  180 PRINT AT T,I;" ■"
  190 NEXT I
  200 NEXT T
  210 FOR T=BT TO BB
  220 PRINT AT T,31;"■"
  230 NEXT T
  240 PRINT AT 21,0;"SCORE:0    HI
-SCORE:";HI
  245 SLOW
  250 FOR T=1 TO BALLS
  260 LET X=30
  265 LET Y=9
  270 LET X1=-1
  290 PRINT AT 21,24;"BALLS:";T
  300 IF (INKEY$<>"I")+(BB=19) TH
EN GOTO 350
  310 PRINT AT BT,31;" "
  320 LET BB=BB+1
  330 LET BT=BT+1
  340 PRINT AT BB,31;"■"
  350 IF (INKEY$<>"S")+(BT=1) THE
N GOTO 400
  360 PRINT AT BB,31;" "
  370 LET BB=BB-1
  380 LET BT=BT-1
  390 PRINT AT BT,31;"■"
  405 IF X=1 THEN LET X1=1
  410 LET X=X+X1
  415 IF (Y=19)+(Y=1) THEN LET Y1
=Y1*(-1)
  420 LET Y=Y+Y1
  425 LET B1=B
  430 LET B=P+33*Y+X
  440 IF PEEK B<>133 THEN GOTO 50
0
  450 LET K=K+1
  460 LET X1=X1*-1
  470 PRINT AT 21,6;K
  500 POKE B,CODE "0"
  505 POKE B1,0
  510 IF X=1 THEN LET X1=X1*-1
  520 GOTO 600-(X=30)*70
  530 GOTO 1000-(Y<=BB)*(Y>=BT)*4
60
  540 LET X1=-1
  550 IF NOT (Y1>0)*(Y=BT)+(Y1<0)
*(Y=BB) THEN GOTO 570
  560 LET Y1=0
  565 GOTO 580
  570 IF Y1=0 THEN LET Y1=Y1+(Y=B
B)-(Y=BT)
  998 GOTO 300
 1000 PRINT AT Y,X;" "
 1010 NEXT T
 1020 PAUSE 200
 1100 IF HI>=K THEN GOTO 1200
 1110 POKE 16514,K
 1120 SCROLL
 1130 SCROLL
 1140 PRINT "CONGRATULATONS. NEW
HI-SCORE"
 1200 SCROLL
 1210 SCROLL
 1220 PRINT "DO YOU WANT TO PLAY
AGAIN (Y/N)?"
 1230 PAUSE 5E4
 1240 IF INKEY$="Y" THEN RUN
 1250 CLS
```



THE DISPLAY will show a grid of 16 squares. The grid contains the first 15 letters of the alphabet and one space. Slide the letters around in the grid, using the space, and the puzzle is solved when the letters are in their correct order.

The letters are moved with the usual cursor controls and a count is kept of the moves taken. Your task is to complete the re-arrangement in as few moves as possible. A diverting little routine, worth having on tape. Submitted by W G Davies of Hereford for the 16K Spectrum.

```
 10 REM "15 PUZZLE"
 20 REM © W G Davies 1982
 100 PRINT AT 8,11;"15 PUZZLE";A
T 20,6;"Choose your colours"
 110 LET a$="OEMKLJCGAHFDNIB "
 120 LET l=1000: DIM b$(16)
 130 LET c$="ABCDEFGHIJKLMNO "
 140 INPUT "Border ";a,"Ink ";b
 160 BORDER a: INK b: PAPER 7
 170 CLS : FOR c=80 TO 176 STEP
24
 180 PLOT c,40: DRAW 0,96: NEXT
c
 190 FOR d=40 TO 136 STEP 24: PL
OT 80,d: DRAW 96,0: NEXT d
 200 LET j=0: LET k=1: LET p=15:
LET q=20
 220 FOR n=6 TO 15 STEP 3: FOR m
=11 TO 20 STEP 3: PRINT AT n,m;a
$(k)
 230 LET k=k+1: NEXT m: NEXT n
 240 GO SUB 490
 250 LET r=p: LET s=q: IF INKEY$
="" THEN GO TO 250
 260 IF INKEY$="5" THEN LET s=q+
3: IF s>20 THEN GO TO 250
 270 IF INKEY$="8" THEN LET s=q-
3: IF s<11 THEN GO TO 250
 280 IF INKEY$="6" THEN LET r=p-
3: IF r<6 THEN GO TO 250
 290 IF INKEY$="7" THEN LET r=p+
3: IF r>15 THEN GO TO 250
 300 IF INKEY$<>"5" AND INKEY$<>
"6" AND INKEY$<>"7" AND INKEY$<>
"8" THEN GO TO 250
 310 PAPER 7: BEEP .1,0: PRINT A
T p,q;SCREEN$ (r,s);AT r,s;" "
 320 GO SUB 400: LET p=r: LET q=
s
 330 LET j=j+1: PRINT AT 3,15;j
 350 GO TO 250
 400 LET a=1: FOR n=6 TO 15 STEP
 3: FOR m=11 TO 20 STEP 3: LET b
$(a)=SCREEN$ (n,m)
 410 LET a=a+1: NEXT m: NEXT n
 420 IF b$=c$ THEN GO TO 440
 430 RETURN
 440 PRINT AT 19,12;"CORRECT": F
OR b=1 TO 16: BEEP .5,b: NEXT b
 450 PRINT AT 21,2;"Press any ke
y to play again"
 460 IF INKEY$="" THEN GO TO 460
 470 PRINT AT 21,2;"
                                "
 480 PRINT AT 19,12;"       ": G
O SUB 600: GO TO 200
 490 FOR y=1 TO 50
 500 LET r=p: LET s=q: LET x=INT
 (RND*4)+5
 510 IF x=5 THEN LET s=q+3: IF s
>20 THEN GO TO 500
 520 IF x=8 THEN LET s=q-3: IF s
<11 THEN GO TO 500
 530 IF x=6 THEN LET r=p-3: IF r
<6 THEN GO TO 500
 540 IF x=7 THEN LET r=p+3: IF r
>15 THEN GO TO 500
 550 PRINT AT p,q;SCREEN$ (r,s);
AT r,s;" "
 560 LET p=r: LET q=s: NEXT y: B
EEP .5,9: BEEP .5,5
 570 RETURN
 600 IF j<l THEN LET l=j
 610 PRINT AT 3,15;"0    ";AT 1,
6;"Best score so far:";l;"    ":
RETURN
```

TWOS UP

TWOS UP is an Australian gambling game in which two coins are held on the tips of the first and second fingers and then spun. Bets are laid on how the coins fall, usually whether odd or even.

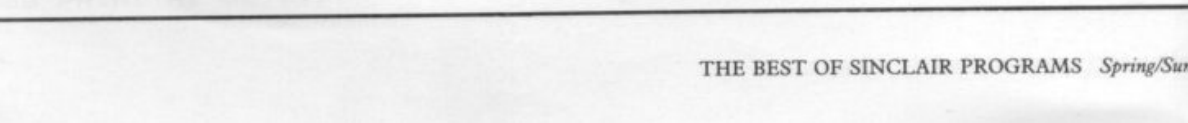
T E Newham of Worcester Park, Surrey, who submitted the program, suggests that the game has real possibilities as a fund-raiser if the four possibilities of head-tail, tail-head, head-head and tail-tail are taken into account.

"Odds of 5-2 against a correct selection should earn a fair percentage," he writes, "though it might be wise to have either a fixed or maximum stake—otherwise a sporting gent from Woolloomoolloo could arrive with a pocketful of tenners and clean out the school fund."

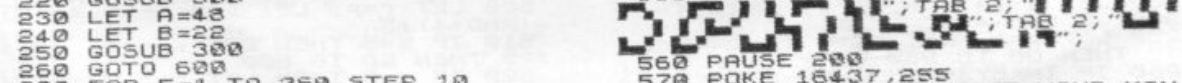
A neat game for two people with excellent graphics—16K ZX-81.

```
 10 REM "TWOS UP"
 20 REM BY T E NEWHAM
 50 GOTO 500
 60 CLS
 70 FAST
100 LET L=4
110 LET C=3
120 LET M=RND
130 IF M<.5 THEN GOSUB 400
140 IF M>=.5 THEN GOSUB 450
150 LET L=4
160 LET C=19
170 LET N=RND
180 IF N<.5 THEN GOSUB 400
190 IF N>=.5 THEN GOSUB 450
200 LET A=16
210 LET B=22
220 GOSUB 300
230 LET A=48
240 LET B=22
250 GOSUB 300
260 GOTO 600
300 FOR F=1 TO 360 STEP 10
310 LET P=F*PI/180
320 LET X=A+14*COS P
330 LET Y=B+14*SIN P
340 PLOT X,Y
350 NEXT F
360 RETURN
400 PRINT AT L,C;"
```

```
410 RETURN
450 PRINT AT L,C;"
```



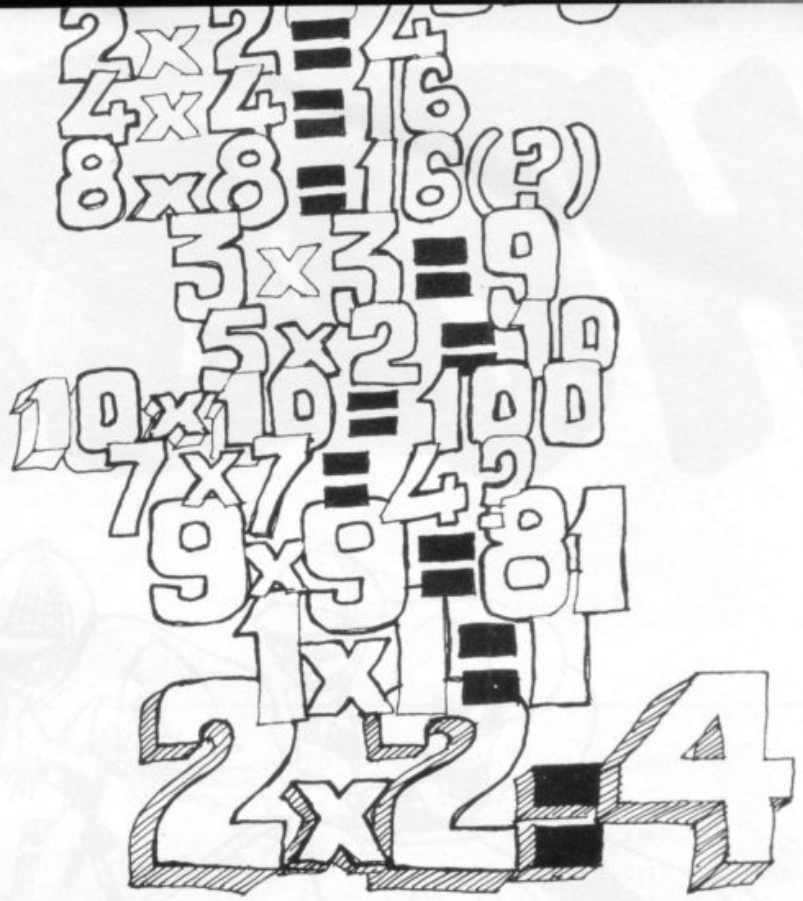
```
460 RETURN
500 SLOW
510 PRINT AT 2,6;"THIS IS ""TWO
S UP"""
520 PRINT AT 4,6;"I SPIN TWO PE
NNIES"
540 PRINT AT 6,2;"YOU BET ON WH
ETHER THEY FALL"
550 PRINT AT 9,2;"
```



```
560 PAUSE 200
570 POKE 16437,255
580 PRINT AT 16,5;"GET YOUR MON
EY ON NOW";
590 PRINT AT 17,5;"
```

```
600 SLOW
610 PAUSE 150
620 POKE 16437,255
630 PRINT AT 20,7;"PRESS ""S""
TO SPIN"
640 IF CODE INKEY$<>56 THEN GOT
O 630
650 IF INKEY$="S" THEN GOTO 60
```

BUILDER



AT LAST there is a program which takes only five minutes to key-in but which will provide you with hours of annoying enjoyment. It is also likely to make you very unpopular with the rest of the family if you are using the television set and they want to watch something else.

Despite its simplicity, it takes a long time to achieve the aim, which is to build a row of = signs. Start by pressing run and then hold down any key until the screen is filled with greater than signs with = at the end of each line. Then keep a key pressed down to move the = sign along a line to try to add it to the other = sign. Releasing the key stops the=sign.

You have one attempt at each line as you go down the screen, the inverse space showing which line you are on. When you reach the bottom you start again at the top. This clever game for the basic ZX-81 was sent by Julian Smith of Maidstone, Kent.

```
 1 GOTO 10
 2 SAVE "BUILDER"
10 FOR I=0 TO 21
20 PRINT AT I,25;"■"
30 FOR J=0 TO 23
40 PRINT AT I,J;">=" AND INKEY
$<>""
50 NEXT J
60 PRINT AT I,25;" "
70 NEXT I
80 GOTO 0
```

SKITTLES


```
 5 REM "SKITTLES"
10 PLOT 3,15
20 PLOT 3,18
30 PLOT 3,21
40 PLOT 3,24
50 PLOT 3,27
60 PLOT 6,16
70 PLOT 6,19
80 PLOT 6,22
90 PLOT 6,25
100 PLOT 9,17
110 PLOT 9,20
120 PLOT 9,23
130 PLOT 12,19
140 PLOT 12,22
150 PLOT 15,21
155 FOR M=1 TO 8
160 LET A=31
170 LET B=20
175 FOR N=31 TO 2 STEP -1
180 PLOT A,B
190 LET A$=INKEY$
195 UNPLOT A,B
197 PLOT A,B
198 UNPLOT A,B
200 IF A$="7" THEN LET B=B+1
210 IF A$="6" THEN LET B=B-1
220 LET A=A-1
230 NEXT N
240 NEXT M
```

WE WILL say nothing about being bowled over by this game, or about going down like nine-pins, or about it being right up our alley. It is a 1K game for the ZX-81 called **Skittles** but the title is somewhat misleading, since the eight balls are steered after they are released, not before.

They are amazingly responsive, manoeuvred with the 6 and 7 keys to a target of 15 pins.

It is a highly-enjoyable game submitted by Philip Teakle of Bristol.

HORSE


```
    1 DIM R(6)
    2 DIM D(6)
    3 LET P=0
    5 FOR N=1 TO 6
    6 LET R(N)=10.00
    7 NEXT N
    8 LET S=0
    9 LET Y=1
   80 DIM A$(6,10)
   90 FOR N=1 TO 6
  100 PRINT "TYPE NAME OR INITIAL
S"
  110 PRINT "OF PLAYER NO.";N
  120 PRINT "OR IF NONE TYPE *"
  130 INPUT A$(N)
  135 CLS
  140 IF A$(N)(1)="*" THEN GOTO 2
00
  150 NEXT N
  200 PRINT AT 1,1;"HORSE NO.    0
"
  205 RACE NO. ";Y
  205 LET Y=Y+1
```

NOW YOU can watch a horse race without having to listen to Peter O'Sullevan tieing himself in knots for the last furlong. It is a race game for up to six players. Each punter enters his initials and then inputs the number of the horse he has selected and whether he wants to bet each way or to win.

The players start with 10 points' worth of capital and score according to the odds on each horse and the type of bet laid. The game ends when one of the punters finds himself without cash.

Sent by C Winn for the expanded ZX-81.

RACE

```
 210 LET P$=" 1 2 3 5 7101216"
 220 FOR N=1 TO 8
 230 LET B=N*2
 240 LET A=B-1
 250 LET X=N+1
 260 PRINT AT X,5;N;"        ";P$(
A TO B);":1"
 270 NEXT N
 280 PRINT AT 11,1;"EACH PLAYER
TYPE IN NO. OF"
 290 PRINT AT 12,1;"HORSE SELECT
ED"
 300 PRINT AT 14,1;"E.G. TYPE IN
 2 FOR NO.2 TO WIN"
 310 PRINT AT 15,1;"OR 5E FOR NO
.5 EACH WAY"
 320 DIM B$(5,6)
 330 DIM H(6)
 340 DIM E$(6)
 350 FOR N=1 TO 6
 355 IF A$(N,1)="*"  THEN GOTO 5
00
 360 PRINT AT 17,5;A$(N);""
 365 PRINT AT 19,6;"TYPE IN NOW"
 370 INPUT B$(N)
 380 LET H(N)=VAL B$(N,1)
 385 IF B$(N,2)="E" THEN LET P=1
 390 NEXT N
 500 DIM D(8)
 505 CLS
 510 LET D$="================"
 515 PRINT D$;
 520 PRINT D$
 530 FOR N=1 TO 8
 535 LET D(N)=29
 540 PRINT TAB 29;"▌";N;"▐"
 545 PRINT
 550 NEXT N
 560 PRINT D$;
 570 PRINT D$
 600 LET F=INT (RND*16)+1
 610 IF F<5 THEN GOTO 700
 620 IF F<8 THEN GOTO 710
 630 IF F<11 THEN GOTO 720
 640 IF F<13 THEN GOTO 730
 650 LET G=F-5
 660 GOTO 800
 700 LET G=1
 705 GOTO 800
 710 LET G=2
 715 GOTO 800
 720 LET G=3
 725 GOTO 800
 730 LET G=4
 800 LET F=2*G-1
 801 IF D(G)=500 THEN GOTO 500
 810 LET K=INT (RND*3)+1
 815 LET K=K+INT G/2
 820 PRINT AT F,D(G);
 830 LET D(G)=D(G)-K
 835 IF D(G)<1 THEN GOTO 870
 840 PRINT AT F,D(G);"▌";G;"▐"
 850 IF D(G)<0 THEN GOTO 900
 860 GOTO 600
 870 PRINT AT F,0;"▌";G;"▐"
 871 GOTO 850
 900 IF P<2 THEN LET W(G)=1
 901 LET D(G)=500
 910 PRINT AT F,0;G;"▐"
 915 IF W(G)=1 THEN PRINT AT 17
10;"FIRST NO. ";G
 920 IF P=0 THEN GOTO 1000
 930 LET P=P+1
 940 IF P=2 THEN GOTO 600
 950 LET W(G)=P-1
 955 IF W(G)=2 THEN PRINT AT 18,
10;"SECOND NO ";G
 956 IF W(G)=3 THEN PRINT AT 19,
10;"THIRD NO. ";G
 959 PAUSE 100
 960 IF P=4 THEN GOTO 1000
 970 GOTO 600
1001 CLS
1005 IF P=0 THEN GOTO 1200
1010 FOR N=1 TO 6
1020 IF B$(N,2)="E" THEN GOTO 10
40
1030 GOTO 1090
1040 FOR G=1 TO 8
1050 IF W(G)>0 AND H(N)=G THEN G
OTO 1080
1060 NEXT G
1065 LET R(N)=R(N)-1
1066 GOTO 1090
1080 GOSUB 1261
1081 LET R(N)=R(N)+0.2*S
1090 NEXT N
1200 PRINT AT 1,1;"PLAYERS SCORE
S ARE :-"
1201 FOR N=1 TO 6
1205 IF A$(N,1)="*" THEN GOTO 13
00
1210 FOR G=1 TO 8
1220 IF H(N)=G AND W(G)=1 THEN G
OTO 1268
1230 NEXT G
1235 LET R(N)=R(N)-1
1240 PRINT AT N+N+1,1;A$(N);"
  ";R(N)
1248 NEXT N
1250 GOTO 1300
1261 IF G=8 THEN LET S=15
1262 IF G=7 THEN LET S=12
1263 IF G=6 THEN LET S=10
1264 IF G=5 THEN LET S=7
1265 IF G=4 THEN LET S=5
1266 IF G<4 THEN LET S=G
1267 RETURN
1268 GOSUB 1261
1269 LET R(N)=R(N)+S
1270 GOTO 1240
1300 LET P=0
1305 PAUSE 400
1310 FOR N=1 TO 8
1320 LET W(N)=0
1330 NEXT N
1340 FOR N=1 TO 6
1350 IF R(N)<0.01 THEN GOTO 1400
1360 NEXT N
1365 CLS
1370 GOTO 200
1400 PRINT AT 14,1;"PLAYER NO. ";
N;" IS OUT OF MONEY"
1405 PAUSE 400
1410 FOR N=1 TO 6
1415 LET R(N)=10
1420 NEXT N
1430 PRINT AT 16,1;"END OF GAME"
1435 PAUSE 600
1440 CLS
1500 GOTO 90
```

ALPHABETICAL SORTING

```
9500 FAST
9530 LET A=1
9540 LET N=100
9550 IF 2**A>N THEN GOTO 9580
9560 LET A=A+SGN A
9570 GOTO 9550
9580 LET F=2**A-1
9590 LET F=INT (F/2)
9600 IF NOT F THEN GOTO 9750
9610 LET D=N-F
9620 LET B=SGN A
9630 LET A=B
9635 LET E=A+F
9650 IF A$(A)>A$(E) THEN GOTO 97
00
9660 LET B=B+SGN B
9670 GOTO (B>D AND 9590)+(9620 A
ND B<=D)
9700 LET B$=A$(A)
9710 LET A$(A)=A$(E)
9720 LET A$(E)=B$
9730 LET A=A-F
9740 GOTO (9650 AND A<1)+(9630 A
ND A>=1)
9750 SLOW
9760 CLS
9770 FOR F=1 TO 100
9780 SCROLL
9790 PRINT A$(F)
9800 NEXT F
9810 RETURN
```

ALPHABETICAL SORTING is a neat routine for sorting A$ into alphabetical order. Alter the numbers in lines 9540 and 9770 according to the number of elements in A$. For example, if you DIM A$ (100,15), the number in those lines should be 100.

Michael Horton of St Edmond's Junior School, Canterbury, who sent the program, says that it is the fastest sort of which he knows for the ZX-81.

FAITHFUL

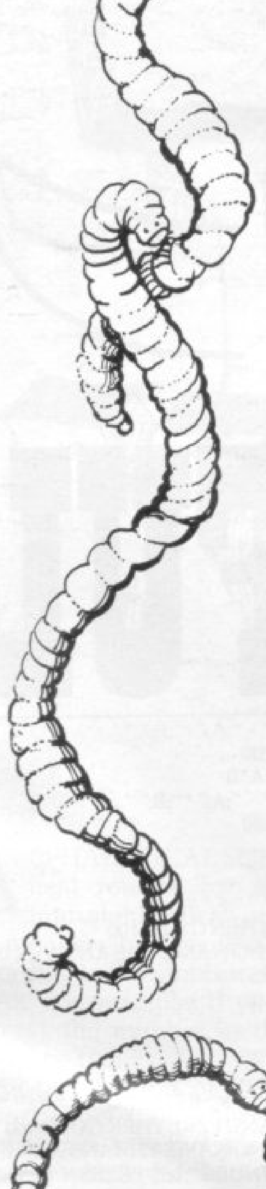
THIS IS one of two programs included in this collection for ZX-80 users. It is a very simple, user-friendly program intended for young children.

B Spencer of Chatham, Kent, who wrote it, said he did it because after two years of owning a ZX-80 he thought it was time he bought a better machine, probably the Spectrum. He wanted to hand his old faithful to his children with something useful for them to do with it.

The listing includes lines to allow the person using the machine to input their name, lines 100, 640, 750. When run, it asks what kind of sum is to be attempted and then shows the required problem. An answer is given and that is judged correct or incorrect, giving the correct answer. Press NEWLINE for another attempt.

In the case of division, the answer is given in terms of a whole number and then the remainder, both of which are input separately.

```
10 LET A=10+RND(50)
20 LET B=1+RND(10)
30 PRINT "SELECT +-/*"
40 INPUT X$
50 IF X$="+" THEN GOTO 200
60 IF X$="-" THEN GOTO 300
70 IF X$="/" THEN GOTO 400
80 IF X$="*" THEN GOTO 500
90 IF X$="S" THEN STOP
100 PRINT "CORRECT NAME PRESS N/L"
110 INPUT G$
120 CLS
130 GOTO 10
200 LET C=A+B
210 PRINT "  ";A;"+";B;" "
220 GOTO 600
300 LET C=A-B
310 PRINT "  ";A;"-";B;" "
320 GOTO 600
400 LET C=A/B
410 LET L=A-(C*B)
420 PRINT "  ";A;"/";B;" "
430 GOTO 700
500 LET C=A*B
510 PRINT "  ";A;"*";B;" "
520 GOTO 600
600 INPUT E
610 PRINT "  ----"
620 PRINT "  ";E;" "
630 IF E=C THEN GOTO 100
640 PRINT "NO NAME THE ANSWER IS
";C;"  PRESS N/L"
650 GOTO 110
700 INPUT F
710 INPUT F2
720 PRINT "  ----------"
730 PRINT "  ";F;" REMAINDER ";F2;" "
740 IF F=C AND F2=L THEN GOTO 100
750 PRINT "NO NAME THE ANSWER IS
";C;" REMAINDER ";L;" "PRESS N/L"
760 GOTO 110
```



The Wo

```
1 LET h=0: LET w$="▚▜▙▟": GO SUB 8000: GO SUB 8500
2 BORDER 0: PAPER 0: CLS : PRINT AT 21,0; INK 7; BRIGHT 1;" © Michael Andreasen 1982": FOR n=0 TO 21 STEP 3: FOR m=0 TO 31: PRINT AT n,m; INK 6;"▚";AT n,m; INK 3;"●": NEXT m: NEXT n: BEEP .3,0: BEEP .3,2: BEEP .3,5
3 LET l=1: LET b=0: LET s=0: LET w=3
4 LET g=4: PAPER 7: INK 0: BORDER 7: GO SUB 100: LET b=0: FOR n=1 TO 20: BEEP .03,0: BEEP .03,3: NEXT n: BORDER 6: PAPER 1: INK 7: CLS : LET x=11: LET y=15: GO SUB 300
5 GO SUB 400: PRINT AT x1,y1;"●";AT x,y; INK 6;w$(d): BEEP .01,0: BEEP .01,-8: IF RND>.9 THEN PRINT AT x1,y1; INK 6;"◎": IF RND<.3 AND l<5 THEN PRINT AT x1,y1; FLASH 1; INK 5;"@"
6 IF a=14 THEN LET s=s+100: LET b=b+1
7 IF a=141 OR b=10 THEN GO TO 1000
8 IF a=15 AND s$="" THEN GO TO 9000
9 GO TO 5
100 CLS : PRINT AT 7,9;"SCORE:";s;AT 9,9;"BONUS:";b;AT 11,9;"WORMS":"▚▚▚▚▚▚▚▚"( TO w+1);AT 13,9;"LAP:";l: LET s=s+b: PRINT AT 16,9;"SCORE:";s: RETURN
300 FOR d=1 TO 4: PRINT AT x,y;w$(d): BEEP .3,0: BEEP .3,-8: IF INKEY$<>"" THEN RETURN
310 NEXT d: GO TO 300
400 LET x1=x: LET y1=y: LET x=x+(d=2)-(d=3): LET y=y+(d=4)-(d=1): IF x=-1 OR x=22 OR y=32 OR y=-1 THEN GO TO 9000
401 LET a=ATTR (x,y): LET s$=SCREEN$ (x,y): LET b$=INKEY$: IF b$>"4" AND b$<"9" THEN LET d=VAL b$-4
402 RETURN
1000 BORDER 0: PAPER 2: INK 6: LET b=b+500: GO SUB 100: FOR n=1 TO 10: BEEP .05.RND*10-10: NEXT n: BEEP .5,-10: CLS : LET g=1000: LET b=0: LET m=6+4*l: FOR n=1 TO 20: PRINT AT RND*20,RND*30; INK 7;"◎": NEXT n: FOR n=1 TO m
1001 LET x=INT (RND*22): LET y=INT (RND*32): IF SCREEN$ (x,y)="" OR (x=11 AND y=15) THEN GO TO 1001
1002 PRINT AT x,y; INK 6;"▚": NEXT n: LET x=11: LET y=15: GO SUB 300
1003 GO SUB 400: PRINT AT x1,y1; INK 7;"●";AT x,y; INK 0;w$(d): BEEP .03,-15: BEEP .03,-20: IF a=22 AND s$="" THEN LET b=b+1: LET s=s+100: BEEP .03,0: IF b=m THEN GO TO 2000
1004 IF a=23 THEN GO TO 9000
1005 GO TO 1003
2000 LET b=b+500: BORDER 6: PAPER 6: INK 0: GO SUB 100: FOR n=1 TO 20: BEEP .01,n: BEEP .01,-n: NEXT n: CLS : PRINT AT 0,0;"■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■": FOR n=1 TO 17 STEP 2: PRINT AT n,0;"□                             □";AT n+1,0;"□ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □": NEXT n
2001 PRINT "□                    ■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■": FOR n=1 TO 17 STEP 4: FOR m=1 TO 27 STEP 4: PRINT AT n,m; INK 1;"▚": NEXT m: NEXT n
2002 LET b=0: LET x=11: LET y=15: GO SUB 300: LET g=2000
2003 GO SUB 400: PRINT AT x1,y1; INK 3;"●";AT x,y; INK 2;w$(d): BEEP .03,-11: BEEP .03,-13: BEEP .03,-15
2004 IF a=49 THEN BEEP .02,-35: LET b=b+1: IF b=35 THEN LET b=7000: GO TO 3000
2005 IF s$<>" " AND a<>49 THEN GO TO 9000
2006 GO TO 2003
3000 BORDER 0: PAPER 0: INK 7: GO SUB 100: FOR n=1 TO 10: BEEP .1,RND*10: NEXT n: POKE 23692,-1: FOR n=1 TO 20: PRINT : NEXT n: LET x=11: FOR y=0 TO 31
3001 PRINT AT x,y; PAPER 4;"□": IF RND<.2 THEN GO TO 3010
3002 NEXT y
3003 LET x=11: LET y=0: GO SUB 300: LET g=3000: PAUSE 300: IF d=1 THEN GO TO 9000
3004 GO SUB 400: PRINT AT x1,y1; INK 5;"●";AT x,y; INK 7;w$(d): BEEP .08,-11: BEEP .08,-30: BEEP .08,-0
3005 IF s$<>"" THEN GO TO 9000
```

THE WORM GAME for the 16K Spectrum was just too difficult for your thick-fingered reviewer, who could reach only the sixth of its seven stages. The game is of the Surround type but there is only one player and you must avoid not only your own tail but also aim to hit certain objects in the field of play.

In the first section, for example, your targets are contained in the tail you leave; in the second they are the dandelions among the deadly rocks. In the third, fourth, fifth, sixth and—we suppose—seventh, they are different again.

This listing represents an original concept in computer games, brilliantly executed. Michael Andreason, of Alloway, Ayr, who wrote the program, reports a staggering best score of 150,490. We wonder if he has considered marketing the game commercially?

Control is by the usual cursor keys; there is a high score facility and list of instructions.

Graphics notes:
1—Graphic D, graphic C, graphic E, graphic B
2—Graphic A
5—Graphic A, graphic H, graphic F
1000—Graphic I
1002—Graphic G
2000—Graphic J.

ORM Game

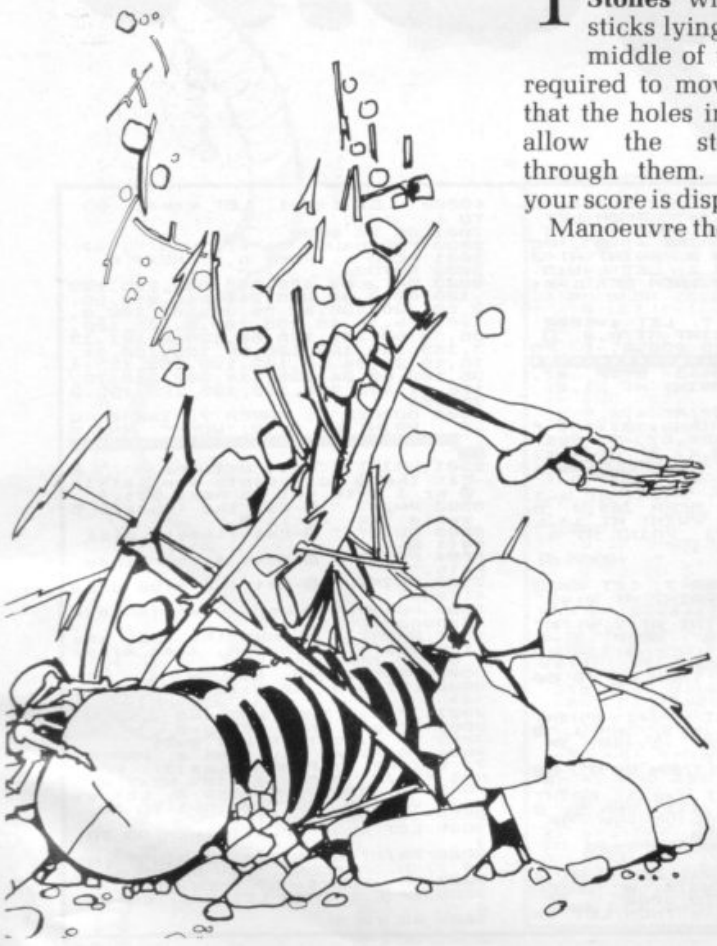
```
3006 IF y=31 THEN LET b=10000: G
O TO 4000
3007 GO TO 3004
3010 LET x=x+(RND<.5 AND x<>20)-
(RND<.5 AND x<>1): PRINT AT x,y;
 PAPER 4;"□": IF RND<.3 THEN GO
TO 3002
3011 GO TO 3010
4000 LET g=4000: BORDER 1: PAPER
 3: INK 7: GO SUB 100: PAUSE 200
: FOR n=21 TO 0 STEP -1: PRINT A
T n,0; PAPER 1;"
                  ": NEXT n: BEEP
.3,0: CLS : FOR n=1 TO 30: PRINT
 AT RND*20,RND*30;"●": NEXT n: L
ET m=3: LET b=3: LET x=11: LET y
=15: GO SUB 300
4001 GO SUB 400: PRINT AT x1,y1;
" ";AT x1,y1; INK 6;("●" AND RND
<.2);AT x,y; INK 0;w$(d);AT m,b;
 INK 5; OVER 1;"*": BEEP .01,3:
BEEP .04,-3: IF m=x AND y=b THEN
 LET b=15000: GO TO 5000
4002 PRINT AT m,b; OVER 1; INK 7
;"*": LET m=m+(RND<.5 AND m<19)-
(RND<.5 AND m>1): LET b=b+(RND<.
5 AND b<29)-(RND<.5 AND b>1): IF
 s$="" THEN GO TO 9000
4003 LET s=s+50: GO TO 4001
5000 LET x=3: BORDER 0: PAPER 0:
 INK 7: GO SUB 100: FOR n=.3 TO
0 STEP -.05: BEEP n,0: BEEP n,-2
: BEEP n,0: BEEP n,-5: NEXT n: F
OR n=1 TO 5: BEEP .02,0: BEEP .0
2,-2: BEEP .02,0: BEEP .02,-5: N
EXT n: CLS : PAPER 2: INK 7: FOR
 n=0 TO 21: PRINT AT n,0;"□      □
": NEXT n
5001 LET b=0: LET g=5000
5002 LET y=INT (RND*4)+1
5003 LET x=x+(INKEY$="8")-(INKEY
$="5"): LET b=b+2: LET s$=SCREEN
$ (5,x): PRINT AT 21,0;"□□□□□□□";
AT 5,x; INK 0;"♜";AT 21,y;"  ": B
EEP .05,0: BEEP .05,2: IF s$=""
THEN LET y=x: LET x=5: GO TO 900
0
5004 PRINT AT 5,x; INK 4;"●": PO
KE 23692,-1: PAPER 0: PRINT AT 2
1,0: PRINT : PAPER 2: IF RND<.7
THEN GO TO 5003
5005 FOR n=1 TO 4: LET x=x+(INKE
Y$="8")-(INKEY$="5"): LET s$=SCR
EEN$ (5,x): PRINT AT 21,0;"□
□";AT 5,x; INK 0;"♜";AT 21,RND*3
+1;("●" AND RND<.1): BEEP .04,-2
: BEEP .04,0: IF s$="" THEN LET
y=5: LET x=5: GO TO 9000
5006 PRINT AT 5,x; INK 4;"●": PO
KE 23692,-1: PAPER 0: PRINT AT 2
1,0: PRINT : PAPER 2: LET b=b+5:
 NEXT n: IF b>1000 THEN LET s=s+
25000: GO TO 6000
5007 GO TO 5002
6000 PAPER 2: INK 7: LET g=6000:
 FOR n=5 TO 21: PRINT AT n,0;"□
  □": NEXT n: POKE 23692,-1: PR
INT "□        □□□□□□□□□□□□□□□□□□□□□□
□□□□□□": FOR n=1 TO 13: BEEP .07,
-3: BEEP .07,-2: PRINT AT 21,0:
PRINT "□
       □";AT 5,x;"♜";AT 4,x;" ":
NEXT n: LET b=INT (RND*10)+18: F
OR n=14 TO 21: BEEP .07,-5: BEEP
 .07,0: PRINT AT 5,x;"♜";AT 4,x;
" ";AT 21,0: PRINT "□□□□□□□□□□□□";
TAB b;"□□";TAB 31;"□": NEXT n
6001>FOR n=5 TO 13: PRINT AT n-1
,x;" ";AT n,x;"♜": BEEP .03,0: B
EEP .03,2: NEXT n: PRINT AT 13,x
;" ": FOR n=0 TO 21: PRINT AT n,
0; INVERSE 1; OVER 1;"
                        ": NEXT n:
 BORDER 4
6002 INPUT "": PAPER 7: LET x=13
: LET y=1: INK 0: PRINT AT x,y;"
■": PAUSE 0
6003 LET y=y+1: PRINT AT x,y;"■"
;AT x,y-1; INK 1;"●": BEEP .1,-1
0: BEEP .1,-5: IF SCREEN$ (14,y)
=" " THEN GO TO 6050
6004 IF INKEY$="7" THEN GO TO 60
10
6005 GO TO 6003
6010 LET x=x-1: LET y=y+1: PRINT
 AT x,y;"■";AT x+1,y-1; INK 1;"●
": BEEP .1,-15: BEEP .1,-10: IF
x=0 THEN GO TO 6050
6011 IF INKEY$="7" THEN GO TO 60
10
6012 LET x=x+1: LET y=y+1: PRINT
 AT x,y;"■";AT x-1,y-1; INK 1;"●
": BEEP .1,-15: BEEP .1,-10: IF
y=31 THEN GO TO 6050
6013 IF x=13 THEN GO TO 7000
6014 GO TO 6012
6050 FOR x=x+1 TO 21: PRINT AT x
,y;"♜";AT x-1,y; INK 1;"●": BEEP
 .3,x: NEXT x: GO TO 9000
7000 IF b=y OR b+1=y THEN LET b=
40000: LET l=l+1: LET w=w+1: GO
TO 4
7001 GO TO 6050
8000 FOR n=USR "a" TO USR "j"+7
8001 READ x: POKE n,x: NEXT n
8002 RETURN
8023 DATA 60,125,255,255,255,255
,126,60,0,99,255,240,240,255,99,
0,60,126,126,60,36,36,102,102,0,
198,255,15,15,255,198,0,102,102,
36,36,60,126,126,60,126,1,121,13
3,165,153,129,126,66,186,186,84,
16,19,20,24,60,102,195,153,153,1
95,102,60,24,126,114,207,243,78,
126,24,255,255,195,195,195,195,2
55,255
8500 BORDER 5: PAPER 7: INK 0: C
LS : PRINT AT 0,12;"WORM"' INK 5
;"■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■
■■"
8501 PRINT '"Instructions:"''" ■
-Eat the ◎ for points and eat 10
 ◎ or 1 ● to get to next set."
8502 PRINT " ■-Eat the flowers ♣
 avoid the rocks ●."
8503 PRINT " ■-Eat flowers miss
wall □."
8504 PRINT " ■-Move along windy
path."
8505 PRINT " ■-Eat the blue dand
elion."
8506 PRINT " ■-Work down to unde
rground       cave."
8507 PRINT " ■-Jump the gap, any
 key begin, 7 for up, take finge
r off 7 for  down."
8508 PAUSE 1000: RETURN
9000 LET b=0: IF x>21 THEN LET x
=21
9001 IF x<0 THEN LET x=0
9002 IF y<0 THEN LET y=0
9003 IF y>31 THEN LET y=31
9004 PRINT AT x,y; INK 0; PAPER
7; BRIGHT 1; FLASH 1;w$(d): FOR
n=1 TO 10: BEEP .1,-15: NEXT n:
PAPER 0: INK 7: BORDER 0: LET w=
w-1: GO SUB 100: FOR n=1 TO 10:
BEEP .15,-20: NEXT n
9005 LET x=3: IF w>0 THEN GO TO
3
9006 PRINT AT 21,11;"AGAIN ?";AT
 0,7;"HIGH SCORE:";h: PAUSE 0
9007 IF INKEY$="n" THEN STOP
9008 IF h<s THEN LET h=s: GO TO
3
9009 GO TO 3
```

KEYBOARD

KEYBOARD is a test for all sharpshooters of the computer keyboard. A letter will appear on the screen heading full tilt for self-obliteration in an inverse space at stage left. Your task is to hit the appropriate key before the letter auto-destructs. Your flying-fingered reviewer managed only five in fast mode.

Submitted by Graham Woods of Redhill, Surrey for the 1K ZX-81.

