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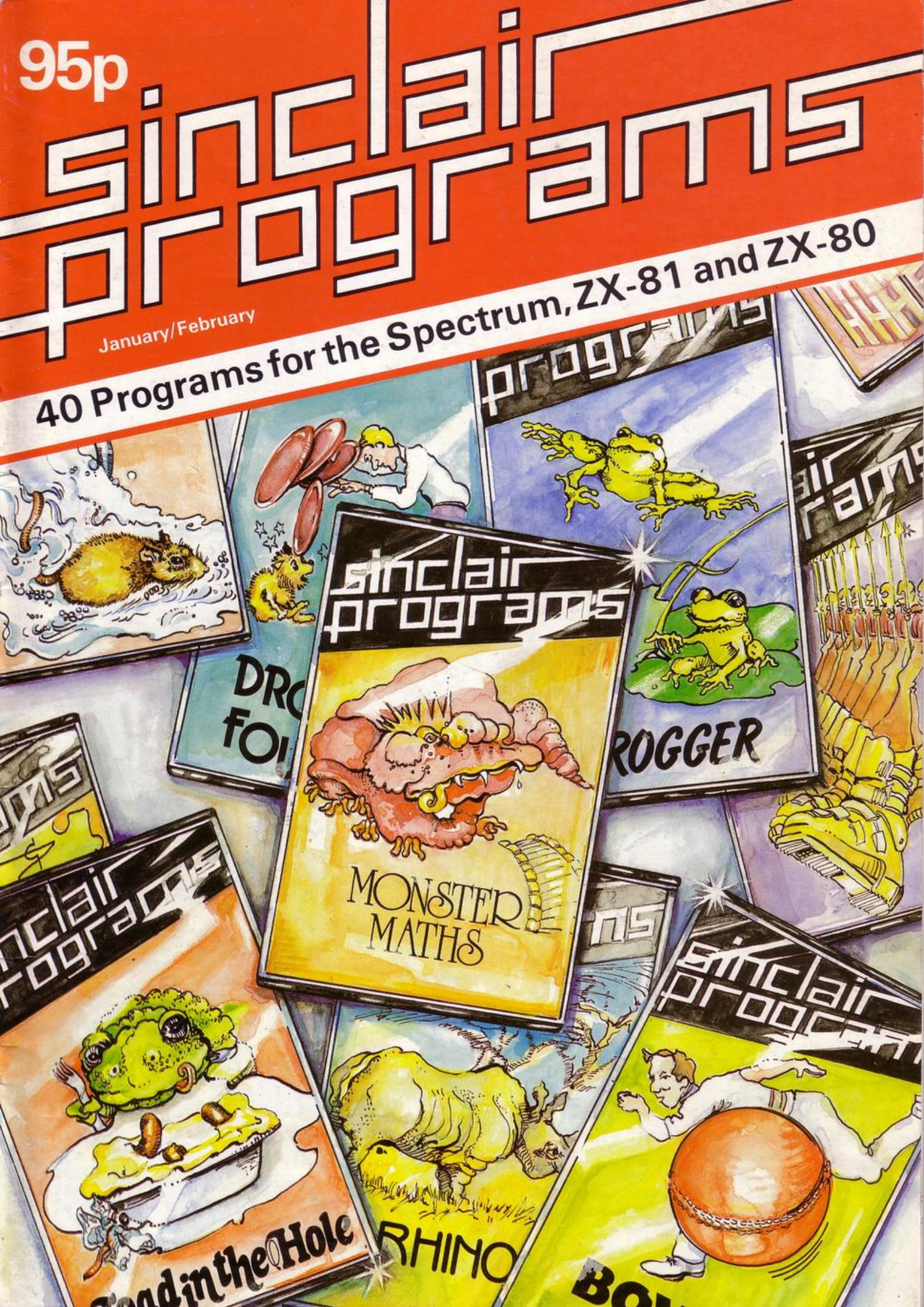
sinclair programs

January/February

40 Programs for the Spectrum, ZX-81 and ZX-80



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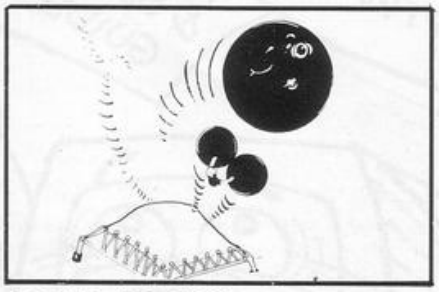

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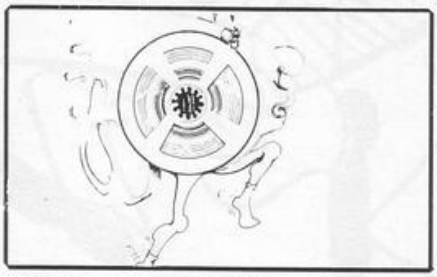

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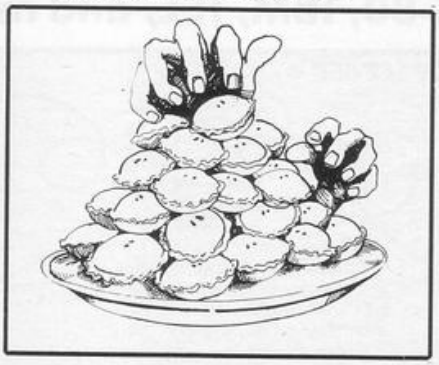

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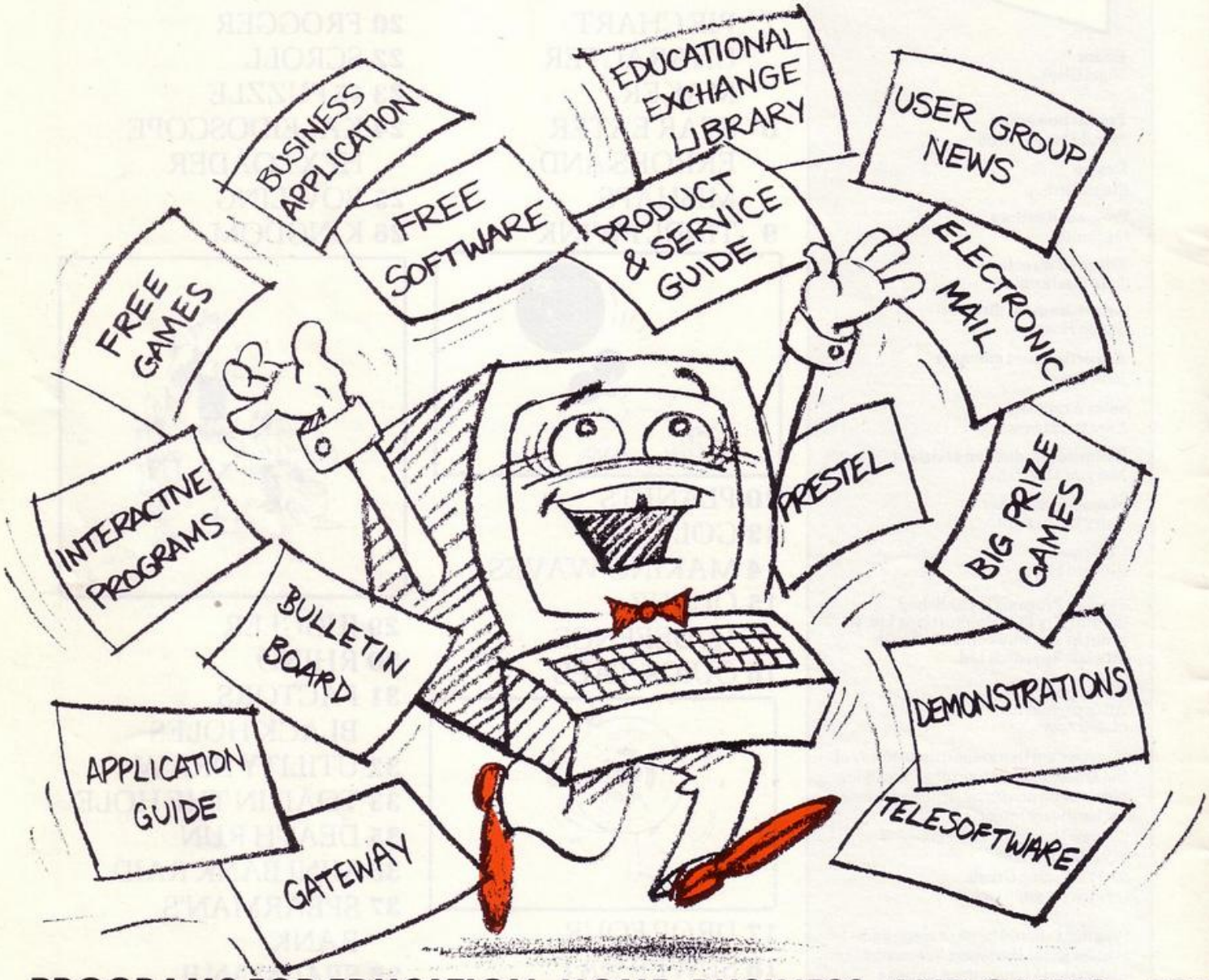

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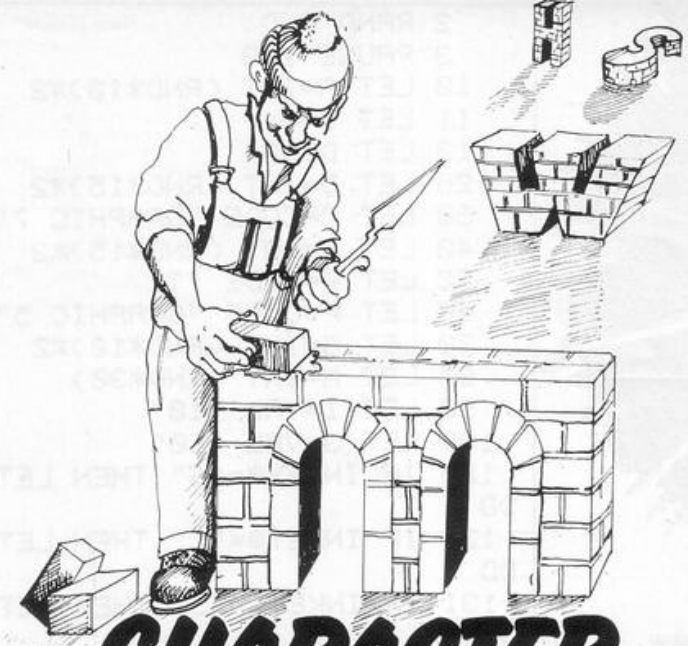


CHARACTER MAKER

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
```

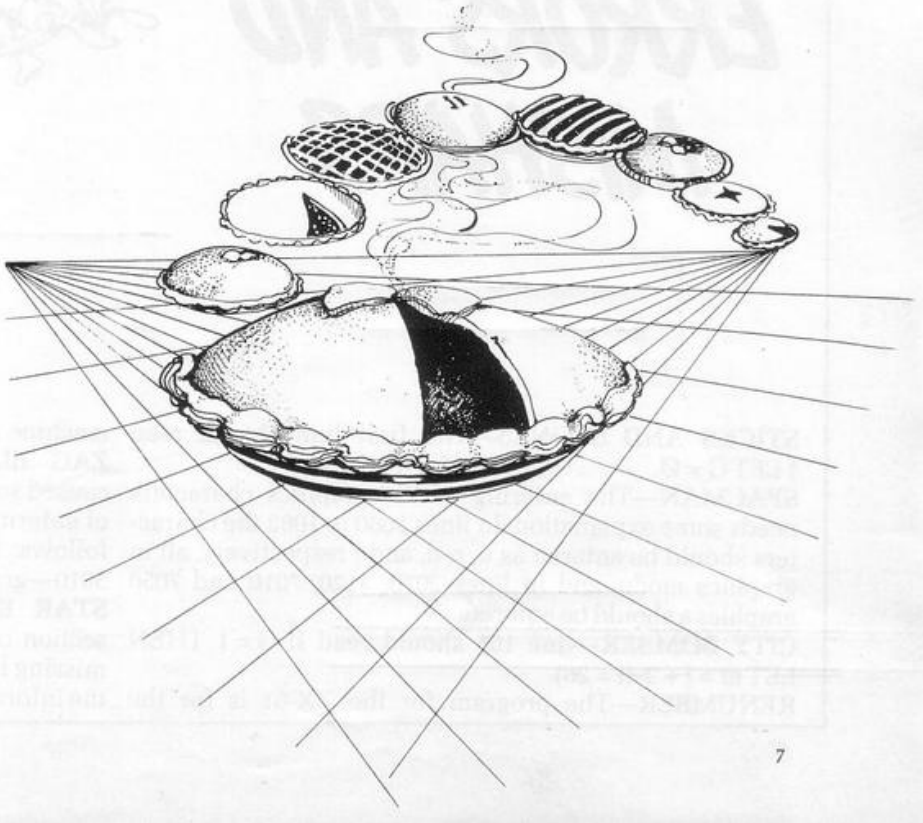
```
10 LET A=RND*255
20 PRINT CHR$ A;
30 GOTO 10
```

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 0,79
  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;0,79: 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$)/2;z$
```



STAR EATER

THE IDEA of **Star Eater,** a game for the unexpanded ZX-81, is to land your 'Y' ship on one of the stars shown on the screen and stay there for as long as possible.

Another ship, represented by 'M', will chase you and make your job of staying on the stars for any length of time an impossibility. If you are moving from star to star the ship will just bounce off you but if you have landed on a star it will destroy you. When the game is completed the computer will indicate your score.

To control your ship you must use the cursor keys. As the game continues it will become more difficult.

It is from Adrian Mansell of Birmingham.

```
    2 RAND RND
    3 PAUSE 100
   10 LET A=INT (RND*10)*2
   11 LET S=0
   12 LET DD=2
   20 LET D=INT (RND*15)*2
   30 LET C=CODE "GRAPHIC 7"
   40 LET B=INT (RND*15)*2
   50 LET E=CODE "?"
   60 LET F=CODE "GRAPHIC 5"
   70 LET G=INT (RND*10)*2
   80 LET H=INT (RND*30)
   90 LET I=VAL "10"
  100 LET J=VAL "10"
  120 IF INKEY$="6" THEN LET I=I+
DD
  130 IF INKEY$="7" THEN LET I=I-
DD
  131 IF INKEY$="5" THEN LET J=J-
DD
  132 IF INKEY$="8" THEN LET J=J+
  133 IF S>=30 THEN LET DD=1
  140 IF I=A AND J=B OR I=C AND J
=D OR I=E AND J=F THEN LET S=S+1
0
  150 IF I=G AND J=H THEN GOTO 10
00
  160 LET G=G-1
  170 LET H=H-1
  180 IF I>G THEN LET G=G+2
  190 IF J>H THEN LET H=H+2
  200 CLS
  201 PRINT AT A,B;"*";AT C,D;"*"
;AT E,F;"*";AT G,H;"M";AT I,J;"Y
"
  210 GOTO 110
1100 PRINT AT I,J;S
```

ERRORS AND MISHAPS

STICKS AND STONES—The first line should read 1 LET G = Ø.

SPACMAN—The entering of the graphics characters needs some explanation. In lines 1060 to 1063 the characters should be entered as u, r, d, and i respectively, all in graphics mode, and in lines 2010, 3120, 7010 and 7050 graphics a should be entered.

CITY BOMBER—line 101 should read IF s = 1 THEN LET m = j + 2–(j = 20).

RENUMBER—The program for the ZX-81 is for the machine with the 16K RAM pack.

ZAG BLASTER—Entering the graphics may have caused some confusion. That can be overcome by instead of entering the graphics characters direct, enter letters as follows: 190 and 400—e in graphics mode; 230, 470 and 5010—graphics f; 260—graphics g.

STAR BATTLE—Unfortunately we omitted a large section of the listing. We have been trying to find the missing lines, without success as yet, but we hope to have the information for our next edition.