```
    1 PRINT "ENTER LEVEL; 1(HARD)
OR 2(EASIER)"
    5 INPUT A
   10 IF A=1 THEN LET P=15
   15 IF A=2 THEN LET P=22
   16 CLS
   17 LET S=0
   18 LET N=0
   20 LET M$=CHR$ (INT (RND*26)+3
8)
   25 PRINT AT 11,0;"■"
   30 FOR X=P TO 0 STEP -1
   35 PRINT AT 11,X;M$;" "
   37 IF INKEY$<>"" THEN GOTO 50
   40 NEXT X
   42 PRINT "NOT FAST ENOUGH"
   45 GOTO 100
   50 LET N$=INKEY$
   55 IF N$=M$ THEN PRINT "YES"
   57 IF N$=M$ THEN LET S=S+1
   60 IF N$<>M$ THEN PRINT "WRONG

  100 FOR Z=0 TO 50
  105 NEXT Z
  107 CLS
  108 LET N=N+1
  109 IF N=10 THEN GOTO 111
  110 GOTO 20
  111 PRINT S
```



THE DISPLAY of **Sticks and Stones** will show you three sticks lying horizontally in the middle of the screen. You are required to move each of them so that the holes in them line up and allow the stone – "O" – to pass through them. After 10 attempts your score is displayed.

Manoeuvre the top stick with keys 1 and Ø, the middle stick with Q and P, and the bottom one with A and NEWLINE. A small but exasperating routine for the 1K ZX-81 from Timothy Taylor, of Perterfield, Hampshire. Graphics notes:

20 – LET E = INT (RND × 4) + 12

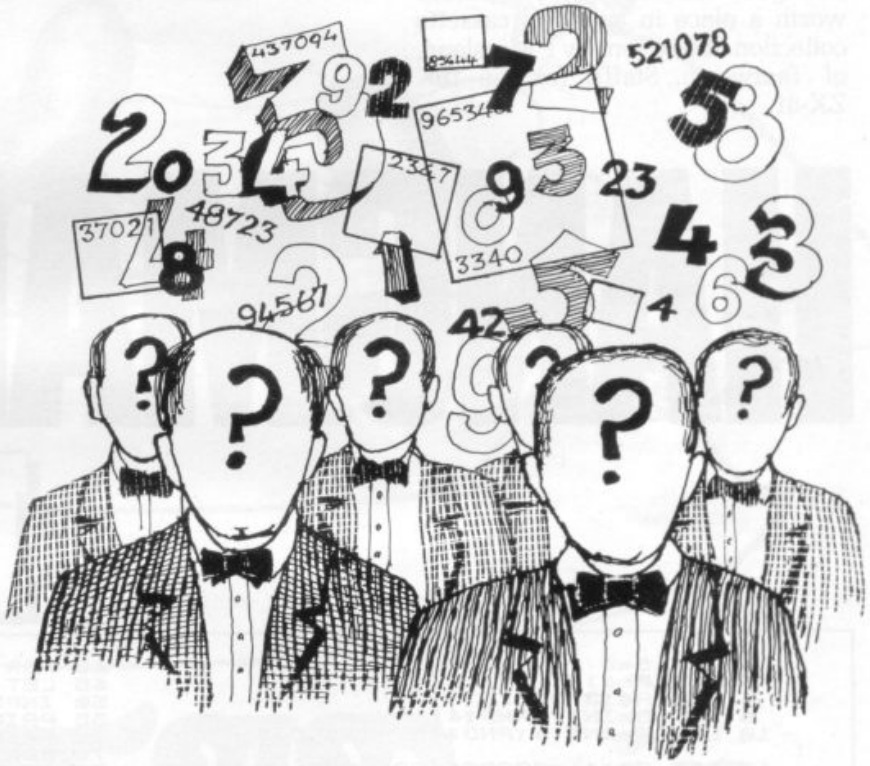
40 – Inverse spaces; graphic inverse As; inverse spaces.

104 – FOR J = 9 TO 11

STICKS AND STONES

```
    3 LET G=0
    4 LET A=12
    5 LET B=A
    6 LET C=A
   10 FOR D=1 TO 10
   20 LET E=INT (RND*4)+12
   30 FOR F=2 TO 12
   40 PRINT AT 9,A;"■■■■ ■";AT 10,
B;"■ ■■■■";AT 11,C;"■■■■ ■";AT F,E
;"O"
   80 LET A=A+(INKEY$="Ø")-(INKEY
$="1")
   90 LET B=B+(INKEY$="P")-(INKEY
$="Q")
  100 LET C=C+(INKEY$=CHR$ 118)-(
INKEY$="A")
  104 FOR J=9 TO 11
  105 IF F=J AND E=A+3 AND E=B+1
AND E=C+2 THEN LET G=G+1
  106 NEXT J
  110 PRINT AT F,E;" "
  120 NEXT F
  130 NEXT D
  140 PRINT "SCORE="; INT (G/3)
```

QUADRATIC EQUATIONS



A NEAT program for solving quadratic equations on an unexpanded ZX-81 has been sent by Richard Harris of Eastleigh, Hampshire.

The program invites you to enter the co-efficients of the equations and then displays the equation with the known values inserted, followed by the roots. It also points-out when a negative square root occurs. Graphics notes:

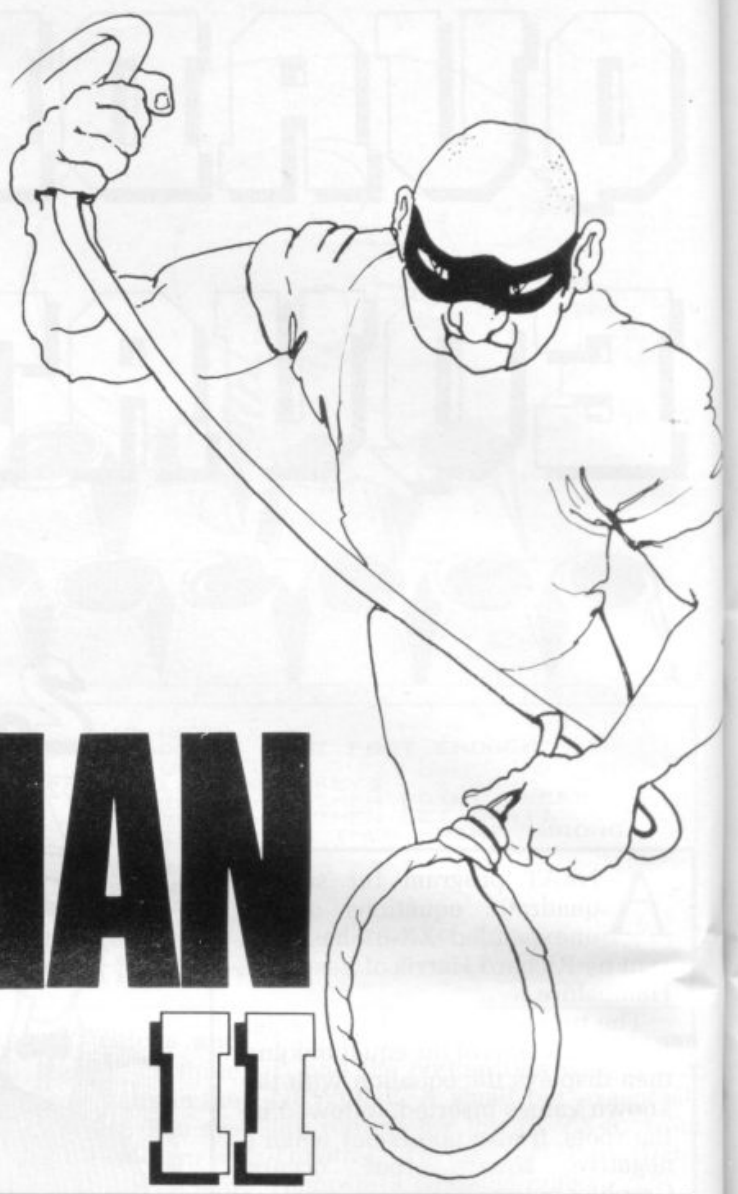
130—Graphic shifted 1.
251—Graphic shifted 2.
530—Two graphic shifted 2s.

```
  2 CLEAR
 10 PRINT "PRESS RUN TO START"
 20 IF INKEY$<>"A" THEN GOTO VA
L "20"
 30 CLS
120 PRINT "A(X)=>2+B(X)+C=0"
130 FOR F=CODE "■" TO VAL "5"
140 PRINT
150 NEXT F
160 PRINT "ENTER A"
170 INPUT A
175 PRINT
180 PRINT "ENTER B"
190 INPUT B
195 PRINT
200 PRINT "ENTER C"
205 PRINT
210 INPUT C
230 PRINT
240 PRINT
241 LET A$="+"
242 LET B$="+"
243 IF B<CODE "" THEN LET A$="-
"
244 IF C<CODE "" THEN LET B$="-
"
245 LET Z=B
246 LET X=C
247 IF B<CODE "" THEN LET Z=-B
248 IF C<CODE "" THEN LET X=-C
250 PRINT A;"X=>2";A$;Z;"X";B$;
;X;"=0"
251 LET L=(ABS B)=>CODE "■"-(VA
L "4"=A=C)
252 IF L<CODE "" THEN GOTO VAL
"500"
253 LET P=SQR L
260 PRINT
270 PRINT
280 PRINT "X=";(-B+P)/(2=A);"
 X=";(-B-P)/(2=A)
320 RUN
500 PRINT
510 PRINT
520 LET P=ABS L
530 PRINT "X=";-B/(CODE "■"=A);
"+/-";(SQR P)/(CODE "■"=A);"Ø"
540 PRINT
550 PRINT "WHERE Ø=SQR ROOT OF
-1"
590 RUN
```

HANGMAN II is an improved and updated version of G Gill's ZX-80 Hangman game the July/August issue of *Sinclair User*. This version makes the giant stride of showing a display of the gallows, advanced one stage for every incorrect guess.

The 120-word vocabulary consists of 40 six-, seven- and eight-letter words selected randomly from a dimensioned string.

This seems a reasonably definitive listing for this game and is therefore worth a place in anyone's cassette collection. It was sent by P Marsland, of Tamworth, Staffs, for the 16K ZX-81.



HANGMAN II

```
   4 LET S=0
   5 LET F=410
   6 DIM A$(3,320)
   8 LET B=INT (RND*4)
  10 LET A=INT ((RND*40)-1)*(B+5
)
  13 LET A$(1)="ACROSSAROUNDALWA
YSANIMALARRIVEBURROWBRANCHSCHOOL
BRIDGECAUGHTMOTHERPEANUTPLEASEDE
SERTDRAGONDERIVESECRETSORROWINSC
THOLLOWAVENGEWEAPONDETACHDEVISED
ESIGNTOMATOSCRAPEQUEASYSQUEALDIS
TILMURDERLETTERNORMALBATTLEVISIO
NMUTINYBARRELVOYAGERETURNDEVOID"
  14 LET A$(2)="DEGRADEANXIOUSTH
ROUGHBELIEVEBENEATHRELIEVEBICYCL
ECRICKETEXCITEDKITCHENSNOWMANBRO
THERCHICKENTONIGHTVINEGARRELEASE
INSTANTWHISTLEUNHAPPYALREADYOUTS
IDESOMEONESTOPPEDFEATHERDRIZZLEC
ABBAGEBECAUSEDIALECTBLANKETAGAIN
STHIMSELFRACCOONTROUBLEBLOSSOMPA
RADOXPOPULARBAFFLEMASSIVETRAFFIC
TRACTOR"
  16 LET A$(3)="FOLLICLEACCIDENT
ALTHOUGHBIRTHDAYBUSINESSCHEERFUL
COMPLETECONTINUEDARKNESSDAYDREAM
DISCOVERDISTANCEELECTRICRESPONSE
PERIODICORNAMENTPAVEMENTSOMETIME
ENORMOUSMOUNTAINMOTORISTLEMONADE
ENDANGERVIOLENCEREVERENTTAPESTRY
REMBERSURPRISETOMORROWYOURSELFHA
NDSOMEEJECTIONTOGETHERFRIGHTENFR
IENDLYFOUNTAINELECTIONDESTRUCTSO
UIRRELGOODNESS"
  18 IF B<1 THEN GOTO 8
  20 LET B$=A$(B)
  30 LET B$=B$(A+1 TO A+(B+5))
  34 PRINT AT 0,10;"[illegible]
"
  35 PRINT AT 2,0;"ENTER YOUR GU
ESS  LIVES LEFT: 10"
  37 FOR N=10 TO B+14
  38 PRINT AT 12,N;"-"
  39 NEXT N
  40 FOR Z=1 TO 10
  45 LET K=0
  50 INPUT H$
  55 PRINT AT 2,30;"  "
  60 PRINT AT 2,30;10-Z
  70 FOR D=1 TO B+5
  75 IF H$=B$(D) THEN LET K=K+1
  80 IF H$=B$(D) THEN LET S=S+1
  85 IF H$=B$(D) THEN PRINT AT 1
2,9+LEN B$( TO D);H$
  90 NEXT D
  95 IF K>0 THEN GOTO 105
  96 GOSUB F
 100 LET F=F+10
 105 IF K>0 THEN LET Z=Z-1
 106 IF S=B+5 THEN GOTO 150
 110 NEXT Z
 120 GOTO 500
 150 PRINT AT 19,0;"YOU GUESSED
IT IN ";Z
 160 STOP
 410 PRINT AT 10,11;"[illegible]"
 415 RETURN
 420 FOR N=9 TO 4 STEP -1
 424 PRINT AT N,11;"  [illegible]"
 425 NEXT N
 426 RETURN
 430 PRINT AT 3,11;"[illegible]"
 435 RETURN
 440 PRINT AT 4,11;" I"
 445 RETURN
 450 PRINT AT 5,11;" O"
 455 RETURN
 460 PRINT AT 6,11;" [illegible]"
 465 RETURN
 470 PRINT AT 6,11;" [illegible]"
 475 RETURN
 480 PRINT AT 6,11;"[illegible]"
 485 RETURN
 490 PRINT AT 7,11;"  [illegible]"
 495 RETURN
 500 PRINT AT 7,11;"[illegible]"
 510 PRINT AT 4,18;"[illegible]
ED";AT 6,18;"[illegible]";AT 8,18;B$
```

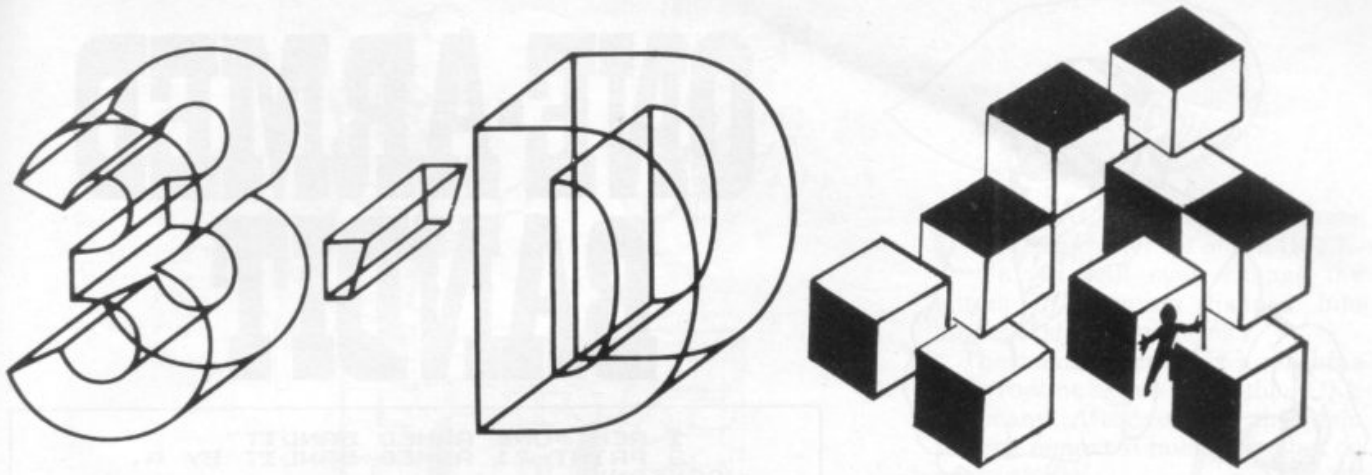
TOAD in the HOLE

TOAD IN THE HOLE is a program to demonstrate vector translations. Its use of strong graphics to illustrate a mathematical concept is reminiscent of the listing on Binomial Distribution in our last issue and should similarly be useful for teachers and students of mathematics.

The program was sent by David Hanson, a mathematics master at Gordonstoun Preparatory School (16K ZX-81).

```
  10 PRINT AT 0,8;"TOAD IN THE H
OLE"
  20 PRINT AT 1,8;"(sixteen grap
hic 7s)"
  30 PRINT AT 2,15;"BY"
  40 PRINT AT 3,10;"DAVID HANSON
"
  50 PAUSE 100
  60 PRINT AT 7,0;"IN THIS GAME,
 YOU MAKE THE TOAD MOVE INTO THE
 HOLE, BY PRESSING THE CORRECT N
UMBER KEYS.          PRESS NEWLINE
TO CONTINUE."
  70 PAUSE 500
  75 CLS
  80 LET E=1
  90 FOR D=2 TO 19
 100 PRINT AT E,D;"(graphic 6)"
 110 NEXT D
 120 LET E=20
 130 FOR D=2 TO 19
 140 PRINT AT E,D;"(graphic 7)"
 150 NEXT D
 160 LET D=1
```

```
 170 FOR E=2 TO 19
 180 PRINT AT E,D;"(graphic 8)"
 190 NEXT E
 200 LET D=20
 210 FOR E=2 TO 19
 220 PRINT AT E,D;"(graphic 5)"
 230 NEXT E
 240 LET E=20
 250 FOR D=4 TO 16 STEP 3
 260 PRINT AT E,D;"(graphic R)"
 270 NEXT D
 280 LET D=1
 290 FOR E=5 TO 17 STEP 3
 300 PRINT AT E,D;"(graphic R)"
 310 NEXT E
 320 PRINT AT 1,1;"(graphic 3)";
AT 1,20;"(graphic 4)";AT 20,1;"(
graphic 2)";AT 20,20;"(graphic 1
)"
 330 PRINT AT 20,0;"0";AT 17,0;"
1";AT 14,0;"2";AT 11,0;"3";AT 8,
0;"4";AT 5,0;"5";AT 2,0;"Y"
 340 PRINT AT 21,1;"0  1  2  3
4  5  X"
 350 LET A$="(graphic Y;inverse
ASTERISK;graphic T)"
 360 LET B$="(graphic 3;inverse
SPACE;graphic 4)"
 370 LET C$="(graphic Q;SPACE;gr
aphic W)"
 380 LET D$="    "
 390 LET E$="(graphic 3;three gr
aphic 6s;graphic 4)"
 400 LET F$="(graphic 8;graphic
A;graphic 5)"
 410 LET G$="(graphic 2;three gr
aphic 7s;graphic 1)"
 500 LET H=INT (RND*3)+2
 510 LET I=INT (RND*3)+2
 520 LET J=(3*H)+1
 530 LET K=3*I
 600 PRINT AT 17,2;A$;AT 18,2;B$
;AT 19,2;C$
 610 PAUSE 50
 650 PRINT AT 20-K,J;G$;AT 19-K,
J;F$;AT 18-K,J;F$;AT 17-K,J;F$;A
T 16-K,J;E$
 700 PRINT AT 0,21;"HOW MANY"
 710 PRINT AT 1,21;"SPACES "
 720 PRINT AT 2,21;"RIGHT ?"
 730 INPUT P
 735 IF P>5 OR P<0 THEN GOTO 720
 740 PRINT AT 4,21;"RIGHT ";P
 750 PAUSE 100
 760 PRINT AT 2,21;"UP ?    "
 770 INPUT Q
 775 IF Q>5 OR Q<0 THEN GOTO 760
 780 PRINT AT 5,21;"UP     ";Q
 790 PAUSE 100
 800 PRINT AT 17,2;D$;AT 18,2;D$
;AT 19,2;D$
 810 LET R=(3*P)+1
 815 LET S=3*Q
 820 PRINT AT 19-S,R+1;C$
 830 PRINT AT 18-S,R+1;B$
 840 PRINT AT 17-S,R+1;A$
 850 PAUSE 100
 870 PRINT AT 1,21;"          "
 880 PRINT AT 2,21;"          "
 890 PRINT AT 4,21;"          "
 900 PRINT AT 5,21;"          "
 910 IF K<>S OR J<>R THEN PRINT
AT 0,21;"HARD LINES"
 915 IF K=S AND J=R THEN PRINT A
T 0,21;"WELL DONE"
 920 PRINT AT 2,21;"THE TOAD"
 930 PRINT AT 3,21;"HAD TO "
 940 PRINT AT 4,21;"MOVE "
 950 PRINT AT 5,21;"ACCORDING"
 960 PRINT AT 6,21;"TO THE "
 970 PRINT AT 7,21;"VECTOR"
 980 PRINT AT 8,21;"TRANSLATION"
 990 PRINT AT 10,24;"(graphic 8;
SPACE;graphic 5)"
1000 PRINT AT 11,24;"(graphic 8;
SPACE;graphic 5)"
1010 PRINT AT 10,25;H
1020 PRINT AT 11,25;I
1030 PRINT AT 16,21;"PRESS RUN"
1040 PRINT AT 17,21;"AND THEN"
1050 PRINT AT 18,21;"NEWLINE"
1060 PRINT AT 19,21;"FOR ANOTHER
"
1070 PRINT AT 20,21;"TRY"
```



3-D HUNT

WE HAVE received many programs for finding something hidden in a grid. **3-D Hunt** is the first we have had requiring a search in a cube.

The display is of a 9 by 9 numbered board representing the front of the cube. Beneath it is a strip representing depth, the right-hand end of the strip being the front of the cube. The computer has a choice of 729 positions in which to hide itself.

Enter a number for the line, another for the column, and a third for the depth. Your position will be displayed and so will three letters to show the relative position of the computer.

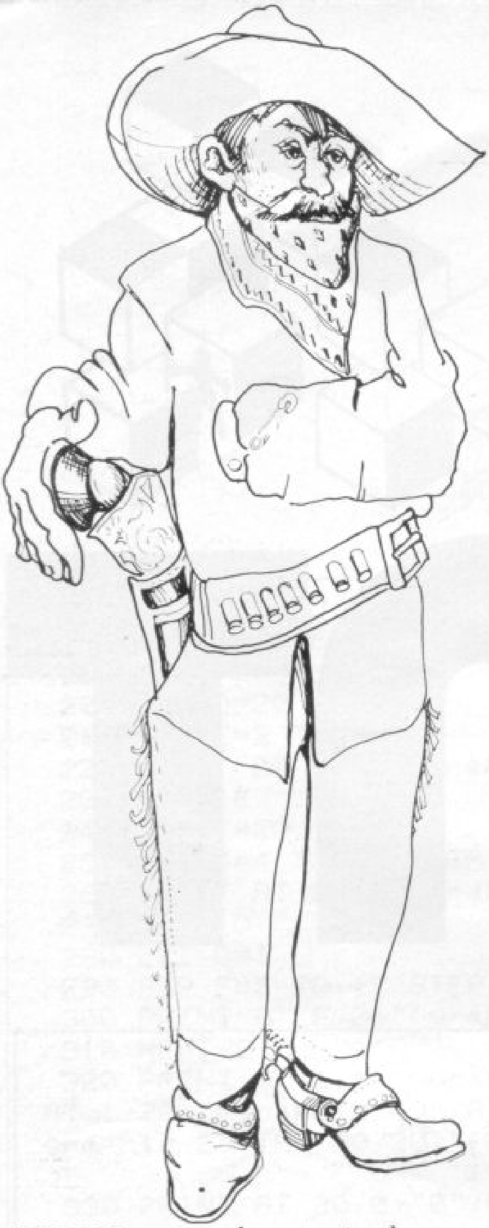
A report of NWF, for example, would indicate that your first and second numbers should be less, and your third should be greater. The last F indicates "in front of".

If one of the report figures does not appear, assume that you have hit the correct value. A black square shows you have found the fugitive and the number of attempts you required is displayed.

An interesting game for the 1K ZX-81 from Paul Allen of Wigan, Greater Manchester. Graphics notes.

6—Inverse hyphen
7—Nine graphic As
8—Graphic D
100—Inverse O
180—Inverse space

```
  1 LET J=CODE "="
  2 LET K=PI-PI
  3 LET Q=PI-PI
  4 LET T=K
  5 LET R=Q
  6 LET P=CODE "-"
  7 LET W$="AAAAAAAAA"
  8 LET G=CODE "dd"
 10 PRINT
 15 FOR I=Q TO G
 20 PRINT Q;W$
 25 LET Q=Q+R
 30 NEXT I
 35 PRINT #;"123456789";G;,,#;W$
 45 GOSUB P
 50 LET L=D
 55 GOSUB P
 60 LET C=D
 65 GOSUB P
 80 INPUT M
 85 INPUT N
 90 INPUT F
 95 LET K=K+R
 96 LET A$="."
 97 LET B$=A$
 98 LET C$=A$
100 IF M=L AND N=C AND F=C THEN
GOTO CODE "O"
105 IF M<L THEN LET A$="S"
110 IF M>L THEN LET A$="N"
115 IF N>C THEN LET B$="W"
120 IF N<C THEN LET B$="E"
125 IF F<D THEN LET C$="F"
130 IF F>D THEN LET C$="B"
135 PRINT AT T,J;A$;B$;C$;AT M,
N;CHR$ T;AT 11,F;K
140 GOTO 80
150 LET D=INT (RND*9)
155 IF D<R OR D>G THEN GOTO P
160 RETURN
180 PRINT AT M,N;"■";K
```



ONE-ARMED BANDIT

```
   1 REM "ONE ARMED BANDIT"
   2 PRINT "1 ARMED BANDIT BY A.
JACKSON"
   5 PAUSE 100
  10 CLS
  20 LET S=0
  25 LET N=10
  50 LET A=INT (RND*5)+6
  51 IF INKEY$<>"" THEN GOTO 55
  52 GOTO 51
  55 LET B=INT (RND*5)+6
  60 LET C=INT (RND*5)+6
  65 GOSUB 1000
  70 LET G=INT (RND*6)
  75 IF G=1 THEN GOSUB 600
  80 IF A$(A)=A$(B) AND A$(B)=A$
(C) THEN GOSUB 300
  85 IF A$(A+1)=A$(B) AND A$(B)=
A$(C-1) THEN GOSUB 200
  90 IF A$(A-1)=A$(B) AND A$(B)=
A$(C+1) THEN GOSUB 200
  95 LET N=N-1
 100 IF N=-1 THEN PRINT AT 0,0;S
 105 IF N=-1 THEN STOP
 110 GOTO 50
 200 REM MINOR WIN
 205 LET S=S+5
 210 PRINT "WIN 5 P"
 220 PAUSE 100
 225 CLS
 230 RETURN
 300 REM JACKPOT
 305 PRINT AT 0,0;"JACKPOT"
 310 LET K=10
 320 PRINT AT 0,30;K
 325 PAUSE 200
 330 PRINT AT 0,0;"GAMBLE ?"
 331 PRINT AT 0,30;K
 335 IF INKEY$="N" THEN LET S=S+
K
 340 IF INKEY$="N" THEN RETURN
 345 IF INKEY$="Y" THEN GOTO 360
 350 GOTO 330
 360 LET L=INT (RND*2)
 365 IF L=1 THEN LET K=K+5
 370 IF L=0 THEN LET K=K-10
 371 IF L=0 THEN LET S=S+K
 375 IF L=0 THEN RETURN
 380 IF K>=50 THEN LET S=S+K
 385 GOTO 330
 600 REM START OF NUDGE
 603 LET H=0
 605 PRINT AT 0,0;"NUDGE ?"
 606 IF INKEY$="N" THEN CLS
 610 IF INKEY$="N" THEN RETURN
 615 IF INKEY$="1" THEN LET A=A+
1
 616 IF INKEY$="Q" THEN LET A=A-
1
 617 IF INKEY$="W" THEN LET B=B-
1
 618 IF INKEY$="E" THEN LET C=C-
1
 620 IF INKEY$="2" THEN LET B=B+
1
 625 IF INKEY$="3" THEN LET C=C+
1
 630 IF INKEY$<>"" THEN LET H=H+
1
 645 IF INKEY$<>"" THEN GOSUB 10
00
 650 IF H>=3 THEN RETURN
 655 GOTO 604
 631 IF K>=50 THEN RETURN
1000 LET A$="[illegible]"
1001 CLS
1005 PRINT AT 7,16;"1  2  3";
A$(A-1);"[illegible]";A$(B-1);"[illegible]";A$(C-1
);"[illegible]";A$(A);"[illegible]";A$(B);"
[illegible]";A$(C);"[illegible]";A$(A+1);"[illegible]
[illegible]";A$(B+1);"[illegible]";A$(C+1)
1006 PRINT AT 0,0;N,S
1010 RETURN
```

IF YOU are too lazy to stand up and gamble, **One-armed Bandit** is a fruit machine simulator for the 16K ZX-81, submitted by Andrew Jackson and Paul Jenner of Warrington, Cheshire.

The aim is to line-up the letters displayed on the three 'reels'. If you manage a jackpot, you are given the chance to take a fifty-fifty gamble with your winnings (Y/N). You can win five pence, or lose 10. Five points can also be won for a diagonal line.

Occasionally you are given a "nudge" option—i.e.,—the chance to change three letters. To move up the reel one place, press 1; for reel two, press 2; and press 3 for reel three. To move a reel down one place, press Q, W or E. If you do not wish to nudge, hit N.

The program usually will wait for some kind of input, so if in doubt hit a key; in desperation, hit RUN.

Graphics notes:

1000—Inverse ABCDEABCDEABCDE.

1005—All inverse spaces, except for inverse hyphens after A$(A) and A$(B).

CHARACTER MAKER

CHARACTER MAKER changes the character set of the 1K ZX-81. It will even change the letters in program listings into blocks of strange patterns.

The main program is a machine code routine set up using the POKE command. After running the main routine remove it line by line but do not use NEW.

When the program is in memory, type-in one of the demonstration programs. They will show continuous patterns on the screen. You can also make your own programs which create patterns on the screen which change at random.

The program was sent by Allister London, of Sleaford, Lincs.

```
10 POKE 17000,62
20 POKE 17002,237
30 POKE 17003,71
40 POKE 17004,201
50 POKE 17001,-122
60 LET Z=USR (17000)
```

```
1 REM DEMO PROGRAMS
10 FOR A=0 TO 255
20 PRINT CHR$ A;
30 NEXT A
```

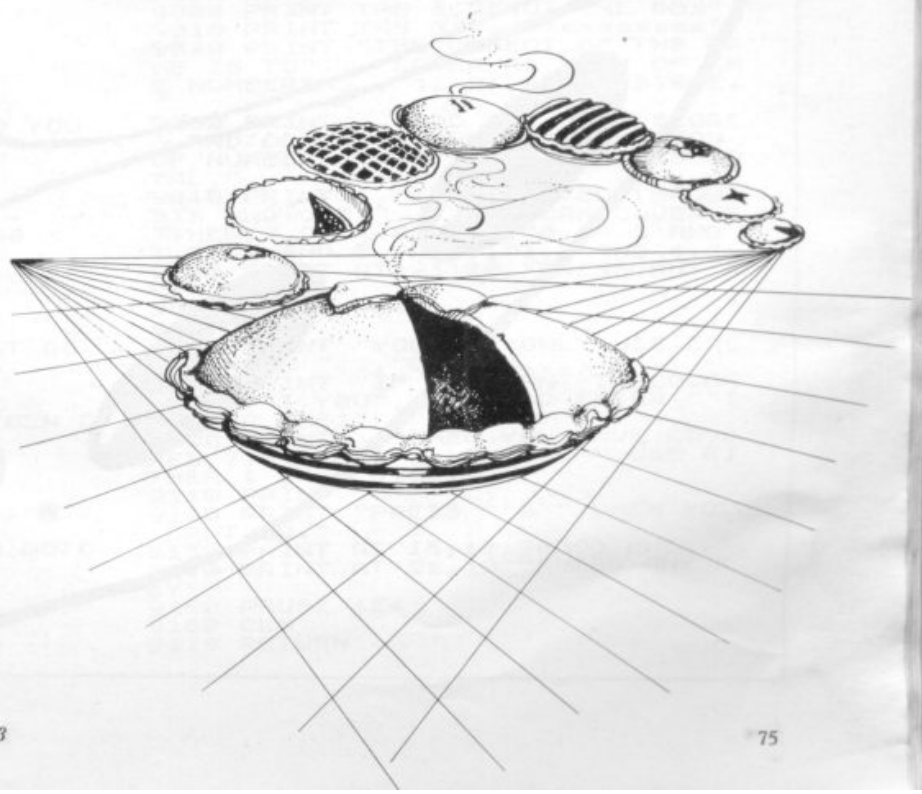
```
10 LET A=RND*255
20 PRINT CHR$ A;
30 GOTO 10
```

PIE CHART

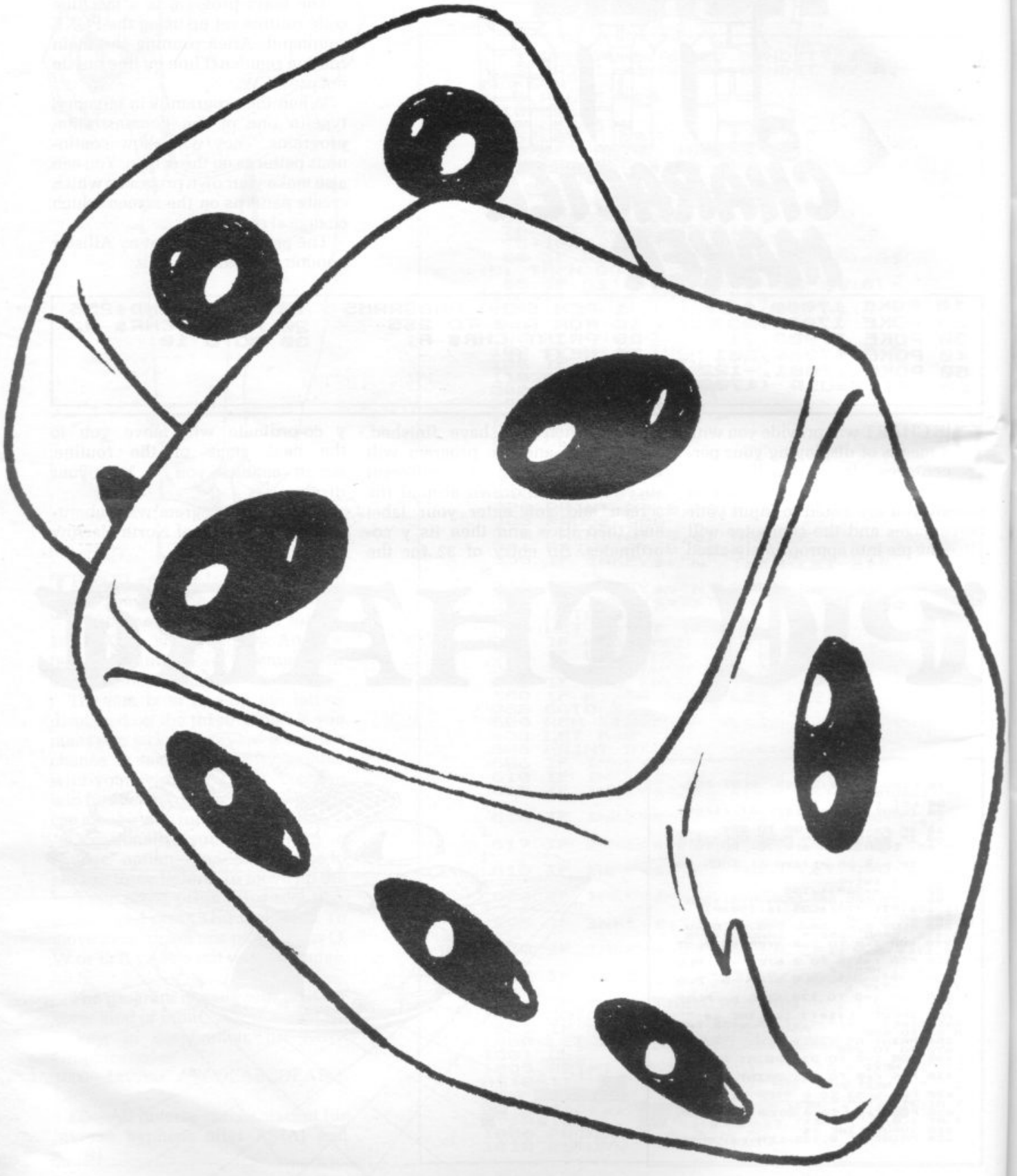
PIE CHART will provide you with a means of displaying your percentages in a really professional way. A circle is shown on screen; you are asked to input your percentages and the computer will slice the pie into appropriately-sized pieces. When you have finished, INPUT "–1" and the program will move to labelling the different slices. A grid is drawn around the screen and you enter your label and then its x and then its y co-ordinates. An entry of 32 for the y co-ordinate will move you to the next stage of the routine, which enables you to title your display.

This useful program was submitted by Paul Smith of North Harrow for the 16K Spectrum.