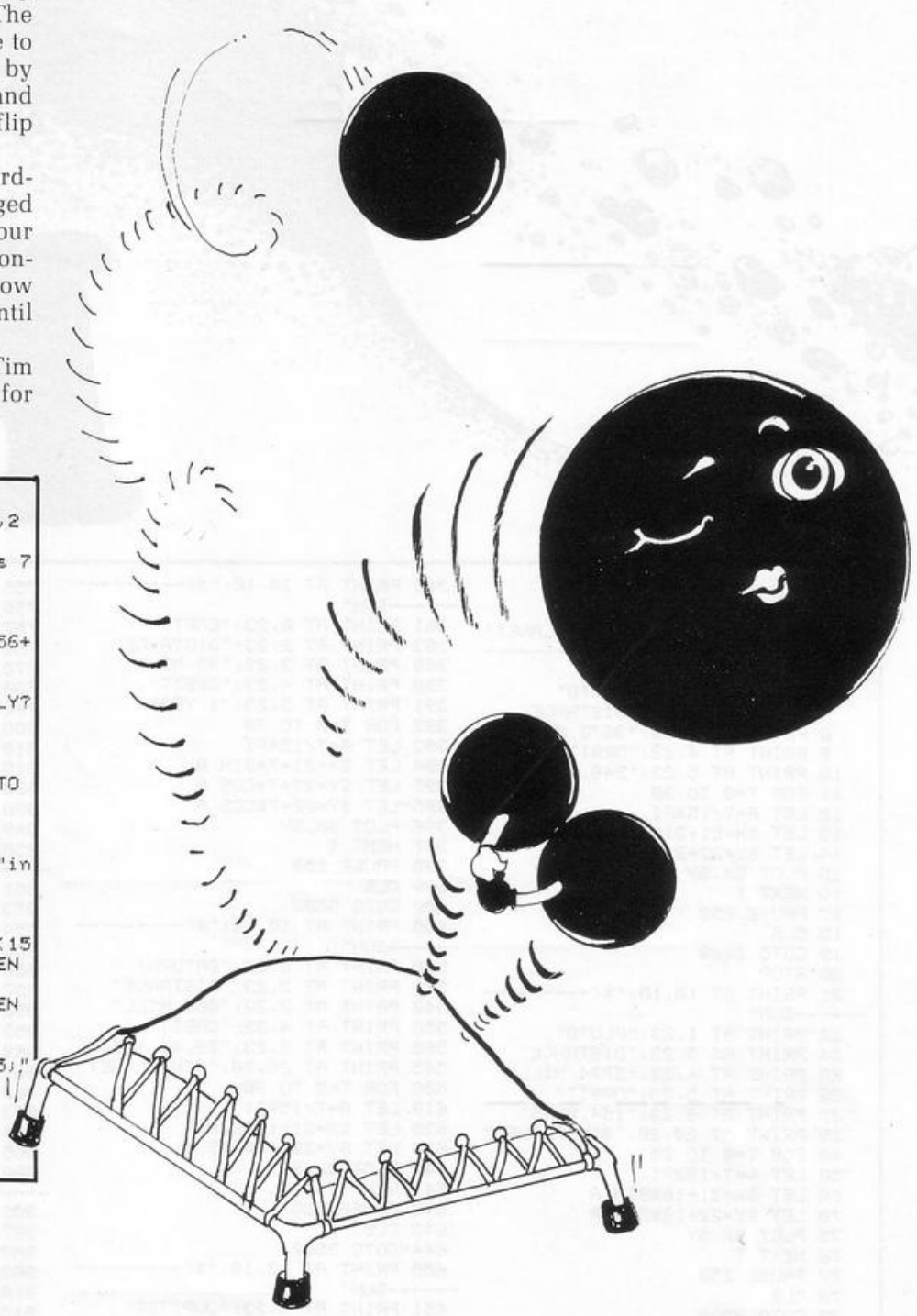
TIDDLY WINKS

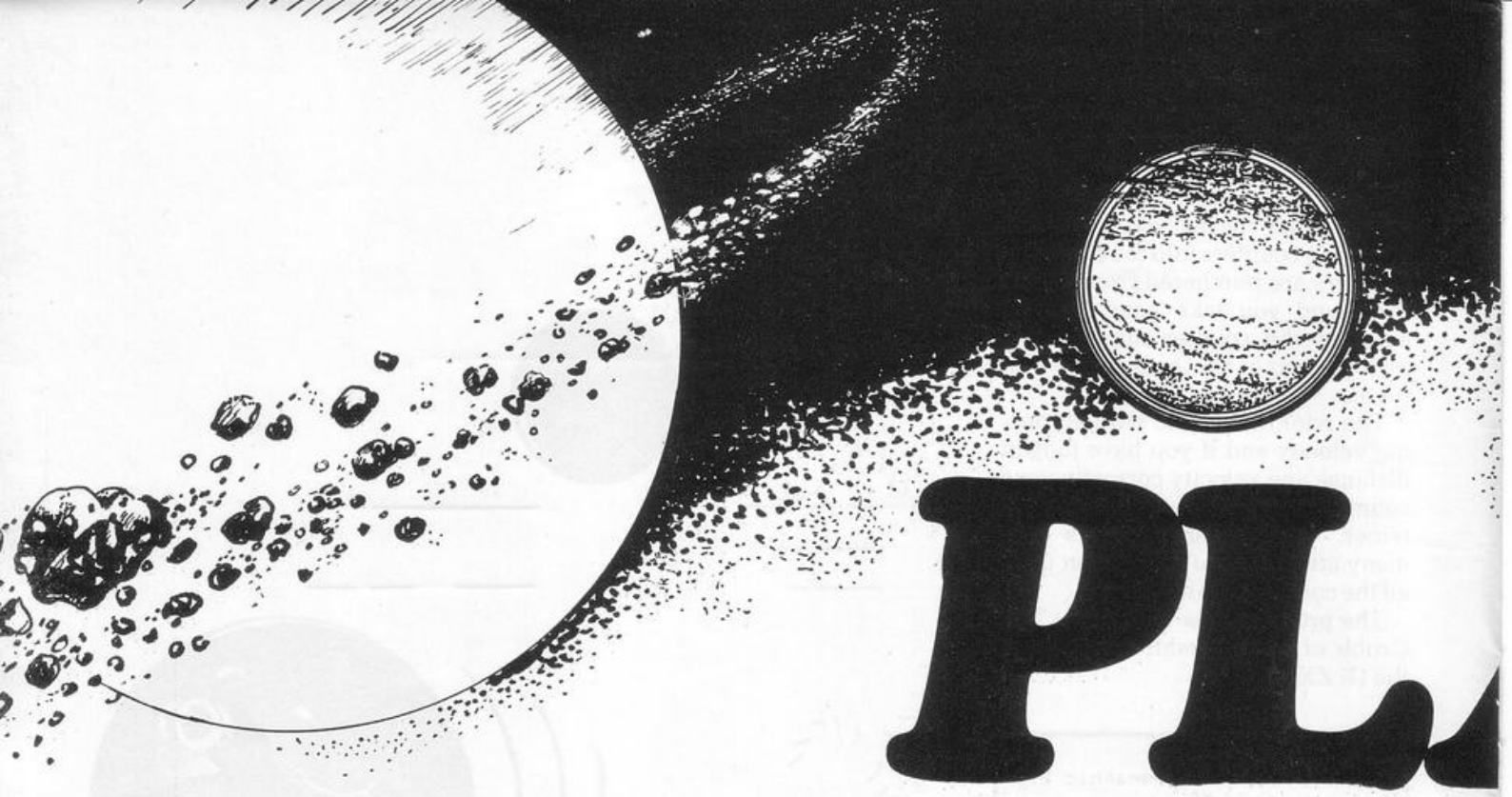
TIDDLY WINKS is a flipping game where a knowledge of aerodynamics will get you nowhere. The object is to wink your tiddles into the container in the middle of the screen. Translated loosely, that means you must flip your play counters into the dish. The counters are numbered from one to three and you take your turn by entering the counter number and then entering the amount of flip force.

The wink will move with according velocity and if you have judged distance and velocity correctly your counter should fall into the container. The computer counts how many attempts you have taken until all the counters are in the pot.

The program was written by Tim Grubb of Leicestershire and is for the 1K ZX-81.

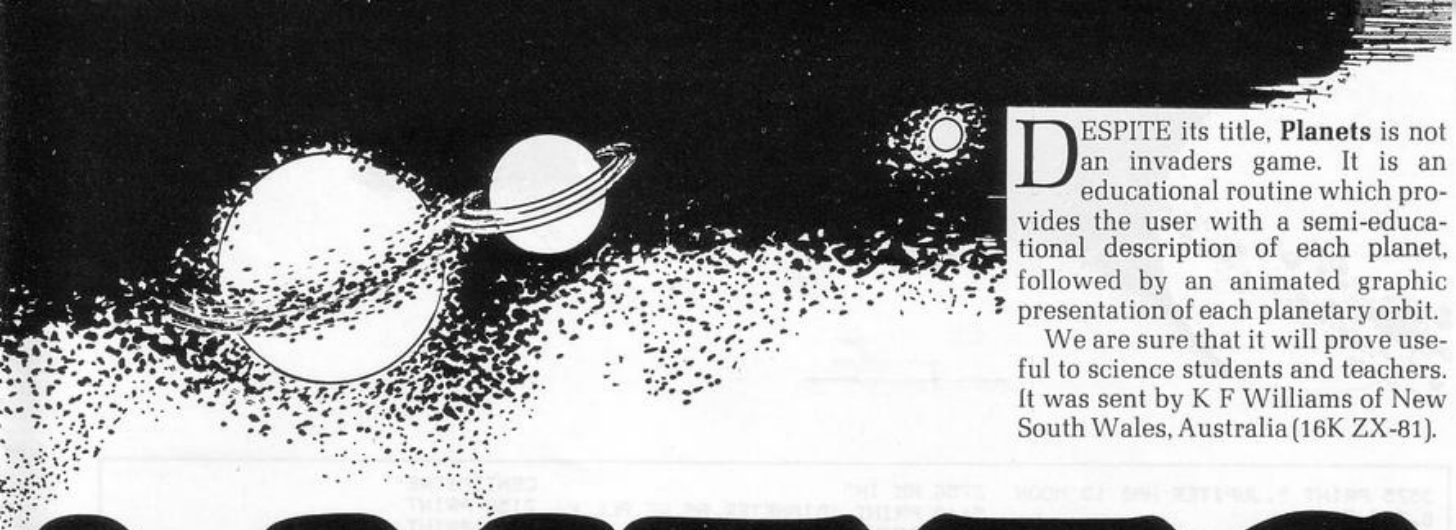
```
  20~PRINT AT 12,A;"graphic 8,2
spaces,graphic 5"
  30 PRINT AT 13,A;"4 graphics 7
"
  35 FOR N=SGN PI TO X
  40 LET B(N)=INT (RND*PI*PI)
  43 PRINT AT 12,B(N);CHR$ (156+
N)
  45 NEXT N
  50 PRINT AT 0,0;"WHICH TIDDLY?
"
  55 INPUT I
  56 IF I>3 THEN GOTO 50
  60 PRINT AT 1,0;"POWER? (1 TO
15)"
  65 INPUT U
  67 FOR P=SGN PI TO U
  70 PRINT AT 11,B(I)+SGN PI;"in
verse space"
  80 LET B(I)=B(I)+1
  90 NEXT P
 100 PRINT AT 12,B(I)+1;CHR$ (15
 110~IF B(I)=13 OR B(I)=12 THEN
PRINT AT 21,0;"WHAT A WINK"
 120 IF B(I)=12 OR B(I)=13 THEN
LET X=X-1
 125 LET M=M+SGN PI
 130 IF X=0 THEN PRINT AT 12,5;"
FINISHED IN ";M;JJ
 135 PAUSE 60
 140 GOTO 4
```





PL

```
   1 REM "PLANETS"
   2 GOTO 1000
   3 PRINT AT 20,20;"9TH PLANET"
   4 PRINT AT 10,10;"*<---------
------SUN"
   5 PRINT AT 0,23;"PLUTO"
   7 PRINT AT 2,23;"DISTANCE"
   8 PRINT AT 3,23;"3670 MILL"
   9 PRINT AT 4,23;"ORBIT"
  10 PRINT AT 5,23;"248.4YRS"
  11 FOR T=0 TO 30
  12 LET A=T/15*PI
  13 LET SX=21+21*SIN A
  14 LET SY=22+21*COS A
  15 PLOT SX,SY
  16 NEXT T
  17 PAUSE 250
  18 CLS
  19 GOTO 2000
  20 STOP
  21 PRINT AT 10,10;"*<---------
------SUN"
  22~PRINT AT 1,23;"PLUTO"
  24 PRINT AT 3,23;"DISTANCE"
  25 PRINT AT 4,23;"2794 MILL"
  26 PRINT AT 5,23;"ORBIT"
  27 PRINT AT 6,23;"164.8YRS"
  28 PRINT AT 20,20;"8TH PLANET"
  40 FOR T=0 TO 30
  50 LET A=T/15*PI
  60 LET SX=21+18*SIN A
  70 LET SY=22+18*COS A
  75 PLOT SX,SY
  76 NEXT T
  77 PAUSE 250
  78 CLS
  79 GOTO 2500
  80 PRINT AT 10,10;"*<---------
------SUN"
  81 PRINT AT 0,23;"URANUS"
  83 PRINT AT 2,23;"DISTANCE"
  84 PRINT AT 3,23;"1783 MILL"
  85 PRINT AT 4,23;"ORBIT"
  86 PRINT AT 5,23;"84.02 YRS"
  87~PRINT AT 20,20;"7TH PLANET"
  98 FOR T=0 TO 30
  99 LET A=T/15*PI
 100 LET SX=21+15*SIN A
 110 LET SY=22+15*COS A
 120 PLOT SX,SY
 125 NEXT T
 130 PAUSE 250
 140 CLS
 150 GOTO 3000
 379 PRINT AT 20,20;"3RD PLANET"
 380 PRINT AT 10,10;"*<---------
------SUN"
 381 PRINT AT 0,23;"EARTH"
 383 PRINT AT 2,23;"DISTANCE"
 389 PRINT AT 3,23;"93 MILL"
 390 PRINT AT 4,23;"ORBIT"
 391 PRINT AT 5,23;"1 YEAR"
 392 FOR T=0 TO 30
 393 LET A=T/15*PI
 394 LET SX=21+7*SIN A
 395 LET SY=22+7*COS A
 395~LET SY=22+7*COS A
 396 PLOT SX,SY
 397 NEXT T
 398 PAUSE 250
 399 CLS
 400 GOTO 5500
 500 PRINT AT 10,10;"*<---------
------SUN"
 510 PRINT AT 0,23;"SATURN"
 530 PRINT AT 2,23;"DISTANCE"
 540 PRINT AT 3,23;"866 MILL"
 550 PRINT AT 4,23;"ORBIT"
 560 PRINT AT 5,23;"29.46 YRS"
 565 PRINT AT 20,20;"6TH PLANET"
 600 FOR T=0 TO 30
 610 LET A=T/15*PI
 620 LET SX=21+13*SIN A
 630 LET SY=22+13*COS A
 640 PLOT SX,SY
 641 NEXT T
 642 PAUSE 250
 643 CLS
 644~GOTO 3500
 650 PRINT AT 10,10;"*<---------
------SUN"
 651 PRINT AT 0,23;"JUPITER"
 653 PRINT AT 2,23;"DISTANCE"
 654 PRINT AT 3,23;"483 MILL"
 655 PRINT AT 4,23;"ORBIT"
 656 PRINT AT 5,23;"11.86 YRS"
 657 PRINT AT 20,20;"5TH PLANET"
 700 FOR T=0 TO 30
 710 LET A=T/15*PI
 720 LET SX=21+10*SIN A
 730 LET SY=22+10*COS A
 735 PLOT SX,SY
 740 NEXT T
 745 PAUSE 250
 746 CLS
 747 GOTO 4000
 750 PRINT AT 10,10;"*<---------
------SUN"
 751 PRINT AT 0,23;"MARS"
 753 PRINT AT 2,23;"DISTANCE"
 754~PRINT AT 3,23;"141 MILL"
 755 PRINT AT 4,23;"ORBIT"
 756 PRINT AT 5,23;"1.88 YRS"
 757 PRINT AT 20,20;"4TH PLANET"
 760 FOR T=0 TO 60
 770 LET A=T/30*PI
 780 LET SX=21+8*SIN A
 790 LET SY=22+8*COS A
 800 PLOT SX,SY
 810 NEXT T
 815 PAUSE 250
 820 CLS
 830 GOTO 5000
 849 PRINT AT 20,20;"2ND PLANET"
 850 PRINT AT 10,10;"*<---------
------SUN"
 851 PRINT AT 0,23;"VENUS"
 853 PRINT AT 2,23;"DISTANCE"
 854 PRINT AT 3,23;"67.2 MILL"
 855 PRINT AT 4,23;"ORBIT"
 856 PRINT AT 5,23;"225 DAYS"
 857 FOR T=0 TO 30
 858~LET A=T/15*PI
 859 LET SX=21+4*SIN A
 860 LET SY=22+4*COS A
 861 PLOT SX,SY
 862 NEXT T
 863 PAUSE 250
 864 CLS
 865 GOTO 7000
 900 PRINT AT 10,10;"*<---------
------SUN"
 905 PRINT AT 0,23;"MERCURY"
 907 PRINT AT 2,23;"DISTANCE"
 908 PRINT AT 3,23;"36 MILL"
 909 PRINT AT 4,23;"ORBIT"
 910 PRINT AT 5,23;"88 DAYS"
 915 PRINT AT 20,20;"1ST PLANET"
 920 FOR T=0 TO 30
 925 LET A=T/15*PI
 930 LET SX=21+2*SIN A
 940 LET SY=22+2*COS A
 950 PLOT SX,SY
 955 NEXT T
 960 PAUSE 250
 970 CLS
 980 GOTO 8000
 999 STOP
1000 PRINT "THE PLANETARY SYSTEM
"
1020 PRINT
1030 PRINT "THIS COMPUTER PROGRA
MME GIVES"
1040 PRINT "DETAILS OF THE SOLAR
 SYSTEM"
1050 PRINT "AND INCLUDES AN ANIM
ATED"
```