```
  10 CIRCLE 128,88,79: PLOT 128,
88: DRAW 0,78
  20 LET t=0
  30 INPUT "Percentage of circle
? ";p
  40 IF p=-1 THEN GO TO 200
  50 IF p=100 THEN PLOT OVER 1;1
28,88: DRAW OVER 1;0,78: GO TO 2
00
  60 IF p<0 OR p>(100-t) THEN GO
 TO 30
  70 LET t=t+p
  80 LET a=360*t/100
  90 PLOT 128,88: DRAW (78)*SIN
(a/180*PI),(78)*COS (a/180*PI)
 100 GO TO 30
 200 PLOT 0,0: DRAW 255,0: DRAW
0,175: DRAW -255,0: DRAW 0,-175
 210 FOR t=0 TO 255 STEP 8: PLOT
 t,174: NEXT t
 220 FOR r=175 TO 0 STEP -8: PLO
T 254,r: NEXT r
 230 FOR b=255 TO 0 STEP -8: PLO
T b,1: NEXT b
 240 FOR l=0 TO 175 STEP 8: PLOT
 1,l: NEXT l
 250 INPUT "Label? "; LINE a$;"
Position? ";x;" ";y: IF y=32 THE
N GO TO 400
 260 PRINT AT x,y;a$
 270 GO TO 250
 400 FOR t=0 TO 31: PRINT AT 0,t
;" ";: NEXT t
 410 FOR r=0 TO 21: PRINT AT r,3
1;" ";: NEXT r
 420 FOR b=31 TO 0 STEP -1: PRIN
T AT 21,b;" ";: NEXT b
 430 FOR l=21 TO 0 STEP -1: PRIN
T AT l,0;" ";: NEXT l
 440 INPUT LINE z$
 450 PRINT AT 0,(32-LEN z$)/2;z$
```



COVER T



THE BOX

A GOOD, interesting game, which takes slightly less than 3K of memory on the ZX-81 is sent by John Ellis, of Wimborne, Dorset. He says it is based on an old French game known as **Shut the Box.**

The aim is to eliminate each of numbers from one to nine by throwing two dice. The total thrown can then be used to eliminate numbers which add to the same total. For example, if a three and a five are thrown, any combination of two numbers adding to eight can be eliminated.

The chosen numbers are entered together and the program checks for illegal moves. The game continues until it is impossible to make a move; no number can be eliminated twice. To end the game, press zero and the total of the numbers remaining is displayed. After a number of plays a running average of the remaining totals is shown; Ellis says that after much practice his average for 10 games was 8.3. The program is user-friendly.

To help with the graphics, in lines 30 and 50 there are 27 inverse spaces; in 80 there are 23 spaces; in 240 there are 17 spaces and 26 spaces.

```
  1 SLOW
  2 LET TOT=0
  3 LET G=0
  4 GOSUB 9000
  5 PRINT "GAME ";G+1
 10 LET N$="123456789"
 20 PRINT AT 1,2;"          SHUT T
HE BOX          "
 30 PRINT TAB 2;"
                          "
 40 PRINT TAB 2;" 1  2  3  4  5
  6  7  8  9 "
 50 PRINT TAB 2;"
                          "
 60 IF N$(7 TO 9)<>"   " THEN G
OTO 140
 70 FOR O=10 TO 13
 80 PRINT AT O,0;"
                "
 90 NEXT O
100 PRINT AT 7,7;"HOW MANY DICE
?  "
110 INPUT A$
120 IF A$="1" THEN LET W=0
130 IF A$="1" THEN GOTO 190
140 PRINT AT 7,7;"    YOU ROLLED
:"
150 LET O=INT (RND*6)+1
160 LET Z=9
170 GOSUB 900
180 LET W=0
190 LET Z=18
200 LET O=INT (RND*6)+1
210 GOSUB 900
220 PRINT AT 17,2;"WHAT DO YOU
WANT TO COVER?"
230 INPUT G$
240 PRINT AT 19,8;"
    ";AT 17,2;"
                "
250 IF G$="0" THEN GOTO 480
260 LET T=0
270 FOR Y=1 TO LEN G$
280 LET T=T+VAL G$(Y)
290 NEXT Y
300 IF T=O+W THEN GOTO 330
310 PRINT AT 19,8;"YOU CANT DO
THAT"
320 GOTO 220
330 FOR Y=1 TO LEN G$
340 IF N$(VAL G$(Y))=" " THEN G
OTO 310
350 NEXT Y
360 FOR Y=1 TO LEN G$
370 LET N$(VAL G$(Y))=" "
380 PRINT AT 3,3*VAL G$(Y);" "
390 NEXT Y
400 IF N$="         " THEN GOTO
420
410 GOTO 60
420 PRINT AT 7,0;
430 FOR I=1 TO 14
440 PRINT "CONGRATULATIONS ";
450 NEXT I
460 LET T=0
470 GOTO 520
480 LET T=0
490 FOR I=1 TO 9
500 IF N$(I)<>" " THEN LET T=T+
VAL N$(I)
510 NEXT I
520 PRINT AT 16,7;"YOU HAD ";T;
" LEFT"
530 LET TOT=TOT+T
540 LET G=G+1
550 PRINT AT 18,5;"YOUR AVERAGE
IS ";INT (1000*TOT/G)/1000
560 PRINT AT 20,1;"PRESS ANY KE
Y FOR ANOTHER GO."
570 IF INKEY$<>"" THEN GOTO 570
580 IF INKEY$="" THEN GOTO 580
590 CLS
600 GOTO 5
900 PRINT AT 10,Z;"
" (4*O-3 TO 4*O)
910 PRINT AT 11,Z;"
" (4*O-3 TO 4*O)
920 PRINT AT 12,Z;"
" (4*O-3 TO 4*O)
930 PRINT AT 13,Z;"   "
940 RETURN
9000 PRINT TAB 6;"SHUT THE BOX"
9010 PRINT TAB 6;"============"
9020 PRINT "THE OBJECT OF THE GA
ME IS TO";,,"COVER AS MANY OF TH
E NUMBERS";,,"(1-9),AS POSSIBLE.
"
9030 PRINT ,,"ADD THE DICE SCORE
S AND COVER";,,"ANY COMBINATION
OF NUMBERS THAT";,,"GIVE THIS TO
TAL."
9040 PRINT ,,"E.G. IF YOU THROW
SIX AND ONE";,,"YOU CAN COVER E
ITHER 7,OR 1 AND";,,"6,OR 3 AND
4,OR 2 AND 5,OR";,,"1,2 AND 4."
9050 PRINT AT 21,10;"PRESS ANY K
EY"
9060 PAUSE 4E4
9070 CLS
9080 PRINT "YOU CAN ONLY USE EAC
H NUMBER ";,,"ONCE.";,,,
9090 PRINT "IF YOU WANT TO COVER
 6 AND 1,YOU";,"SHOULD ENTER ""1
6"" OR ""61"".";
9100 PRINT ,,"WHEN YOU HAVE COVE
RED 7,8 AND 9";,,"YOU CAN USE EI
THER 1 OR 2 DICE."
9110 PRINT
9120 PRINT "PRESS ""0"" WHEN YOU
 CANT GO."
9130 PRINT AT 15,12;"GOOD LUCK."
9140 PRINT AT 21,10;"PRESS ANY K
EY"
9150 PAUSE 4E4
9160 CLS
9170 RETURN
```

GHOST TREKKER

GHOST TREKKER is a genuinely challenging game requiring quick thinking and quick cursor fingers as you chase a ghost around the haunted house.

You begin as an inverse V in the top left of the screen and change direction anti-clockwise with 1 and clockwise with Ø. Both you and the ghost leave a trail which you are not allowed to cross in your attempt to corner the wayward wraith.

If you have sufficient luck and animal cunning to corner the fugitive phantom, you will be congratulated and your time displayed. A demanding game for the expanded ZX-81 from Alistair Crowe, of Llandudno, Gwynedd. Graphics notes:

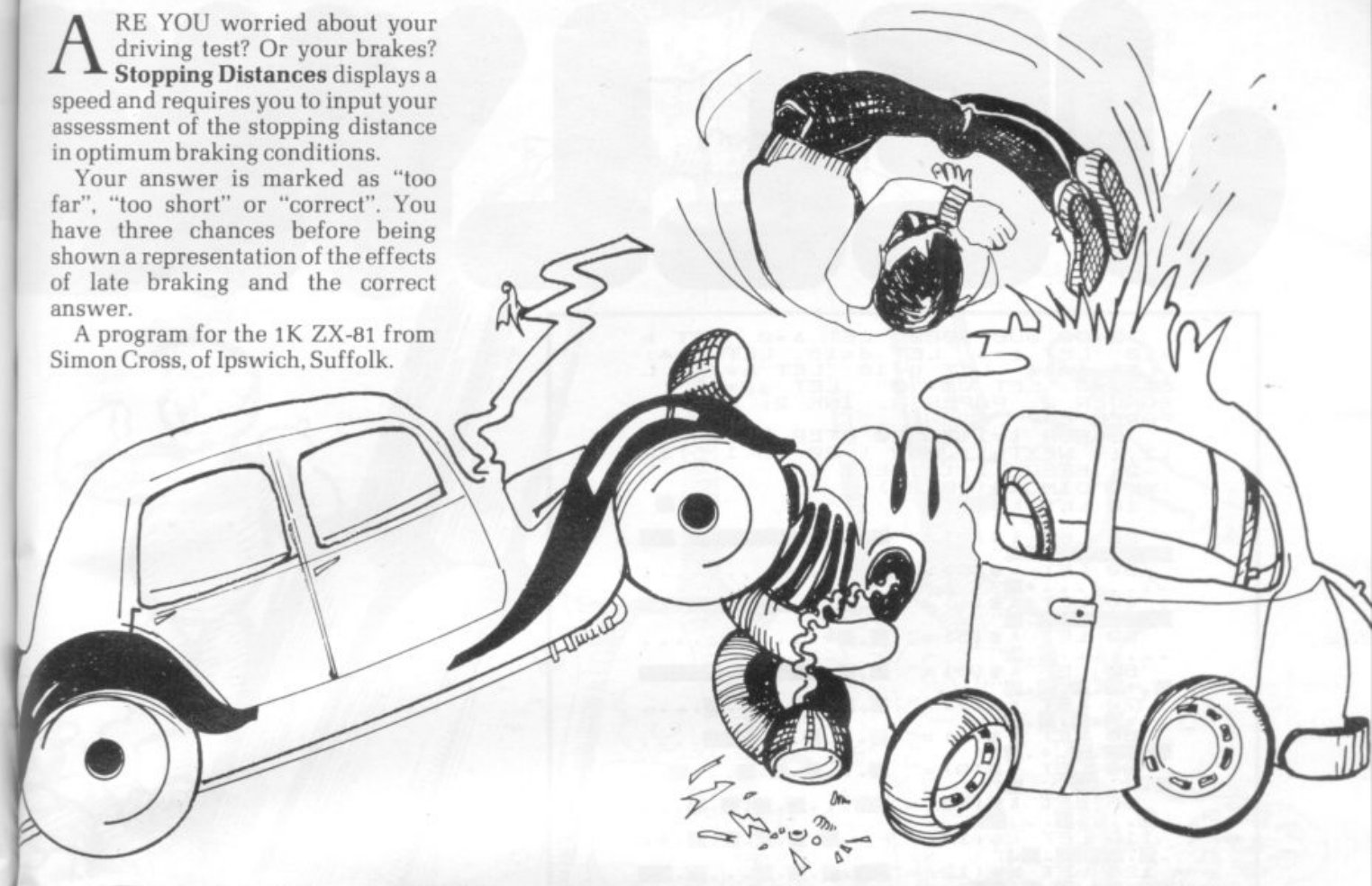
110—Thirty-two inverse full stops.
130—Inverse A, graphic shifted M, inverse V, graphic shifted N.
350 & 400—Inverse full-stop.
410—Graphic A.
530—Inverse "Congratulations, you have caught the ghost. It took you ..... time units.
550—You hit a trail and have been killed.
560—For another go, press any key.

```
  10 FOR A=0 TO 21
 110 PRINT AT A,0;"
 120 NEXT A
 130 LET A$="
 140 LET X=1
 150 LET Y=1
 160 LET Y=1
 170 LET P=INT (RND*18)+2
 180 LET Q=P
 190 LET DIR=INT (RND*4)+1
 200 LET T=0
 210 GOTO 370
 220 LET A=A+(INKEY$="0")-(INKEY
$="1")
  10 FOR A=0 TO 21
 110 PRINT AT A,0;"
 120 NEXT A
 130 LET A$="
 140 LET X=1
 150 LET Y=1
 160 LET A=3
 170 LET P=INT (RND*18)+2
 180 LET Q=P
 190 LET DIR=INT (RND*4)+1
 200 LET T=0
 210 GOTO 370
 220 LET A=A+(INKEY$="0")-(INKEY
$="1")
 230 IF A<1 THEN LET A=4
 240 IF A>4 THEN LET A=1
 250 LET X=X+(A=3)-(A=1)
 260 LET Y=Y+(A=2)-(A=4)
 270 IF X>20 THEN LET X=1
 280 IF X<1 THEN LET X=20
 290 IF Y>30 THEN LET Y=1
 300 IF Y<1 THEN LET Y=30
 310 PRINT AT XX,YY;" "
 320 PRINT AT X,Y;
 330 LET C=PEEK (PEEK 16396+256*
PEEK 16399)
 340 IF C=11 THEN GOTO 530
 350 IF C<>CODE "
" THEN GOTO 55
0
 360 PRINT AT X,Y;A$(A)
 370 LET XX=X
 380 LET T=T+1
 390 LET YY=Y
 400 PRINT AT INT (RND*22),INT (
RND*32);"
"
 410 PRINT AT P,Q;"
"
 420 LET P=P+(DIR=1)-(DIR=2)
 430 LET Q=Q+(DIR=3)-(DIR=4)
 440 IF P<1 THEN LET P=20
 450 IF P>20 THEN LET P=1
 460 IF Q<1 THEN LET Q=30
 470 IF Q>30 THEN LET Q=1
 480 PRINT AT P,Q;""""
 490 IF RND(.8 THEN GOTO 220
 500 LET ZEE=INT (RND*4)+1
 510 LET DIR=ZEE
 520 GOTO 220
 530 PRINT AT 0,0;"CONGRATULATIO
NS YOU HAVE      CAUGHT THE GH
OST, IT TOOK YOU ";T;"  TIME UNIT
S"
 540 GOTO 560
 550 PRINT AT 0,0;"YOU HIT A TRA
IL AND HAVE BEEN  KILLED."
 560 PRINT "FOR ANOTHER GO PRESS
 ANY KEY."
 570 PAUSE 100
 580 IF INKEY$="" THEN GOTO 560
 590 GOTO 1
```

ARE YOU worried about your driving test? Or your brakes? **Stopping Distances** displays a speed and requires you to input your assessment of the stopping distance in optimum braking conditions.

Your answer is marked as "too far", "too short" or "correct". You have three chances before being shown a representation of the effects of late braking and the correct answer.

A program for the 1K ZX-81 from Simon Cross, of Ipswich, Suffolk.

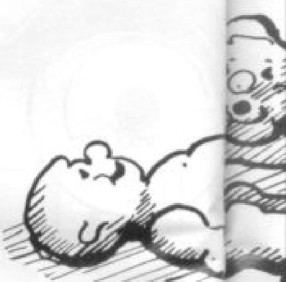


STOPPING DISTANCE

```
   5 CLS
  10 LET A=0
  20 LET B=10*INT (RND*7)
  30 IF B<20 THEN GOTO 20
  40 LET C=B+(B-20)/10*.5*B+B
  50 PRINT "WHAT IS THE MINIMUM
STOPPING"
  60 PRINT "DISTANCE IN FEET FOR
 A CAR"
  70 PRINT "TRAVELLING AT ";B;"
M.P.H. ?"
  80 INPUT D
  90 FOR N=5 TO 7
 100 PRINT AT N,0;"
                  "
 110 NEXT N
 120 PRINT AT 5,0;D;" FEET"
 130 LET A=A+1
 140 IF C=D THEN GOTO 300
 150 PRINT AT 7,0;"WRONG-";
 160 IF D>C THEN PRINT "TOO FAR.
";
 170 IF D<C THEN PRINT "TOO SHOR
T.";
 180 IF A=3 THEN GOTO 210
 190 PRINT " TRY AGAIN"
 200 GOTO 80
 210 LET A$="    "
 220 LET B$="    "
 230 PRINT AT 9,17;A$;AT 10,16;B
$;AT 9,1;A$;AT 10,0;B$;
 240 FOR N=0 TO 40
 250 NEXT N
 260 PRINT AT 9,3;A$;AT 10,2;B$;
AT 9,5;A$;AT 10,4;B$;AT 9,7;A$;A
T 10,6;B$;AT 9,9;A$;AT 10,8;B$;A
T 9,11;A$;AT 00,10;B$;AT 9,13;A$
;AT 10,12;B$;AT 9,15;A$;AT 10,14
;B$;AT 9,17;"  ";AT 10,16;"
    CRUNCH"
 270 PRINT
 280 PRINT "CORRECT ANSWER = ";C
;" FEET"
 290 GOTO 330
 300 IF A>1 THEN LET A$=" TRIES"
 310 LLIST A=1 THEN LET A$=" TRY
"
 320 PRINT AT 10,0;"CORRECT. YOU
 NEEDED ";A;A$
 330 PRINT AT 13,0;"PRESS N/L FO
R ANOTHER GO"
 340 INPUT A$
 350 RUN
```

JELLYM

```
   2 GO SUB 9000: LET a=0: LET b
=10: LET c=4: LET d=18: LET e=4:
 LET f=14: LET g=10: LET h=18: L
ET i=3: LET v$="●": LET j$="◐":
BORDER 2: PAPER 2: INK 2: CLS :
PAPER 6
   3 FOR l=1 TO 20 STEP 2: BEEP
.1,l: NEXT l: FOR l=20 TO 1 STEP
 -2: BEEP .1,l: NEXT l
   9 DIM k$(20,27)
  10 LET k$(1)="                 █ █
"
  20 LET k$(2)=" ████████████ ██
██████████"
  30 LET k$(3)=" █....*..........
.........*█"
  40 LET k$(4)=" █.█...█████████
████████.█"
  50 LET k$(5)=" █.█*...........
.......█.█"
  60 LET k$(6)=" █.█.████*.█████
█.*█.█.█.█"
  70 LET k$(7)=" █.█.█.....█....
...█.█.█.█"
  80 LET k$(8)=" █...█...███....
████.█.*.█"
  90 LET k$(9)=" █...█.█.█...█..
█.*...█...█"
  95 LET k$(10)="██...█.█.█.█...
.█....█...██"
 110 LET k$(11)="  .█.█.█.█.█.*.
.█.████.█. "
 120 LET k$(12)="██.█.█.█...█.██
██.█..█.█.██"
 130 LET k$(13)=" █.█.█.███.█...
.*...*.█.█.█"
 140 LET k$(14)=" █...█...█.████
███...█..*█"
 150 LET k$(15)=" █...█.█.█.....
......█....█"
 160 LET k$(16)=" █.█.███.███████
.*.████.█.█"
 170 LET k$(17)=" █.█..*.........
.█....*..█.█"
 180 LET k$(18)=" █...........*..
...........█"
 200 LET k$(19)=" ████████████ █
███████████"
 210 LET k$(20)="                █ █
"
 220 PRINT : FOR l=1 TO 20: INK
2: PRINT "█";k$(l): NEXT l
 300 LET k$(h,i)=" "
 305 IF A>=978 THEN CLS : LET a=
0: BORDER 2: PAPER 2: INK 2: CLS
 : PAPER 6: GO TO 3
 310 IF INKEY$="" THEN GO TO 355
 315 IF INKEY$="5" THEN LET j$="
◑"
 320 IF INKEY$="6" THEN LET j$="
◒"
 325 IF INKEY$="7" THEN LET j$="
◓"
 330 IF INKEY$="8" THEN LET j$="
◐"
 355 PRINT AT h,i;" "
 360 IF j$="◓" AND k$(h-1,i)<>"█
" THEN LET h=h-1
 370 IF j$="◐" AND k$(h,i+1)<>"█
" THEN LET i=i+1: IF i>26 THEN L
ET i=2
 375 IF j$="◒" AND k$(h+1,i)<>"█
" THEN LET h=h+1: IF h>19 THEN L
ET h=2
 380 IF j$="◑" AND k$(h,i-1)<>"█
" THEN LET i=i-1: IF i<2 THEN LE
T i=26
 385 IF h<2 THEN LET h=20
 390 PRINT AT H,I; INK 0;v$
 395 IF k$(h,i)="." THEN LET a=a
+1: PRINT AT 0,0;"Score ";a: BEE
P .001,50
 400 IF k$(h,i)="*" THEN LET a=a
+50: PRINT AT 0,0;"Score ";a: GO
 SUB 7000
 405 PRINT AT b,g;k$(b,g): IF IN
T (RND*2)+(B>H) AND k$(b-1,g)<>"
█" THEN LET b=b-1
 410 IF INT (RND*2)+(B<H) AND k$
(b+1,g)<>"█" THEN LET b=b+1
 420 IF INT (RND*2)+(G>I) AND k$
(b,g-1)<>"█" THEN LET g=g-1
 425 IF INT (RND*2)+(G<I) AND k$
(b,g+1)<>"█" THEN LET g=g+1
 430 PRINT AT b,g; INK 1;"Ж"
 435 PRINT AT H,I; INK 0;j$
 440 IF (b=h AND g=i) OR (c=h AN
D e=i) OR (d=h AND f=i) THEN PRI
NT AT h,i; FLASH 1;j$: FOR l=-20
 TO -40 STEP -1.5: BEEP .1,l: NE
XT l: STOP
 445 PRINT AT c,e;k$(c,e): IF IN
T (RND*2)+(C>H) AND k$(c-1,e)<>"
█" THEN LET c=c-1
 450 IF INT (RND*2)+(C<H) AND k$
(c+1,e)<>"█" THEN LET c=c+1
 455 IF INT (RND*2)+(E>I) AND k$
```



R BUNET of Barking, Essex, sent **Jellymen,** which bears some resemblance to a Spacman routine but has a character of its own.

Your monster is controlled by the usual cursor keys and must travel round the maze consuming food pellets, with a bonus of 50 points for the larger pellets. Jellyman ghosts wait to attack you, though occasionally a bold frontal attack on them will enable you to survive.

A running score is kept and the game stops when a monster catches you. (16K Spectrum). Graphics notes:

2-Graphic G; graphic A.
30—Larger dots should be entered as graphics.
315—Graphic B.
320—Graphic C
325—Graphic D
430—Graphic E

EN

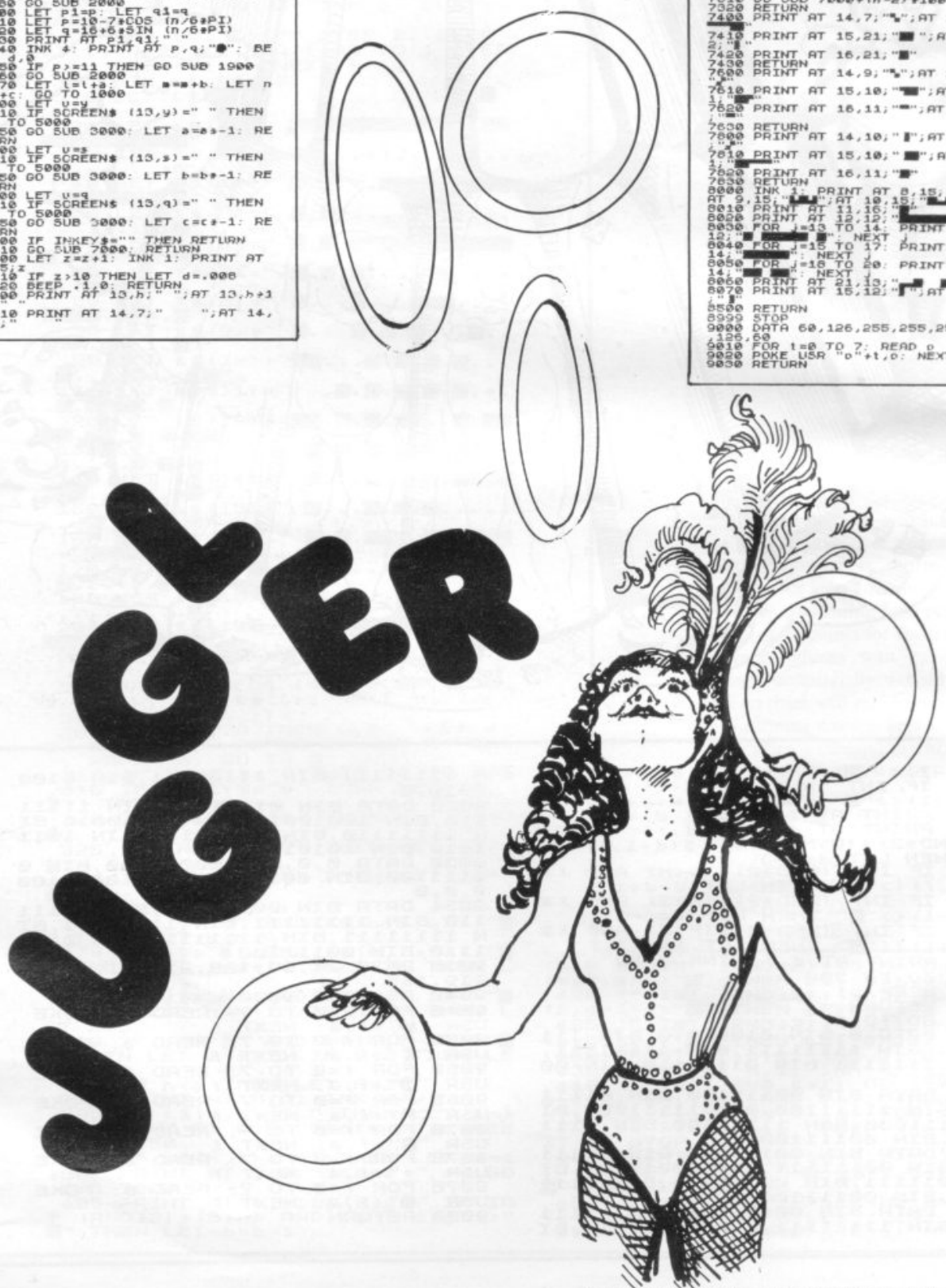
```
(c,e-1)<>"■" THEN LET e=e-1
 460 IF INT (RND*2)+(E<I) AND k$
(c,e+1)<>"■" THEN LET e=e+1
 465 PRINT AT c,e; INK 2;"■"
 470 PRINT AT d,f;k$(d,f); IF IN
T (RND*2)+(D>H) AND k$(d-1,f)<>"
■" THEN LET d=d-1
 475 IF INT (RND*2)+(D<H) AND k$
(d+1,f)<>"■" THEN LET d=d+1
 480 IF INT (RND*2)+(F>I) AND k$
(d,f-1)<>"■" THEN LET f=f-1
 485 IF INT (RND*2)+(F<I) AND k$
(d,f+1)<>"■" THEN LET f=f+1
 490 PRINT AT d,f; INK 3;"■"
 495 GO TO 300
7000 BEEP .1,-6
7001 RETURN
8999 GO TO 1
9000 DATA 0,BIN 01000010,BIN 111
00111,BIN 11111111,BIN 11111111,
BIN 11111111,BIN 01111110,BIN 00
111100
9010 DATA BIN 00111100,BIN 01111
110,BIN 11111100,BIN 11111000,BI
N 11111000,BIN 11111100,BIN 0111
1110,BIN 00111100
9020 DATA BIN 00111100,BIN 01111
110,BIN 00111111,BIN 00011111,BI
N 00011111,BIN 00111111,BIN 0111
1110,BIN 00111100
9025 DATA BIN 00111100,BIN 01111
110,BIN 11111111,BIN 11111111,BI
N 11111111,BIN 11100111,BIN 0100
0010,0
9030 DATA BIN 01111100,BIN 11111
110,BIN 10010010,BIN 10010010,BI
N 11111110,BIN 11111110,BIN 1111
1110,BIN 10101010
9032 DATA 0,0,BIN 00011000,BIN 0
0111100,BIN 00111100,BIN 0001100
0,0,0
9034 DATA BIN 00111100,BIN 01111
110,BIN 11111111,BIN 11111111,BI
N 11111111,BIN 11111111,BIN 0111
1110,BIN 00111100
9035 DATA 24,60,126,219,219,255,
219,145
9040 RESTORE 9000
9045 FOR f=0 TO 7: READ a: POKE
USR "■"+f,a: NEXT f
9050 FOR f=0 TO 7: READ a: POKE
USR "■"+f,a: NEXT f
9060 FOR f=0 TO 7: READ a: POKE
USR "■"+f,a: NEXT f
9065 FOR f=0 TO 7: READ a: POKE
USR "■"+f,a: NEXT f
9070 FOR f=0 TO 7: READ a: POKE
USR "■"+f,a: NEXT f
9075 FOR f=0 TO 7: READ a: POKE
USR "■"+f,a: NEXT f
9078 FOR f=0 TO 7: READ a: POKE
USR "■"+f,a: NEXT f
9080 RETURN
```

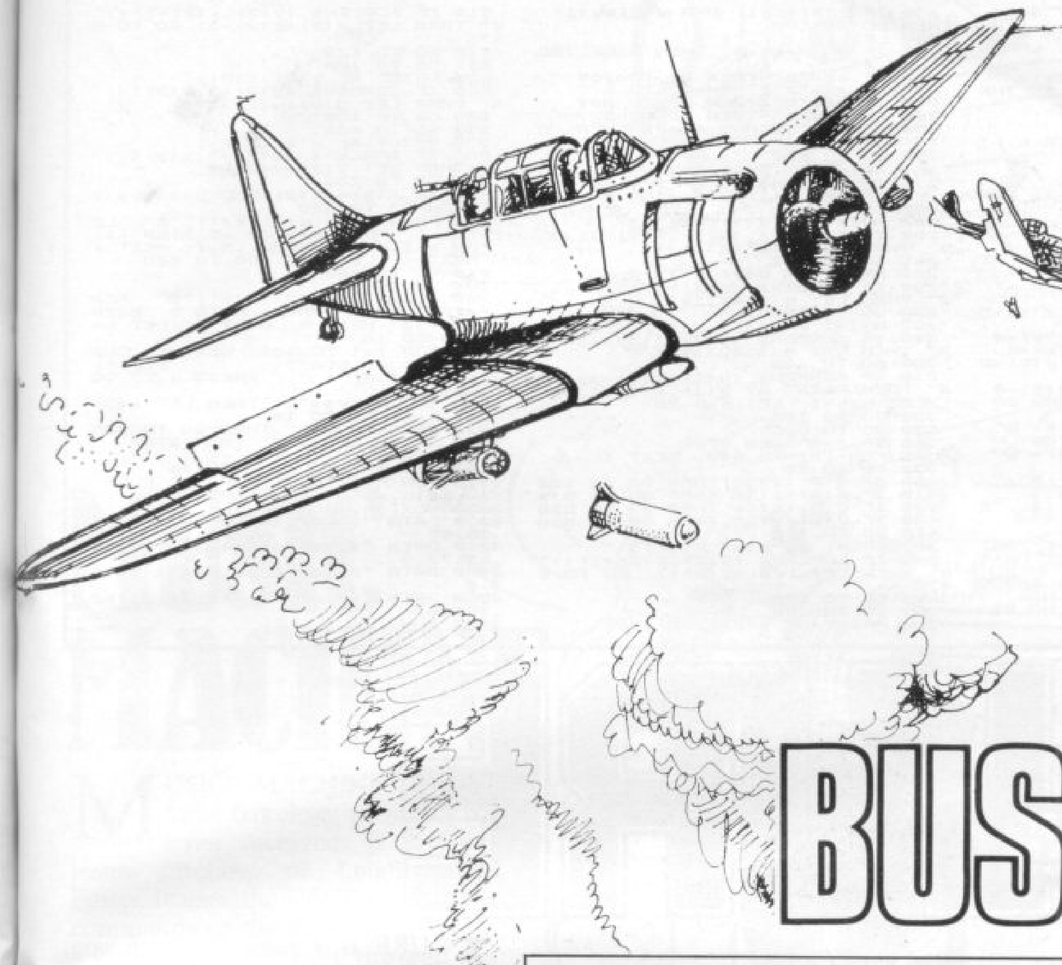
```
  100 REM  Juggler  © W G Davies
1982
  150 REM Use 1 & 0 keys to cont-
rol robot's arms
  200 GO SUB 9000
  300 LET h=0: LET z1=0: GO SUB 8
000
  400 LET z=0: PRINT AT 1,5;z
  450 PLOT 0,0: DRAW 255,0
  500 LET a=.4: LET b=.333: LET c
=.5
  550 LET l=9: LET m=9: LET n=9
  600 LET x=3: LET y=0: LET p=3:
LET q=0: LET r=3: LET s=0
  700 GO SUB 7300
  800 LET d=.01
  900 INVERSE 1: PRINT AT 0,0;"Cu
rrent Score";AT 0,22;"Best Score
": INVERSE 0
 1000 LET x1=x: LET y1=y
 1010 LET x=10-10*COS (l/6*PI)
 1020 LET y=16+10*SIN (l/6*PI)
 1030 PRINT AT x1,y1;" "
 1040 INK 2: PRINT AT x,y;"●": BE
EP d,0
 1050 IF x>=11 THEN GO SUB 1700
 1060 GO SUB 2000
 1400 LET r1=r: LET s1=s
 1410 LET r=10-8*COS (m/6*PI)
 1420 LET s=16+8*SIN (m/6*PI)
 1430 IF r>11 THEN LET r=12
 1440 PRINT AT r1,s1;" "
 1460 INK 3: PRINT AT r,s;"●": BE
EP d,0
 1470 IF r>=11 THEN GO SUB 1000
 1480 GO SUB 2000
 1600 LET p1=p: LET q1=q
 1610 LET p=10-7*COS (n/6*PI)
 1620 LET q=16+6*SIN (n/6*PI)
 1630 PRINT AT p1,q1;" "
 1640 INK 4: PRINT AT p,q;"●": BE
EP d,0
 1650 IF p>=11 THEN GO SUB 1900
 1660 GO SUB 2000
 1670 LET l=l+a: LET m=m+b: LET n
=n+c: GO TO 1000
 1700 LET v=x
 1710 IF SCREEN$ (13,y)=" " THEN
GO TO 5000
 1750 GO SUB 3000: LET a=a*-1: RE
TURN
 1800 LET v=s
 1810 IF SCREEN$ (13,s)=" " THEN
GO TO 5000
 1850 GO SUB 3000: LET b=b*-1: RE
TURN
 1900 LET v=q
 1910 IF SCREEN$ (13,q)=" " THEN
GO TO 5000
 1950 GO SUB 3000: LET c=c*-1: RE
TURN
 2000 IF INKEY$="" THEN RETURN
 2010 GO SUB 7000: RETURN
 3000 LET z=z+1: INK 1: PRINT AT
1,5;z
 3010 IF z>10 THEN LET d=.008
 3020 BEEP .1,0: RETURN
 4000 PRINT AT 13,h;" ";AT 13,h+1
6;" "
 4010 PRINT AT 14,7;"    ";AT 14,
22;"  "
 4020 PRINT AT 15,8;"    ";AT 15,
22;"  "
 4030 PRINT AT 16,11;" ";AT 16,21
;" "
 4040 RETURN
 5000 PRINT AT x,y;" ";AT r,s;" "
;AT p,q;" "
 5010 FOR j=13 TO 21
 5020 PRINT AT j-1,v;" ": IF j=14
 THEN LET j=j+5
 5030 PRINT AT j,v;"●": PAUSE 5:
NEXT j
 5040 BEEP 1,0
 5050 INPUT "Press ENTER to play
again"; LINE z$
 5060 PRINT AT 21,v;" ";AT 1,5;"
"
 5070 IF z1<z THEN LET z1=z
 5080 INK 1: PRINT AT 1,26;z1
 5090 GO TO 400
 7000 IF INKEY$="1" THEN GO SUB 7
100
 7010 IF INKEY$="0" THEN GO SUB 7
200
 7020 RETURN
 7100 IF h=0 THEN RETURN
 7110 GO SUB 4000
 7120 LET h=h-2
 7130 GO SUB 7300: RETURN
 7200 IF h=10 THEN RETURN
 7210 GO SUB 4000
 7220 LET h=h+2
 7230 GO SUB 7300: RETURN
 7300 INK 1: PRINT AT 13,h;"▀";A
T 13,h+16;"▀"
 7310 GO SUB 7000+(h-2)*100
 7320 RETURN
 7400 PRINT AT 14,7;"▄";AT 15,8;"
▀▀"
 7410 PRINT AT 15,21;"▀";AT 14,2
2;"▄"
 7420 PRINT AT 16,21;"▀"
 7430 RETURN
 7600 PRINT AT 14,9;"▄";AT 14,23;
"▄"
 7610 PRINT AT 15,10;"▀▀";AT 15,2
3;"▀▀"
 7620 PRINT AT 16,11;"▀";AT 16,21
;"▀"
 7630 RETURN
 7800 PRINT AT 14,10;"▐";AT 14,25
;"▌"
 7810 PRINT AT 15,10;"▀";AT 15,2
3;"▀▀"
 7820 PRINT AT 16,11;"▀"
 7830 RETURN
 8000 INK 1: PRINT AT 8,15;"▀▀";
AT 9,15;"▀▀";AT 10,15;"▀▀"
 8010 PRINT AT 11,15;"▀▀"
 8020 PRINT AT 12,12;"▀▀▀▀"
 8030 FOR j=13 TO 14: PRINT AT j,
12;"▀ ▀ ▀ ▀": NEXT j
 8040 FOR j=15 TO 17: PRINT AT j,
14;"▀▀": NEXT j
 8050 FOR j=18 TO 20: PRINT AT j,
14;"▀ ▀": NEXT j
 8060 PRINT AT 21,13;"▀ ▀"
 8070 PRINT AT 15,12;"▐";AT 15,20
;"▌"
 8500 RETURN
 8999 STOP
 9000 DATA 60,126,255,255,255,255
,126,60
 9010 FOR t=0 TO 7: READ p
 9020 POKE USR "p"+t,p: NEXT t
 9030 RETURN
```

WG DAVIES of Hereford has sent a frivolous but funny game for the 16K Spectrum. It is called **Juggler** and requires you to keep three coloured balls in the air by manoeuvring the juggler's ape-like arms with keys 1 and 0.

The listing is complete with sound effects and a running score. It would be ideal for keeping children entertained on wet winter afternoons.

For graphics in lines 1040, 1460, 1640 and 5030 enter 0 in graphics mode.





DAM BUSTERS

A DAMBUSTERS game for the ZX-81. Droning over Hamburg in the flak-riddled Lancaster, the bomb-aimer tensed over his sights, the Barnes-Wallace special already spinning in the bomb bay—and everybody humming the tune.

You have 10 dams to bust and the bombs are bounced by the novel cosine-controlled routine in line 320. The position of the dam is randomised and the bomb is released with any key.

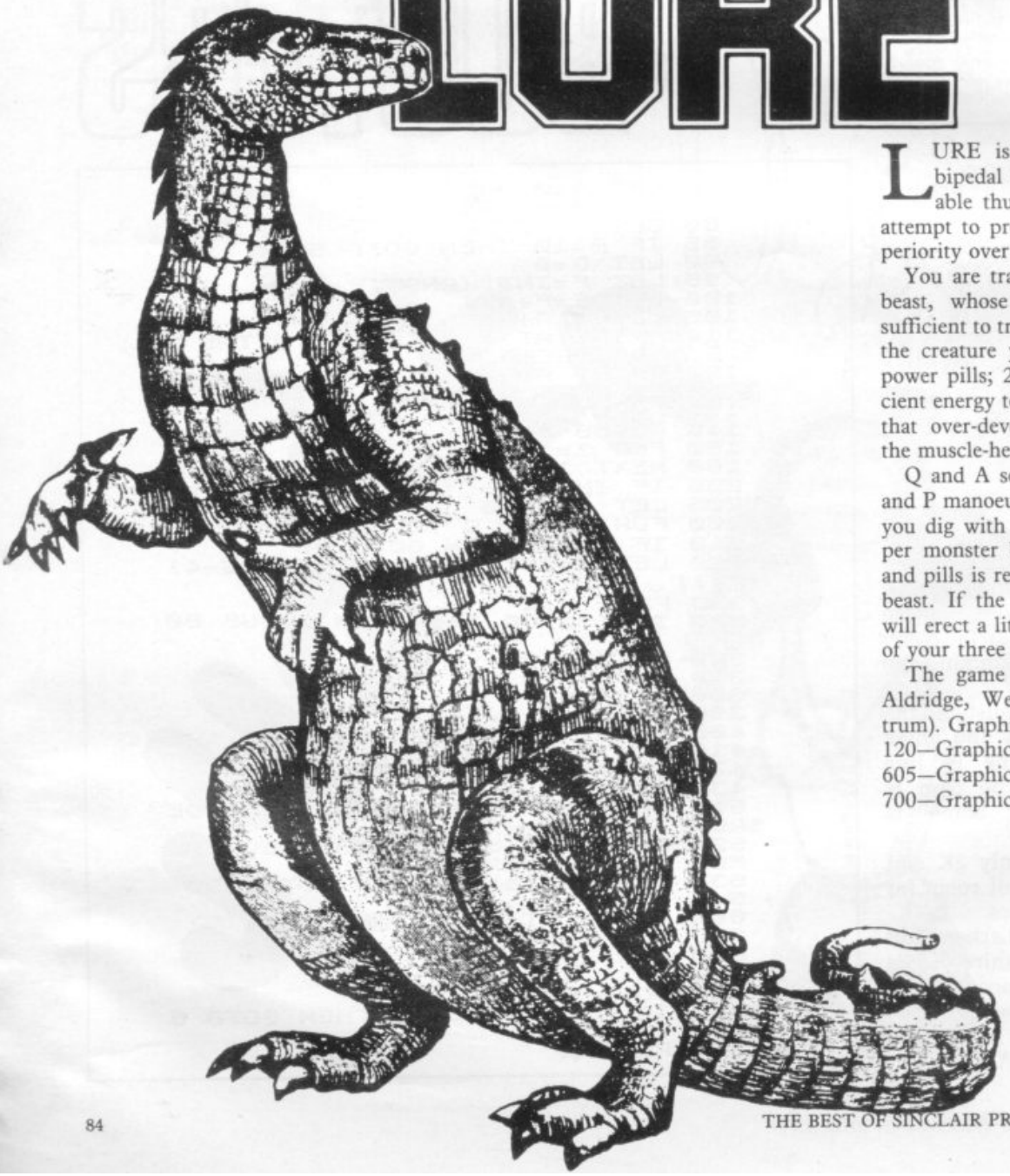
The program uses only 2K and there should be plenty of room for elaboration of the graphics.

Submitted by R Larham, of Chatteris, Cambridgeshire. The reviewer managed to account for only seven. Graphics notes:
600 – Graphic shifted A inverse asterisk, graphic shifted A.

```
  70 LET A=0
  75 LET B=A
  80 CLS
  85 IF A=10 THEN GOTO 500
  90 LET D=0
  95 LET F=INT (RND*15)+15
 100 LET E=F+2
 105 LET A=A+1
 110 PRINT AT 4,4;"DAM ";A;TAB 1
5;B;" DESTROYED"
 120 PRINT AT 20,0;"▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒
▒▒▒▒▒▒▒▒▒▒"
 130 PRINT AT 19,F;CHR$ 139
 140 GOSUB 400
 150 FOR Z=1 TO 12
 160 NEXT Z
 200 IF INKEY$="" THEN GOTO 120
 205 LET G=D+10
 300 FOR H=INT G TO 63 STEP 2
 310 IF H>63 THEN GOTO 80
 320 LET I=INT (8+4*COS (H/(G-4)
*PI))
 330 PLOT H,I
 340 IF I=4 OR I=5 THEN GOSUB 80
0
 360 GOSUB 400
 370 UNPLOT H,I
 380 NEXT H
 390 GOTO 80
 400 PRINT AT 12,D;" ▒▒▒"
 410 LET D=D+1
 420 IF D>28 THEN GOTO 80
 430 RETURN
 510 PRINT AT 4,4;"TOTAL DAMS DE
SROYED ";B
 520 PRINT AT 8,0;"PRESS NEWLINE
FOR NEXT GAME"
 530 IF INKEY$="" THEN GOTO 530
 540 RUN
 600 PRINT AT 19,F;"▒▒▒"
 610 LET B=B+1
 620 FOR Z=1 TO 24
 630 NEXT Z
 700 GOTO 80
 800 IF H=E OR H=E+1 THEN GOTO 6
00
 810 RETURN
```

```
   5 LET h=3: LET s=0: LET l=3: LET hs=0
  10 LET a=0: DIM x(2): DIM y(2): LET y(1)=1: LET x(1)=16: LET x(2)=16: LET y(2)=20
  15 IF l<=0 THEN GO TO 800
  20 CLS : OVER 0: BORDER 3: INK 0: PAPER 9
  30 FOR a=3 TO 18
  40 FOR b=4 TO 28 STEP 4
  50 PRINT INVERSE 1; PAPER 6; INK 0;AT a,b;"■"
  60 NEXT b
  70 FOR n=6 TO 28 STEP 4
  80 PRINT INVERSE 0; INK 1; PAPER 7;AT a,n;"."
  85 NEXT n
  90 NEXT a
  95 PRINT AT 0,0; PAPER 3;"                              ";AT 21,0;"                              "
 100 LET b=1
 101 IF x(b)>=31 THEN LET x(b)=31
 102 IF x(b)<=0 THEN LET x(b)=0
 103 IF y(b)<1 THEN LET y(b)=1
 105 IF y(b)>=20 THEN LET y(b)=20
 106 IF y(b)<=0 THEN LET y(b)=0
 107 LET b=b+1: IF b<=2 THEN GO TO 101
 108 IF SCREEN$ (y(2),x(2))="©" THEN LET s=s+100: GO SUB 700
 109 IF SCREEN$ (y(1),x(1))="©" THEN GO TO 330
 110 IF SCREEN$ (y(1),x(1))="." THEN LET s=s+10: LET a=a+1
 120 PRINT INK 2;AT y(1),x(1);"▚";AT y(2),x(2);" INK 1;"▟"
 123 IF s>hs THEN LET hs=s
 124 IF h=-1 THEN PRINT INK 7;AT 21,0;"      You Ran Out Of Holes      ": GO TO 600
 125 PRINT PAPER 7; INK 3; INVERSE 1;AT 0,4;"SCORE=";s;"  HI=";hs;" LIVES=";l;AT 21,0;"  HOLES LEFT=";h;"  ENERGY=";a;" "
 130 IF x(2)=x(1) AND y(2)=y(1) THEN GO TO 600
 200 LET a$=INKEY$
 205 IF INKEY$<>"" THEN BEEP .00 31266,47
 210 IF a$="p" THEN GO TO 267
 220 IF a$="o" THEN GO TO 277
 230 IF a$="q" THEN GO TO 287
 240 IF a$="a" THEN GO TO 297
 250 IF a$="m" AND a>=20 THEN GO TO 310
 260 GO TO 400
 267 PRINT AT y(1),x(1);" "
 270 IF SCREEN$ (y(1),x(1)+1)<>" " THEN LET x(1)=x(1)+1
 275 GO TO 400
 277 PRINT AT y(1),x(1);" "
 280 IF SCREEN$ (y(1),x(1)-1)<>" " THEN LET x(1)=x(1)-1
 285 GO TO 400
 287 PRINT AT y(1),x(1);" "
 290 IF SCREEN$ (y(1)-1,x(1))<>" " THEN LET y(1)=y(1)-1
 295 GO TO 400
 297 PRINT AT y(1),x(1);" "
 300 IF SCREEN$ (y(1)+1,x(1))<>" " THEN LET y(1)=y(1)+1
 305 GO TO 400
 310 IF SCREEN$ (y(1),x(1)+1)<>" " THEN PRINT AT y(1),x(1)+1;"©": LET h=h-1: LET a=a-20
 320 GO TO 100
 330 GO TO 605
 340 IF l=0 THEN STOP
 345 FOR f=1 TO 100: NEXT f
 350 GO TO 10
 400 IF x(2)<x(1) THEN GO TO 500
 410 IF x(2)>x(1) THEN GO TO 510
 420 IF y(2)<y(1) THEN GO TO 520
 430 IF y(2)>y(1) THEN GO TO 530
 440 GO TO 100
 500 PRINT AT y(2),x(2);" "
 503 IF SCREEN$ (y(2),x(2)+1)<>" " THEN LET x(2)=x(2)+1: GO TO 537
 505 GO TO 420
 507 GO TO 100
 510 PRINT AT y(2),x(2);" "
 513 IF SCREEN$ (y(2),x(2)-1)<>" " THEN LET x(2)=x(2)-1: GO TO 517
 515 GO TO 420
 517 GO TO 100
 520 PRINT AT y(2),x(2);" "
 523 IF SCREEN$ (y(2)+1,x(2))<>" " THEN LET y(2)=y(2)+1
 525 GO TO 430
 527 GO TO 400
 530 PRINT AT y(2),x(2);" "
 533 IF SCREEN$ (y(2)-1,x(2))<>" " THEN LET y(2)=y(2)-1
 537 GO TO 100
 600 IF x(1)<>x(2) AND y(1)<>y(2) THEN GO TO 100
 605 PRINT ;AT y(1),x(1);"‡": LET l=l-1: FOR f=-2 TO -5 STEP -1: FOR a=1 TO 3: BEEP .5,f: NEXT a: NEXT f: LET h=3: GO TO 620
 610 GO TO 100
 630 GO TO 10
 700 PRINT AT y(2),x(2);"@": FOR f=10 TO 20: FOR a=-5 TO 5: BEEP .01,f+a: NEXT a: NEXT f: LET h=3: GO TO 10
 800 FOR f=1 TO 100: NEXT f: CLS : PRINT AT 5,0;"                    Score=";s;AT 10,0;"          PRESS y TO GO AGAIN":
 805 IF INKEY$="y" THEN LET l=3: LET s=0: GO TO 10
 810 IF INKEY$="" THEN GO TO 805
 820 IF INKEY$<>"y" THEN STOP
 830 STOP
9000 FOR f=1 TO 4: READ a$
9010 FOR n=0 TO 7: READ a: POKE USR a$+n,a
9020 NEXT n: NEXT f
9030 DATA "a",60,16,60,90,153,24,36,66
9040 DATA "b",48,16,240,48,60,50,81,72
9050 DATA "c",0,60,66,90,90,66,60,0
9060 DATA "d",24,24,126,24,24,60,126,0
9999 RUN
```

LURE



LURE is a game in which you, bipedal mammal with the opposable thumb and wrinkled cortex, attempt to prove your evolutionary superiority over a dumb dinosaur.

You are trapped in a maze with the beast, whose minimal intelligence is sufficient to track you down. As you flee the creature you are able to consume power pills; 20 of them give you sufficient energy to dig a trap. Then employ that over-developed fore-brain to lure the muscle-head into the hole.

Q and A send you up and down; O and P manoeuvre you left and right and you dig with M. You have three holes per monster but your supply of holes and pills is renewed if you can trap the beast. If the dinasaur catches you he will erect a little cross and you lose one of your three lives.

The game was sent by A Ward of Aldridge, West Midlands. (16K Spectrum). Graphic notes:
120—Graphic A, graphic B
605—Graphic D.
700—Graphic C.

MUSIC MACHINE

MUSIC MACHINE is the most frivolous program we have received. It is from Jason Fitchew of Leigh-on-Sea, Essex. It uses the FAST and SLOW commands on the ZX-81 to generate a kind of musical scale through the TV speaker.

The scale is to be found on keys 1 to 6 and is the kind of basso-profondo associated usually with Count Dracula hunched over the organ keys in the crypt at midnight. Tune the dial slightly off-station to start the background hum, turn up the volume and shake to that vampire beat. Graphics notes: 68, 180 and 243—Inverse.

```
    5 FAST
    6 SLOW
    7 FAST
   25 IF INKEY$="3" THEN GOTO COD
E "C"
   27 IF INKEY$="4" THEN GOTO VAL
  "80"
   28 IF INKEY$="5" THEN GOTO COD
E "■"
   29 IF INKEY$="6" THEN GOTO VAL
  "200"
   30 GOTO CODE "■"
   40 FAST
   41 SLOW
   50 SLOW
   60 FAST
   65 IF INKEY$="2" THEN GOTO COD
E "▌"
   67 IF INKEY$="4" THEN GOTO VAL
  "80"
   68 IF INKEY$="5" THEN GOTO COD
E "■"
   69 IF INKEY$="6" THEN GOTO VAL
  "200"
   70 GOTO CODE "C"
   80 FAST
   81 FAST
   83 SLOW
   90 SLOW
   91 SLOW
  110 FAST
  120 IF INKEY$="2" THEN GOTO COD
E "▌"
  125 IF INKEY$="3" THEN GOTO COD
E "C"
  126 IF INKEY$="5" THEN GOTO COD
E "■"
  127 IF INKEY$="6" THEN GOTO VAL
  "200"
  130 GOTO VAL "80"
  140 FAST
  150 SLOW
  152 SLOW
  153 SLOW
  154 SLOW
  160 FAST
  170 IF INKEY$="4" THEN GOTO VAL
  "80"
  171 IF INKEY$="2" THEN GOTO COD
E "▌"
  172 IF INKEY$="3" THEN GOTO COD
E "C"
  173 IF INKEY$="6" THEN GOTO VAL
  "200"
  180 GOTO CODE "■"
  200 FAST
  210 FAST
  220 SLOW
  221 SLOW
  222 SLOW
  223 SLOW
  229 SLOW
  230 FAST
  240 IF INKEY$="2" THEN GOTO COD
E "▌"
  241 IF INKEY$="3" THEN GOTO COD
E "C"
  242 IF INKEY$="4" THEN GOTO VAL
  "80"
  243 IF INKEY$="5" THEN GOTO COD
E "■"
  250 GOTO VAL "200"
```

OUTL

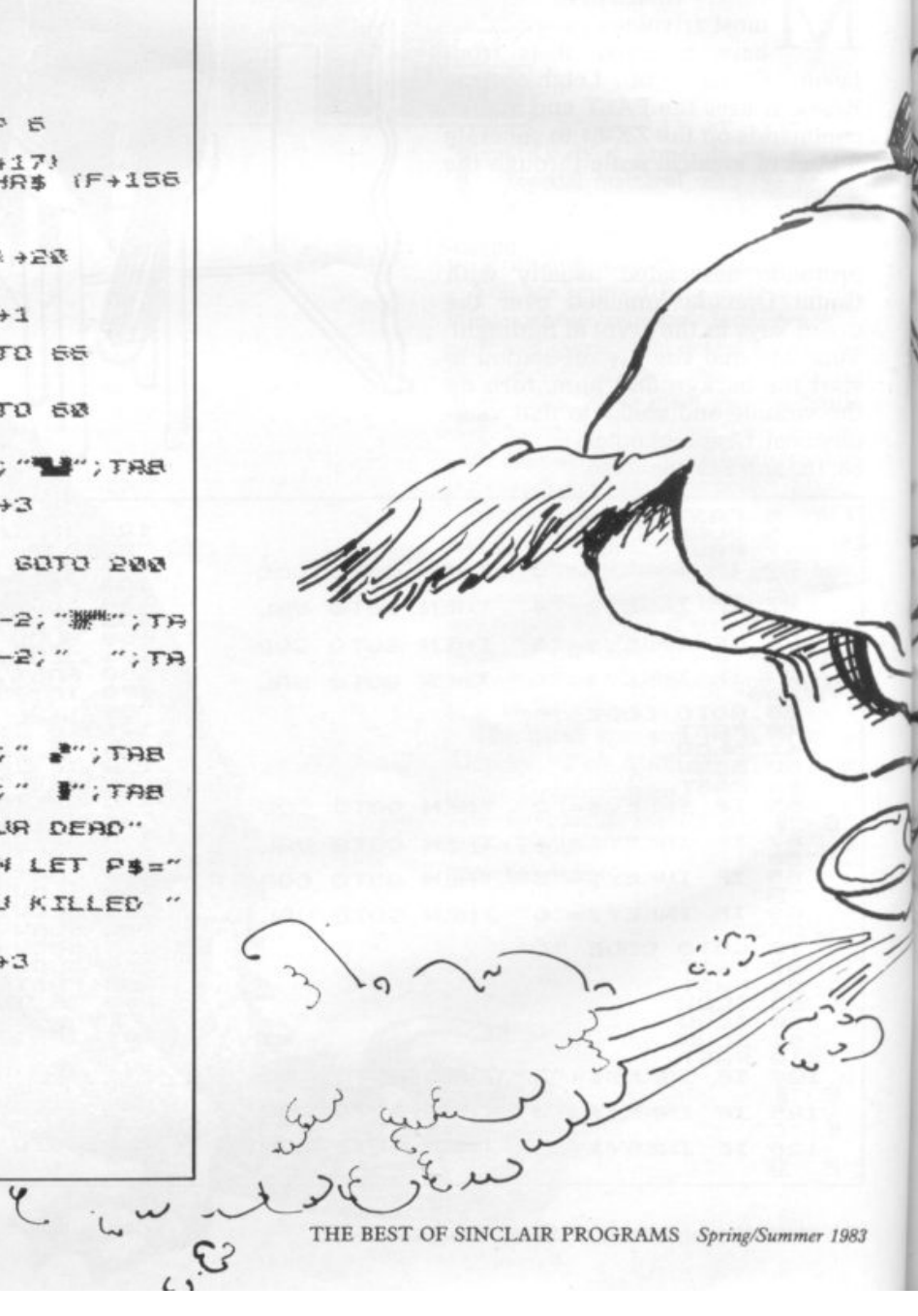
SOME OF the best graphics we have seen are the striking feature of this reaction game for the 16K ZX-81.

D G Lomas, of Dukinfield, Cheshire, who submitted **Outlaw,** has managed to achieve something approaching the effect of a slow animated film by drawing and re-drawing the outlaws as they fall dead.

There are five of the villians who reach for their guns in a random order. Your task is to press the appropriate key before they can kill you. The pleasure of shooting first is enhanced by those fine graphics.

Graphic Notes:
359 – Graphic shifted 1, graphic shifted 2.
1010 – PRINT AT x(F)+I, Y; A$(I).

```
    1 RAND
    5 LET F=0
    6 LET N=0
    7 DIM X(6)
    8 DIM A(6)
   10 DIM A$(4,5)
   12 LET A$(1)="  -■-"
   14 LET A$(3)="  ■ "
   16 LET A$(4)=" ▟▙"
   20 FOR Y=2 TO 26 STEP 6
   22 LET F=F+1
   25 LET X(F)=INT (RND*17)
   30 LET A$(2)=" ▛"+(CHR$ (F+156
))+"▜"
   40 GOSUB 1000
   50 NEXT Y
   51 LET U=INT (RND*71)+20
   52 FOR S=1 TO U
   54 NEXT S
   60 LET T=INT (RND*5)+1
   62 FOR A=1 TO 5
   63 IF A(A)=0 THEN GOTO 66
   64 NEXT A
   65 GOTO 162
   66 IF A(T)=1 THEN GOTO 60
   70 LET A(T)=1
   80 LET Q=2+(6*(T-1))
   90 PRINT AT X(T)+2,0;"▜";TAB
 0+3;"▙"
  100 LET L=INT (RND*5)+3
  105 LET T$=STR$ T
  110 FOR R=1 TO L
  120 IF INKEY$=T$ THEN GOTO 200
  130 NEXT R
  132 FOR U=1 TO 5
  135 PRINT AT X(T)+2,0-2;"▒▒";TA
B 0+5;"▒▒"
  138 PRINT AT X(T)+2,0-2;"  ";TA
B 0+5;"  "
  139 NEXT U
  140 FOR U=1 TO 25
  141 NEXT U
  145 PRINT AT X(T)+2,0;" ▟";TAB
0+3;"▙ "
  150 PRINT AT X(T)+3,0;" ▌";TAB
0+3;"▌ "
  160 PRINT AT 0,10;"YOUR DEAD"
  162 LET P$=" "
  163 IF N>1 OR N=0 THEN LET P$="
S"
  166 PRINT AT 21,5;"YOU KILLED "
;N;" OUTLAW";P$
  170 STOP
  200 LET D=INT (RND*4)+3
  202 LET N=N+1
  205 LET F=T
  208 LET Y=2+(6*(T-1))
  210 GOSUB D*100
  220 GOTO 51
  300 LET A$(2)=" ▟▙"
  301 LET A$(1)="  -■-"
  302 LET A$(3)="  ■ "
  303 LET A$(4)=" ▟▙"
  310 GOSUB 1000
```



AW

```
315 LET A$(1)="        "
316 LET A$(3)="        "
318 LET A$(2)="        "
320 LET A$(4)="        "
322 GOSUB 1000
325 LET A$(1)="        "
335 LET A$(2)="        "
337 LET A$(3)="        "
340 GOSUB 1000
345 LET A$(4)="        "
350 GOSUB 1000
355 LET X(T)=X(T)+1
357 LET A$(3)="        "
359 LET A$(4)="        "
360 PRINT AT X(T),Y;"        "
365 GOSUB 1000
370 LET A$(1)="        "
372 LET A$(2)="        "
374 LET A$(3)="        "
376 LET A$(4)="        "
380 GOSUB 1000
385 LET A$(2)="        "
387 LET A$(3)="        "
389 LET A$(4)="        "
395 GOSUB 1000
398 RETURN
400 LET A$(2)="        "
401 LET A$(1)="        "
402 LET A$(3)="        "
403 LET A$(4)="        "
410 GOSUB 1000
415 LET A$(2)="        "
418 LET A$(3)="        "
420 LET A$(4)="        "
425 GOSUB 1000
428 LET A$(1)="        "
430 LET A$(2)="        "
432 LET A$(3)="        "
434 LET A$(4)="        "
435 FOR U=1 TO 6
436 NEXT U
440 GOSUB 1000
450 LET A$(1)="        "
452 LET A$(2)="        "
454 LET A$(3)="        "
456 LET A$(4)="        "
457 PRINT AT X(T),Y;"   "
458 FOR U=1 TO 6
459 NEXT U
460 GOSUB 1000
470 RETURN
500 LET A$(1)="        "
502 LET A$(3)="        "
504 LET A$(4)="        "
510 LET A$(2)="        "
515 GOSUB 1000
520 LET A$(1)="        "
522 LET A$(2)="        "
524 LET A$(3)="        "
526 LET A$(4)="        "
527 FOR U=1 TO 6
528 NEXT U
530 GOSUB 1000
540 LET A$(2)="        "
542 LET A$(3)="        "
544 LET A$(4)="        "
546 PRINT AT X(T),Y-1;"   "
550 GOTO 1000
560 RETURN
600 LET A$(2)="        "
601 LET A$(1)="        "
602 LET A$(3)="        "
603 LET A$(4)="        "
610 GOSUB 1000
615 LET A$(2)="        "
618 LET A$(3)="        "
620 LET A$(4)="        "
621 FOR U=1 TO 6
622 NEXT U
625 GOSUB 1000
630 LET A$(2)="        "
632 LET A$(3)="        "
634 LET A$(4)="        "
636 LET A$(1)="        "
638 FOR U=1 TO 6
639 NEXT U
640 GOSUB 1000
650 LET A$(1)="        "
652 LET A$(2)="        "
654 LET A$(3)="        "
656 LET A$(4)="        "
658 PRINT AT X(T),Y+3;"   "
660 GOSUB 1000
670 RETURN
1000 FOR I=1 TO 4
1010 PRINT AT X(F)+I,Y;A$(I)
1020 NEXT I
1030 RETURN
```

BEAN CUP

```
 10 DIM A(14)
100 FOR J=1 to 14
110 IF J=7 OR J=14 THEN GOTO 130
120 LET A(J)=4
130 NEXT J
200 FOR J=1 TO 7
210 PRINT A(15-J); "2 spaces";
220 NEXT J
230 PRINT
240 PRINT
250 PRINT "4 spaces";
260 FOR J=1 TO 7
270 PRINT A(J); "2 spaces";
280 NEXT J
290 PRINT
300 PRINT
310 PRINT "ENTER CUP NO."
320 INPUT C
330 CLS
340 GOSUB 1000
400 FOR J=1 TO 6
410 IF NOT A(14-J)=0 THEN
GOTO 440
420 NEXT J
430 GO TO 460
440 LET C=14-J
450 GOSUB 1000
460 IF A(7)+A(14)<48 THEN GOTO
200
470 IF A(7)=A(14) THEN PRINT "A
DRAW"
480 IF A(7)> A(14) THEN PRINT
"YOU WIN"
490 IF A(7)<A(14) THEN PRINT "I
WIN"
500 STOP
1000 IF A(C)=0 THEN RETURN
1010 FOR J=C+1 TO A(C)+C
1020 LET K=J
1030 IF J>14 THEN LET K=J-14
1040 LET A(K)=A(K)+1
1050 NEXT J
1060 LET A(C)=0
1070 IF NOT A(K)=1 OR NOT K=7 OR
NOT K=14 THEN RETURN
1080 LET A(K)=A(K)+A(14-K)
1090 LET A(14-K)=0
2000 RETURN
```

SOMETIMES, when the cursor finger is worn to the knuckle and we are blinking at 50 cycles per second, nothing pleases us like a game where thinking is not just something between you and a high score. When the game works on a ZX-80, we are really happy.

Beancup is a fine brain-game from Nigeria. You sit cross-legged with a row of seven cups in front of you. Each cup contains four beans—except the store-cup on the right-hand end of the row, which is empty. Your opponent faces you with exactly the same equipment in front of him.

The display will show you two rows of numbers, representing the beans. The bottom row is yours and the top one is operated by the suddenly-cunning ZX-80.

You move by taking all the beans from one of your cups and dropping one into the cup on its right, one into the cup on the right of that, and so on, anti-clockwise round all 14 cups until you finish. You cannot empty the store-cups. The game ends when all the beans are out of circulation and the winner is the player with the most beans in his store cup.

Input the number of the cup you wish to empty and the computer will display the position of the beans after your move and its own response. If you have no beans on your side to move, then enter any number from 1 to 6.

If you can beat the machine you are better than we are. Submitted by Paul Morriss of Alford, Lincs.

LINEAL REGRESSION

```
   1 REM "LR"
  10 LET A=0
  20 LET B=0
  30 LET C=0
  40 LET D=0
  50 LET E=0
  80 LET H=0
  90 PRINT "HOW MANY PAIRS OF NU
MBERS?"
 100 INPUT N
 105 CLS
 110 PRINT "INPUT X THEN Y."
 120 INPUT X
 130 INPUT Y
 135 CLS
 140 LET A=A+X
 150 LET B=B+Y
 160 LET C=C+X*X
 170 LET D=D+Y*Y
 180 LET E=E+X*Y
 190 LET F=A/N
 200 LET G=B/N
 210 LET H=H+1
 220 IF H<N THEN GOTO 110
 270 LET I=(N*E-A*B)/(N*C-A*A)
 280 LET J=G-I*F
 290 PRINT "Y=";J;"+";I;"X"
 300 LET K=(N*E-A*B)/(N*D-B*B)
 310 LET L=F-K*G
 320 PRINT "X=";L;"+";K;"Y"
 330 LET P=SQR (D/(N-1)-(B*B/(N*
(N-1))))
 340 LET Q=SQR (C/(N-1)-(A*A/(N*
(N-1))))
 350 PRINT "X SIGMA(N-1)= ";Q
 360 PRINT "Y SIGMA(N-1)= ";P
 370 LET Q=SQR (((1/N)*C)-F*F)
 380 LET R=SQR (((1/N)*D)-G*G)
 390 PRINT "X SIGMA(N)= ";Q
 400 PRINT "Y SIGMA(N)= ";R
 410 LET S=((1/N)*E-(F*G))/(Q*R)
 420 PRINT "CORRELATION COEFFICI
ENT(R)="
 430 PRINT "R=";S
 440 PRINT "STANDARD ERROR OF ES
TIMATE"
 450 PRINT "S(Y)= ";R*SQR (1-S*S
)
 460 PRINT "S(X)= ";Q*SQR (1-S*S
)
```

IF YOU are struggling with mathematics homework, **Lineal regression** calculates those tricky problems using the ZX-81. It relates both x to y and y to x, as well as giving the probable errors involved.

From Martyn Whitwood, of Rotherham, South Yorkshire.

√5 FACTORS

JASON MINETT of Birkenhead, Merseyside, has sent two programs for calculating factors. The first will find all the factors of a given number and the second will provide its prime factors.

In both cases the machine waits for a number to be input and then prints the appropriate answers (1K ZX-81).

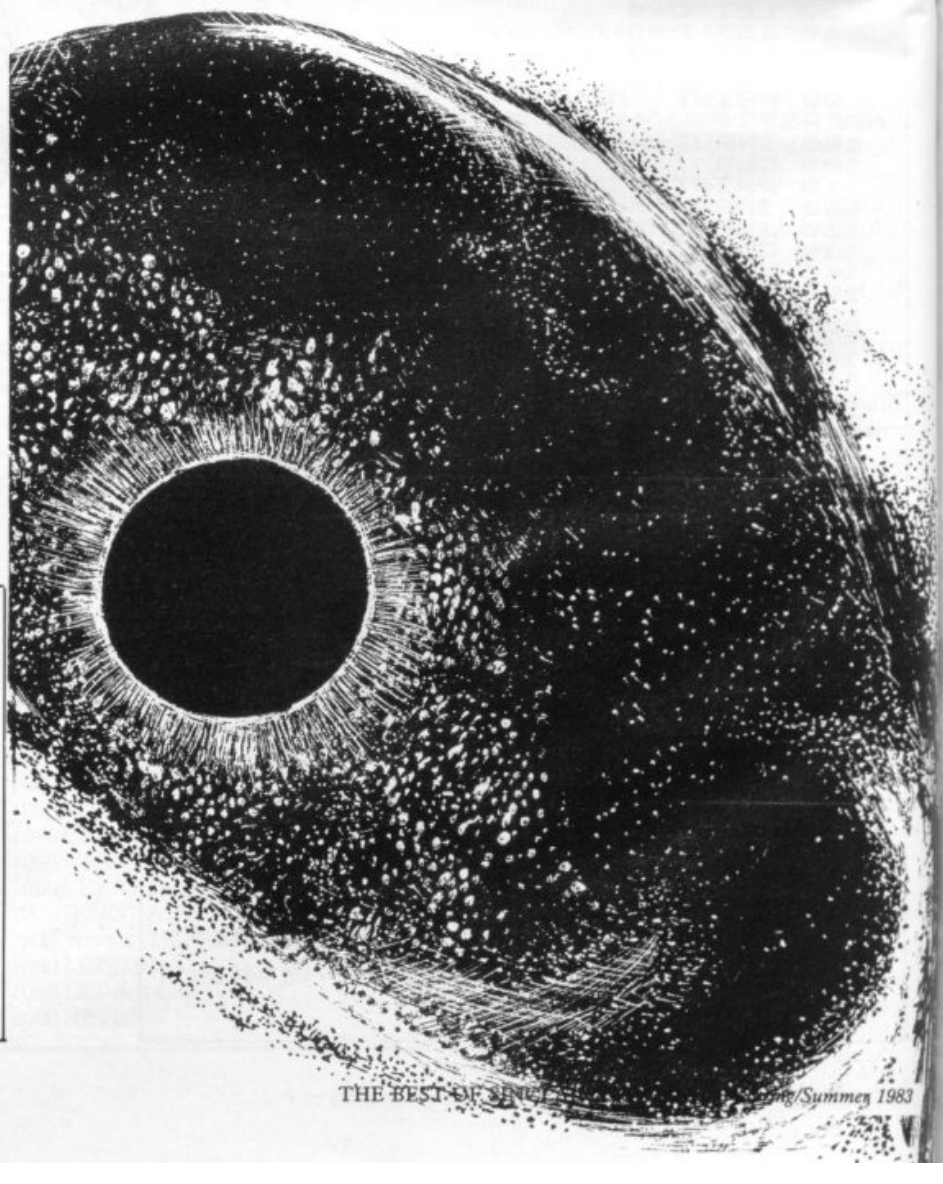
```
  5~REM FACTORS
 10 FAST
 20 INPUT A
 30 PRINT A;
 40 FOR B=A-1 TO 1 STEP -1
 50 IF A/B=INT (A/B) THEN PRINT
",";B;
 60 NEXT B
 70 PRINT "."
 80 RUN


  5~REM PRIME FACTORS
 20 INPUT A
 30 PRINT A;"=";
 40 LET B=2
 50 IF A/B<>INT (A/B) THEN GOTO
80
 60 GOSUB 190
 70 GOTO 50
 80 FOR B=3 TO A STEP 2
 90 FOR C=3 TO B-1 STEP 2
100 IF B/C=INT (B/C) THEN GOTO
110 NEXT C
120 IF A/B<>INT (A/B) THEN GOTO
150
130 GOSUB 190
140 GOTO 120
150 NEXT B
160 POKE 16398,(PEEK 16398)-1
170 PRINT "."
180 RUN
190 PRINT B;"*";
200 LET A=A/B
210 RETURN
```

BLACK HOLES

BLACK HOLES is an uncomplicated game for the IK XZ-81 for which you are required to manoeuvre your speeding spacecraft through a whole cosmos of the omnivorous megastars.

Change course with keys 8 and 5 and when you crash the length of time you survived will be displayed. Sent by James Hatchell of Guildford, Surrey.

```
  10 LET A=17300
  20 LET D=0
  30 LET Y=10
  40 LET B=INT (RND*21)
  50 PRINT AT 21,B;" "
  60 PRINT AT 9,Y-1;"   "
  70 IF Y=21 THEN LET Y=1
  80 IF Y=0 THEN LET Y=20
  90 PRINT AT 10,Y;"H"
 100 POKE A,B
 110 LET D=D+1
 120 LET A=A+1
 130 LET Y=Y+(INKEY$="8")-(INKEY
$="5")
 140 SCROLL
 150 IF A=17350 THEN LET A=17300
 160 IF PEEK (A-12)=Y THEN GOTO
180
 170 GOTO 40
 180 PRINT "CRASH ";D
```



CONSTELLATIONS

CONSTELLATIONS is a program specially for all avid stargazers. After the lengthy process of entering it, press RUN and NEW LINE and a menu is provided, listing 10 groups of stars. Pick which one you wish to see and the group of stars is shown, along with its name.

The list available is the same as that sent by the writer of the program but others can be added or substituted according to taste.

The main idea is to provide some kind of record of a particular constellation, so it is essential to save the program on cassette.

Kevan Cheyne, aged 10, of Hartlepool, Cleveland, wrote the program for a school project on stars. No doubt the next project will be to draw a picture of Patrick Moore.