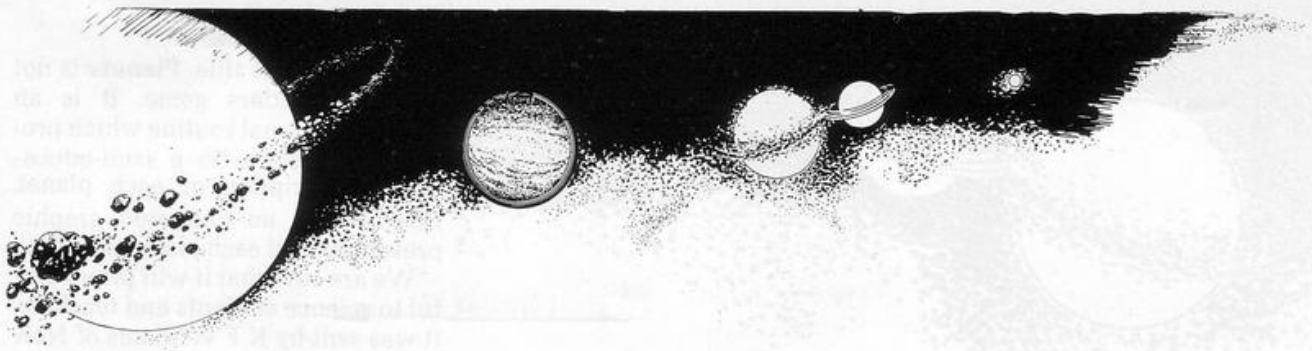


DESPITE its title, **Planets** is not an invaders game. It is an educational routine which provides the user with a semi-educational description of each planet, followed by an animated graphic presentation of each planetary orbit.

We are sure that it will prove useful to science students and teachers. It was sent by K F Williams of New South Wales, Australia (16K ZX-81).

ANETS

```
1060 PRINT "REPRESENTATION OF TH
E PLANETARY"
1070 PRINT "ORBITS OF OUR SOLAR
SYSTEM."
1075 PRINT
1100 PRINT "PRESS ""NEWLINE KEY"
" TO START"
1110 PRINT "YOUR JOURNEY THROUGH
 TIME AND"
1120 PRINT "S P A C E."
1121 PRINT
1122 PRINT
1123 PRINT """PLUTO"" ""NEPTUNE"
" ""URANUS"""
1125 PRINT
1126 PRINT """SATURN"" ""JUPITER
"" ""MARS"""
1128 PRINT
1129 PRINT """EARTH"" ""VENUS""
""MERCURY"""
1132 INPUT A$
1135 CLS
1140 IF A$="" THEN GOTO 1200
1200 PRINT "PLUTO"
1220 PRINT "THE NINTH PLANET OF
THE SOLAR"
1230 PRINT "SYSTEM,ORBITING THE
SUN AT A"
1240 PRINT "MEAN DISTANCE OF 39.
53AU IN"
1250 PRINT "248.4 YEARS.PLUTO WA
S DISCOVERED"
1260 PRINT "IN 1930 FOLLOWING OB
SERVATIONS"
1270 PRINT "OF PERTURBATIONS IN
NEPTUNES"
1280 PRINT "ORBIT.PLUTOS MASS IS
 PROBABLY"
1290 PRINT "LESS THAN 0.1 OF THA
T OF EARTH."
1295 PRINT "DIAMETER IS PROBABLY
 5000 TO"
1296 PRINT "6000 KILOMETRES AND
THE ORBIT IS"
1297 PRINT "VERY ECCENTRIC"
1298 PRINT
1299 PRINT
1300 PRINT "PRESS ""NEWLINE TO S
EE ORBIT"
1302 INPUT A$
1303 CLS
1304 IF A$="" THEN GOTO 3
2000 PRINT "NEPTUNE"
2011 PRINT
2012 PRINT
2013 PRINT "THE FOURTH LARGEST P
LANET AND"
2014 PRINT "THE EIGHTH PLANET FR
OM THE SUN."
2015 PRINT "NEPTUNE WAS FIRST DI
SCOVERED IN"
2016 PRINT "1846 BASED ON PERTUR
BATIONS IN"
2017 PRINT "THE ORBIT OF URANUS.
NEPTUNE HAS TWO MOONS,""TRITON""
 AND ""NEREID"""
2018 PRINT "NEPTUNES ""YEAR""IS
164.8 TIMES"
2019 PRINT "THAT OF EARTH.ITS DI
AMETER IS"
2020 PRINT "ABOUT 51 M/M AND ITS
 MASS ABOUT"
2021 PRINT "17.45 TIMES THAT OF
THE EARTH"
2022~PRINT
2023 PRINT
2024 PRINT "PRESS ""NEWLINE"" TO
 SEE ORBIT"
2025 INPUT A$
2026 CLS
2027 IF A$="" THEN GOTO 21
2500 PRINT "URANUS"
2515 PRINT
2520 PRINT "THE THIRD LARGEST PL
ANET IN THE"
2530 PRINT "SOLAR SYSTEM AND SEV
ENTH FROM"
2540 PRINT "THE SUN.PHYSICALLY V
ERY SIMILAR"
2550 PRINT "TO NEPTUNE,BUT RATHE
R LARGER"
2560 PRINT "53 M/M +/- 5 0/0.ITS
 DISTANCE"
2570 PRINT "FROM THE SUN IS 19.2
AU AND IT"
2580 PRINT "ORBITS THE SUN IN 84
.02 YEARS."
2590 PRINT "URANUS HAS FIVE MOON
S IN ORBITS"
2591 PRINT "THAT ARE RETROGRADE.
"
2592 PRINT
2593 PRINT
2594 PRINT "PRESS ""NEWLINE"" TO
 SEE ORBIT"
2595 INPUT A$
2596 CLS
2597 IF A$="" THEN GOTO 80
3000 PRINT "SATURN"
3015 PRINT
3020 PRINT
3025 PRINT "THE SECOND LARGETS P
LANET IN THE"
3030 PRINT "SOLAR SYSTEM AND THE
 SIXTH FROM"
3035 PRINT "FROM THE SUN.IT ORBI
TS THE SUN"
3040 PRINT "IN 29.46 YEARS AT A
DISTANCE OF"
3045 PRINT "9.54AU.SATURN HAS TH
E LOWEST"
3050 PRINT "DENSITY OF ALL OF TH
E PLANETS,"
3055 PRINT "LESS THAN THAT OF WA
TER,AND MAY"
3060 PRINT "CONTAIN OVER 60 0/0
HYDROGEN BY"
3065 PRINT "MASS.ITS TOTAL MASS
IS 95 TIMES"
3070 PRINT "THAT OF EARTH.SATURN
 HAS TEN"
3075 PRINT "MOONS AND ITS MOST S
TRIKING"
3080 PRINT "FEATURE ARE THE SYST
EM OF RINGS"
3090 PRINT "16 KM THICK AND THOU
GHT TO BE"
3095 PRINT "COMPOSED OF TINY ICE
 PARTICLES"
3100 PRINT
3110 PRINT
3125 PRINT "PRESS ""NEWLINE"" TO
 SEE ORBIT"
3130 INPUT A$
3135 CLS
3140 IF A$="" THEN GOTO 500
3500 PRINT "JUPITER"
3520 PRINT
3530 PRINT
3535 PRINT "JUPITER IS THE LARGE
ST AND MOST"
3540 PRINT "MASSIVE IN THE SOLAR
 SYSTEM AND"
3545 PRINT "IS FIFTH FROM THE SU
N. MASS IS"
3550 PRINT "317.8 TIMES THAT OF
THE EARTH."
3555 PRINT "JUPITER IS 5.20AU FR
OM THE SUN"
3560 PRINT "AND HAS AN ORBIT OF
11.86 EARTH"
3565 PRINT "YEARS.ATMOSPHERE CON
SISTS MAINLY"
3570 PRINT "OF METHANE,AMMONIA A
ND HYDROGEN"
```



```
3575 PRINT ".JUPITER HAS 13 MOON
S,THE TWO"
3580 PRINT "LARGEST BEING ""GANE
YMEDE"" AND"
3585 PRINT """CALLISTO.JUPITER H
AS A VERY"
3590 PRINT "PROMINENT FEATURE CA
LLED ""THE"
3595 PRINT "RED SPOT"" THAT HAS
BEEN STUDIED"
3600 PRINT "FOR OVER 150 YEARS"
3610 PRINT
3620 PRINT
3630 PRINT "PRESS ""NEWLINE"" TO
 SEE ORBIT"
3635 INPUT A$
3640 CLS
3650 IF A$="" THEN GOTO 650
4500 PRINT "MARS"
4520 PRINT
4530 PRINT
4535 PRINT "MARS IS THE FOURTH P
LANET FROM"
4540 PRINT "THE SUN,WITH AN ORBI
T OF 687"
4545 PRINT "EARTH DAYS.AND IS 1.
52AU FROM"
4550 PRINT "THE SUN.THE HIGHEST
TEMPERATURE"
4555 PRINT "AT THE EQUATOR IS AB
OUT 30 DEG."
4560 PRINT "AND THE LOWEST ABOUT
 -100 DEG,"
4565 PRINT "CENTIGRADE.MARS HAS
A MEAN DIAM."
4570 PRINT "OF 6750 KM,AND HAS D
ISTINCTIVE"
4575 PRINT "POLAR ICE CAPS WITH
SEASONAL"
4580 PRINT "RECESSION.MARS HAS T
WO MOONS"
4585 PRINT """PHOBOS"" AND ""DEI
MOS"" AND"
4590 PRINT "IT IS UNSURE IF MARS
 CAN SUPPORT"
4591 PRINT "LIFE AS KNOWN ON PLA
NET EARTH."
4592 PRINT
4593 PRINT
4594 PRINT "PRESS ""NEWLINE"" TO
 SEE ORBIT"
4595 INPUT A$
4596 CLS
4597 IF A$="" THEN GOTO 750
5000 PRINT "EARTH"
5020 PRINT
5030 PRINT
5040 PRINT "PLANET EARTH IS THE
THIRD PLANET"
5050 PRINT "FROM THE SUN,AND AT
THIS TIME"
5060 PRINT "THE ONLY PLANET KNOW
N TO SUPPORT"
5070 PRINT "LIFE AS WE KNOW IT.T
HE EARTH IS"
5080 PRINT "RATHER LARGER THAN V
ENUS,AND HAS"
5090 PRINT "AN ORBIT OF APPROX.O
NE YEAR ON"
5100 PRINT "ITS JOURNEY AROUND T
HE SUN.EARTH"
5120 PRINT "IS SLIGHLTY FLATTENE
D AT THE"
5130 PRINT "POLES AND IS ABOUT 1
2756 KM IN"
5140 PRINT "DIAMETER.AS WE ALL K
NOW,EARTH"
5150 PRINT "HAS ONE MOON.THE EAR
TH WAS"
5160 PRINT "FORMED ABOUT 4550 MI
LION YEARS"
5170 PRINT "AGO AND HAS SUPPORTE
D MAN FOR"
5180 PRINT ".009 0/0 OF THIS TIM
E"
5190 PRINT
5195 PRINT "PRESS ""NEWLINE"" TO
 SEE ORBIT"
5200 INPUT A$
5210 CLS
5220 IF A$="" THEN GOTO 379
5500 PRINT "VENUS"
5520 PRINT
5530 PRINT
5540 PRINT "VENUS IS THE SECOND
PLANET FROM"
5550 PRINT "THE SUN AND IS ABOUT
 THE SAME"
5560 PRINT "SIZE AS THE EARTH.AN
D IS .72AU"
5570 PRINT "DISTANT FROM THE SUN
,AND ORBITS"
5580 PRINT "THE SUN IN 225 DAYS,
ABOUT TWO"
5590 PRINT "THIRDS OF AN EARTH Y
EAR."
5600 PRINT "THE SURFACE TEMPERAT
URE IS ABOUT"
5610 PRINT "750 DEGRESS K.THE SU
RFACE IS"
5620 PRINT "COMPLETELY OBSCURED
BY DENSE"
5630 PRINT "CLOUDS CONTANING SUL
PHURIC ACID"
5640 PRINT "LIFE AS WE KNOW IT C
OULD NOT"
5650 PRINT "EXIST UNDER THESE CO
NDITIONS"
5660 PRINT
5670 PRINT
5680 PRINT "PRESS ""NEWLINE"" TO
 SEE ORBIT"
5690 INPUT A$
5691 CLS
5695 GOTO 849
6000 PRINT "STANDBY"
7000 PRINT "MERCURY"
7020 PRINT
7030 PRINT
7040 PRINT "MERCURY IS THE PLANE
T CLOSEST TO"
7050 PRINT "THE SUN.NIGHT SURFAC
E TEMP IS"
7060 PRINT "THOUGHT TO BE 110 DE
GRESS K,AND"
7070 PRINT "AND MIDDAY EQUATORIA
L TEMP ABOUT"
7080 PRINT "600 DEGREES K.THUS P
RECLUDING"
7090 PRINT "LIFE AS WE KNOW IT O
N EARTH"
7100 PRINT "MERCURY HAS LITTLE O
R NO KNOWN"
7120 PRINT "ATMOSPHERE,AND HAS N
O MOONS"
7130 PRINT "THE PLANETS AVERAGE
DENSITY IS"
7140 PRINT "5.2 GRAMS PER CUBIC
CENTIMETRE"
7150 PRINT
7160 PRINT
7170 PRINT "PRESS ""NEWLINE"" TO
 SEE ORBIT"
7180 INPUT A$
7190 CLS
7195 IF A$="" THEN GOTO 900
8000 PRINT """ZX-81 MICRO-COMPUT
ER"""
8020 PRINT
8030 PRINT "TRUSTS YOU HAVE ENJO
YED THIS"
8035 PRINT
8040 PRINT "LITTLE TRIP THROUGH
THE SOLAR"
8045 PRINT
8050 PRINT "SYSTEM AND THAT IT H
AS GIVEN YOU"
8055 PRINT
8060 PRINT "FOOD FOR THOUGHT AND
 A BETTER"
8065 PRINT
8070 PRINT "UNDERSTANDING OF OUR
 UNIVERSE"
8080 PRINT
8090 PRINT
8091 PRINT
8092 PRINT "** ** ** ** ** ** **
 ** ** ** **"
8093 PAUSE 800
8094 CLS
8095 PRINT "AS A SOBERING THOUGH
T HERE ARE"
8100 PRINT "THE DISTANCES FROM T
HE SUN IN"
8200 PRINT "MILES OF EACH OF OUR
 9 PLANETS"
8300 PRINT
8400 PRINT "PLUTO.....3670 MILLI
ON MILES"
8500 PRINT "NEPTUNE...2794 MILLI
ON MILES"
8510 PRINT "URANUS....1783 MILLI
ON MILES"
8520 PRINT "SATURN....866.2 MILL
ION MILES"
8530 PRINT "JUPITER...483.3 MILL
ION MILES"
8540 PRINT "MARS......141.5 MILL
ION MILES"
8550 PRINT "EARTH.....93 MILLION
 MILES"
8560 PRINT "VENUS.....67.2 MILLI
ON MILES"
8570 PRINT "MERCURY...36 MILION
MILES"
8580 PRINT
8590 PRINT "IT TAKES SUNLIGHT 8.
33 MINUTES"
8595 PRINT "TO REACH EARTH AT 18
6000 MILES"
8600 PRINT "PER SECOND........."
8610 PRINT "IT WOULD TAKE A ""JU
MBO"" JET 645"
8620 PRINT "DAYS AT 600 MPH NON-
STOP......."
8630 PRINT
8640 PRINT ".........THINK ABOUT
 IT"
9000 STOP
9001 SAVE "PLANETS"
9002 GOTO 1
```