```
 10 PRINT "CONSTELLATION MENU"
 15 PRINT "                   "
 20 PRINT "1. DELPHINUS"
 30 PRINT "2. LYRA"
 35 PRINT "3. BOOTES"
 36 PRINT "4. LEPUS"
 40 PRINT "5. PEGASUS"
 41 PRINT "6. CANCER"
 42 PRINT "7. LIBRA"
 43 PRINT "8. CETUS"
 44 PRINT "9. AURIGA"
 45 PRINT "10. THE LITTLE DOG"
 46 FOR F=1 TO 9
 47 PRINT "                   "
 48 NEXT F
 50 INPUT A
 60 IF A<1 OR A>10 THEN GOTO 9
 70 GOTO A*100
100 CLS
105 PRINT TAB 1,"DELPHINUS"
110 PLOT 21,42
120 PLOT 46,43
130 PLOT 26,22
140 PLOT 51,22
150 PLOT 56,0
151 GOTO 1100
200 CLS
205 PRINT TAB 20,"LYRA"
210 PLOT 31,30
215 PLOT 36,32
220 PLOT 56,36
225 PLOT 54,9
230 PLOT 45,2
235 PLOT 31,15
240 PLOT 16,3
245 PLOT 12,8
250 PLOT 7,37
251 GOTO 1100
300 CLS
305 PRINT TAB 20,"BOOTES"
310 PLOT 32,23
320 PLOT 35,36
325 PLOT 30,33
330 PLOT 22,36
335 PLOT 25,21
340 PLOT 29,4
350 PLOT 24,3
360 PLOT 34,2
370 GOTO 1100
400 CLS
401 PRINT TAB 20,"LEPUS"
410 PLOT 32,10
420 PLOT 42,14
425 PLOT 47,12
430 PLOT 45,22
435 PLOT 46,27
440 PLOT 42,27
445 PLOT 37,20
450 PLOT 27,24
455 PLOT 24,26
460 PLOT 23,23
465 PLOT 28,13
470 GOTO 1100
500 CLS
501 PRINT TAB 20,"PEGASUS"
510 PLOT 32,15
515 PLOT 30,10
520 PLOT 28,3
525 PLOT 45,3
530 PLOT 7,30
535 PLOT 26,43
540 PLOT 45,33
545 PLOT 48,33
550 PLOT 47,29
555 PLOT 49,27
560 GOTO 1100
600 CLS
602 PRINT TAB 20,"CANCER"
610 PLOT 32,37
620 PLOT 42,39
630 PLOT 57,43
640 PLOT 10,39
645 PLOT 22,22
650 PLOT 42,25
660 GOTO 1100
700 CLS
701 PRINT TAB 20,"LIBRA"
710 PLOT 32,37
720 PLOT 42,27
730 PLOT 24,27
740 PLOT 26,9
750 PLOT 24,7
760 PLOT 36,14
770 GOTO 1100
800 CLS
801 PRINT TAB 20,"CETUS"
810 PLOT 39,17
820 PLOT 54,15
830 PLOT 43,13
835 PLOT 49,2
840 PLOT 35,5
845 PLOT 16,30
850 PLOT 31,10
855 PLOT 14,34
860 PLOT 14,38
865 PLOT 18,42
870 PLOT 25,39
875 PLOT 21,37
880 PLOT 18,34
890 GOTO 1100
900 CLS
902 PRINT TAB 20,"AURIGA"
910 PLOT 32,21
920 PLOT 25,41
930 PLOT 18,22
940 PLOT 14,9
950 PLOT 39,0
960 PLOT 39,18
970 PLOT 42,18
971 PLOT 41,22
980 GOTO 1100
1000 CLS
1002 PRINT TAB 18,"THE LITTLE DO
G"
1010 PLOT 10,10
1090 PLOT 40,40
1100 PRINT AT 21,0,"TO HOLD:H"
1104 FOR S=1 TO 100
1105 IF INKEY$="H" THEN LET S=0
1106 IF INKEY$="Z" THEN COPY
1110 NEXT S
1111 RUN
1120 SAVE "CON"
1121 RUN
```

GRUB RACE

GRUB RACE involves a race between three good representations of caterpillars. The progress of the race is decided by random elements in the program and the player places bets on the likely winner, starting with a total of £100.

The race is complicated by the fact that at any moment the caterpillars may turn into butterflies which, after fluttering on the screen for a time, return to being caterpillars and have to start again. Complete instructions are included in the program once it is run.

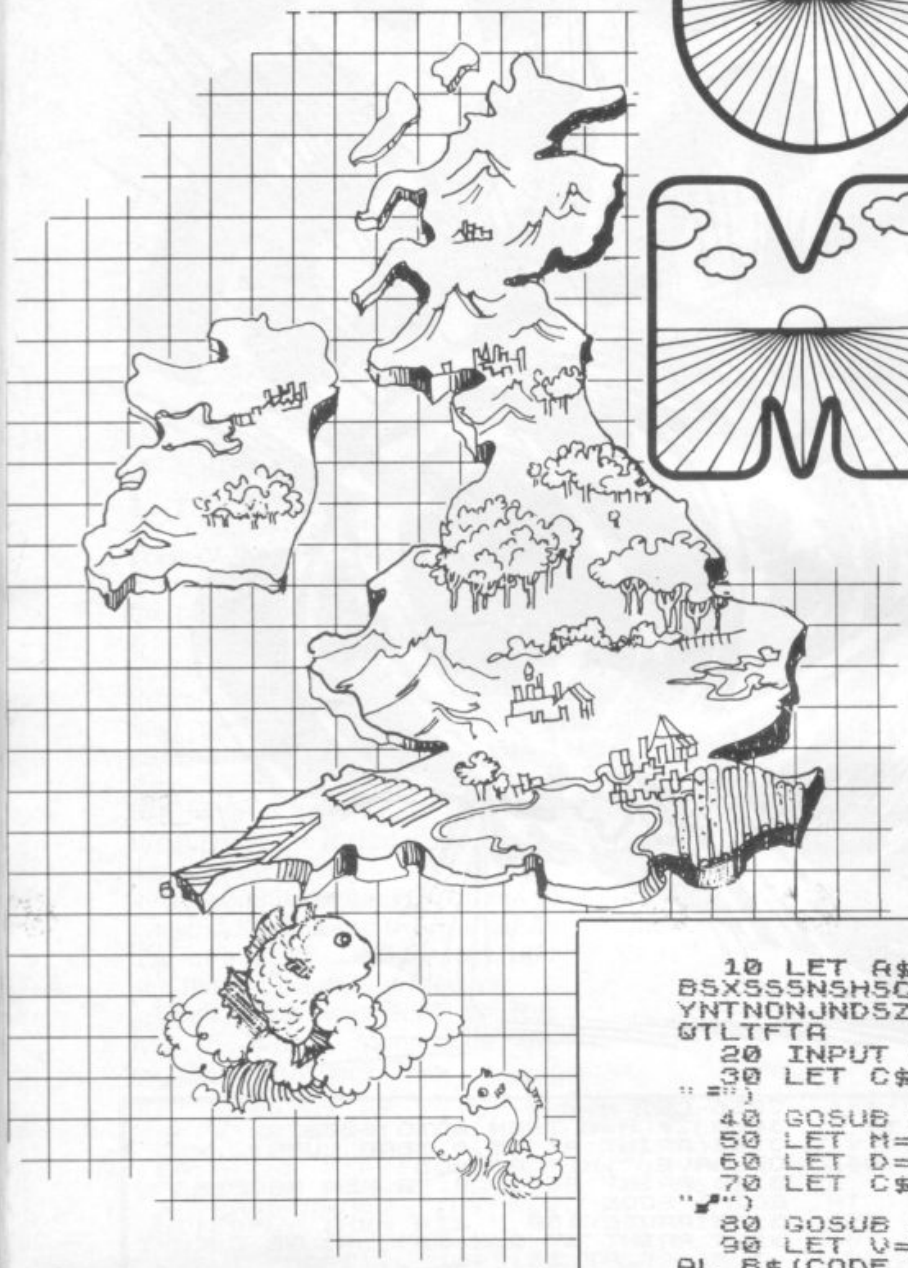
The graphics in lines 60, 70, and 80 are 30 shifted Ss and two shifted As and the butterflies in lines 1061, 1071 and 1081 include two shifted As.

Grub Race was sent by Roy Kay of Wirral, Merseyside and requires a RAM pack.

```
   1 PRINT AT 1,10;"GRUB RACE"
   2 PRINT AT 4,3;"WILL YOUR CHO
SEN GRUB ";AT 5,3;"BE FIRST TO R
EACH THE ";AT 6,3;"SAFETY OF THE
 CABBAGE PATCH?";AT 7,3;"IF HE I
S TRANSFORMED ";AT 8,3;"INTO A B
UTTERFLY THEN HIS ";AT 9,3;"LIFE
 WILL BE SPECTACULAR";AT 10,3;".
..BUT SHORT...";AT 12,3;"EACH BU
TTERFLY ";AT 13,3;"IS RESSURECTE
D AS A GRUB ";AT 14,3;"AND BEGIN
S AGAIN "
   3 PRINT AT 18,4;"PRESS ANY KE
Y TO START"
   5 PAUSE 4E4
   6 CLS
  20 LET M=100
  50 REM GRUB RACE
  60 PRINT AT 12,0;"▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒"
  65 PRINT AT 10,0;"3";AT 6,0;"2
";AT 2,0;"1"
  70 PRINT AT 8,0;"▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒"
  80 PRINT AT 4,0;"▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒"
  85 GOTO 2000
  90 LET X=0
  92 LET Y=0
  94 LET Z=0
 150 PRINT AT 3,X;"▖";AT 3,X-1;"
";AT 3,X-2;" ";AT 3,X+1;"▟";AT
3,X+2;" "
 155 PRINT AT 7,Y;"▖";AT 7,Y-1;"
";AT 7,Y-2;" ";AT 7,Y+1;"▟";AT
7,Y+2;" "
 160 PRINT AT 11,Z;"▖";AT 11,Z-1
;" ";AT 11,Z-2;" ";AT 11,Z+1;"▟"
;AT 11,Z+2;" "
 170 LET X=X+INT (RND*2)
 180 LET Y=Y+INT (RND*2)
 190 LET Z=Z+INT (RND*2)
 200 IF X>29 THEN LET X=29
 220 IF Y>29 THEN LET Y=29
 230 IF Z>29 THEN LET Z=29
 231 IF X=29 OR Y=29 OR Z=29 THE
N GOTO 3000
 240 LET T=INT (RND*30)+1
 250 IF T=25 THEN GOSUB 1000
 600 GOTO 150
1000 LET G=INT (RND*3)+1
1001 PRINT AT 3,X-1;" ";AT 7,Y-1
;" ";AT 11,Z-1;" "
1010 IF G=1 THEN GOTO 1050
1020 IF G=2 THEN GOTO 1060
1030 IF G=3 THEN GOTO 1070
1050 FOR J=1 TO 50
1051 PRINT AT 3,X;"▒:▒"
1052 PRINT AT 3,X;"   "
1055 NEXT J
1056 LET X=0
1057 RETURN
1060 FOR J=1 TO 50
1061 PRINT AT 7,Y;"▒:▒"
1062 PRINT AT 7,Y;"   "
1063 NEXT J
```


```
1064 LET Y=0
1065 RETURN
1070 FOR J=1 TO 50
1071 PRINT AT 11,Z;"▒:▒"
1072 PRINT AT 11,Z;"  "
1073 NEXT J
1074 LET Z=0
1075 RETURN
2000 REM
2010 PRINT AT 15,0;"YOU HAVE UP
TO ";M;" POUNDS TO BET"
2020 PRINT AT 16,0;"FIRST ENTER
GRUB 1,2 OR 3"
2030 INPUT A$
2035 IF A$<>"1" AND A$<>"2" AND
A$<>"3" THEN GOTO 2010
2040 PRINT AT 15,0;"GRUB ";A$;"
IT IS....(16 SPACES)"
2050 PRINT AT 16,0;"HOW MUCH MON
EY ARE YOU BETTING?"
2060 INPUT K
2065 IF K>M THEN GOTO 2040
2070 GOSUB 6000
2080 GOTO 90
3000 LET X=X
3010 LET Y=Y
3020 LET Z=Z
3040 IF X=29 AND A$="1" THEN GOT
O 4000
3045 IF Y=29 AND A$="2" THEN GOT
O 4000
3050 IF Z=29 AND A$="3" THEN GOT
O 4000
3055 LET M=M-K
3060 IF M=0 THEN GOTO 5000
3100 PRINT AT 15,0;"BAD LUCK...Y
OU HAVE ";M;" POUNDS"
3110 PRINT AT 16,0;"A NEW RACE B
EGINS SOON                "
3120 PAUSE 150
3125 PRINT AT 3,X-1;"   ";AT 7,Y
-1;"   ";AT 11,Z-1;"   "
3128 GOSUB 6000
3130 GOTO 85
4000 LET M=M+K
4010 PRINT AT 15,0;"YOU GOT A WI
NNER...(12 SPACES)"
4020 PRINT AT 16,0;"YOU NOW HAVE
 ";M;" POUNDS,A NEW    RACE BEGI
NS SOON"
4030 PAUSE 150
4031 PRINT AT 3,X-1;"   ";AT 7,Y-
1;"   ";AT 11,Z-1;"   "
4035 GOSUB 6000
4040 GOTO 85
5000 PRINT AT 15,0;"YOU HAVE NO
MONEY LEFT"
5010 PRINT AT 16,0;"PRESS ANY KE
Y TO PLAY AGAIN"
5020 PAUSE 4E4
5030 CLS
5040 GOTO 20
6000 PRINT AT 15,0;"(32 SPACES)"
6020 PRINT AT 16,0;"(64 SPACES)"
6030 RETURN
```

U.K. MAP



A USEFUL program for helicopter pilots and long-distance crows, is how D G Chapman describes his **U.K. Map** routine for the 1K ZX-81. AA handbooks and the like generally list towns with a four-figure reference number which refers to the 10-kilometre, squares which make up the National Grid.

Input a pair of those numbers—e.g., SK57NW32—and the computer will calculate the distance in miles between the south-west corners of the relevant squares.

```
  10 LET A$="5U5R5H     NUNRNMNGN
B5X5S5N5H5CNXN5NNNNNNC5Y5T5O5J5DN
YNTNONJND5Z5U5P5K5ENZNU  NK  TUT
GTLTFTA              TRTMTG"
  20 INPUT B$
  30 LET C$=B$(CODE "▀" TO CODE
" =")
  40 GOSUB CODE "COS "
  50 LET M=N
  60 LET D=C
  70 LET C$=B$(CODE "▐" TO CODE
"▄")
  80 GOSUB CODE "COS "
  90 LET V=ABS ((M-N)*CODE "▐"+V
AL B$(CODE "▄")-VAL B$(CODE "▒")
)
 100 LET H=ABS ((C-D)*CODE "▒"+V
AL B$(CODE "▐")-VAL B$(CODE "▀")
)
 110 PRINT INT (50R (V**2+H**2))
*6.21;" M ";B$(1 TO 4);"  TO  ";
B$(5 TO 8)
 120 STOP
 200 FOR N=CODE "▀" TO 107 STEP
CODE " ▄"
 210 IF C$=A$(N TO N+CODE "▀") T
HEN GOTO 230
 220 NEXT N
 230 FOR C=CODE "▀" TO CODE "▐"
 240 IF N<=CODE "=" THEN GOTO 27
0
 250 LET N=N-CODE "="
 260 NEXT C
 270 RETURN
```

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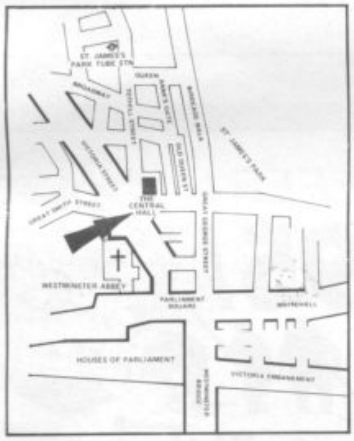

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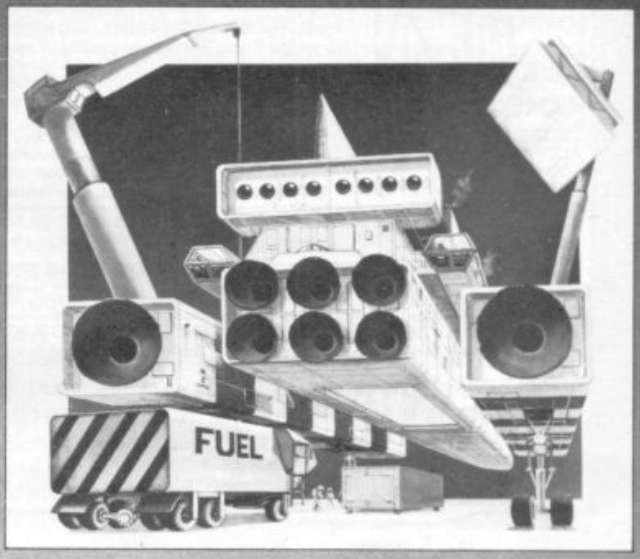

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SIMPLE SIMON

```
  5 DIM N(20)
 10 LET D=1
 20 FOR B=1 TO D
 30 LET N(B)=INT (RND*3)
 40 GOTO N(B)*50
 50 FOR A=1 TO 200
 60 SLOW
 70 FAST
 80 NEXT A
 90 GOTO 500
100 FOR A=1 TO 200
110 SLOW
115 FAST
130 NEXT A
140 GOTO 500
150 FOR A=1 TO 200
160 SLOW
170 FAST
175 FAST
180 NEXT A
190 GOTO 500
500 NEXT B
510 FOR C=1 TO D
520 INPUT X
530 IF X<>N(C) THEN GOTO 700
540 NEXT C
550 LET D=D+1
560 GOTO 20
700 PRINT "SCORE=";D-1
710 PRINT "CORRECT SEQUENCE="
720 FOR U=1 TO D
730 PRINT N(U);"-";
740 NEXT U
```

SIMON may be simple but this game for the unexpanded ZX-81 is complex; you must increase the volume of your television set to hear the ZX-81 make its noises. Then you must guess, using keys 1 to 4 on the keyboard, the correct pitch and order of the notes played.

You must enter key 1 for the highest note and key 4 for the lowest. When you have guessed which notes have been played, the computer will continue to play the game until you have an incorrect note. When that happens you will be given your score and the proper sequence of the notes which you had incorrect.

JUDGMENT

```
  3 LET Z=0
 35 FOR M=1 TO 20
 40 CLS
 41 LET E=INT (RND*30)+1
 44 PRINT AT 21,0;"30 INVERSE S
PACES"
 50 PRINT AT 20,E;"GRAPHIC 6"
 60 INPUT A
 70 PRINT AT 3,A;"INVERSE ."
 90 PRINT AT 19,A;"GRAPHICS G"
105 IF A=E THEN GOTO 130
107 PRINT AT 20,E;E
110 PAUSE 100
120 NEXT M
125 GOTO 160
130 LET Z=Z+1
132 PRINT AT 20,E;"*"
140 PAUSE 100
150 NEXT M
160 CLS
170 PRINT AT 11,0;"YOU HAVE KIL
LED ";Z;" ALIENS"
180 PRINT AT 12,0;20-Z;" ARE AL
IVE ON THE GROUND"
190 IF Z=20 THEN GOTO 210
200 STOP
210 PRINT AT 13,0;"YOU MAY NOW
LIVE ON EARTH IN"
220 PRINT AT 14,0;"PEACE.....VE
RY WELL DONE."
```

JUDGMENT DAY has arrived for the fearless ZX-81 alien fighter on planet Earth. As a member of the Space Cadet Corps you must stop the aliens from making a permanent base.

The ground is shown at the bottom of the screen and the alien craft is shown as a bump above the landscape. You have 20 shots in your cannon and each one must count. You fire by entering a number from one to 30, corresponding to positions from left to right on the screen.

When you have entered your guess, your spaceship will travel across the screen and drop its bomb. The number which appears in front of the alien after you have fired is the correct position of the target.

The program was sent by Robert Courtney, of Isleworth, Middlesex.

KINGDOM

```
  1 PRINT AT 3,7;"**************
****"
  2 PRINT AT 4,7;"*
  *"
  3 PRINT AT 5,7;"* K I N G D O
 M *"
  4 PRINT AT 6,7;"*
  *"
  5 PRINT AT 7,7;"**************
****"
  6 PRINT AT 10,0;"  YOU HAVE T
O GOVERN A VILLAGE";AT 12,0;"FOR
 A PERIOD OF FIVE YEARS.YOU";AT
14,0;"MUST TRY TO KEEP ALIVE AS
MANY"
  7 PRINT AT 16,0;"PEOPLE AS PO
SSIBLE,THEY WILL DO";AT 18,0;"ON
E OF THREE JOBS.";AT 20,0;"YOU M
UST PROTECT THEM AGAINST.."
  8 PRINT AT 21,5;"TYPE ANY KEY
 TO CONT."
  9 IF INKEY$="" THEN GOTO 9
 10~FOR F=10 TO 21
 11 PRINT AT F,0;"
                "
 12 NEXT F
 13 PRINT AT 10,0;"...(A)=>FLOO
DS";AT 11,0;"...(B)=>STARVATION"
;AT 12,0;"...(C)=>THEIVES";AT 14
,0;"YOU HAVE TO BE AS RICH AS PO
SS.";AT 16,0;"AT THE END OF THE
FIVE YEARS";AT 18,0;"AND THE RIC
HEST WINS."
 14 PRINT AT 21,5;"TYPE ANY KEY
 TO CONT."
 15 IF INKEY$="" THEN GOTO 15
 16 FOR F=10 TO 21
 17 PRINT AT F,0;"
                "
 18 NEXT F
 19 PRINT AT 10,0;"HOW MANY PLA
YERS?  ";
 20 INPUT A
 21 PRINT A
 22~DIM N$(A,11)
 23 DIM U(A)
 24 GOSUB 7000
 34 PRINT AT 21,5;"TYPE ANY KEY
 TO START"
 35 IF INKEY$="" THEN GOTO 35
 36 FOR F=1 TO 22
 37 SCROLL
 38 NEXT F
 39 GOSUB 8000
 40 DIM M(A)
 41 DIM C(A)
 42 DIM Q(A)
 43 FOR F=1 TO A
 44 LET M(F)=1000
 45 LET Q(F)=1000
 46 LET C(F)=2500
 47 NEXT F
 48 DIM D(A)
 49 DIM N(A)
 50 DIM Z(A)
 51 DIM X(A)
 52~DIM T(A)
 53 FOR F=1 TO A
 54 LET Z(F)=0
 55 LET X(F)=0
 56 LET T(F)=0
 57 NEXT F
100 REM start
105 LET S=0
110 LET Y=0
115 LET S=S+1
120 IF S=1 THEN LET Y$="SPRING"
125 IF S=2 THEN LET Y$="SUMMER"
130 IF S=3 THEN LET Y$="AUTUMN"
135 IF S=4 THEN LET Y$="WINTER"
140 IF S=1 THEN LET Y=Y+1
150 IF S=4 THEN LET S=0
170 FOR P=1 TO A
175 LET N(P)=INT (RND*10)
176 LET Q(P)=Q(P)+N(P)
180 PRINT AT 0,9;Y$;" YEAR ";Y
190 IF N$(P)(11)="M" AND U(P)>1
8 THEN PRINT "KING ";N$(P)( TO 1
0)
193 IF N$(P)(11)="F" AND U(P)<=
18 THEN PRINT "PRINCESS ";N$(P)(
TO 10)
195 IF N$(P)(11)="M" AND U(P)<=
18 THEN PRINT "PRINCE ";N$(P)( T
O 10)
200 IF N$(P)(11)="F" AND U(P)>1
8 THEN PRINT "QUEEN ";N$(P)( TO
10)
201 PRINT
202 PRINT N(P);" PEOPLE CAME TO
 THE VILLAGE."
203 PRINT
210 PRINT TAB 9;"CASUALTIES:"
211 PRINT " STARVED . FLOODS .
THEIVES"
212 PRINT TAB 3;X(P);TAB 12;Z(P
);TAB 22;T(P)
214 PRINT "**********************
************"
220 PRINT TAB 10;"YOU HAVE:"
240 PRINT TAB 15-(((LEN (STR$ M
(P)))+2)/2);"$";M(P);","
260 PRINT TAB 15-(((LEN (STR$ Q
(P)))+8)/2);Q(P);" PEOPLE,"
280 PRINT TAB 15-(((LEN (STR$ C
(P)))+15)/2);C(P);" SACKS OF COR
N."
290 PRINT "**********************
************"
300 PRINT "LABOUR ARRANGEMENT:"
320 PRINT "(A) MENDING THE DYKE
";
330 INPUT A1
335 IF INT A1<>A1 THEN GOTO 330
340 PRINT A1
360 PRINT "(B) PLANTING CORN ";
370 INPUT A2
375 IF INT A2<>A2 THEN GOTO 370
380 PRINT A2
400 PRINT "(C) DEFENDING THE VI
LLAGE ";
409 INPUT A3
410 IF INT A3<>A3 THEN GOTO 409
411 PRINT A3
412 IF A1+A2+A3<=Q(P) THEN GOTO
420
413 PRINT AT 21,5;"TOO MANY PEO
PLE"
414 FOR F=1 TO 22
415 IF INT A3<>A3 THEN GOTO 410
416 NEXT F
417 GOTO 180
420 IF Y$<>"SPRING" THEN GOTO 4
30
422 PRINT "HOW MANY SACKS OF CO
RN ARE TO   BE PLANTED?  ";
423 INPUT D(P)
424 PRINT D(P)
425 IF D(P)>C(P) THEN GOTO 422
426 LET C(P)=C(P)-D(P)
427 IF D(P)/10>A2 THEN LET D(P)
=A2*10
430 PRINT AT 21,5;"TYPE ANY KEY
 TO CONT."
440 IF INKEY$="" THEN GOTO 440
450 FOR F=1 TO 22
460 SCROLL
465 NEXT F
466 FAST
470 PRINT AT 0,0;M$
490 PRINT AT 8,14;"******";AT 9
,14;"*    *";AT 10,14;"* ++ *";A
T 11,14;"*    *";AT 12,14;"*****
*"
500 PRINT AT 10,27;"T"
501 LET T(P)=0
502 LET Z(P)=0
503 LET X(P)=0
504 SLOW
510 IF A1<Q(P)/2.2 THEN GOSUB 1
000
520 IF A3<Q(P)/2.2 THEN GOSUB 2
000
530 IF D(P)<Q(P)*2 THEN GOSUB 3
000
535 LET C(P)=(C(P)/1.2)+D(P)*3
540 IF C(P)+D(P)<Q(P)*2 THEN GO
SUB 4000
550 IF C(P)+D(P)>Q(P)*2 THEN GO
SUB 5000
560 LET Q(P)=Q(P)*1.2
565 LET Q(P)=INT (Q(P))
575 LET C(P)=INT (C(P))
580 LET M(P)=M(P)*1.09
583 LET M(P)=INT (M(P))
590 FOR F=1 TO 22
600 SCROLL
610 NEXT F
611 IF M(P)<0 THEN LET M(P)=0
612 IF C(P)<0 THEN LET C(P)=0
613 IF Q(P)<0 THEN LET Q(P)=0
620 NEXT P
630 IF Y<5 THEN GOTO 115
640 PRINT AT 0,0;"NOW FOR THE W
INNER....."
644 LET W$=""
645 LET W=0
650 FOR F=1 TO A
660 PRINT N$(F)( TO 10);" WITH
$";M(F);","
```

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You are first given instructions for the game and asked to input your name, age and sex. Depending on the information you supply, you will be dubbed king, queen, prince or princess and then asked to decide how best to divide your available workforce in the season ahead. Consider the crops or your subject will starve. Bear the bandits in mind or your minions are murdered. Delay on the dykes and they will drown.

It is reasonably difficult. Our 1,000 subjects were reduced to single figures after the first year.

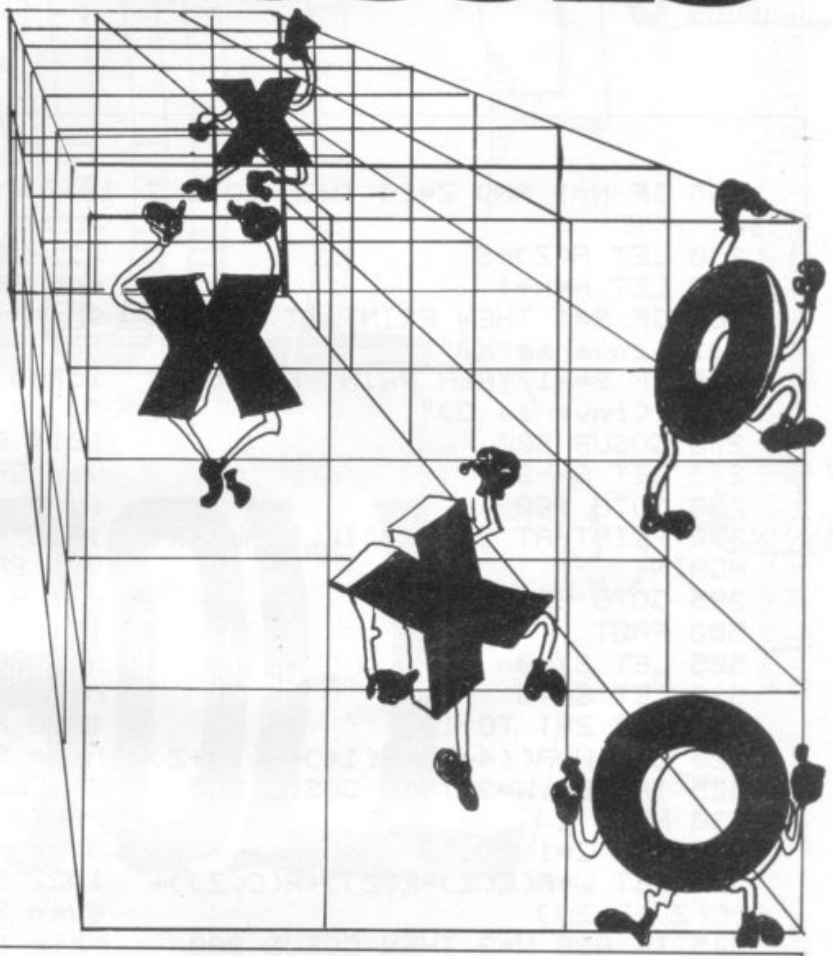
Any number can play and you have five years in which to justify your kingship and to amass as much money as possible by the judicious selling of surplus grain.

Good luck, your highness, and thanks to Andrew Johnson of Amersham, Bucks, who submitted this excellent listing (16K ZX-81).

```
 680 IF M(F)>W THEN LET W$=N$(F)
( TO 10)
 690 IF M(F)>W THEN LET W=M(F)
 700 NEXT F
 705 POKE 16418,0
 710 PRINT AT 20,0;"CONGRATULATI
ONS ";W$;"       YOU ARE THE WINN
ER OF THE GAME  WITH $";W
 730 GOTO 10000
1000 REM DYKE
1010 IF INT (RND*3)+1=1 THEN RET
URN
1020 LET K=INT (RND*10)+5
1030 FOR F=3 TO K+3
1040 FOR G=0 TO 21
1050 PRINT AT G,F;"(graphic A)"
1060 NEXT G
1070 IF K*10>Q(P) THEN LET K=INT
 (Q(P)/10)
1080 LET Q(P)=Q(P)-K*10
1090 IF K>8 THEN LET M(P)=M(P)-(
(K-8)*100)
1095 LET Z(P)=K*10
1100 LET C(P)=C(P)-K*15
1110 RETURN
2000 REM DEF
2010 IF INT (RND*3)+1=1 THEN RET
URN
```

```
2020 LET K=INT (RND*10)+5
2025 IF K*6>Q(P) THEN LET K=INT
(Q(P)/6)
2030 FOR F=27 TO 16 STEP -1
2040 PRINT AT 10,F;"T "
2050 NEXT F
2060 FOR F=1 TO K
2070 PRINT AT 10,16;"(graphic 4)
"
2080 PRINT AT 10,16;"(graphic 1)
"
2090 PRINT AT 10,16;"(graphic 2)
"
2100 PRINT AT 10,16;"(graphic 3)
"
2110 NEXT F
2120 FOR F=16 TO 27
2130 PRINT AT 10,F;" T"
2140 NEXT F
2150 LET Q(P)=Q(P)-K*6
2151 LET T(P)=K*6
2160 LET C(P)=C(P)-K*25
2170 LET M(P)=M(P)-K*15
2180 RETURN
3000 REM STAR
3010 LET K=ABS (D(P)-(Q(P)*2))
3015 IF K>Q(P) THEN LET K=Q(P)
3020 LET Q(P)=Q(P)-(INT (K))
3035 LET X(P)=K
3040 RETURN
4000 REM BUY
4010 LET K=INT (RND*5)+15
4020 FOR F=1 TO 22
4030 SCROLL
4040 NEXT F
4050 PRINT AT 0,0;"YOU HAVEN'T G
OT ENOUGH CORN TO  FEED YOUR VIL
LAGE-YOU MUST BUY  SOME..."
4060 PRINT
4070 PRINT "CURRENT BUYING RATE
= ";K
4080 PRINT
4090 PRINT "YOU HAVE £";M(P)
4100 PRINT
4110 PRINT "THE MOST YOU CAN HAV
E ARE ";INT (M(P)/K)
4120 PRINT "SACKS"
4140 PRINT "HOW MANY DO YOU WANT
 TO BUY?";
4150 INPUT I
4160 IF I>(M(P)/K) THEN GOTO 414
0
4170 PRINT I
4180 PRINT
4190 PRINT "THAT WILL COST £";I*
K
4200 LET M(P)=M(P)-(K*I)
4210 LET C(P)=C(P)+I
4220 RETURN
5000 REM SELL
5010 FOR F=1 TO 22
5020 SCROLL
5030 NEXT F
5040 PRINT AT 0,0;"YOU HAVE A SU
RPLUS OF CORN,DO   YOU WANT TO S
ELL ANY,IF SO      SPECIFY  THE
AMOUNT."
5050 INPUT A$
5060 IF A$(1)="N" THEN RETURN
5070 LET K=VAL A$
5071 IF K<=C(P) THEN GOTO 5080
5072 PRINT
5073 PRINT "YOU ONLY HAVE ";INT
(C(P));" SACKS."
5074 IF INKEY$="" THEN GOTO 5074
5075~GOTO 5000
5080 LET J=INT (RND*5)+5
5090 PRINT K;" SACKS OF CORN,AT"
5100 PRINT "£";J;" A SACK,WILL M
AKE "
5110 PRINT "£";K*J
5120 LET M(P)=M(P)+K*J
5130 LET C(P)=C(P)-K
5140 RETURN
7000 FOR F=1 TO A
7010 CLS
7020 PRINT "PLAYER ";F
7030 PRINT
7040 PRINT "YOUR NAME PLEASE:  "
7050 INPUT N$(F)
7051 PRINT N$(F)
7052 PRINT
7060 PRINT "YOUR AGE(APROX)? ";
7070 INPUT U(F)
7080 PRINT U(F)
7090 PRINT
7100 PRINT "ARE YOU MALE(M)/FEMA
LE(F)? ";
7110 INPUT N$(F)(11)
7120 PRINT N$(F)(11)
7130 PRINT
7140 PRINT "O.K.? ";
7150 INPUT H$
7160 PRINT H$
7170 IF H$="NO" OR H$="N" THEN G
OTO 7010
7180 NEXT F
7190 RETURN
8000 FAST
8005 LET M$=""
8010 FOR F=1 TO 22
8020 LET M$=M$+"(three graphic A
s;inverse SPACE;twenty two SPACE
s;six /s)"
8030 NEXT F
8040 SLOW
8050 RETURN
9000 SAVE "KINGDOM"
9010 RUN
```

3-D NOUGHTS & CROSSES

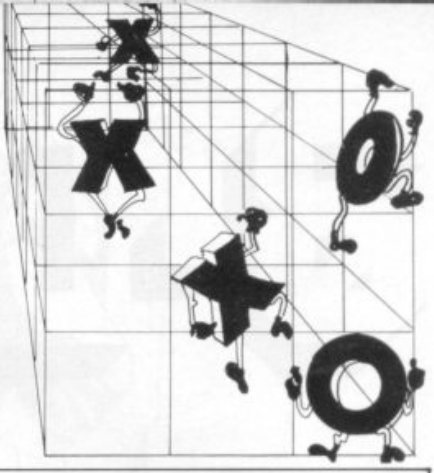


P R SCOTT of Goldalming, Surrey, has sent the kind of program Mr Spock plays on long, winter evenings. **3D Noughts and Crosses** displays a cube and 27 possible positions for the Xs and Os. Unlike the 2D version, the game must be continued until all the positions are filled, the object being not to obtain the first completed row but as many as possible.

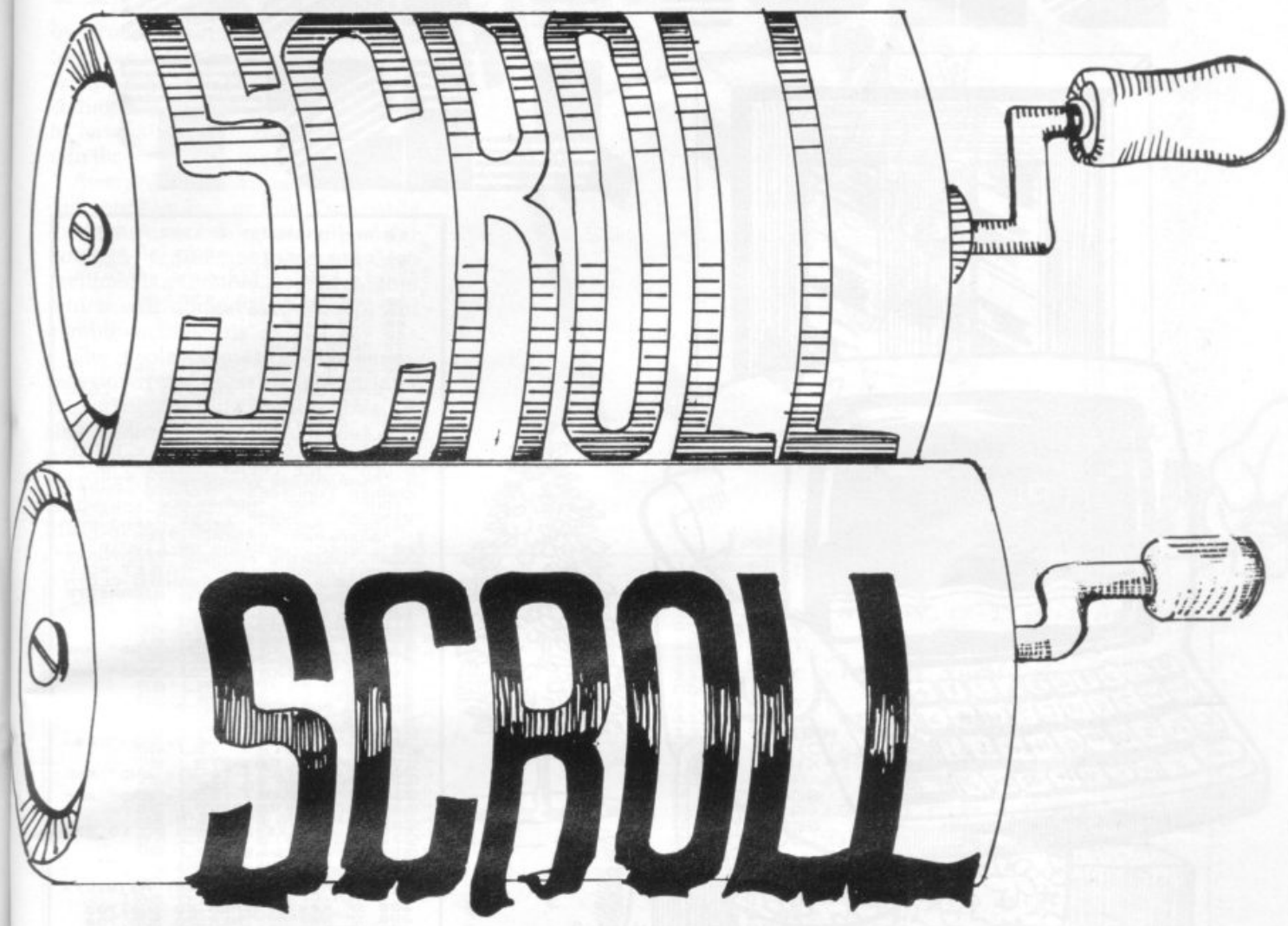
The player who starts has an advantage, as finally he occupies one space more than his opponent and so, to level matters, the first player is prevented from occupying the centre square on his first attempt.

The program checks for that and other illegal moves, as well as setting-up the board, indicating whose turn is next, and giving the correct score throughout. Moves are entered by keying-in a letter, then a number, then NEWLINE. "A" indicates the front face of the cube, "B" the centre and "C" the rear. Entering "R" will restart the game (16K ZX-81).