GOLF 80

IT IS DIFFICULT playing a game of golf inside a ZX-80. The version submitted by S Hughes of Bushey, Hertfordshire, is entertaining but obviously very much condensed.

You are told the number of the hole, its distance and par, and asked to select a club. At the end of the game, the course par and your score are displayed. The program is set for nine holes but can be changed to 18 by replacing line 815 with "A = 19 THEN GO TO 830".

```
  1 LET X = Ø
  2 LET A = 1
  3 LET F = Ø
  4 LET H = Ø
  5 LET B = Ø
  9 RAND
 50 LET D = RND(245) + 175
 51 LET P = 4
 52 IF D < 276 THEN LET P = 3
 53 IF D > 350 THEN LET P = 5
 61 PRINT
 65 PRINT "HOLE," ; A; ":□";D;□ YARD(S)
TO PLAY"
100 PRINT
110 PRINT "PAR □";P
120 PRINT
135 IF NOT D = Ø THEN PRINT B; "□
STROKE(S) PLAYED"
138 IF NOT H = 1 THEN PRINT "CLUB? 5 TO
9"
139 IF H = 1 THEN PRINT "PUTTER? 1 TO 4"
140 INPUT W
141 CLS
150 LET T = 1
160 IF W = 2 THEN LET T = W
170 IF W = 3 THEN LET T = RND (2) + 4
180 IF W = 4 THEN LET T = RND (4) + 8
190 IF W = 5 THEN LET T = RND (6) + 20
200 IF W = 6 THEN LET T = RND (9) + 45
201 IF W = 7 THEN LET T = RND (8) + 96
220 IF W = 8 THEN LET T = RND (9) + 135
230 IF W = 9 THEN LET T = RND (15) + 195
240 LET D = D – T
245 PRINT "STROKE,";T;"□ YARD(S)"
246 LET B = B + 1
250 IF D > –1 THEN GOTO 260
255 LET D = –D
256 PRINT D; "□ PAST HOLE"
268 IF D = Ø THEN GOTO 800
269 IF D < 18 AND D > – 19 THEN PRINT "ON
GREEN"
270 IF D < 18 AND D > –19 THEN LET H = 1
280 GO TO 60
800 IF B > P THEN PRINT "BOGIE □";B;, B-P;
"□OVER"
801 IF B = P THEN PRINT "PAR □"; B
802 IF P-1 = B THEN PRINT "BIRDIE □";B
803 IF P-2 = B THEN PRINT "EAGLE□";B
805 LET X = X + B
807 LET F = F+P
810 LET A = A+1
815 IF A = 10 THEN GOTO 830
820 GOTO TO 4[839 PRINT "C/PAR□";F
840 PRINT "Y/SCORE□";X
□ IS A SPACE
```

```
  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 15,6;"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.

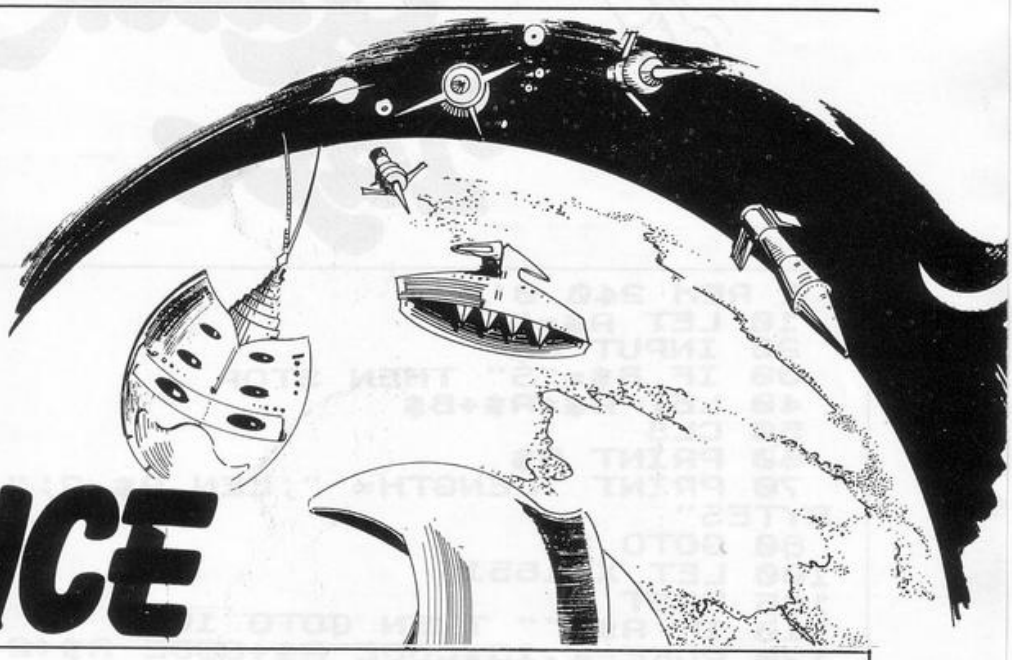
making WAVES

QUEUE

QUEUE is for the unexpanded ZX-81 and presents a simulation of a queueing system in a post office. There are five servers at the windows and the customers form a single queue. Customers are represented by M and F and a full-stop signifies that a server is free.

Underneath the queue is a single figure from zero to nine which can be changed by pressing one of the corresponding characters on the keyboard. That shows the average rate at which customers arrive. An arrival rate of fewer than five means that the servers are underloaded, and more than five overloaded. The author, W E Thompson of Aldeburgh, Suffolk, says that theory predicts average queue lengths of 1, 0.001; 2, 0.04; 3, 0.4; 4, 4.2; 5, 15; 6, 27; 7, 39; 8, 30; 9, 31. The model shows that the queue can be far from its average for long periods, 1K ZX-81.