```
  5 DIM A(27)
 10 DIM C(18)
 15 DIM R(18)
 20 DIM X(27)
 25 DIM Y(27)
 30 LET X$="020814020814020814061218061218061218101622101622101622"
 35 LET Y$="060606121212181818040404101010161616020202080808141414"
 40 FOR Z=1 TO 27
 45 LET X(Z)=VAL X$(2*Z-1 TO 2*Z)
 50 LET Y(Z)=VAL Y$(2*Z-1 TO 2*Z)
 55 NEXT Z
 60 LET C$="020405050505060810111111112131313"
 65 LET R$="010301020304030109010809100903060912"
 70 FOR Z=1 TO 18
 75 LET C(Z)=VAL C$(2*Z-1 TO 2*Z)
 80 LET R(Z)=VAL R$(2*Z-1 TO 2*Z)
 90 NEXT Z
100 FOR Z=1 TO 27
105 LET A(Z)=0
110 NEXT Z
115 LET S=1
120 LET N=1
170 CLS
175 GOSUB 1000
180 IF S=1 THEN PRINT AT 2,0;""X"" TO GO"
185 IF S=-1 THEN PRINT AT 2,0;""O"" TO GO"
190 PRINT AT 20,14;"
    "
200 INPUT Z$
205 IF N=28 THEN GOTO 100
210 IF Z$(1)="R" THEN GOTO 100
215 IF Z$(1)="A" THEN LET Z=0
220 IF Z$(1)="B" THEN LET Z=9
225 IF Z$(1)="C" THEN LET Z=18
235 LET Z=Z+VAL Z$(2)
240 IF A(Z)<>0 THEN GOTO 390
```



```
 245 IF N=1 AND Z=14 THEN GOTO 3
90
 250 LET A(Z)=S
 255 LET N=N+1
 260 IF S=1 THEN PRINT AT Y(Z),X
(Z);"(inverse X)"
 265 IF S=-1 THEN PRINT AT Y(Z),
X(Z);"(inverse O)"
 270 GOSUB 500
 275 LET S=-S
 280 GOTO 180
 390 PRINT AT 20,14;"ILLEGAL;TRY
 AGAIN"
 395 GOTO 200
 500 FAST
 505 LET SX=0
 510 LET SO=0
 515 FOR Z=1 TO 13
 520 LET W=A(14-Z)+A(14)+A(14+Z)
 525 IF ABS W=3 THEN GOSUB 800
 530 NEXT Z
 535 FOR Z=1 TO 18
 540 LET W=A(C(Z)-R(Z))+A(C(Z))+
A(C(Z)+R(Z))
 545 IF ABS W=3 THEN GOSUB 800
 550 LET V=28-C(Z)
 555 LET W=A(V-R(Z))+A(V)+A(V+R(
Z))
 560 IF ABS W=3 THEN GOSUB 800
 565 NEXT Z
 570 PRINT AT 20,0;"(inverse X)=
";SX;",(inverse O)= ";SO
 575 SLOW
 580 RETURN
 800 IF W=3 THEN LET SX=SX+1
 803 IF W=-3 THEN LET SO=SO+1
 810 RETURN
1000 PRINT AT 0,6;"3D NOUGHTS AN
D CROSSES"
1004~PRINT AT 2,10;"1;(five grap
hic 7s);2;(five graphic 7s);3"
1006 PRINT AT 3,7;"(graphic 6;in
verse SPACE;graphic 7);/;(eight
SPACEs;graphic 6;inverse SPACE;g
raphic 7;graphic 8)"
1008 PRINT AT 4,6;"1;(three SPAC
Es);/;SPACE;2;(five SPACEs);3;(t
hree SPACEs;graphic 8)"
1010 PRINT AT 5,3;"(graphic 6;in
verse SPACE;graphic 7;four SPACE
s);/;(four SPACEs;graphic 6;inve
rse SPACE;graphic 7;four SPACEs;
graphic 8)"
1012 PRINT AT 6,2;"1;(five graph
ic7s);3;(seven SPACEs;graphic 8)
"
1014 PRINT AT 7,2;"(graphic 5;se
ven SPACEs);/;three SPACEs;graph
ic 8;seven SPACEs;graphic 8)"
1016~PRINT AT 8,2;"(graphic 5;se
ven SPACEs);4;(three SPACEs;grap
hic 8);SPACE;5;(five SPACEs);6"
1018 PRINT AT 9,2;"(graphic 5;se
ven SPACEs);/;(three SPACEs;grap
hic 8;seven SPACEs;graphic 8)"
1020 PRINT AT 10,2;"(graphic 5;t
hree SPACEs);4;(three SPACEs);/;
SPACE;5;SPACE;(graphic 8;three S
PACEs);6;(three SPACEs;graphic 8
)"
1022 PRINT AT 11,2;"(graphic 5;s
even SPACEs);/;(three SPACEs;gra
phic 8;seven SPACEs;graphic 8)"
1024 PRINT AT 12,2;"4;(five SPAC
Es);5;SPACE;/;(three SPACEs);6;(
seven SPACEs;graphic 8)"
1026 PRINT AT 13,2;"(graphic 5;s
even SPACEs);/;(three SPACEs;gra
phic 8;seven SPACEs;graphic 8)"
1028~PRINT AT 14,2;"(graphic 5;s
even SPACEs);7;(three /s;graphic
 8);/;8;(five /s);9"
1030 PRINT AT 15,2;"(graphic 5;f
our SPACEs;three /s;four SPACEs;
graphic 8;four SPACEs;graphic 6;
inverse SPACE;graphic 7)"
1032 PRINT AT 16,2;"(graphic 5;t
hree SPACEs);7;(five SPACEs);8;S
PACE;(graphic 8;three SPACEs);9"
1034 PRINT AT 17,2;"(graphic 5;t
hree /s;eight SPACEs;graphic 8;g
raphic 6;inverse SPACE;graphic 7
)"
1036 PRINT AT 18,2;"7;five graph
ic 6s);8;(five graphic 6s);9"
1090 RETURN
```



SCROLL is a machine code program to move the display across the screen in any one of eight directions. Enter Listing 1, keying 126 characters in the REM statement in line 1. The variables S1 to S9 correspond to the compass points NW, N, NE, W, E, SW, S and SE. RUN the program and the machine code will be POKEd into the REM statement. Then delete lines 10 to 70 and replace then with the demonstration routine in Listing 2. If the direct command "GOTO 10" is then entered, the versatility of this scroll program will be demonstrated. Submitted by Stephane Crainic, of Paris. [16K ZX-81]

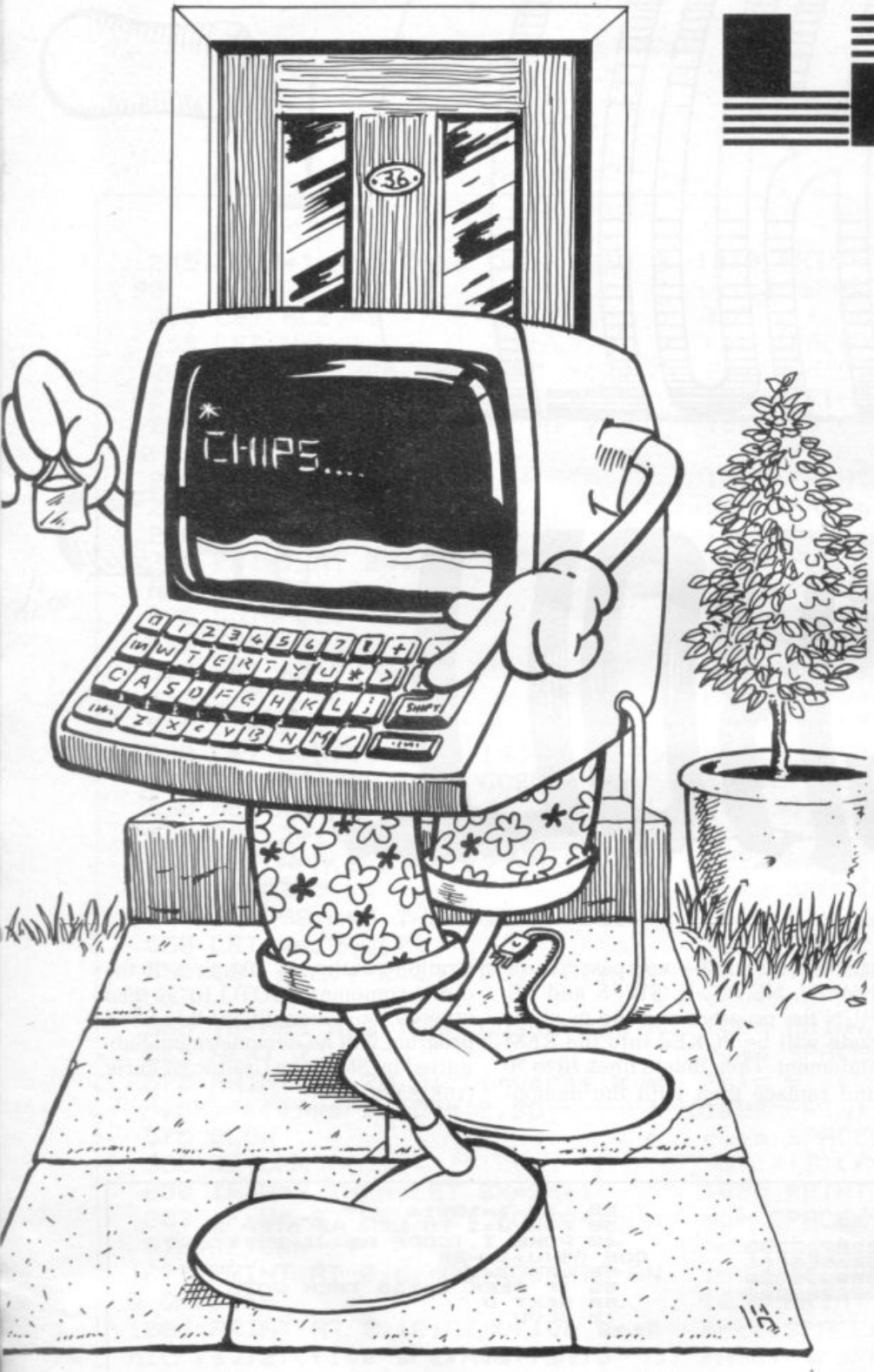
LISTING 1

```
  1 REM 1111111111222222222233
3333333444444444455555555556666
6666677777777778888888888999999
9990000000000111111111122222222
2333333
  2 LET S1=16626
  3 LET S2=16514
  4 LET S3=16633
  5 LET S4=16560
  6 LET S6=16588
  7 LET S7=16619
  8 LET S8=16529
  9 LET S9=16612
 10 LET A$="2A0C40E5112100019D10
1D602EDB0C92A1040114300ED52E5112
100ED52D101B502EDB82A0C4006202233
60010F6C92A0C4011D6021906162B4E3
6002B7EFE7626021803 10F2C9714F18F
12A0C4006162 34E3600237EFE7628021
80310F2C9714F18F1CDCC40CD9140C9C
DB040CD9140C9CDB040CD8240C9CDCC4
0CD8240C9"
 19 FAST
 20 LET I=16514
 30 FOR J=1 TO LEN A$ STEP 2
 40 POKE I,(CODE A$(J)-28)*16+C
ODE A$(J+1)-28
 50 LET I=I+1
 55 IF PEEK I=118 THEN GOTO 70
 60 NEXT J
 70 SLOW
```

LISTING 2

```
 10 LET A$="30"
 20 LET A$(2)=STR$ (VAL A$(2)+1
)
 30 IF A$(2)="5" THEN GOTO 20
 40 FOR I=1 TO 22
 50 PRINT "===SINCLAIR USER AND
PROGRAMS==="
 60 NEXT I
 70 FOR I=1 TO 32
 80 RAND USR VAL A$
 90 NEXT I
100 CLS
110 GOTO 20
```

SHOPPING LIST




```
  10 REM SHOPLIST © 1982 N COPAG
E
  20 DATA "MEAT","FRUIT & VEGETA
BLES","FROZEN FOOD","CANS,JARS,
PACKETS ETC.","CLEANING MATERIAL
S","SUNDRY ITEMS"
  30 REM SHOPPING LIST
  40 DIM A$(6,20,20)
  50 DIM L$(6,32)
  60 FOR N=1 TO 6
  70 READ L$(N)
  80 NEXT N
  90 DATA "PORK CHOPS","BACON","
HAM","STEAK","MINCED MEAT","LIVE
R","LAMB CHOPS","SAUSAGES","CHIC
KEN","END","ONIONS","TOMATOES","
GARLIC","PEPPERS","CABBAGE","CAR
ROTS","POTATOES","SALAD","ORANGE
S","LEMONS","BANANAS","PEARS","E
ND","FISH","FISH FINGERS","HAMBU
RGERS","FROZEN PEAS","FROZEN MIX
ED VEG","ICE CREAM","MILK","BUTT
ER","MARGARINE","YOGHURT","END",
"CANNED TOMATOES","TOMATO PUREE",
"SOUP","JAM","MARMALADE","OIL",
"VINEGAR","SUGAR","FLOUR","SALT",
"RICE","BREAD","RICE","SPAGHETT
I","BREAKFAST CEREAL","TEA","COF
FEE","END","WASHING UP LIQUID","
SOAP","WASHING POWDER","TOOTHPAS
TE","KITCHEN ROLLS","TOILET ROLL
S","SHOE POLISH","CLEANING CLOTH
S","END","STATIONERY","CIGARETTE
S","END"
 100 FOR N=1 TO 6
 110 FOR C=1 TO 20
 120 READ A$(N,C)
 130 IF A$(N,C)( TO 3)="END" AND
N<=5 THEN NEXT N
 140 IF A$(N,C)( TO 3)="END" AND
N=6 THEN GO TO 160
 150 NEXT C
 160 GO SUB 570: REM BORDER/INTR
O
 170 FOR N=1 TO 6
 180 CLS : PRINT TAB 5;">>>";L$(
N)
 190 FOR C=1 TO 20
 200 IF A$(N,C)( TO 3)="END" AND
N<=5 THEN GO TO 750
 210 IF A$(N,C)( TO 3)="END" AND
N=6 THEN GO TO 320
 220 PRINT AT C,5;A$(N,C)
 230 IF INKEY$="" THEN GO TO 230
 240 FLASH 0
 250 LET X$=INKEY$
 260 IF X$<>"y" AND X$<>"n" THEN
GO TO 230
 270 IF X$="y" THEN LET A$(N,C)=
"X"+A$(N,C)
 280 IF X$="y" THEN GO SUB 700
 290 IF X$="n" THEN GO SUB 730
 300 NEXT C
 310 NEXT N
 320 LPRINT INVERSE 1;"S H O P P
I N G   L I S T "
 330 LPRINT
 340 FOR N=1 TO 6
 350 LPRINT ">>>";L$(N)
 360 FOR C=1 TO 20
 370 IF A$(N,C)(3 TO )="END" THE
N NEXT N
 380 IF A$(N,C)(1)="X" THEN LPRI
NT A$(N,C)(2 TO )
 390 NEXT C
 400 LPRINT
 410 NEXT N
 420 PRINT AT 10,5;"ANYTHING ELS
E?"
 430 PRINT  AT 12,5;"TYPE IN & E
NTER"
 440 PRINT AT 14,5;"OR PRESS N T
O STOP"
 450 LPRINT "+ + + +": LPRINT
 460 INPUT U$
 470 IF U$<>"" AND U$<>"N" THEN
LPRINT U$
 480 IF U$="" THEN GO TO 500
 490 GO TO 460
 500 FOR K=1 TO 4
 510 LPRINT " "
 520 NEXT N
 530 CLS
 540 STOP
 550 SAVE "SHOPLIST"
 560 RUN
 570 REM BORDER ETC
 580 BORDER 1: PAPER 6: INK 0: C
LS
 590 PRINT AT 0,9;"SHOPPING LIST
"
 600 OVER 1: PRINT AT 0,9;"_____
_____": OVER 0
 610 PRINT : PRINT TAB 1;"I WILL
TRY TO REMIND YOU WHAT"
 620 PRINT TAB 1;"YOU NEED. PRES
S Y (FOR YES) OR"
 630 PRINT TAB 1;"N (FOR NO)."
 640 PRINT
 650 PRINT TAB 1;"PRESS ENTER TO
START"
 660 INPUT X$
 670 FOR N=-30 TO 35: BEEP .03,N
: NEXT N
 680 CLS
 690 RETURN
 700 REM SOUNDEFFECTS
 710 BEEP .1,17: BEEP .2,14
 720 RETURN
 730 FOR J=1 TO 3: BEEP .1,-30:
NEXT J
 740 RETURN
 750 CLS : NEXT n
9998 PRINT USR 64000
```

SHOPPING LIST is a program for the 16K Spectrum with printer which enables the user quickly and efficiently to compile a list of items to be purchased.

The possible items are displayed one by one and you must hit the Y or N key as appropriate. At the end of the routine the chosen goods are listed through the printer, with the option of adding extra requirements.

It is a genuinely-useful memory aid and provides a rare practical use for the printout. The listing was supplied by Nigel Copage of Abu Dhabi. (16K Spectrum).

HIGHER LOWER

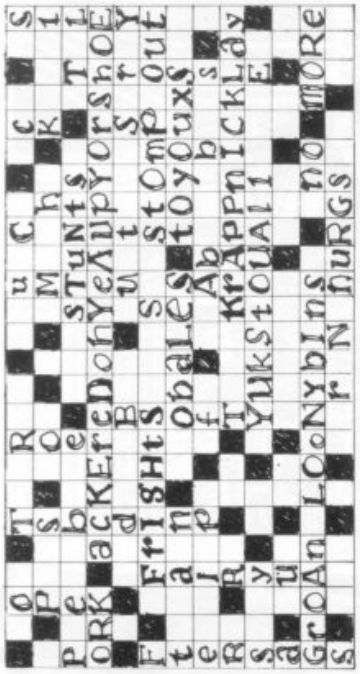
HIGHER-LOWER is an excellent gambling routine based loosely on the TV game hosted by Bruce Forsyth. It involves trying to guess if the next card in a series will be higher or lower than the preceding one. In this version you need to have all five in correct order to win the round and the money.

Aces are a sure winner, since they can count as high or low. Two cards the same are decided on suit, and if you win the odds are increased. Also included is a Gamble/Collect routine which will double the odds if you gamble successfully.

The display shows the five cards, face down and up, with appropriately garish flashing instructions. A fine program, well thought-out and presented, from Neil Streeter of Hastings, East Sussex. (16K ZX-81).

Graphics:
210 Four inverse Xs.

```
  5 GOSUB 9000
 10 DIM A$(8,5)
 20 DIM T$(11,5)
 30 LET A$(1)="■■■■■ "
 35 LET A$(2)="■   ■ "
 40 LET A$(3)="■ ■ ■ "
 45 LET A$(4)="■   ■ "
 46 LET A$(5)="■ ■ ■ "
 50 LET A$(6)="■   ■ "
 55 LET A$(7)="■ ■ ■ "
 56 LET A$(8)="■■■■■ "
 60 LET T$(1)="11112"
 65 LET T$(2)="66662"
 70 LET T$(3)="76872"
 75 LET T$(4)="48842"
 80 LET T$(5)="46842"
 85 LET T$(6)="45842"
 86 LET T$(7)="35842"
 87 LET T$(8)="44442"
 90 LET T$(9)="43442"
 95 LET T$(10)="34342"
 96 LET T$(11)="86882"
100 DIM C(5)
105 LET ODDS=1
110 DIM S(5)
120 FOR X=1 TO 5
130 LET C(X)=INT (RND*13+1)
140 LET S(X)=INT (RND*4+1)
150 FOR Y=1 TO X-1
160 IF C(Y)=C(X) AND S(Y)=S(X)
THEN GOTO 130
170 NEXT Y
180 NEXT X
185 PRINT AT 5,9;"ODDS=";ODDS;"
 : 1"
190 FOR X=1 TO 5
200 FOR Y=1 TO 7
210 PRINT AT 6+Y,(X-1)*6+1;"■■■
■"
220 NEXT Y
230 NEXT X
240 LET X=1
250 GOSUB 1000
260 LET X=X+1
270 PRINT AT 16,8;"■IGHER    LOW
ER?"
280 PRINT AT 16,8;"HIGHER    ■OW
ER?"
290 LET A=CODE INKEY$
300 IF A<>45 AND A<>49 THEN GOT
O 270
310 PRINT AT 16,8;"
   "
320 GOSUB 1000
325 GOTO 2000
330 IF X=5 THEN GOTO 3000
335 GOTO 260
1000 LET C=C(X)
1010 LET S=S(X)
1020 LET C$=("A" AND C=1)+("T" A
ND C=10)+("J" AND C=11)+("Q" AND
 C=12)+("K" AND C=13)+(STR$ C AN
D C>1 AND C<10)
1025 IF C=1 THEN LET C=14
1026 IF C>10 THEN LET C=1
1027 IF C=14 THEN LET C=11
1030 LET S$=("H" AND S=1)+("C" A
ND S=2)+("D" AND S=3)+("S" AND S
=4)
1040 PRINT AT 7,(X-1)*6+1;"■■■■
"
1050 PRINT AT 8,(X-1)*6+1;"■ ";C$
;S$;" ■"
1060 FOR Y=1 TO 5
1070 PRINT AT 8+Y,(X-1)*6+1;A$(V
AL T$(C,Y))
1080 NEXT Y
1090 FOR Y=1 TO X-1
1100 IF C(Y)=C(X) THEN LET ODDS=
ODDS+1
1110 NEXT Y
1120 PRINT AT 5,14;ODDS;" : 1  "
1130 RETURN
2000 IF (C(X)=1 OR C(X-1)=1) AND
 C(X)<>C(X-1) THEN GOTO 330
2005 IF A=45 AND C(X)>C(X-1) THE
N GOTO 330
2010 IF A=49 AND C(X)<C(X-1) THE
N GOTO 330
2015 IF C(X)<>C(X-1) THEN GOTO 2
040
2020 IF A=45 AND S(X)>S(X-1) THE
N GOTO 330
2030 IF A=49 AND S(X)<S(X-1) THE
N GOTO 330
2040 PRINT AT 16,11;"■■■■■■■■"
2050 LET STAKE=STAKE-BET*ODDS
2060 PRINT AT 3,13;STAKE;"  "
2070 IF STAKE=0 THEN PRINT AT 16
,1;"YOU""VE LOST ALL YOUR MONEY.
"
2080 IF STAKE=0 THEN STOP
2090 PRINT AT 18,7;"PRESS ""D""
TO DEAL."
2100 IF INKEY$="D" THEN GOTO 212
0
2110 GOTO 2100
2120 PRINT AT 16,11;"          "
;AT 18,7;"                "
2150 GOTO 100
3000 PRINT AT 16,11;"■■■■■■■■"
3010 PRINT AT 18,8;"GAMBLE COLLE
CT"
3020 PRINT AT 18,8;"■■■■■■ COLLE
CT"
3030 LET A=CODE INKEY$
3040 IF A<>40 AND A<>44 THEN GOT
O 3010
3050 PRINT AT 18,8;"
   "
3060 IF A=44 AND RND<.5 THEN GOT
O 2040
3070 IF A=40 THEN GOTO 3100
3080 LET ODDS=ODDS*2
3090 PRINT AT 5,14;ODDS;" : 1 "
3095 GOTO 3010
3100 LET STAKE=STAKE+BET*ODDS
3110 GOTO 2060
9000 PRINT TAB 9;"■■■■■■■■■■■"
9010 FOR X=0 TO 63
9020 PLOT X,0
9030 PLOT X,41
9040 IF X<41 THEN PLOT 0,X
9050 IF X<41 THEN PLOT 63,X
9060 NEXT X
9070 LET STAKE=100
9080 LET BET=5
9090 PRINT AT 3,3;"YOU HAVE $";S
TAKE;AT 3,24;"$5 A GO"
9120 RETURN
```



WORD

WORD PUZZLER is not so much a game as a game generator.

The object is to make word puzzles like those which appear in puzzle magazines, where a series of words is hidden in a grid of random letters.

The words can be vertical, reversed or diagonal, but rarely obvious.

The ingenious program requires a list of up to 15 words each of up to 12 letters, in order of length and pressing NEWLINE TO to start. The screen goes blank as the computer goes into fast mode to re-arrange the

```
  10 REM *WORDSQUARE GENERATOR*
  20 REM (C) A.BLACKBURN 1982
  25 REM
  26 REM
  30 PRINT "[redacted] WORDSQUARE [redacted]
[redacted]"
  40 PRINT '''''"THIS PROGRAM G
ENERATES","WORDSQUARE PUZZLES",,
,"PLEASE INPUT THE NUMBER OF WOR
DSYOU HAVE..(YOU CAN USE UP TO 1
5)"
  50 INPUT N
  55 IF N>15 THEN GOTO 50
  60 DIM X(12)
  70 DIM Y(12)
  80 DIM D(16)
  90 DIM G$(15,15)
 100 CLS
 110 PRINT "PLEASE INPUT YOUR ";
N;" WORDS NOW","IN ORDER OF LENG
TH (LONGEST","FIRST,SMALLEST LAS
T)"
 120 PRINT ,,"YOU CAN USE UP TO
12 LETTERS PERWORD"
 125 PRINT
 126 INPUT A$
 127 DIM W$(15,LEN A$)
 128 LET W$(1)=A$
 129 PRINT A$,
 130 FOR M=2 TO N
 140 INPUT W$(M)
 150 PRINT W$(M),
 160 NEXT M
 170 PRINT AT 17,0;"IT WILL TAKE
 ME A FEW MINUTES","TO SORT THE
WORDS OUT",,,"**PRESS NEWLINE TO
 START"
 180 INPUT U$
 190 CLS
 200 FAST
 210 REM ** MAIN LOOP **
 215 LET D(1)=0
 220 FOR M=1 TO N
 230 REM **RANDOM DIRECTIONS+STA
RTING POINTS**
 240 LET D(M+1)=INT (RND*8)+1
 245 IF D(M+1)=D(M) THEN GOTO 24
0
 250 LET L=INT (RND*15)+1
 260 LET C=INT (RND*15)+1
 280 FOR A=1 TO LEN W$(M)
 290 GOSUB 1000+D(M+1)*20
 300 IF L<1 OR L>15 THEN GOTO 25
0
 310 IF C<1 OR C>15 THEN GOTO 25
0
 320 LET A$=W$(M,A)
 330 IF G$(L,C)<>" " AND G$(L,C)
<>A$ THEN GOTO 240
 340 LET X(A)=L
 350 LET Y(A)=C
 360 NEXT A
 370 REM **OK WE HAVE A WORD FIT
 SO PUT IT IN THE GRID**
 380 FOR K=1 TO LEN W$(M)
 390 LET G$(X(K),Y(K))=W$(M,K)
 400 NEXT K
 410 REM **GET NEXT WORD**
 420 NEXT M
 425 REM ** WORDSQUARE COMPLETE
**
 430 SLOW
```

PUZZLER

letters and hide the words in a square of 15 by 15 letters.

Eventually the word puzzle is shown on the screen and the game is to find the input words which are listed by the side of the square.

The grid can be printed so that a number of puzzles with different words can be made at the same time.

The dimensions of the square are set by the variable G$(15,15) which can be altered to provide other sizes.

Word Puzzler is from Andrew Blackburn, of North Hykeham, Lincoln.

```
  450 FOR D=1 TO 10000
  455 LET A$=INKEY$
  460 PRINT AT 5,0;"[illegible]
[illegible]"
  470 PRINT AT 20,0;"PRESS ""C""
TO CONTINUE"
  480 IF A$="C" THEN GOTO 495
  488 PRINT AT 5,0;"* O.K. WORDSQ
UARE IS COMPLETE *"
  489 NEXT D
  495 CLS
  500 PRINT "PLEASE INPUT THE TIT
LE OF YOUR","WORDSQUARE"
  505 INPUT T$
  506 CLS
  510 PRINT AT 0,5;T$
  515 FOR S=1 TO LEN T$
  520 PRINT AT 1,4+S;"■"
  525 NEXT S
  526 PRINT
  530 FOR A=1 TO 15
  535 FOR B=1 TO 15
  540 IF G$(A,B)=" " THEN LET G$(
A,B)=CHR$ (INT (RND*26)+38)
  550 PRINT G$(A,B);
  560 NEXT B
  570 PRINT "(4 SPACES)";W$(A)
  590 NEXT A
  600 PRINT AT 21,0;"INPUT ""C""
TO COPY THE SCREEN"
  610 INPUT U$
  620 PRINT AT 21,0;"(32 SPACES)"
  630 IF U$="C" THEN COPY
  640 GOTO 600
 1000 REM ** DIRECTIONS **
 1020 LET C=C-1
 1030 RETURN
 1040 LET C=C+1
 1050 RETURN
 1060 LET L=L+1
 1070 RETURN
 1080 LET L=L-1
 1090 RETURN
 1100 LET L=L+1
 1110 GOTO 1040
 1120 LET L=L-1
 1130 GOTO 1020
 1140 LET L=L+1
 1150 GOTO 1020
 1160 LET L=L-1
 1170 GOTO 1040
D834 REM
E090 REM
```

1982

BITS "N" BYTES

```
ASBITTUJUAWRXNI    COMPUTER
VWDIHGJPMUEEAZK    SOFTWARE
YJLYKCONQTRIBLE    HARDWARE
WXETRNHGUAQYQHV    KEYBOARD
GPAHIOUPWDTGTCY    PRINTER
SQNJRCMDJESNQUV    SILICON
BTEKYOREMBJPRRN    MEMORY
SSEECAFHMFQLISO    SCREEN
SCRYHKYWORCIMOC    CURSOR
EVCBZEECIXEESRI    MICRO
NFSOFTWAREPPQAL    BYTE
UIQAJCHIPAHOZVI    CHIP
RUURCNPWDOGMRKS    STOP
FWYDHLUUSGMIVXG    BIT
AOTVGRETNIRPIUA    RUN
```

EXAMPLE WORDSQUARE USING THIS PROGRAM

81 BREAKOUT

DAVID JOHNSON of Belper, Derbyshire, has sent a new version of the traditional arcade game of **Breakout.**

Two layers of bricks have to be pulverised using a ball which bounces off walls and a bat controlled by the player. Ten points are scored for every brick hit and a bonus ball is given for each screen cleared. You start with three balls and control the bat by pressing Q for left and P for right. (16K ZX-81).

```
  5 LET H$="0"
 10 LET S=0
 11 LET TS=0
 15 LET L=3
 20 LET P=2
 30 LET N=2
 40 PRINT "(graphic E;thirty gr
aphic 7s;graphic R)"
 41 PRINT AT 0,7;"HIGH SCORE 00
000";AT 0,23-(LEN H$);H$
 45 PRINT "(graphic 5;thirty SP
ACEs;graphic 8)"
 50 PRINT "(graphic 5;thirty al
ternate graphic Fs and Gs;graphi
c 8)"
 60 PRINT "(graphic 5;thirty al
ternate graphic Gs and Fs;graphi
c 8)"
 70 FOR F=4 TO 20
 80 PRINT "(graphic 5;thirty SP
ACEs;graphic 8)"
 90 NEXT F
100 LET X=1
110 LET Y=1
120 LET B=0
130 LET B$="(SPACE;three graphi
c 7s;SPACE)"
140 PRINT AT X,Y;" "
150 LET X=X+N-1
160 LET Y=Y+P-1
170 IF X=19 THEN GOSUB 500
180 IF X=2 OR X=3 THEN GOSUB 70
0
190 IF Y=30 THEN LET P=0
200 IF X=1 THEN LET N=2
210 IF Y=1 THEN LET P=2
220 LET B=B+(INKEY$="P" AND B+4
<31)-(INKEY$="Q" AND B>0)
230 PRINT AT 20,B;B$
240 PRINT AT X,Y;"O"
250 GOTO 140
500 IF Y=B+1 OR Y=B+3 THEN GOTO
600
510 IF Y<>B+2 THEN GOTO 1000
520 LET N=0
530 RETURN
610 LET N=-0.5
620 RETURN
700 PRINT AT X,Y;
710 IF PEEK (PEEK 16398+256*PEE
K 16399)<>0 THEN GOTO 750
720 RETURN
750 LET S=S+10
755 IF S>590 THEN GOTO 2000
760 LET N=2
770 RETURN
1000 LET L=L-1
1001 LET TS=TS+S
1002 LET S=0
1010 IF L=0 THEN GOTO 1100
1020 PRINT AT 10,11;"BALL LOST"
1030 FOR F=1 TO 50
1040 NEXT F
1050 PRINT AT 10,11;"          "
1060 LET X=1+L
1070 LET Y=1+L
1080 GOTO 140
1110 PRINT AT 10,11;"GAME OVER "
;AT 11,11;"SCORE ";TS
1120 IF TS>VAL H$ THEN LET H$=ST
R$ TS
1130 PAUSE 4E4
1135 CLS
1140 GOTO 10
2000 PRINT AT 11,10;"BONUS BALL"
2010 LET TS=TS+S
2020 LET S=0
2030 FOR F=1 TO 50
2040 NEXT F
2050 LET L=L+1
2060 GOTO 20
```

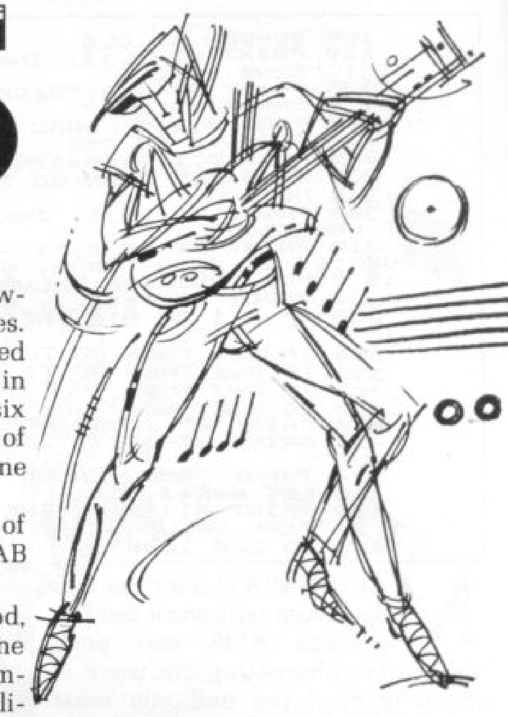
```
  100 BORDER 1: CLS
  120 PRINT AT 0,11; INK 2; BRIGH
T 1;"SINE WAVE"
  130 PRINT AT 1,2;"PEAK R.M.S. a
nd AVERAGE VALUES"
  200 PLOT 0,110: DRAW 255,0
  210 FOR Q=0 TO 255
  220 PLOT Q,110+40*SIN (Q/64*PI)
  230 IF Q=255 THEN GO TO 300
  240 NEXT Q
  300 PRINT AT 15,8; INK 1;"SELEC
T FUNCTION"
  310 PRINT AT 16,2;"1---PEAK VAL
UE";AT 17,2;"2---RMS. VALUE";AT
18,2;"3---AVERAGE VALUE"
  320 INPUT "Select 1, 2,or 3";A
  330 IF A<1 OR A>3 THEN GO TO 32
0
  340 IF A=1 THEN GO TO 400
  350 IF A=2 THEN GO TO 500
  360 IF A=3 THEN GO TO 600
  400 GO SUB 1000
  410 PRINT AT 14,10;"PEAK VALUE"
  420 PRINT AT 15,7;"INPUT RMS. V
ALUE"
  430 INPUT "RMS. VALUE ";R
  440 LET Q=R*1.414
  450 PRINT AT 18,4; INK 2; BRIGH
T 1;"PEAK VALUE = ";Q
  460 GO SUB 1020
  470 GO TO 300
  500 GO SUB 1000
  510 PRINT AT 15,7;"INPUT RMS. V
ALUE"
  520 PRINT AT 15,7;"INPUT PEAK V
ALUE"
  530 INPUT "PEAK VALUE ";P
  540 LET Q=P*0.707
  550 PRINT AT 18,4; INK 2; BRIGH
T 1;"RMS. VALUE = ";Q
  560 GO SUB 1020
  570 GO TO 300
  600 GO SUB 1000
  610 PRINT AT 14,10;"AVERAGE VAL
UE"
  620 PRINT AT 15,8;"INPUT PEAK V
ALUE"
  630 PRINT "PEAK VALUE ";P
  640 LET Q=P*0.637
  650 PRINT AT 18,4; INK 2; BRIGH
T 1;"AVERAGE VALUE = ";Q
  660 GO SUB 300
1000 FOR Q=14 TO 21: PRINT AT Q,
0; PAPER 2;"
                ": NEXT Q
1010 RETURN
1020 PAUSE 200: FOR Q=14 TO 21:
PRINT AT Q,0;"
                ": NEXT Q
1030 RETURN
2000 SAVE "sine" LINE 10
```

MAKING WAVES for the 16K Spectrum will work out the average RMS and peak values of an alternating sine wave. A menu is displayed and you must select one of the functions. If you want to find the peak value the program will ask you to enter the known RMS value; it is the other way round to find the RMS value and if you want to find the average value no input is required.

The graphics of the program are good and make this a fine educational program and mathematical aid. The program was sent by David Price, of Caerphilly, Glamorgan.

making WAVES

CHORDS



FOR ALL who are trying to master a musical instrument, **Chords** is a good learning aid. By entering the name of a chord, the notes which comprise it are displayed on a piano keyboard shown at the top of the screen.

Despite some chords having complicated titles, the program can deal with them by using a code for the different elements, such as the note, whether in major or minor and whether diminished or not. The code is shown on the screen beneath the keyboard.

To help in printing, the keyboard line 1030 contains a shifted 8 then a shifted 7 and a shifted space followed by alternate shifted 7s and spaces.

Line 1070 is made up of a shifted 8,30 shifted 6s and a shifted 5, and in lines 1100 to 1200 there are six spaces for letters in the second set of doubles and 32 shifted 7s in line 1210.

In line 1110 there are two sets of double quotes, shifted Q, after TAB 26.

Chords was sent by Paul Hopgood, of Wantage, Oxfordshire. It was one of the runners-up in the May competition in our companion publication, *Sinclair User*, and needs the 16K RAM pack.