```
  10 DIM Q$(32)
  20 LET S$="....."
  30 LET U=SGN PI
  40 LET Z=NOT U
  50 LET Q=U
  60 LET A=Z
  70 RAND
  80 IF "0"<=INKEY$ AND INKEY$<=
"9" THEN LET A=VAL INKEY$
  90 PRINT AT 5,Z;A
 100 LET R=RND*(5+A)
 110 IF R<5 THEN GOTO 210
 120 IF Q>32 THEN GOTO 80
 130 LET R=INT (RND*2)
 140 LET C$=("M" AND R)+("F" AND
NOT R)
 150 LET Q$(Q)=C$
 160 FOR I=31 TO Q-U STEP -U
 170 PRINT AT U,I;C$;" "
 180 NEXT I
 190 LET Q=Q+U
 200 GOTO 230
 210 LET S$(INT R+U)="."
 220 PRINT AT 3,Z;S$
 230 IF Q=U THEN GOTO 80
 240 FOR I=U TO 5
 250 IF S$(I)<>"." THEN NEXT I
 260 IF I=6 THEN GOTO 80
 270 LET S$(I)=Q$(U)
 280 LET Q=Q-U
 290 PRINT AT U,Z;" ";AT 3,Z;S$
 300 LET Q$=Q$(2 TO )
 310 FOR I=U TO Q
 320 PRINT AT U,I-U;Q$(I);" "
 330 NEXT I
 340 GOTO 80
```



1K DEFENCE

DEFENDERS is a conventional Earth defence game but is fast enough to be genuinely challenging. A succession of aliens appear at screen-left and skim across the surface of the planet towards your craft.

Go up with 7 and down with 6 and trigger your blaster-beam with Ø. The planet surface in line 5 could be made more rugged with graphic Ts, Ys and 7s.

1K Defenders was sent by Simon Cox of Dunstable. Bedfordshire (1K ZX-81).

```
   1 FOR Z=PI/PI TO CODE "(graph
ic T)"
   2 PRINT AT RND*CODE "(graphic
 S)",RND*CODE "(";CHR$ 27
   3 NEXT Z
   4 LET T=PI-PI
   5 PRINT AT CODE "(graphic 5)"
,PI-PI;"(thirty two graphic 6s)"
   6 SLOW
  10 LET A=PI/PI
  20 LET B=CODE ";"
  30 LET C=INT (RND*CODE "(graph
ic D)")
  40 PRINT AT A,T;CHR$ 18;AT C,B
;"(graphic 4;SPACE)";AT A,T;CHR$
 0
  50 IF B=T THEN GOTO VAL "200"
  55 IF INKEY$="0" THEN GOSUB VA
L "100"
  70 LET B=B-PI/PI
  80 LET A=A+(INKEY$="6")-(INKEY
$="7")
  90 GOTO CODE "C"
 100 FOR N=CODE "(graphic 2)" TO
B
 101 PRINT AT A,N;CHR$ 131;AT A,
T;CHR$ 18
 103 NEXT N
 105 PRINT AT C,B;CHR$ 23
 106 PAUSE CODE "="
 107 FAST
 108 CLS
 109 GOTO CODE "(graphic 1)"
 200 PRINT "GAME OVER"
```

Quick Tape

QUICK TAPE, a machine code tape routine, will allow you to save and load 16K programs on the ZX-81 in less than a minute. In technical terms the program increases the machine baud rate to 1,500. To put in the program for the first time, type-in and run the hex loader, which is the first program in the listing. In answer to the program prompt, type-in the machine code listing line by line. When you have finished the listing, type 'S' and the machine code will be transferred to the REM statement in line 1. Then delete the loader, line by line, keeping the REM intact.

Type-in the second program, starting at line 10. The REM in line 1 should look like the REM statement which you have just created. When you run this program it will SAVE itself on to tape and then NEW automatically. The machine code routine is then stored above RAMTOP ready for use.

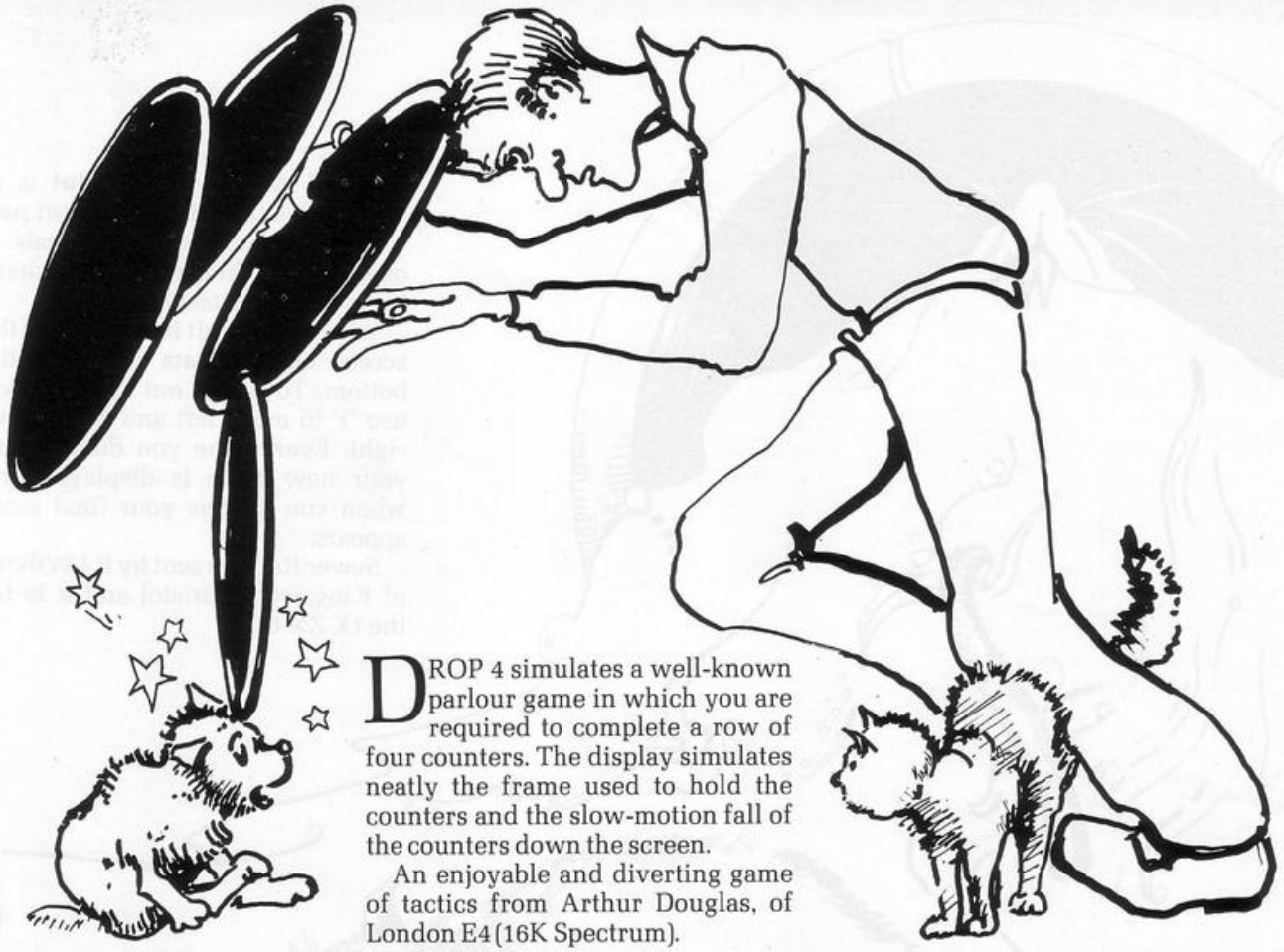
To SAVE a program, type RAND USE 32512 and to LOAD, type RAND USR 32525. When you want to use the program LOAD it normally and RUN. The Basic will destroy itself after transferring the machine code above RAMTOP. The routine will then be ready to use on your faster computer.

Quick Tape was sent by K S Beddoe of Botley, Southampton and is proving very useful.