```
  10 DIM C$(7,3)
  20 DIM N(4)
  30 REM ...................DISPLAY
  40 GOSUB 1000
  50 REM ......SET UP NOTE TABLE
  60 GOSUB 1500
  70 PRINT AT 21,0;"CHORD NAME ?
"
  80 INPUT A$
  90 IF A$(1)="Q" THEN STOP
 100 LET N$=A$(1)
 110 LET A$=A$(2 TO )
 120 REM ..........ROOT POSITION
"
 130 GOSUB 2000
 140 REM .............ACCIDENTALS
 150 IF N$="""" THEN LET N(1)=N(
1)+1
 160 IF N$="." THEN LET N(1)=N(1
)-1
 170 REM ................CHORDS
 180 FOR I=1 TO 7
 190 IF N$=S$(I) THEN GOSUB I*50
0+2000
 200 NEXT I
 300 IF A$<>"" THEN GOTO 100
 310 REM ............PRINT CHORD
 320 PRINT AT 5,1;"(31 SPACES)"
 330 FOR I=1 TO 4
 340 IF N(I)<>0 THEN PRINT AT 5,
N(I);"*"
 350 NEXT I
 360 FOR I=1 TO 4
 370 LET N(I)=0
 380 NEXT I
 390 GOTO 80
1000 REM ****CREATE  DISPLAY****
1010 PRINT "  CHORD FORMATION C
ALCULATOR      "
1020 PRINT
1030 PRINT "█▀▀█▀█▀▀█▀█▀█▀▀█▀█▀▀█
▀▀▀▀▀▀▀▀▀▀▀"
1040 PRINT "█ █ █  █ █ █  █ █  █
 █ █  █ █"
1050 PRINT "█ █ █  █ █ █  █ █  █
 █ █  █ █"
1060 PRINT "█";TAB 31;"█"
1070 PRINT "█▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄
▄▄▄▄▄▄▄▄▄▄█"
1080 PRINT
1090 PRINT "  INSTRUCTION
     CODE     "
1100 PRINT "█ NOTE";TAB 26;"A-G
█"
1110 PRINT "█ SHARP";TAB 26;""""
"     █"
1120 PRINT "█ FLAT";TAB 26;".
█"
1130 PRINT "█ INVERSION";TAB 26;
"I     █"
1140 PRINT "█ MAJOR";TAB 26;"M
█"
1150 PRINT "█ MINOR";TAB 26;"N
█"
1160 PRINT "█ AUGMENTED";TAB 26;
"+     █"
1170 PRINT "█ DIMINISHED";TAB 26
;"-     █"
1180 PRINT "█ SIXTH";TAB 26;"6
█"
1190 PRINT "█ SEVENTH";TAB 26;"7
█"
1200 PRINT "█ QUIT";TAB 26;"Q
█"
1210 PRINT "▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀
▀▀▀▀▀▀▀▀▀▀▀"
1220 RETURN
1500 REM ***SET UP NOTE TABLE***
1510 LET C$(1)="C01"
1520 LET C$(2)="D03"
1530 LET C$(3)="E05"
1540 LET C$(4)="F06"
1550 LET C$(5)="G08"
1560 LET C$(6)="A10"
1570 LET C$(7)="B12"
1580 LET S$="MN67I+-"
1590 RETURN
2000 REM **FIND PRINT POSITION**
2010 FOR I=1 TO 7
2020 IF N$=C$(I,1) THEN LET N(1)
=VAL C$(I,2 TO )
2030 NEXT I
2040 RETURN
2500 REM ******MAJOR CHORD******
2510 LET N(2)=N(1)+4
2520 LET N(3)=N(1)+7
2530 LET N(4)=0
2540 RETURN
3000 REM ******MINOR CHORD******
3010 LET N(2)=N(1)+3
3020 LET N(3)=N(1)+7
3030 LET N(4)=0
3040 RETURN
3500 REM *******ADD SIXTH*******
3510 LET N(4)=N(1)+9
3520 RETURN
4000 REM ******ADD SEVENTH******
4010 LET N(4)=N(1)+10
4020 RETURN
4500 REM ***INVERSION ROUTINE***
4510 LET T=N(1)
4520 LET N(1)=N(2)
4530 LET N(2)=N(3)
4540 LET N(3)=N(4)
4550 IF T<>0 THEN LET N(4)=T+12
4560 RETURN
5000 REM ****AUGMENTED CHORD****
5010 LET N(2)=N(1)+4
5020 LET N(3)=N(1)+8
5030 LET N(4)=0
5040 RETURN
5500 REM ***DIMINISHED  CHORD***
5510 LET N(2)=N(1)+3
5520 LET N(3)=N(1)+6
5530 LET N(4)=N(1)+9
5540 RETURN
```

WIPE OUT

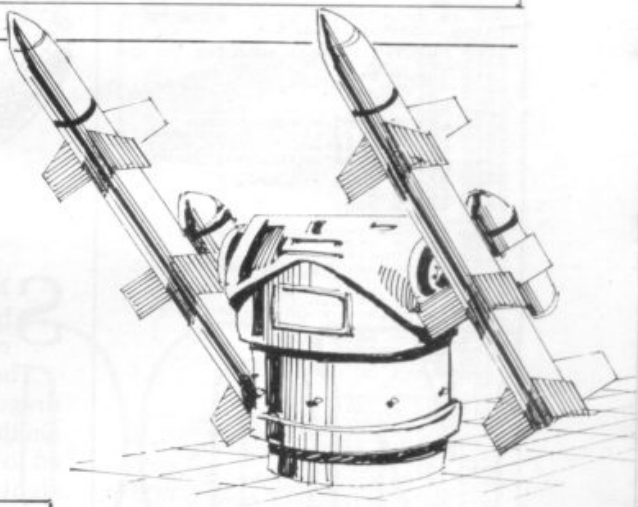
A DECEPTIVELY simple but frustrating game has been sent by Keith Paterson of Newmarket, Suffolk. When run, two walls are displayed with an O between them. The O can be used to eliminate the walls but as it does so it leaves a trail of Os behind it when moving vertically. No trail is left when moving horizontally.

The object is to finish with only one O on the screen. Despite a lengthy attempt by the *Sinclair Programs* reviewer, that proved impossible but Paterson maintains that it can be done with a little thought and concentration.

The O is moved by the cursor keys in the usual directions. It can run on the 1K ZX-81.

```
    2 PRINT "USE 5,6,7,8 TO  CLS
"
    3 PAUSE 200
    4 CLS
    6 FOR X=1 TO 6
    7 PRINT TAB 0;"■"
    8 PRINT TAB 15;"■"
    9 NEXT X
   10 LET A=10
   20 LET B=10
   25 LET D$=" O "
   30 PRINT AT A,B;D$
   40 IF INKEY$="8" THEN LET B=B+
1
   50 IF INKEY$="5" THEN LET B=B-
1
   51 IF INKEY$="6" THEN LET A=A+
1
   52 IF INKEY$="7" THEN LET A=A-
1
   53 PRINT AT A+1,B;" "
   54 IF B>16 OR B<0 THEN LET B=0
   55 IF A>12 OR A<0 THEN LET A=0
   56 PRINT AT A-1,B;" "
   60 GOTO 30
```

SHIPS



```
    1 LET C=0
    2 LET A=0
    3 RAND
    4 FOR A=1 TO 10
    5 CLS
   40 LET M=18
   92 LET F=2*(INT (RND*8))
   95 FOR B=0 TO 20
  100 PRINT AT F,B;" ■■■ "
  125 PRINT AT 19,15;"■■■■■"
  130 IF M<F THEN LET M=18
  140 IF INKEY$="P" OR M<18 THEN
PRINT AT M,16;"."
  150 IF B=15 AND M=F THEN GOTO 1
500
  160 IF INKEY$="P" OR M<18 THEN
GOSUB 1000
  300 PRINT AT F,B;"   "
  370 NEXT B
  500 NEXT A
  700 PRINT AT 20,16;C
 1000 PRINT AT M,16;" "
 1010 LET M=M-2
 1020 RETURN
 1500 PRINT AT M,B;"BANG"
 1700 PAUSE 50
 1750 LET C=C+1
 1800 NEXT A
 2000 PRINT AT 20,16;C
```

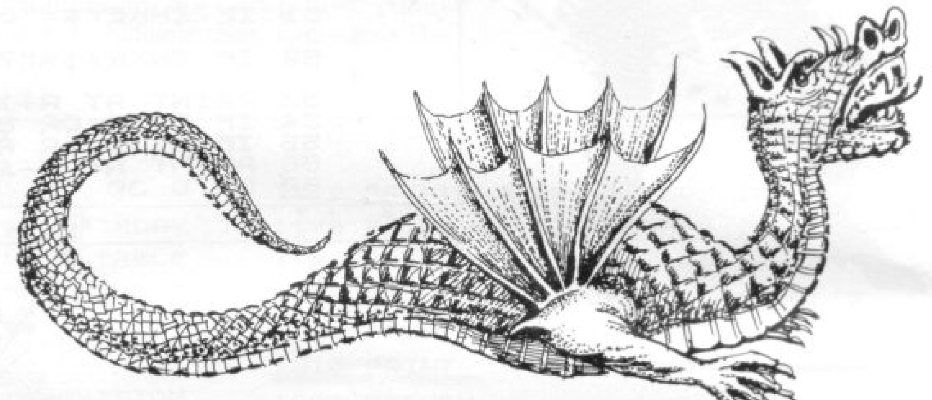
FOR THE 1K ZX-81, **Ships** is a simple type of missile game in which a target moves at various distances from the gun across the screen and the objective is to hit it. Ten ships pass and the score is shown at the end of each game.

Only one shot can be made at a time, so the skill is in judging when to fire, so that the missile and ship coincide. When a hit is made in the middle of the ship, BANG is shown on the screen.

Press RUN and NEW LINE to start each game and P to fire the missile. The *Sinclair Programs* reviewer managed a top score of four.

The graphics in line 1ØØ are, all shifted, 3,6 and 4 and line 125,Q,F and W. Ships was sent by Ian Johnston, of Newmarket, Suffolk.

SMAUG



SMAUG is an *Adventure* game based on a circular maze of rooms.

The object is obviously to find a dragon called Smaug and then kill it. On the way you risk being transported to other caves by Orcs or catching sight of a dreaded Balrog, which is fatal instantly.

Having slain the dragon, you must steal the Arkenstone which assists you by protecting you from Orc-porting and also warns of impending Balrogs.

Smaug has no graphics built in yet but perhaps that could be the next development for interested readers.

The program requires 5K and was submitted by Mrs C M Corns of Enfield.

```
  10 REM "SMAUG"
  15 REM C M CORNS
  20 LET X=0
  30 RAND
  40 PRINT TAB 3;"SMAUG AND THE ARKENSTONE"
  50 PRINT AT 7,0;"DO YOU NEED A
N EXPLANATION OF","THE STORY?  Y
 OR N"
  60 INPUT Q$
  70 IF Q$="Y" THEN GOTO 110
  80 IF Q$="N" THEN GOTO 120
  90 PRINT AT 10,0;"MAKE UP YOUR
 MIND..."
 100 GOTO 60
 110 GOSUB 1000
 120 CLS
 130 GOSUB 2000
 135 SLOW
 140 CLS
 145 GOTO 3000
 150 IF X<>0 THEN GOTO 140
 160 IF Y=E AND ARK=0 THEN GOTO
7000
 164 IF Y=E AND ARK=1 THEN GOTO
170
 166 IF Y<>E THEN GOTO 200
 170 PRINT TAB 4;"HURRAH, YOU GOT OUT"
 180 PRINT ,,TAB 2;"YOU HAVE THE ARKENSTONE"
 185 PRINT ,,"GANDALF WILL MAKE
YOU AN","HONORARY HOBBIT.",,,"BU
T YOU WERE LUCKY - SMAUG","WILL
GET YOU NEXT TIME."
 190 GOTO 230
 200 IF Y<>BALROG THEN GOTO 230
 210 PRINT ,,TAB 9;"AAAAAAAARGH"
 215 PRINT ,,TAB 5;"YOU MET THE BALROG"
 230 PRINT
 240 PRINT ,,"ANOTHER GAME? (Y O
R N)"
 250 INPUT Q$
 260 IF Q$="Y" THEN GOTO 120
 270 PRINT ,,TAB 13;"BYE"
 280 STOP
1000 CLS
1010 PRINT ,,"YOUR AIM IS TO FIN
D SMAUG AND","KILL HIM SO THAT Y
OU CAN TAKE","THE ARKENSTONE."
1020 PRINT ,,"SMAUG LIVES IN A N
ETWORK OF 20","INTERCONNECTING C
AVES - EACH","CAVE HAS 3 EXITS L
EADING FROM IT"
1030 PRINT ,,"THERE ARE DANGERS
THOUGH - THREE","CAVES CONTAIN O
RCS WHO CAN","MAGICALLY TRANSPOR
T YOU TO","ANOTHER CAVE AT RANDO
M."
1040 PRINT ,,"YOU ONLY HAVE 5 AR
ROWS WITH","WHICH TO KILL SMAUG
- USE","THEM WISELY."
1050 PRINT ,,"PRESS NEWLINE TO C
ONTINUE"
1060 INPUT Q$
1070 CLS
1080 PRINT ,,"WHEN YOU SHOOT AT
SMAUG YOU","MIGHT BE LUCKY AND K
ILL HIM,","OR HE MIGHT RUN AWAY
(TAKING","THE ARKENSTONE WITH HI
M) OR HE","MAY ATTACK YOU"
1170 PRINT ,,"OH, I NEARLY FORGO
T - "
1190 PRINT ,,"ONE CAVE HAS A BAL
ROG IN IT.","THIS IS AN AWFUL
THING","WHICH WILL KILL YOU ON S
IGHT"
1200 PRINT ,,"PRESS NEWLINE TO C
ONTINUE"
1210 INPUT Q$
1230 RETURN
2000 LET S=5
2005 FAST
2010 LET B$="BCJADEADNBCGBGH"
2020 LET B$=B$+"LRSDELELRMRSANP"
2030 LET B$=B$+"NOPFGHIQTCJKKQT"
2040 LET B$=B$+"JKTMOSFHIFIQOPM"
2050 LET A$=B$
2060 GOSUB 2500
2070 LET Y=R
2080 GOSUB 2500
2090 LET E=R
2100 IF E=Y THEN GOTO 2080
2110 GOSUB 2500
2120 LET ORC1=R
2130 IF ORC1=Y OR ORC1=E THEN GO
TO 2110
2140 GOSUB 2500
2150 LET BALROG=R
2160 IF BALROG=Y OR BALROG=E OR
BALROG=ORC1 THEN GOTO 2140
2170 GOSUB 2500
2180 LET ORC2=R
2190 IF ORC2=Y OR ORC2=BALROG OR
 ORC2=ORC1 OR ORC2=E THEN GOTO 2
170
2200 GOSUB 2500
2210 LET ORC3=R
2220 IF ORC3=Y OR ORC3=E OR ORC3
=BALROG OR ORC3=ORC1 OR ORC3=ORC
2 THEN GOTO 2200
2230 GOSUB 2500
2240 LET SMAUG=R
2250 IF SMAUG=Y OR SMAUG=E OR SM
AUG=ORC1 OR SMAUG=ORC2 OR SMAUG=
ORC3 OR SMAUG=BALROG THEN GOTO 2
230
2270 LET ARK=0
2300 LET X=X+1
2400 RETURN
2500 LET R=INT (RND*20)+1
2510 RETURN
3000 IF Y=E OR Y=BALROG THEN GOT
O 3230
3020 IF Y=SMAUG THEN GOTO 3270
3030 IF Y=ORC1 OR Y=ORC2 OR Y=OR
C3 THEN GOTO 3250
3060 PRINT "YOU ARE IN ROOM ";Y
3080 GOSUB 8000
3110 PRINT "TUNNELS LEAD TO ";R1
;" ";R2;" ";R3
3112 IF ARK=1 THEN GOSUB 3500
3115 IF R1=E OR R2=E OR R3=E THE
N GOTO 3150
3140 GOTO 3160
3150 PRINT "[illegible]"
3160 PRINT "WHERE WILL YOU MOVE
TO? ";
3170 INPUT Y
3175 PRINT Y
3180 IF Y=R1 OR Y=R2 OR Y=R3 THE
N GOTO 3240
3210 PRINT "YOU CANNOT - TRY AGA
IN"
3220 GOTO 3160
3230 LET X=0
3240 GOTO 150
3250 GOTO 4000
3260 GOTO 3000
3270 IF S>0 THEN GOTO 3310
3280 PRINT "[illegible]","[illegible]"
3300 GOTO 3230
3310 GOSUB 5000
3320 IF Q$="R" THEN GOTO 3060
3330 GOTO 3240
3500 IF R1=BALROG OR R2=BALROG O
R R3=BALROG THEN GOTO 3550
3510 GOTO 3560
3550 PRINT ,,"WARNING",,"THE A
RKENSTONE IS WARNING YOU","THAT
BALROGS ARE NEAR......"
3560 RETURN
4000 PRINT TAB 4;"THERE ARE ORCS IN HERE"
4005 IF ARK=1 THEN GOTO 4027
4010 LET G=INT (RND*20)+1
4020 LET Y=G
4025 PRINT ,,"YOU HAVE BEEN ORC-
PORTED TO","ROOM ";G
4026 GOTO 4030
4027 PRINT ,,"BUT YOU HAVE THE A
RKENSTONE","ORC MAGIC IS NO GOOD
 NOW"
4028 GOTO 3060
4030 GOTO 3260
5000 PRINT ,,TAB 5;"THIS IS SMAUGS DEN"
5010 PRINT ,,"SHOOT OR RUN?","RE
PLY S OR R"
5020 INPUT Q$
5030 IF Q$="S" THEN GOTO 5080
5040 IF Q$="R" THEN GOTO 5070
5050 PRINT "ANSWER QUICKLY"
5060 GOTO 5010
5070 RETURN
5080 PRINT ,,TAB 12;"BANG"
5090 LET Q=RND
5100 IF Q<=.33 THEN GOSUB 6000
5110 IF Q<=.66 AND Q>.33 THEN GO
TO 6100
5120 IF Q>.66 THEN GOSUB 6200
5130 RETURN
6000 PRINT ,,TAB 8;"MISSED.....",TAB 5;"SMAUG GOT YOU....."
6010 GOTO 230
6020 RETURN
6100 PRINT ,,"YOU MISSED, SMAUG
RAN AWAY","HE HAS TAKEN THE ARKE
NSTONE","WITH HIM"
5110 GOSUB 8000
6140 LET SMAUG=R2
6150 IF SMAUG=E OR SMAUG=BALROG
THEN GOTO 6160
6155 GOTO 6190
6160 LET SMAUG=R1
6170 IF SMAUG=E OR SMAUG=BALROG
THEN GOTO 6180
6175 GOTO 6190
6180 LET SMAUG=R3
6190 GOTO 3060
6200 PRINT ,,TAB 4;"YOU HAVE KILLED SMAUG",,,TAB 3;"[illegible]"
6210 PRINT ,,"BUT CAN YOU ESCAPE
 TO THE EXIT?"
6220 LET SMAUG=0
6230 LET ARK=1
6260 GOTO 3060
6270 RETURN
7000 PRINT TAB 10;"THE EXIT"
7010 PRINT ,,"YOU HAVE NOT GOT T
HE","ARKENSTONE. IF YOU RETURN",
"WITHOUT IT GANDALF WILL TURN",
YOU INTO A BEETLE. GO BACK AND",
"FETCH IT."
7020 LET X=1
7030 GOTO 3060
8000 FOR I=1 TO Y
8010 LET R1=CODE (A$)-37
8020 LET A$=A$(2 TO )
8030 LET R2=CODE (A$)-37
8040 LET A$=A$(2 TO )
8050 LET R3=CODE (A$)-37
8060 LET A$=A$(2 TO )
8070 NEXT I
8080 LET A$=B$
8100 RETURN
```

PONTOON

THIS VERSION of the card game **Pontoon** requires a minimum of 4K RAM on the ZX-81. The program is a very good simulation of the game which is played with the computer as the dealer.

S is pressed for stick and T for twist, with the answer as to whether you wish to play again after the end of a game being a Y or N. No betting is involved—only the satisfaction of having beaten the computer.

To help with the graphics for the card designs, on lines 30 to 100 there are five spaces between the quotes.

Pontoon was sent by Paul Mapstone, of London N7.

```
  1 REM  **ZX81  PONTOON**
  2 REM  **BY P.MAPSTONE**
  5 RAND
 10 DIM A$(8,5)
 20 DIM T$(11,6)
 30 LET A$(1)="┌─┐  "
 40 LET A$(2)="│ │  "
 50 LET A$(3)="│▚ ▞│  "
 60 LET A$(4)="│ ▚ │  "
 70 LET A$(5)="│▞ ▚│  "
 80 LET A$(6)="│ ▞ │  "
 90 LET A$(7)="│ ▞ │  "
100 LET A$(8)="└─┘  "
110 LET T$(1)="188882"
120 LET T$(2)="168682"
130 LET T$(3)="176872"
140 LET T$(4)="148842"
150 LET T$(5)="146842"
```

```
  150 LET T$(6)="145842"
  170 LET T$(7)="135842"
  180 LET T$(8)="144442"
  190 LET T$(9)="143442"
  200 LET T$(10)="134342"
  210 LET T$(11)="186882"
  280 PRINT AT 21,20;"CREDITS:10"
  290 LET CR=10
  300 DIM P(6)
  310 DIM D(6)
  320 FOR N=1 TO 6
  330 LET P(N)=0
  340 LET D(N)=0
  350 NEXT N
  360 LET L=0
  370 LET C=1
  380 LET NP=2
  400 GOSUB 2000
  410 LET DS=N
  420 LET D(1)=N
  430 PRINT AT 7,1;"DEALERS SCORE
=";DS
  440 LET L=6
  450 GOSUB 2000
  460 LET P(1)=N
  470 LET L=0
  480 LET C=6
  490 LET N=1
  500 GOSUB 2020
  510 LET L=6
  520 GOSUB 2000
  550 LET P(2)=N
  560 PRINT AT 15,1;"PLAYERS SCOR
E="
  570 PRINT AT 17,1;"STICK OR TWI
ST?"
  600 LET PT=P(1)+P(2)+P(3)+P(4)+
P(5)+P(6)
  610 IF PT=21 AND NP=2 THEN GOTO
 2100
  620 IF PT<22 THEN GOTO 685
  629 REM SETS ACE=1
  630 LET N=1
  640 IF P(N)<>11 THEN GOTO 670
  650 LET P(N)=1
  660 GOTO 600
  670 LET N=N+1
  675 IF N=7 THEN GOTO 2200
  680 GOTO 640
  685 PRINT AT 15,15;PT
  690 IF NP=6 THEN GOTO 2300
  700 IF INKEY$="" THEN GOTO 700
  710 IF INKEY$="S" THEN GOTO 100
0
  720 LET C=C+5
  730 LET NP=NP+1
  740 GOSUB 2000
  750 LET P(NP)=N
  760 GOTO 600
 1000 IF NP=5 THEN GOTO 2400
 1009 REM ***DEALERS TURN
 1010 LET ND=1
 1020 LET L=0
 1030 LET C=1
 1040 LET DT=D(1)+D(2)+D(3)+D(4)
D(5)
 1050 IF DT=21 AND ND=2 THEN GOT(
 3000
 1060 IF DT<32 THEN GOTO 1135
 1070 LET N=1
 1080 IF D(N)<>11 THEN GOTO 1110
 1090 LET D(N)=1
 1100 GOTO 1040
 1110 LET N=N+1
 1120 IF N<6 THEN GOTO 1080
 1130 GOTO 3100
 1135 PRINT AT 7,15;DT
 1140 IF ND=5 THEN GOTO 3200
 1150 IF DT>=PT THEN GOTO 3500
 1160 LET C=C+5
 1170 LET ND=ND+1
 1180 GOSUB 2000
 1190 LET D(ND)=N
 1200 GOTO 1040
 1999 REM PICK RANDOM CARD
 2000 LET N=INT (RND*13)+2
 2010 IF N>11 THEN LET N=10
 2019 REM PLOT RANDOM CARD AT L,C
 2020 FOR W=1 TO 6
 2030 PRINT AT L+W,C;A$(VAL T$(N,
W))
 2040 NEXT W
 2050 RETURN
 2100 PRINT AT 15,15;"***PONTOON*
**"
 2110 LET N=2
 2150 GOTO 3600
 2200 PRINT AT 15,15;"BUST"
 2210 GOTO 3500
 2300 PRINT AT 15,15;"SIX CARD TR
ICK"
 2310 LET N=4
 2330 GOTO 3600
 2400 PRINT AT 15,15;"FIVE CARD T
RICK"
 2410 LET N=2
 2420 GOTO 3600
 3000 PRINT AT 7,15;"***PONTOON**
*"
 3010 GOTO 3500
 3100 PRINT AT 7,15;"BUST"
 3110 LET N=1
 3120 GOTO 3600
 3200 PRINT AT 7,15;"FIVE CARD TR
ICK"
 3500 LET CR=CR-1
 3510 PRINT AT 19,5;"YOU LOSE 1 C
REDIT"
 3530 IF CR>0 THEN GOTO 3700
 3540 PRINT AT 21,28;"0"
 3550 PRINT AT 17,1;"YOU HAVE RUN
 OUT OF CREDITS,     WOULD YOU LI
KE TO TRY AGAIN?"
 3560 IF INKEY$="" THEN GOTO 3550
 3570 IF INKEY$="N" THEN STOP
 3580 CLS
 3590 RUN
 3600 LET CR=CR+N
 3610 IF N>1 THEN PRINT AT 19,5;"
YOU WIN ";N;" CREDITS"
 3620 IF N=1 THEN PRINT AT 19,5;"
YOU WIN 1 CREDIT"
 3700 PRINT AT 21,28;CR;" "
 3710 PRINT AT 17,1;"(16 SPACES)"
 3720 PRINT AT 21,1;"DEAL?"
 3730 IF INKEY$="" THEN GOTO 3720
 3740 IF INKEY$="N" THEN STOP
 3750 CLS
 3760 PRINT AT 21,20;"CREDITS:";C
R
 3770 GOTO 320
```

COMPUTER COMBAT

THE FIRST question often asked about a new machine is "Does it play *Space Invaders?*". Though a 1K machine has considerable difficulty getting anywhere near, *Computer Combat* for 1K ZX-81 is a type of mini space invaders but with only one invader and one base and a much slower rate of firing.

The object of the game is to hit the invader as many times as possible before it lands or you run out of missiles. Twenty-five missiles normally are given but that can be altered by changing the value of B in line 5.

You receive five points for hitting it but lose one is you miss. Use keys 5 and 8 to move left and right respectively and key 0 to fire. The invaders' missiles are shown as an asterisk and yours as a cross. The program is good for beginners, as it is easy to understand the function of each line as there are none of the usual POKES and PEEKS or other complicated functions.

If you want to get more memory, enter in direct mode the following BEFORE entering the program:

POKE 16389,68 followed by NEWLINE
NEW followed by NEWLINE

The program will run continuously until the BREAK key is used.

Computer Combat was sent in by 15-year-old Anthony Wells, of totnes, Devon.

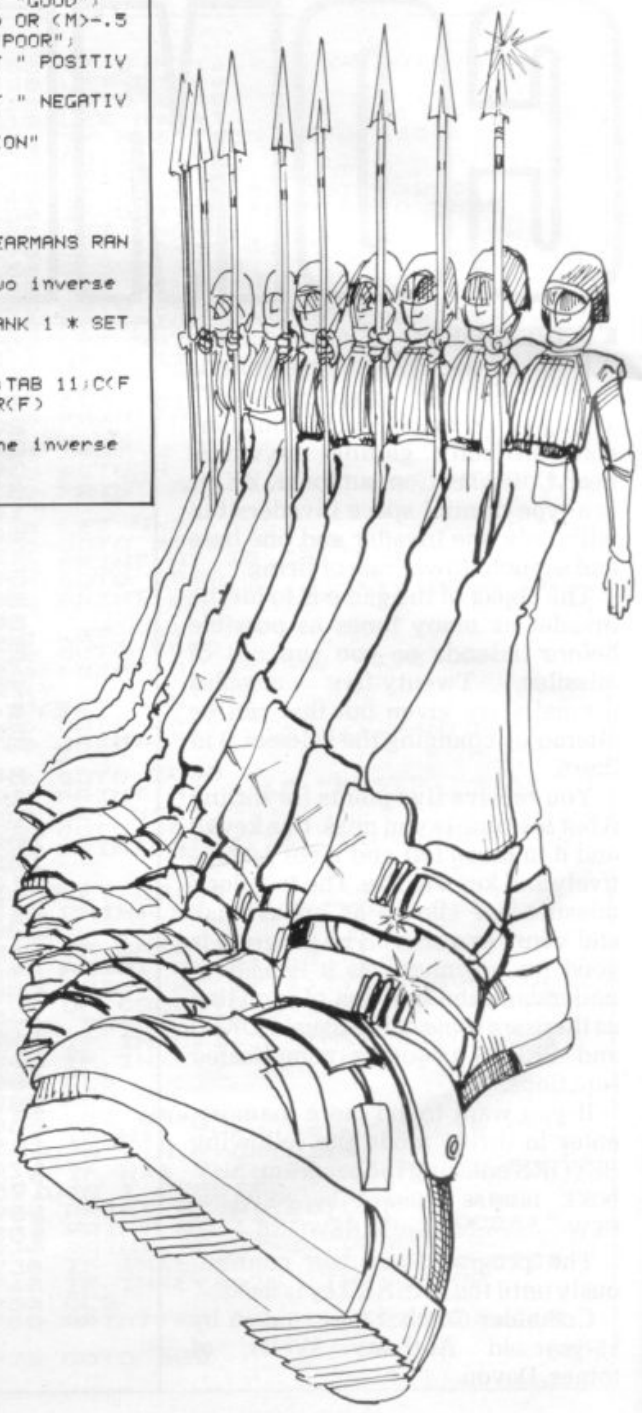
```
  5 LET B=VAL "25"
 10 LET S=PI-PI
 15 LET M=PI-PI
 20 LET X=VAL "16"
 25 LET Y=PI-PI
 30 LET M=M+2
 35 IF M>VAL "20" THEN GOTO VAL
"100"
 40 CLS
 45 LET R=INT (RND*5)
 50 IF R=3 THEN GOSUB 155
 55 PRINT AT M,Y;"▀▄▀"
 60 LET Y=Y+VAL "2"
 65 IF Y=VAL "30" THEN GOTO 25
 70 PRINT AT 21,X;" ▟ "
 75 LET X=X+(INKEY$="8")*3-(INK
EY$="5")*3
 80 IF INKEY$="0" THEN GOSUB 11
5
 85 IF B<=VAL "0" THEN GOTO VAL
"100"
 95 GOTO VAL "40"
100 PRINT AT 12,10;"SCORE=";S
105 PAUSE VAL "300"
110 RUN
115 PRINT AT M,X;"+"
120 IF X+1<>Y THEN LET S=S-1
125 IF X+1=Y THEN PRINT AT M,X-
1;"***"
130 IF X+1=Y THEN LET S=S+5
135 LET B=B-VAL "1"
140 RETURN
145 PAUSE VAL "50"
150 GOTO VAL "40"
155 PRINT AT 21,Y;CHR$ 23
160 IF X=Y THEN GOSUB VAL "170"
165 RETURN
170 PRINT AT 21,Y;"<*>"
175 PAUSE VAL "40"
180 LET S=S-VAL "5"
185 RETURN
```

```
  1 REM SPEARMAN
 50 PRINT AT 21,0;"  SPEARMANS
RANK COEFFICIENT"
 52 PAUSE 50
 55 SCROLL
 56 SCROLL
 60 PRINT AT 21,0;"NO. OF VALUE
S?"
 70 INPUT I
 75 SCROLL
 76 IF I>=10 THEN PRINT CHR$ 15
7;CHR$ (I+146)
 77 IF I<10 THEN PRINT CHR$ (I+
156)
 78 SCROLL
 82 LET J=0
 83 LET K=0
 85 LET B=0
 87 DIM C(I)
 88 DIM D(I)
 89 DIM S(I)
 90 DIM A(I)
 95 DIM R(I)
 96 PRINT AT 21,0;"GREATEST OR
SMALLEST FIRST?(G/S)"
 97 INPUT A$
 98 SCROLL
 99 IF A$="G" THEN PRINT "GREAT
EST"
 100 IF A$="S" THEN PRINT "SMALL
EST"
 101 SCROLL
 102 SCROLL
 103 IF J=0 THEN PRINT AT 21,0;"
FIRST ";I;" VALUES?"
 104 IF J=1 THEN PRINT AT 21,0;"
SECOND ";I;" VALUES?"
 105 SCROLL
 106 SCROLL
 107 FOR F=1 TO I
 110 INPUT A(F)
 115 PRINT AT 21,0;A(F)
 116 SCROLL
 120 NEXT F
 130 FOR F=1 TO I
 135 FOR G=1 TO I
 140 IF A(F)>A(G) THEN LET B=B+1
 145 NEXT G
 150 IF A$="G" THEN LET R(F)=-B+
I
 155 IF A$="S" THEN LET R(F)=B+1
 160 LET B=0
 165 NEXT F
 170 IF J=1 THEN GOTO 300
 200 REM re defining variables
 210 FOR F=1 TO I
 220 LET C(F)=R(F)
 230 LET D(F)=A(F)
 235 LET J=1
 240 NEXT F
 241 SCROLL
 242 SCROLL
 250 GOTO 103
 300 REM calculating coeff
 310 FOR F=1 TO I
 320 LET S(F)=((C(F)-R(F))*(C(F)
-R(F)))
 322 LET X=K+S(F)
 323 LET K=K+S(F)
 325 NEXT F
 330 LET E=INT (((6*X)/(I**3-I))
*100+.5)
 335 LET M=1-E/100
 340 GOSUB 500
 350 REM correlation
 355 PRINT
 357 PRINT "SPEARMANS RANK = ";M
 358 PRINT
 360 IF M=0 THEN PRINT "NO";
 370 IF M=1 OR M=-1 THEN PRINT "
PERFECT";
 390 IF (M<1 AND M>=.5) OR (M<-.
5 AND M>-1) THEN PRINT "GOOD";
 400 IF (M<.5 AND M>0) OR (M>-.5
 AND M<0) THEN PRINT "POOR";
 410 IF M>0 THEN PRINT " POSITIV
E";
 420 IF M<0 THEN PRINT " NEGATIV
E";
 430 PRINT " CORRELATION"
 440 STOP
 500 FOR F=1 TO 21
 505 SCROLL
 507 NEXT F
 510 PRINT AT 0,7;"SPEARMANS RAN
K"
 520 PRINT "(thirty two inverse
SPACEs)"
 530 PRINT "SET 1 * RANK 1 * SET
 2 * RANK 2 "
 535 FOR F=1 TO I
 540 PRINT TAB 2;D(F);TAB 11;C(F
);TAB 19;A(F);TAB 28;R(F)
 545 NEXT F
 550 PRINT "(thirty one inverse
SPACEs)"
 560 RETURN
```

SPEAR MAN'S RANK

SPEARMAN'S coefficient of rank correlation is used to prove hypotheses of relationship between two sets of values. This program calculates **Spearman's Rank** for up to 14 pairs of values; any more will run over the page on the final printout.

The program was sent by Ian Holwill of Richmond, Surrey, who writes that he had trouble with the calculations, since the ZX-81 did not seem to store the numbers correctly. He overcame the problem by using the rounding technique in line 330, then dividing the result by 100 later in the listing. That gives a value to two decimal places. (16K ZX-81).



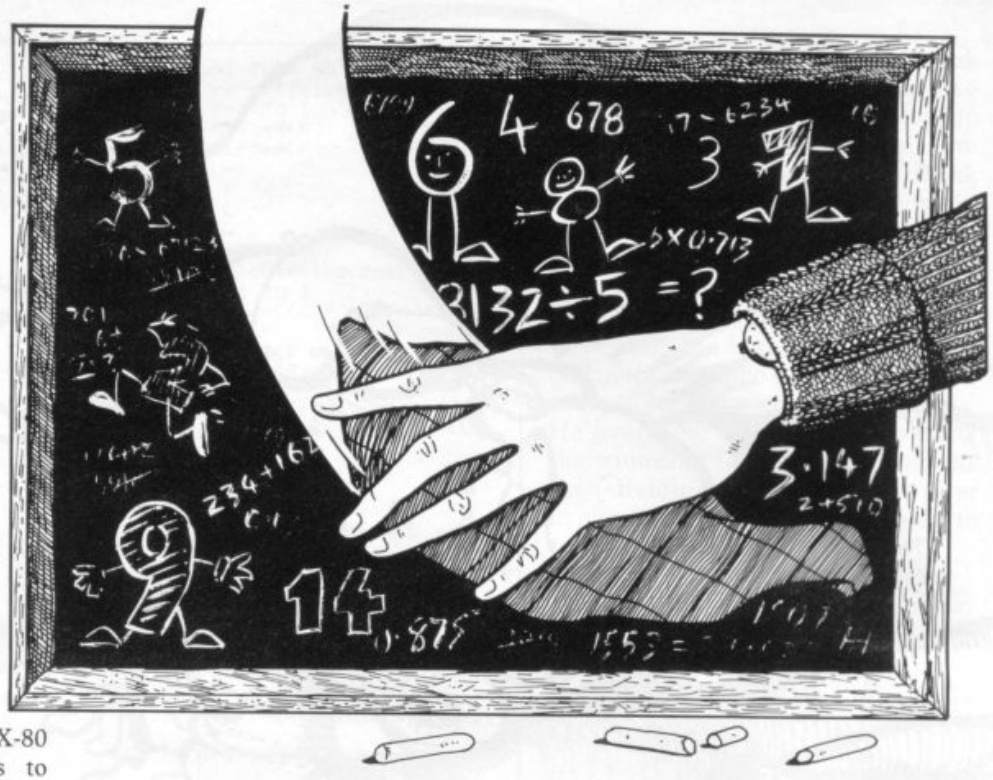
Monster Maths

EDUCATIONAL GAMES are always popular and useful routines for the Sinclair machines. **Monster Maths** is designed to test simple mathematical skills. The student is set 20 problems. Each incorrect answer extends a bridge towards a ravenous monster and 10 errors will enable it to cross over and eat you.

Lines can be changed to alter the range of numbers dealt with and the mathematical process required. Submitted by Russell Newby, of Biggin Hill, Kent (1K ZX-81).

```
   9 PRINT AT 9,5;"?(twelve SPAC
ES;graphic Q,T,Y,T,Y)"
  10~PRINT AT 10,5;"(inverse SPA
CE;ten SPACEs;five graphic Fs)"
  20 LET S=0
  25~LET T=0
  30 FOR F=1 TO 20
  35 PRINT AT 14,5;"(seventeen S
PACEs)"
  40~LET A=INT (RND*50)+10
  50 LET B=INT (RND*50)+10
  60~PRINT AT 14,5;A;"+";B;"=";
  70 INPUT N
  80 IF N=A+B THEN PRINT AT 14,1
2;N;" CORRECT"
  85 IF N=A+B THEN LET T=T+1
  90 IF N<>A+B THEN PRINT AT 14,
12;" WRONG"
 100 IF N<>A+B THEN LET S=S+1
 110 IF N<>A+B THEN PRINT AT 10,
5+S;"(graphic S)"
 120 IF S=10 THEN GOTO 200
 125 PAUSE 50
 130 NEXT F
 180 PRINT "SCORE ";T
 185 STOP
 200~FOR G=12 TO 5 STEP -.5
 210 PRINT AT 9,G;"(graphics Q,T
,Y,T,Y)"
 220 NEXT G
 230 PRINT "YOU ARE DEAD"
```

NUMBERBOARD



NUMBERBOARD is a 1K ZX-80 program whose subject is to move the inverse plus sign from the top left-hand corner of the screen to the inverse question mark at the bottom right. You move with the usual cursor keys and your final score is the total of all the numbers on which you land in the course of your journey, the lower the better. To start the game, use GOTO 1 instead of RUN.

Numberboard was sent by Robert Bumstead, of Keswick, Cumbria.