```
  1 REM 240 0'5
  10 LET A$=""
  20 INPUT B$
  30 IF B$="S" THEN STOP
  40 LET A$=A$+B$
  50 CLS
  60 PRINT A$
  70 PRINT "LENGTH= ";LEN A$/2;"
 BYTES"
  80 GOTO 20
 100 LET X=16514
 105 FAST
 110 IF A$="" THEN GOTO 160
 120 POKE X,16*CODE A$+CODE A$(2
) -476
 130 LET A$=A$(3 TO )
 140 LET X=X+1
 150 GOTO 110
 160 SLOW
 170 STOP

  10 SAVE "FAST TAPE ROUTINE"
  20 PRINT "FAST TAPE ROUTINE"
  30 PRINT "TO SAVE RAND USR 325
12"
  40 PRINT "TO LOAD RAND USR 325
25"
  50 PAUSE 150
  60 RAND USR 16738
```

Machine code listing

16514	CD	23	0F	11	06	7F	CD	2B
16522	7F	CD	2B	0F	C9	CD	23	0F
16530	21	1D	7F	22	16	40	CD	70
16538	7F	CD	2B	0F	C9	0B	0B	0B
16546	00	00	00	00	00	00	CD	A8
16554	03	38	F9	EB	11	CB	12	CD
16562	46	0F	30	2E	10	FE	1B	7A
16570	B3	20	F4	CD	4E	7F	CB	7E
16578	23	28	F8	21	09	40	CD	4E
16586	7F	CD	FC	01	18	F8	5E	37
16594	CB	13	C8	9F	E6	02	C6	01
16602	4F	D3	FF	06	23	10	FE	CD
16610	46	0F	30	72	06	1E	10	FE
16618	0D	20	EE	C3	D8	7F	18	E0
16626	CD	A8	03	CB	12	CB	0A	CD
16634	7C	7F	18	FB	0E	01	06	00
16642	3E	7F	DB	FE	D3	FF	1F	30
16650	49	17	17	38	28	10	F1	F1
16658	BA	D2	E5	03	62	6B	CD	7C
16666	7F	CB	7A	79	20	03	BE	20
16674	D6	23	17	30	F1	FD	34	15
16682	21	09	40	50	CD	7C	7F	71
16690	CD	FC	01	18	F6	D5	1E	31
16698	06	0E	1D	DB	FE	17	CB	7B
16706	7B	38	F5	10	F5	D1	20	04
16714	FE	56	30	B2	3F	CB	11	30
16722	AD	C9	7A	A7	28	BB	CF	0C
16730	A7	06	50	10	FE	C3	6E	7F
16738	21	82	40	11	00	7F	01	E0
16746	00	ED	B0	21	FF	7E	22	04
16754	40	C3	C3	03				

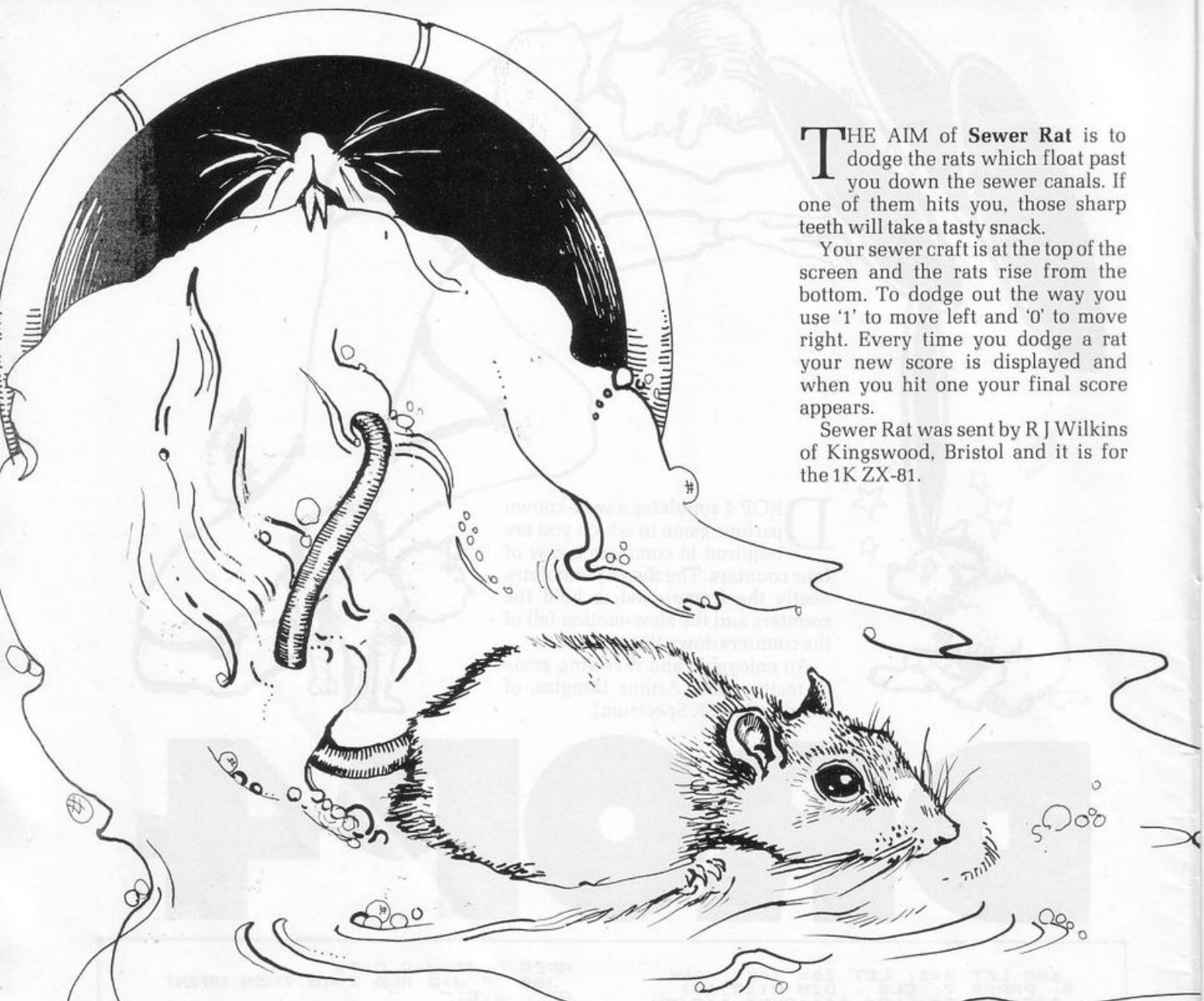


DROP 4 simulates a well-known parlour game in which you are required to complete a row of four counters. The display simulates neatly the frame used to hold the counters and the slow-motion fall of the counters down the screen.

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"
```



sewer rat

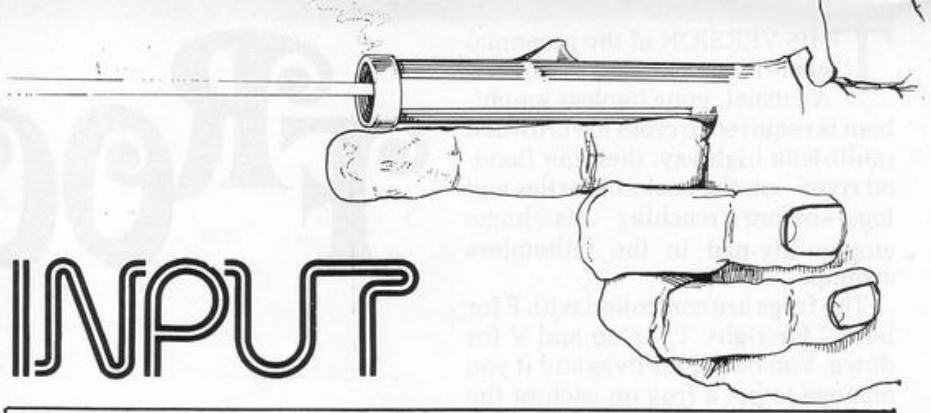
THE AIM of **Sewer Rat** is to dodge the rats which float past you down the sewer canals. If one of them hits you, those sharp teeth will take a tasty snack.

Your sewer craft is at the top of the screen and the rats rise from the bottom. To dodge out the way you use '1' to move left and '0' to move right. Every time you dodge a rat your new score is displayed and when you hit one your final score appears.

Sewer Rat was sent by R J Wilkins of Kingswood, Bristol and it is for the 1K ZX-81.

```
  5 LET DD=PI/PI
 10 LET S=PI-PI
 15 LET A=VAL "4"
 20 FOR B=VAL "1" TO VAL "20"
 25 PRINT "space,graphic A,5 sp
aces,graphic A"
 30 NEXT B
 35 LET D=INT (RND*VAL "5")+VAL
 "2"
 40 FOR C=VAL "19" TO PI/PI STE
P -DD
 50 LET E=INT (RND*3)+1
 60 IF E=2 AND D>2 THEN LET D=D
-1
 63 IF C<=VAL "5" THEN LET D=A
 65 LET A=A+(INKEY$="0" AND A<V
AL "6")-(INKEY$="1" AND A>VAL "2
")
 70 IF C=VAL "1" AND D=A THEN G
OTO VAL "200"
 80 PRINT AT VAL "1",A;"inverse
 V";AT C,D;"inverse *";AT VAL "1
 100~PRINT AT VAL "1",A;"inverse
 space";AT C,D;"inverse space"
 105 NEXT C
 110 LET S=S+PI/PI
 115 PRINT AT PI/PI,VAL "8";"SCO
RE=";S
 120 IF S>VAL "5" THEN LET DD=VA
L "2"
 125 IF S>VAL "10" THEN LET DD=V
AL "3"
 130 GOTO VAL "35"
 200 PRINT AT PI-PI,VAL "8";"FIN
AL"
 220 STOP
```

TIMED INPUT



IN SOME games programs it is useful to allow the player only a limited amount of time to respond. **Timed Inputs,** by A F Olivera of Gibraltar, is a subroutine for the ZX-81 which can be added to a program to allow the player a certain amount of time to reply.

That depends on the values put into the POKE statements at lines 500 and 510. The numbers are POKEd into the FRAMES counter which controls the ZX-81 control clock. The values in the program already will set the FRAMES counter to 32767 50ths of a second. It can be re-set by altering the POKE numbers.

The program will return the keys pressed by the player in the I$ variable. That can then be checked by the programmer's own control program.

```
  500 POKE 16436,255
  510 POKE 16437,127
  520 LET I$=""
  530 CLS
  540 PRINT AT 21,0;I$
  550 IF PEEK 16436+PEEK 16437*25
6<32767-5*50 THEN RETURN
  560 IF INKEY$<>"" THEN GOTO 550
  570 IF PEEK 16436+PEEK 16437*25
6<32767-5*50 THEN RETURN
  580 IF INKEY$="" THEN GOTO 570
  590 IF CODE INKEY$=118 THEN RET
URN
  600 LET I$=I$+INKEY$
  610 IF CODE I$(LEN I$)=119 THEN
 LET I$=I$( TO LEN I$-2)
  620 GOTO 530
```

Mince Pounce

```
   10 PRINT "ENTER TIME REQUIRED"
   20 INPUT A
   30 CLS
   40 LET A$="          000000000
0000"
   50 FOR B=0 TO 13
   60 PRINT A$
   70 NEXT B
   80 LET Y=9
   90 LET Z=0
  100 FOR E=0 TO A
  110 PRINT AT Z,Y;"<"
  120 IF INKEY$="8" THEN LET Y=Y+
1
  130 IF INKEY$="5" THEN LET Y=Y-
1
  140 IF INKEY$="6" THEN LET Z=Z-
1
  150 IF INKEY$="7" THEN LET Z=Z+
1
  160 PRINT AT Z,Y;"<"
  170 NEXT E
```