```
 10 FOR F=1 TO 479
 20 LET J=RND(5)
 30 PRINT J;
 40 NEXT F
 50 PRINT CHRS(143)
 60 LET Y=0
 70 LET X=0
 80 LET T=0
 90 LET Z=Y*33+X+1+PEEK
(16396)+PEEK(16397)*256
100 IF PEEK(Z)=143 THEN GOTO 180
110 LET T=T+PEEK(Z)-28
120 POKE Z, 147
130 INPUT A
140 POKE Z,0
150 LET X=X+(1 NAD A=8)-(1 AND A=5)
160 LET Y=Y+(1 AND A=6)-(1 AND A=7)
170 GOTO 90
180 PRINT "FINISHED IN"; T
```

Jackpot

USERS with 1K can now pass the hours using their machines to gamble. **Jackpot** is a fruit machine routine without the fruit. Hit any key except SHIFT or SPACE to change the line of numbers until three in a row appear. A running total is kept of your money and credits.

The program was sent by Darren Hatton of High Wycombe, Bucks. (1K ZX-81).

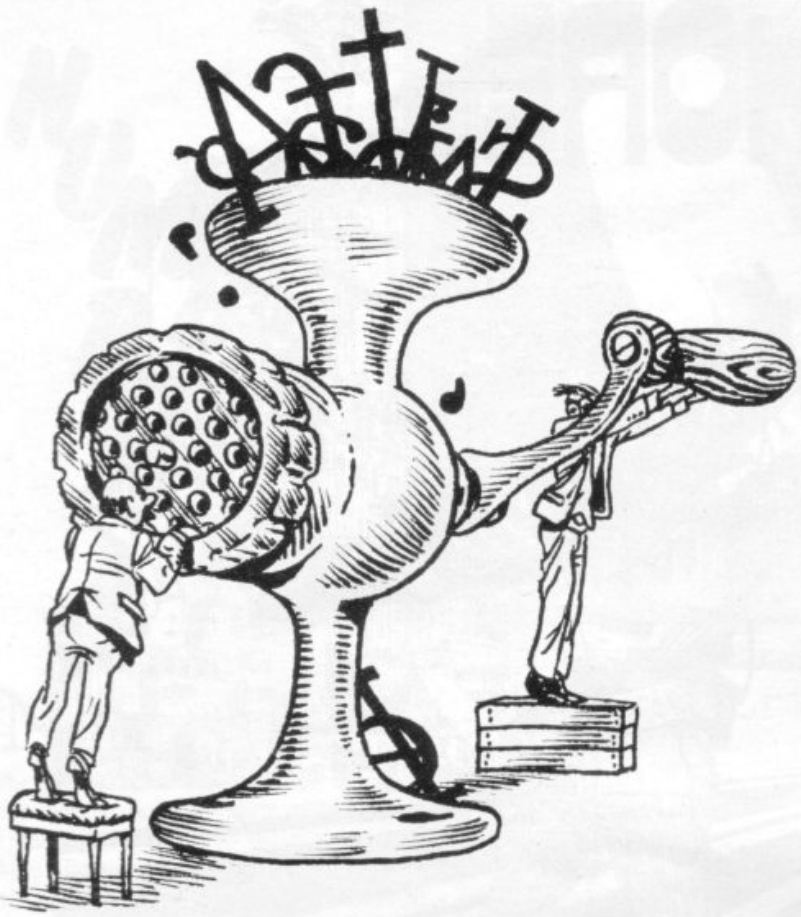
```
  10 PRINT "(graphic E;five grap
hic 7s;graphic R)"
  20 PRINT "(graphic 5;five HYPH
ENs;graphic 8)"
  30 PRINT "(graphic W;five grap
hic 6s;graphic 0)"
  40 LET F=200
  50 PRINT AT 0,10;"TOTAL MONEY"
  60 PRINT AT 1,12;F;"  "
  70 PRINT AT 3,10;"CREDITS"
  75 PRINT AT 4,12;F/10;"  "
  80 LET B=INT (10*RND)
  90 LET A=INT (10*RND)
 100 LET C=INT (10*RND)
 110 PAUSE 9999
 120 PRINT AT 1,1;A
 130 PRINT AT 1,3;B
 140 PRINT AT 1,5;C
 150 IF A=B AND B=C THEN GOTO 17
0
 160 GOTO 190
 170 LET F=F+40
```

SEMAPHORE

SEMAPHORE has sharp graphics and is educational, too. You can teach yourself with the help of an animated instructor supplied by Dr G A Jeffery of Stanley, Co. Durham.

Press any letter and the little man in the middle distance will give the appropriate semaphore signal, while FUNCTION induces something which looks like an attempt at vertical take-off, but is really the signal for Attention. 16K ZX-81.

```
  10 FOR X=12 TO 45
  20 PLOT X,25
  30 NEXT X
  40 PRINT AT 4,13;"     ";AT 5,
14;" O ";AT 6,13;" ██▀ ";AT 7,13
;" █  ";AT 8,14;"▞ ▚"
  50 IF INKEY$<>"" THEN GOTO 50
  60 IF INKEY$="" THEN GOTO 60
  70 LET A$=INKEY$
  80 IF A$=CHR$ 38 THEN PRINT AT
 4,13;"     ";AT 5,14;" O ";AT 6
,13;" ▟█  ";AT 7,13;"▒ ▒  "
  90 IF A$=CHR$ 39 THEN PRINT AT
 4,13;"     ";AT 5,14;" O ";AT 6
,13;"▒▀█  ";AT 7,13;"  ▒  "
 100 IF A$=CHR$ 40 THEN PRINT AT
 4,13;"▒    ";AT 5,14;"▚O ";AT
6,13;" █   ";AT 7,13;"  ▒  "
 110 IF A$=CHR$ 41 THEN PRINT AT
 4,13;" ▒   ";AT 5,14;"▐O ";AT 6
,13;" █   ";AT 7,13;"  ▒  "
 120 IF A$=CHR$ 42 THEN PRINT AT
 4,13;"    ▒";AT 5,14;" O▞";AT 6
,13;" █   ";AT 7,13;"  ▒  "
 130 IF A$=CHR$ 43 THEN PRINT AT
 4,13;"     ";AT 5,14;" O ";AT 6
,13;" █▀▒";AT 7,13;"  ▒  "
 140 IF A$=CHR$ 44 THEN PRINT AT
 4,13;"     ";AT 5,14;" O ";AT 6
,13;" █▖ ";AT 7,13;"  ▒ ▒"
 150 IF A$=CHR$ 45 THEN PRINT AT
 4,13;"     ";AT 5,14;" O ";AT 6
,13;"▒▀█  ";AT 7,13;"▒▟█  "
 160 IF A$=CHR$ 46 THEN PRINT AT
 4,13;"▒    ";AT 5,14;"▚O ";AT 6
,13;" ▟█  ";AT 7,13;"▒ █  "
 170 IF A$=CHR$ 47 THEN PRINT AT
 4,13;"  ▒  ";AT 5,14;"▐O ";AT 6
,13;" █▀▒";AT 7,13;"  █  "
 180 IF A$=CHR$ 48 THEN PRINT AT
 4,13;"  ▒  ";AT 5,14;" O▐ ";AT 6
,13;" ▟█  ";AT 7,13;"▒ █  "
 190 IF A$=CHR$ 49 THEN PRINT AT
 4,13;"    ▒";AT 5,14;" O▞";AT 6
,13;" ▟█  ";AT 7,13;"▒ █  "
 200 IF A$=CHR$ 50 THEN PRINT AT
 4,13;"     ";AT 5,14;" O ";AT 6
,13;" ▟█▀▒";AT 7,13;"▒ █  "
 210 IF A$=CHR$ 51 THEN PRINT AT
 4,13;"     ";AT 5,14;" O ";AT 6
,13;" ▟█▖ ";AT 7,13;"▒ █ ▒"
 220 IF A$=CHR$ 52 THEN PRINT AT
 4,13;"▒    ";AT 5,14;"▚O ";AT 6
,13;"▒▀█  ";AT 7,13;"  █  "
 230 IF A$=CHR$ 53 THEN PRINT AT
 4,13;"  ▒  ";AT 5,14;" O▐ ";AT 6
,13;"▒▀█  ";AT 7,13;"  █  "
 240 IF A$=CHR$ 54 THEN PRINT AT
 4,13;"    ▒";AT 5,14;" O▞";AT 6
,13;"▒▀█  ";AT 7,13;"  █  "
 250 IF A$=CHR$ 55 THEN PRINT AT
 4,13;"     ";AT 5,14;" O ";AT 6
,13;"▒▀█▀▒";AT 7,13;"  █  "
 260 IF A$=CHR$ 56 THEN PRINT AT
 4,13;"     ";AT 5,14;" O ";AT 6
,13;"▒▀█▖ ";AT 7,13;"  █ ▒"
 270 IF A$=CHR$ 57 THEN PRINT AT
 4,13;"▒ ▒  ";AT 5,14;"▚O▐ ";AT 6
,13;" █   ";AT 7,13;"  █  "
 280 IF A$=CHR$ 58 THEN PRINT AT
 4,13;"▒   ▒";AT 5,14;"▚O▞";AT 6
,13;" █   ";AT 7,13;"  █  "
 290 IF A$=CHR$ 59 THEN PRINT AT
 4,13;" ▒   ";AT 5,14;"▐O ";AT 6
,13;" █▖ ";AT 7,13;"  █ ▒"
 300 IF A$=CHR$ 60 THEN PRINT AT
 4,13;"    ▒";AT 5,14;" O▞";AT 6
,13;" █▀▒";AT 7,13;"  █  "
 310 IF A$=CHR$ 61 THEN PRINT AT
 4,13;"    ▒";AT 5,14;" O▞";AT 6
,13;" █▖ ";AT 7,13;"  █ ▒"
 320 IF A$=CHR$ 62 THEN PRINT AT
 4,13;"▒    ";AT 5,14;"▚O ";AT 6
,13;" █▀▒";AT 7,13;"  █  "
 330 IF A$=CHR$ 63 THEN PRINT AT
 4,13;"     ";AT 5,14;" O ";AT 6
,13;" █▀▒";AT 7,13;"  █▖▒"
 340 IF A$=CHR$ 27 THEN PRINT AT
 4,13;"     ";AT 5,14;" O ";AT 6
,13;" ██  ";AT 7,13;"  ▒  "
 350 IF A$=CHR$ 121 THEN GOTO 51
0
 500 GOTO 50
 510 FOR X=1 TO 5
 520 PRINT AT 4,13;"▒   ▒";AT 5,
14;"▚O▞";AT 6,13;"  █  ";AT 7,13
;" █  "
 525 FOR N=1 TO 5
 530 NEXT N
 550 PRINT AT 4,13;"     ";AT 5,
14;" O ";AT 6,13;" ▟█▖ "; AT 7,1
3;"▒ █ ▒"
 560 NEXT X
 570 GOTO 40
```



WOR
PROCE

A PROGRAM which allows the 16K ZX-81 to be used as a word processor has been sent by K J Moore of Shoeburyness, Essex. It was a runner-up in the May competition in our companion publication, *Sinclair User*.

It allows the user to enter text directly on to the screen; the print position can be moved to any point using the cursor keys and up to 10 screens of text can be entered.

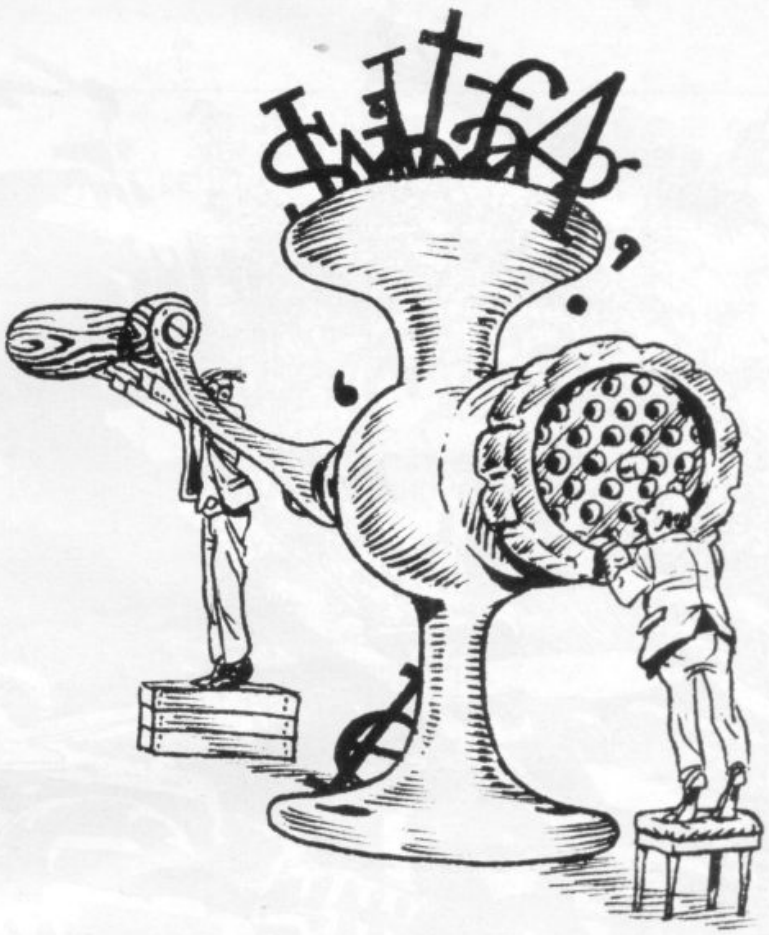
When run, a brief list of instructions is given and to continue press NEWLINE, when 'Screen 1' will appear. Press NEWLINE again and you are ready to enter text.

Moore advises that when the program is run for the first time the user becomes used to entering text on the screen before proceeding to press

```
LISTING OF ZX WORD PROCESSOR

  10 PRINT AT 2,0;"    WORD-PROCESSOR
"
  15 PRINT AT 4,0;"USE THE KEY-B
OARD AS NORMAL"
  20 PRINT AT 6,0;"PRESS ""NEW-L
INE"" FOR A SPACE"
  25 PRINT "PRESS ""FUNCTION"" F
OR A NEW LINE"
  30 PRINT "PRESS ""GRAPHICS"" F
OR INV CHRS"
  35 PRINT "PRESS ""EDIT"" FOR P
RINTING MENU"
  40 PRINT
  50 PRINT
  60 PRINT "DO NOT PRESS THE ""S
PACE"" KEY -"
  70 PRINT "THIS WILL STOP THE P
ROGRAM..."
  80 INPUT U$
  90 CLS
 100 LET DFA=PEEK 16396+256*PEEK
 16397
 110 LET G=0
 120 LET OP1=0
 130 LET OP2=0
 140 LET N=1
 150 DIM A$(10,22,32)
 200 FOR N=1 TO 10
 205 LET OP1=0
 206 LET G=0
 210 PRINT AT 10,5;"SCREEN ";N
 220 INPUT U$
 230 CLS
 240 FOR L=0 TO 21
 250 FOR C=0 TO 31
 260 LET CI=0
 265 IF INKEY$="" THEN GOTO 260
 290 LET A=CODE INKEY$
 291 IF A>63 AND A<112 THEN GOTO
 280
 292 IF A<11 THEN GOTO 260
 295 IF A=118 AND G=0 THEN LET A
=0
 300 IF A=116 THEN GOSUB 5000
 310 IF A>111 AND A<116 THEN GOS
UB 1000
 350 IF A=121 AND OP1=0 THEN GOT
O 415
 352 IF A>118 THEN GOTO 260
 355 IF A=117 THEN GOSUB 6000
 360 IF A=117 THEN GOTO 240
 370 IF A=116 THEN GOTO 260
 375 IF G=1 THEN GOSUB 5500
 380 IF CI=1 THEN GOTO 260
 385 LET OP1=0
 390 LET A$(N,L+1,C+1)=CHR$ A
 400 PRINT AT L,C;CHR$ A
 405 IF INKEY$<>"" THEN GOTO 405
 410 NEXT C
 415 IF INKEY$<>"" THEN GOTO 415
 420 NEXT L
 430 NEXT N
 435 GOSUB 6000
 440 GOTO 240
1000 IF A=112 THEN LET L=L-1
1010 IF A=113 THEN LET L=L+1
1020 IF A=114 THEN LET C=C-1
1030 IF A=115 THEN LET C=C+1
1035 IF C<0 THEN LET C=0
1040 IF C>31 THEN LET C=31
1045 IF L<0 THEN LET L=0
1047 IF L>21 THEN LET L=21
1050 IF OP1<>0 THEN POKE OP1,OP2
1060 LET OP1=DFA+(L*33)+C+1
1070 LET OP2=PEEK OP1
1080 PRINT AT L,C;"■"
1090 LET CI=1
1100 RETURN
5000 IF INKEY$<>"" THEN GOTO 500
0
5005 IF G=1 THEN GOTO 5040
5010 LET G=1
5020 PRINT AT L,C;"▒"
5030 RETURN
5040 LET G=0
5050 PRINT AT L,C;"■"
5060 RETURN
5500 IF A=116 THEN LET A=128
5505 IF A<11 OR A>64 AND A<>128
THEN GOTO 5000
5510 IF A<>128 THEN LET A=A+128
5520 RETURN
6000 LET P=0
6005 LET S$="N"
6010 CLS
6020 PRINT AT 2,0;"1. LIST SCREE
N N"
6030 PRINT "2. LIST SCREEN N UNT
IL Z"
6040 PRINT "3. LIST SCREEN X THR
U Y"
6050 PRINT "4. LIST SCREEN X THR
U Y UNTIL Z"
6060 PRINT "5.PRINT SCREEN N"
6070 PRINT "6.PRINT SCREEN N UNT
IL Z"
6080 PRINT "7.PRINT SCREEN X THR
U Y"
6090 PRINT "8.PRINT SCREEN X THR
U Y UNTIL Z"
```

ORD CISSOR

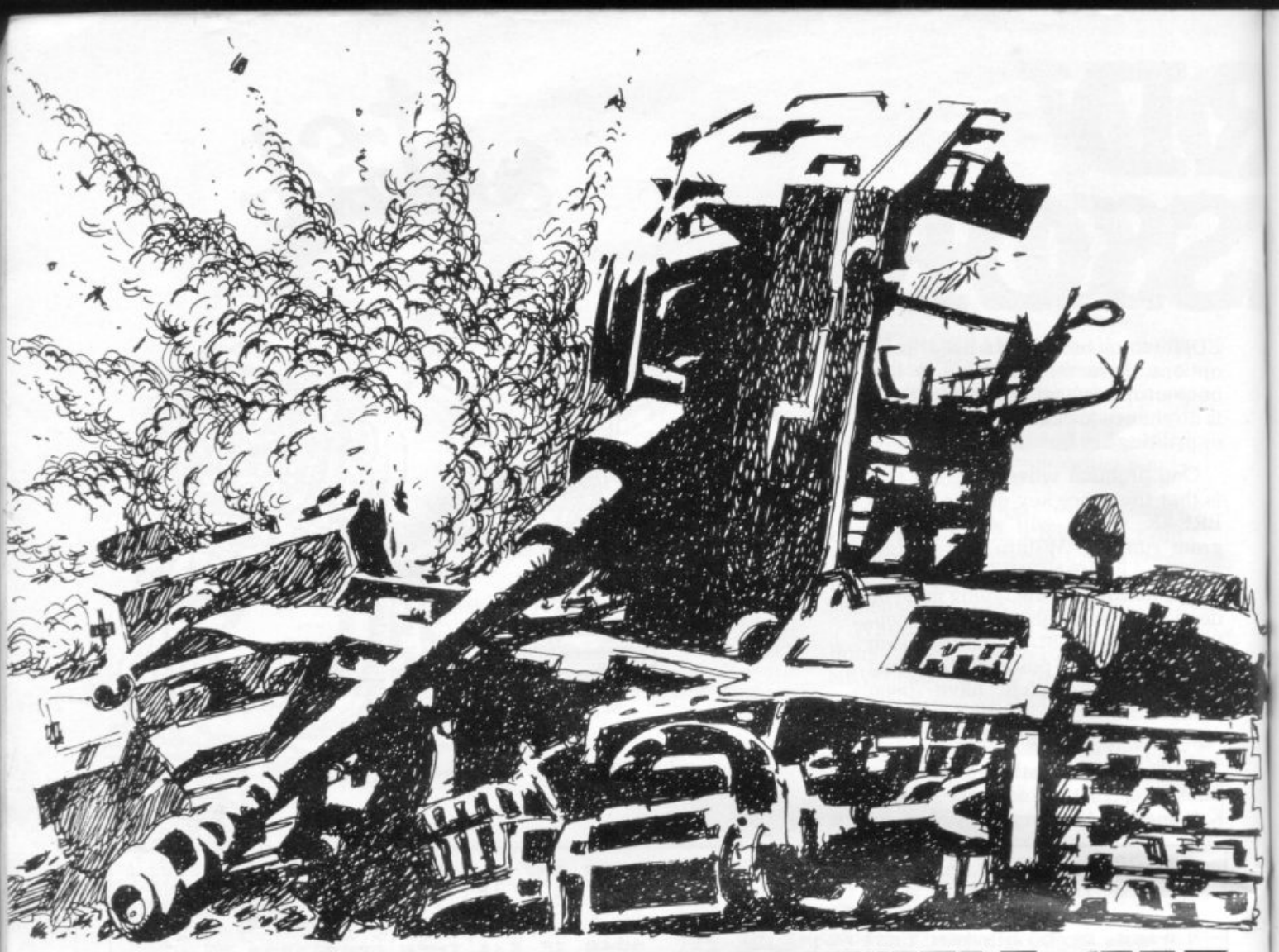


EDIT, which brings up a list of print options. A further warning is that once an option has been chosen there is no chance to change it until listing or printing has finished.

One problem when entering text is that the space key doubles as the BREAK, which will stop the program running. Within that system the space key is NEWLINE. It is also worth noting that the typing must be done at the normal speed for acceptance by the ZX-81, which can seem slow. While it is possible to correct letters, ones which have been missed cannot be inserted without repeating a good deal of text.

To make the listing clearer, in lines 1080, 5020 and 5050 are inverse K, G and K again.

```
5100 PRINT AT 14,0;"SELECT PROG
RAM CHOICE"
5110 INPUT D
5120 IF D<1 OR D>8 THEN GOTO 60
0
5125 IF D>4 THEN LET P=1
5130 CLS
5135 IF D>4 THEN LET D=D-4
5140 LET PR=6200+(100*D)
5150 GOTO PR
5300 IF P=0 THEN PRINT AT 2,0;"1
. LIST SCREEN N"
5305 IF P=1 THEN PRINT AT 2,0;"5
.PRINT SCREEN N"
5310 PRINT AT 4,0;"ENTER N"
5340 INPUT X
5345 IF X<1 OR X>10 THEN GOTO 63
40
5350 LET Y=X
5355 LET Z=1
5360 GOTO 6000
5400 IF P=0 THEN PRINT AT 2,0;"2
. LIST SCREEN N UNTIL Z"
5405 IF P=1 THEN PRINT AT 2,0;"6
.PRINT SCREEN N UNTIL Z"
5410 PRINT AT 4,0;"ENTER N"
5415 INPUT X
5417 IF X<1 OR X>10 THEN GOTO 64
15
5420 LET Y=X
5425 PRINT AT 4,0;"ENTER Z"
5430 INPUT Z
5440 IF Z<1 THEN GOTO 6430
5450 GOTO 6000
5500 IF P=0 THEN PRINT AT 2,0;"3
. LIST SCREEN X THRU Y"
5505 IF P=1 THEN PRINT AT 2,0;"7
.PRINT SCREEN X THRU Y"
5510 PRINT AT 4,0;"ENTER X"
5512 INPUT X
5515 IF X<1 OR X>9 THEN GOTO 651
0
5520 PRINT AT 4,0;"ENTER Y"
5522 INPUT Y
5523 IF Y>10 THEN GOTO 6520
5525 IF Y<=X THEN GOTO 6520
5530 LET Z=1
5540 GOTO 6000
5600 IF P=0 THEN PRINT AT 2,0;"4
. LIST SCREEN X THRU Y UNTIL Z"
5605 IF P=1 THEN PRINT AT 2,0;"8
.PRINT SCREEN X THRU Y UNTIL Z"
5610 PRINT AT 4,0;"ENTER X"
5612 INPUT X
5615 IF X<1 OR X>9 THEN GOTO 661
0
5620 PRINT AT 4,0;"ENTER Y"
5622 INPUT Y
5625 IF Y<=X THEN GOTO 6620
5626 IF Y>10 THEN GOTO 6620
5630 PRINT AT 4,0;"ENTER Z"
5635 INPUT Z
5640 IF Z<1 THEN GOTO 6630
5645 GOTO 6000
6000 CLS
6005 IF P=1 THEN GOTO 8100
6010 PRINT AT 2,0;"DO YOU WANT:"
6020 PRINT AT 4,0;"1. A CONTINUO
US LISTING      OR,"
6030 IF P=0 THEN PRINT "2. A PAG
E BY PAGE LISTING ?"
6040 PRINT AT 9,0;"ENTER CHOICE"
6050 INPUT Q
6060 IF Q<1 OR Q>2 THEN GOTO 604
0
6070 GOTO 6200
8100 PRINT AT 2,0;"DO YOU WANT P
AGE SEPARATORS ?"
8110 PRINT AT 6,0;"ENTER 'Y' OR
'N'"
8120 INPUT S$
8130 IF S$<>"N" AND S$<>"Y" THEN
 GOTO 8120
6200 FOR R=1 TO Z
6210 FOR S=X TO Y
6220 CLS
6230 IF Q=2 AND P=0 THEN PRINT A
T 10,5;"SCREEN ";S
6240 CLS
6250 IF P=1 AND S$="Y" THEN LPRI
NT
6260 IF P=1 AND S$="Y" THEN LPRI
NT "----------------------------
----"
6270 IF P=1 AND S$="Y" THEN LPRI
NT
6280 FOR T=1 TO 22
6290 PRINT A$(S,T)
6300 NEXT T
6310 IF Q=2 AND P=0 THEN INPUT U
$
6320 IF P=1 THEN COPY
6330 NEXT S
6340 NEXT R
6350 LET N=Y
6360 IF P=1 AND S$="Y" THEN LPRI
NT
6370 IF P=1 AND S$="Y" THEN LPRI
NT "----------------------------
----"
6380 IF P=1 AND S$="Y" THEN LPRI
NT
6390 RETURN
```



ROCKET ATTACK

```
   3 GO SUB 1000
  10 LET a=1: LET b=0: LET s=b:
LET t=20
 100 LET c=19: LET e=29: LET d=a
 160 PRINT AT 21,b;"
                   "
 170 PRINT AT 20,b;"■"
 180 LET y=INT (RND*10)+10
 182 BEEP 0.09,20
 185 PRINT AT y,e;"ab  ": IF INK
EY$="p" THEN PRINT AT c,d;"  "
 190 IF INKEY$="p" THEN PRINT AT
 c,d;"/"
 191 BEEP 0.009,-12
 200 IF y=c AND e=d THEN GO TO 4
00
 210 PRINT AT c,d;","
 220 IF INKEY$="p" THEN LET c=c-
a: LET d=d+1
 240 IF c=4 THEN GO TO 410
 250 LET e=e-a
 260 IF e=b THEN GO TO 410
 270 GO TO 105
 400 LET s=s+1: PRINT AT y,e-1;"
>XXX<": BEEP 0.3,-29: PAUSE 20
 410 CLS : LET t=t-a: IF t<>b TH
EN GO TO 100
 440 PRINT AT 10,11;"Game over"
 450 PRINT AT 12,11;"Score=";s
 460 FOR f=-10 TO 10: BEEP 0.09,
f: BORDER RND*7: NEXT f: BEEP 2,
-17: STOP
1000 FOR f=0 TO 7
1010 READ cg: POKE USR "a"+f,cg
1020 NEXT f
1030 DATA 0,0,28,63,255,255,127,
0,0
1040 FOR f=0 TO 7
1050 READ cg: POKE USR "b"+f,cg
1060 NEXT f
1070 DATA 14,28,56,254,255,248,2
48,0,0
1080 RETURN
```

ROCKET ATTACK is yet another spin-off from the *Sinclair Programs* R&D industry. J Sells of Enfield has updated a program printed originally in our May-June issue.

He has Spectrumised D E Healey's Rocket Attack games, composed originally for the ZX-81. The game involves a squadron of 20 planes heading towards your missile station. Pressing P will fire the missile. To destroy the plans you can either hit them directly or leave the missile in their path. Your hawk-eyed reviewer only managed 12 out of 20. Graphics notes:

160—Three graphics 8s, twenty-nine graphic 3s.

170—Graphic 6.

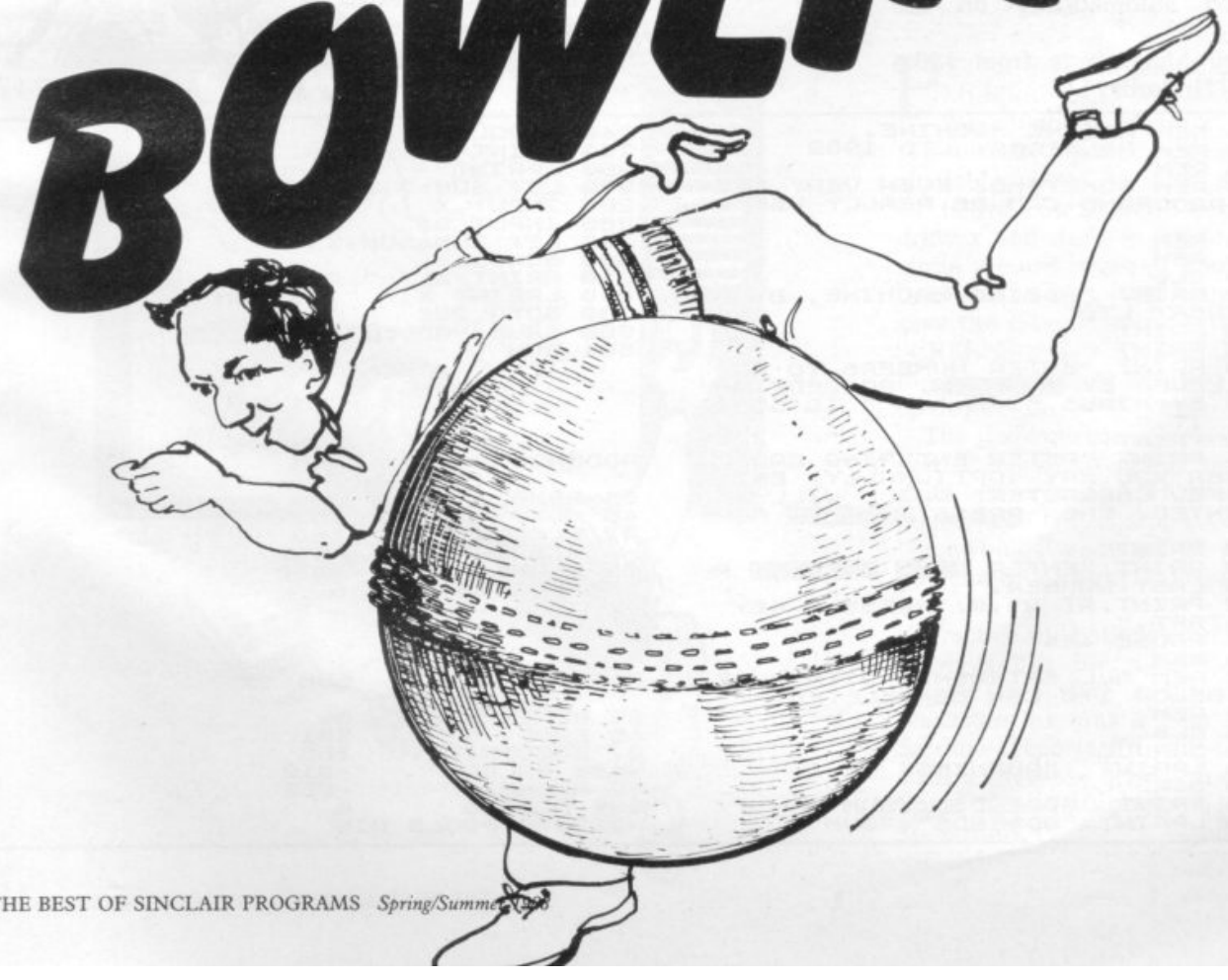
185—"ab" as in graphic mode.

440—Inverse video "Game over",

```
  1 LET Q=CODE ""
  2 LET S=Q
  3 LET C=Q
  4 LET M=CODE "(graphic 1)"
  5 FOR B=M TO CODE "(graphic 4
)"
  6 FOR A=M+C TO CODE "(graphic
 E)"-C
  7 PRINT AT B,A;"T"
  8 NEXT A
  9 LET C=C+M
 10 NEXT B
 11 LET X=CODE "(graphic 7)"
 20 LET F=M
 25 LET Y=CODE "?"
 30 LET X=X+(INKEY$="8" AND X<C
ODE "(graphic T)")-(INKEY$="5" A
ND X>CODE "")
 35 PRINT AT Y,X;" O "
 40 IF F>CODE "(graphic E)" THE
N GOTO CODE "(inverse -)"
 45 IF INKEY$="0" THEN GOSUB CO
 45~IF INKEY$="0" THEN GOSUB CO
DE "W"
 50 GOTO CODE ";"
 60 PRINT AT Y,X+M;
 65 IF PEEK (PEEK 16398+VAL "25
6"*PEEK 16399)=CODE "T" THEN LET
 Q=Q+M
 70 PRINT AT Y,X+M;"O";AT Y,X+M
;"(inverse O)";AT Y,X+M;" "
 75 LET Y=Y-M
 80 IF Y=M-M THEN LET F=F+M
 90 IF Q>S AND RND<VAL ".5" THE
N LET X=X-M
 95 IF Q>S AND RND>VAL ".6" THE
N LET X=X+M
100 LET S=Q
110 IF Y=M-M THEN RETURN
120 GOTO CODE "W"
150 PRINT Q
```

SIXTEEN PINS appear at the top of the screen for **Bowling** and the ball at the bottom. Use keys 5 and 8 to line up the two and press key 0 to bowl. The ball will be deflected by impact with the pins and thus make your task more difficult. For every pin hit you will add one to your score; the score is printed after eight balls and the game ends (1K ZX-81).

BOWLING



ADDING MACHINE

ADDING MACHINE allows you to keep a running total of your expenditures and income—income is entered as a negative figure. First enter the amount of money involved—press NEWLINE and then enter a description of the item. As it stands the program will off-load each item automatically to a printer with a running total, though those lines can easily be deleted and the same information is displayed automatically on the screen.

Adding Machine is from Mike Salem of Hilderbay Ltd.

```
  10 REM ADDING MACHINE.
  20 REM HILDERBAY LTD 1982
  30 REM
  40 REM SOMETIMES EVEN VERY SIM
PLE PROGRAMS CAN BE REALLY USEFU
L.
  50 REM
  60 REM
  70 CLS
  80 PRINT "ADDING MACHINE, BY H
ILDERBAY LTD"
  90 PRINT
 100 PRINT
 110 PRINT "ENTER NUMBERS TO ADD
 FOLLOWED BY NEWLINE. PRECEDE NU
MBER BY MINUS SIGN ""-"" TO SUBT
RACT IT."
 112 PRINT
 114 PRINT "AFTER ENTERING EACH
NUMBER YOU MAY (OPTIONALLY) ENTE
R A FEW CHARACTERS WHICH WILL BE
 PRINTED. THEN PRESS NEWLINE AGA
IN."
 120 PRINT
 130 PRINT "ENTER STOP NEWLINE A
FTER LAST NUMBER."
 132 PRINT AT 21,0;"PRESS A KEY
TO START."
 134 PAUSE 4E4
 140 REM
 150 REM ALL SATEMENTS WITH NUMB
ERS BELOW 170 CAN BE DELETED.
 160 REM
 170 CLS
 180 SCROLL
 190 LPRINT ,"RUNNING"
 210 SCROLL
 220 PRINT "ADDENDS","SUM"
 230 LPRINT "ADDENDS","SUM"
 240 SCROLL
 250 PRINT
 260 LPRINT
 270 LET SUM=0
 280 INPUT X
 285 INPUT Q$
 290 LET SUM=SUM+X
 300 SCROLL
 310 PRINT X;" ";Q$,SUM
 320 LPRINT X;" ";Q$,SUM
 330 GOTO 280
 500 SAVE "ADDER"
 501 RUN
```

```
                          RUNNING
ADDENDS                   SUM

86 RENT                   86
45 FOOD                   131
37 ELECTRICITY            168
-480 SALARY               -312
62 PHONE                  -250
256 ACCESS                6
```

```
ADDENDS                   SUM

86 RENT                   86
45 FOOD                   131
37 ELECTRICITY            168
-480 SALARY               -312
62 PHONE                  -250
256 ACCESS                6
-523000 POOLS WIN
```

```
  100 REM Utility Draw
  110 REM © 1982 P Safranek
  120 GO SUB 340: CLS : LET x=0:
LET y=0
  130 LET a$=INKEY$
  140 IF a$<>"o" AND a$<>"d" AND
a$<>"s" AND a$<>"r" AND a$<>"c"
THEN GO TO 210
  150 IF a$="o" THEN GO SUB 390
  160 IF a$="d" THEN GO SUB 430
  180 IF a$="s" THEN GO SUB 520
  190 IF a$="r" THEN GO SUB 410
  200 IF a$="c" THEN GO SUB 490
  210 LET x=x+(a$="j")-(a$="g")
  220 LET y=y+(a$="y")-(a$="n")
  230 LET x=x+(a$="u")-(a$="b")
  240 LET y=y+(a$="u")-(a$="b")
  250 LET x=x+(a$="m")-(a$="t")
  260 LET y=y+(a$="t")-(a$="m")
  270 IF x<0 THEN LET x=0
  280 IF x>255 THEN LET x=255
  290 IF y>175 THEN LET y=175
  300 IF y<0 THEN LET y=0
  310 PLOT x,y: PLOT OVER 1;x,y
  320 PLOT x,y: PLOT OVER 0;x,y
  330 GO TO 130
  340 INPUT "ink    [0-7]?";i;"pap
er [0-7]?";p;"border[0-7]?";b
  350 IF i<0 OR i>7 THEN GO TO 34
0
  360 IF p<0 OR i>7 THEN GO TO 34
0
  370 IF b<0 OR b>7 THEN GO TO 34
0
  380 BORDER b: PAPER p: INK i
  390 INPUT "over[0 or 1]?";o: IF
o<>1 AND o<>0 THEN GO TO 390
  400 RETURN
  410 INPUT "x?";x,"y?";y
  420 RETURN
  430 INPUT "x coord";a
  440 INPUT "y coord";b
  450 INPUT "draw x?";c
  460 INPUT "draw y?";d
  470 PLOT a,b: DRAW c,d
  480 RETURN
  490 INPUT "x?";xx;"y?";yy;"r?";
r
  500 CIRCLE xx,yy,r
  510 RETURN
  520 INPUT "Name?"; LINE f$
  530 SAVE f$SCREEN$
  540 RETURN
  550 SAVE "ut.draw" LINE 100
```

UTILITY DRAW

PETER SAFRANEK of Ashford, Middlesex, has sent a very useful graphics program for the 16K or 48K Spectrum. Commands available are "o" to input the over: "d" to draw for inputted x and y and draw x and draw y; "c" to draw a circle around inputted x and y co-ordinates and inputted radius; "s" to save the design on the screen as a SCREEN$; and "r" to re-set the flashing pixel cursor to inputted x and y co-ordinates.

The pixel cursor is moved in any one of eight directions using the eight letters around "H" on the keyboard—i.e., T, Y, U, G, J, B, N and M. Once you have entered the program you can SAVE it by entering "RUN 550".

Practice and patience can produce displays like the map of Europe shown; an outline on the screen in washable ink was a help for this, Safranek reports. The advantage of such a saveable display for educational purposes is obvious (16 or 48K Spectrum).

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You may decide to begin with the 16K version. If so, you can still return it later for an upgrade. The cost? Around £60.

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Your ZX Spectrum comes with a mains adaptor and all the necessary leads to connect to most cassette recorders and TVs (colour or black and white).

Employing Sinclair BASIC (now used in over 500,000 computers worldwide) the ZX Spectrum comes complete with two manuals which together represent a detailed course in BASIC programming. Whether you're a beginner or a competent programmer, you'll find them both of immense help. Depending on your computer experience, you'll quickly be moving into the colourful world of ZX Spectrum professional-level computing.

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Key features of the Sinclair ZX Spectrum

- Full colour – 8 colours each for foreground, background and border, plus flashing and brightness-intensity control.
- Sound – BEEP command with variable pitch and duration.
- Massive RAM – 16K or 48K.
- Full-size moving-key keyboard – all keys at normal typewriter pitch, with repeat facility on each key.
- High-resolution – 256 dots horizontally x 192 vertically, each individually addressable for true high-resolution graphics.
- ASCII character set – with upper- and lower-case characters.
- Teletext-compatible – user software can generate 40 characters per line or other settings.
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