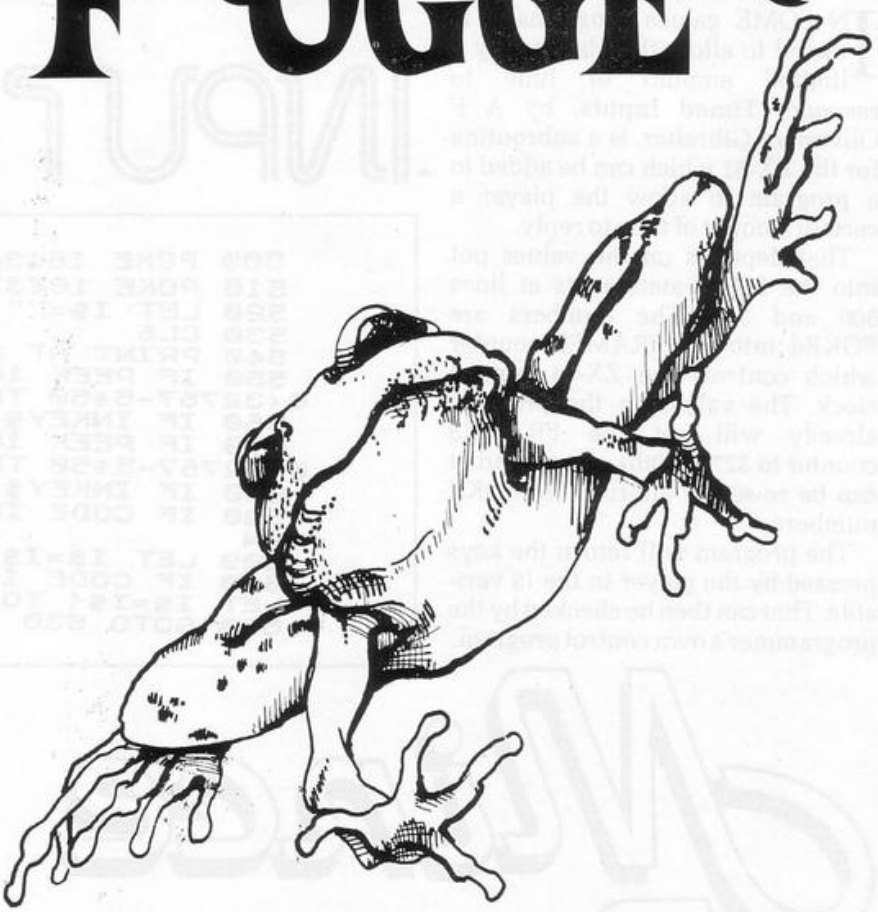
IF THE TASTE of mince pies is still in your mouth you might like to try **Mince Pounce,** which is a pie addicts' paradise. The aim of the 1K game for the ZX-81 is to eat your way through a table of mince pies in as short a time as possible.

At the start, you are asked to enter a time code. The codes quoted by the author, Andrew Blight of Fleet, Hampshire, include 400 for one minute and 1,000 for two-and-a-half minutes. You can increase the time but the idea is to reduce your time.

The arrow is your mouth and it can be moved around the table using the cursor keys. When the time has expired the game stops and reports code 0/10. There are 169 pies on the table.

There are 10 spaces and 13 Os in line 40.

FROGGER



THIS VERSION of the perennial game must surely be definitive. As usual, your hapless amphibian is required to cross the crowded multi-lane highway, then the flooded river—on the backs of turtles and logs—before reaching his home atop a lily-pad in the fathomless swamp.

The frogs are controlled with F for left, G for right, T for up and V for down. You have four lives and if you manage to get a frog on each of the lily-pads you receive a bonus frog, up to a maximum of four. Remember, though, only one frog per pad is allowed. There is a timer and a high-score facility.

After the program has been entered it should be started with "RUN 2000" to define the graphics, after which the normal RUN can be used.

Andrew Pennel of Cliftonville, Kent, who sent the program, says that **Frogger** was written for the 48K Spectrum but that owners of the 16K machine can use it by splitting it into two parts, 2000-2660 first, and 5-1580 second.

This listing is probably unbeatable for the Spectrum. It is certainly the best we have seen. (48K or 16K Spectrum).

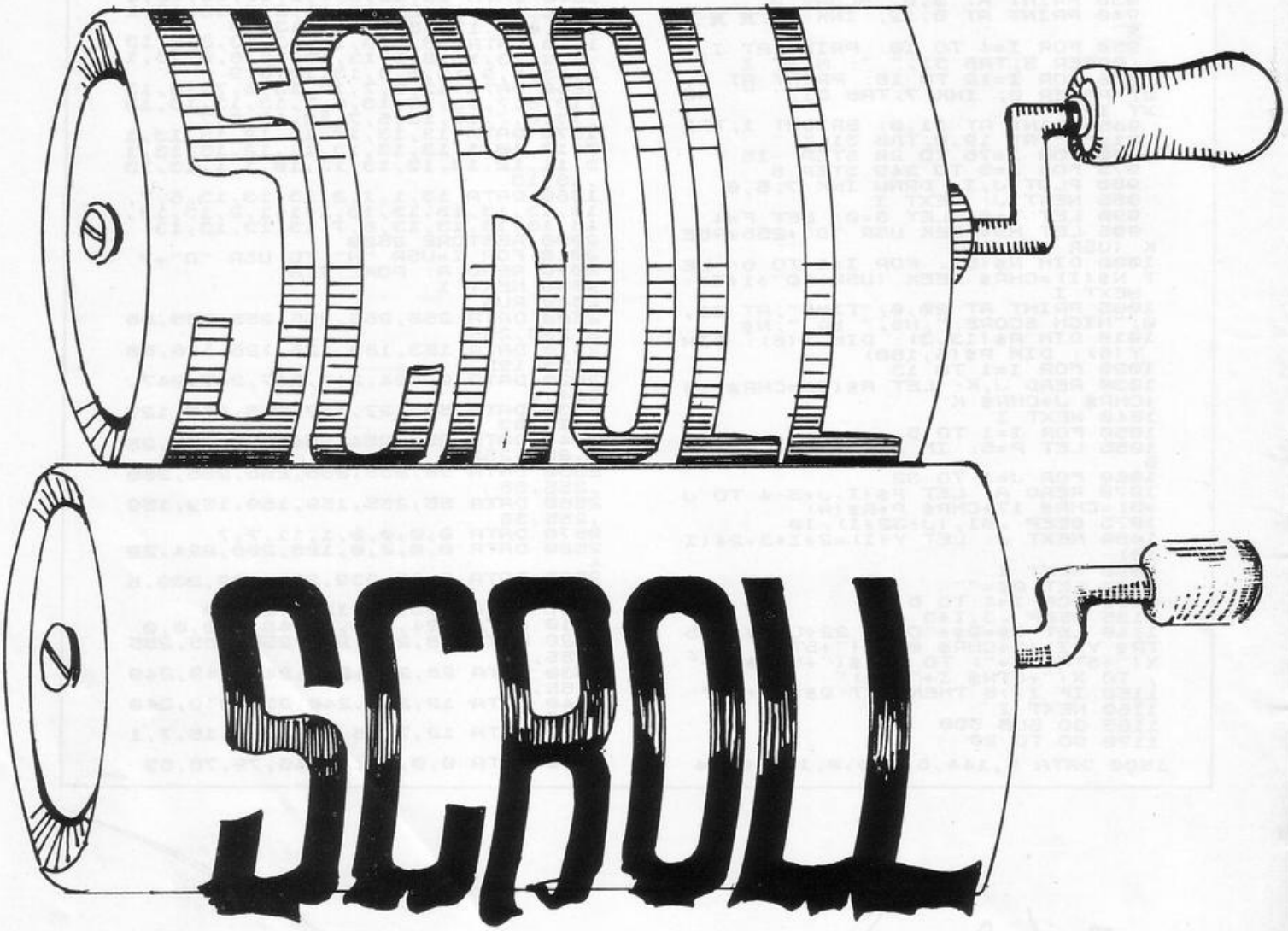
Graphics notes:

110, 180, etc.—Graphic B

310—Graphic H, graphic I; graphic K, graphic L.

```
  1 REM ********FROGGER
  2 REM by Andrew Pennell
  5 POKE 23658,8
 10 GO TO 900
 20 FOR I=1 TO 6
 30 LET X(I)=5*INT (RND*31)+1
 40 NEXT I
 50 PRINT VAL$ Q$
 60 LET A=20
100 LET X=16: LET Y=19
110 PRINT AT Y,X; INK 4;"R"
120 PAUSE 20
130 PRINT VAL$ Q$
140 FOR I=1 TO 6: LET X(I)=X(I)
-10*(I/2=INT (I/2))+5
150 LET X(I)=X(I)-160*(X(I)>160
)+160*(X(I)<5): NEXT I
160 PRINT VAL$ Q$: IF Y>9 THEN
GO TO 200
170 LET X=X+(A=40)-(A=43): IF X
<0 OR X>31 THEN GO TO 400
180 PRINT AT Y,X; PAPER 5; INK
4;"R"
200 LET B=ATTR (Y,X): IF B=5 OR
B=6 THEN GO TO 400
205 LET T=T-1: PLOT OVER 1;32+T
,12
206 IF T=0 THEN LET F=1: GO TO
400
210 LET XX=X: LET YY=Y: LET K$=
INKEY$
220 IF K$="" THEN PRINT AT Y,X;
PAPER 8; INK 4;"R": GO TO 140
225 BEEP .02,-10
230 LET X=X+(K$="G")-(K$="F"):
IF Y=21 THEN LET Y=19
240 IF X<0 OR X>31 THEN GO TO 4
00
250 LET Y=Y+2*(K$="V")-2*(K$="T
"): IF Y=21 THEN LET Y=19
260 IF K$="T" THEN LET S=S+5: P
RINT AT 0,6;S
270 LET A=ATTR (Y,X): IF YY=11
OR YY=19 THEN PRINT AT YY,XX; BR
IGHT 1;" "
280 IF A=160 OR A=47 OR A=5 OR
A=6 OR A=8 THEN GO TO 400
290 PRINT AT Y,X; PAPER 8; INK
4;"R"
300 IF A<>56 THEN GO TO 140
305 PRINT VAL$ Q$
310 LET I=8*INT (X/8)+3: PRINT
AT 2,I; INK 4;"H";AT 3,I;"I"
315 LET S=S+50: PRINT AT 0,6;S
320 BEEP 2,10
330 LET FF=FF+1: IF FF=4 THEN G
O SUB 500
340 GO TO 20
400 PRINT VAL$ Q$
405 PRINT AT Y,X+(X<0)-(X>31);
INK 8; PAPER 8; FLASH 1; OVER 1;
"R"
410 PRINT AT 0,10+2*F;" ": BEEP
3,-10
415 LET F=F-1
420 IF F=0 THEN GO TO 600
430 PRINT AT Y,X+(X<0)-(X>31);
INK 8; PAPER 8; OVER 1;"R"
440 GO TO 20
500 FOR I=3 TO 30 STEP 8
510 PRINT AT 2,I;"  ";AT 3,I;"
": NEXT I
520 LET FF=0: IF F=4 THEN GO TO
525
522 LET F=F+1: PRINT AT 0,10+2*
F; INK 4;"R"
525 FOR T=T TO 120: PLOT 32+T,1
2: BEEP .01,T/10: NEXT T
530 IF S<>0 THEN LET S=S+100: P
RINT AT 0,6;S
540 RETURN
600 PRINT AT 0,12;"          "
610 PRINT AT 11,8;" YOU SCORED
";S;" "
620 IF S<HS THEN GO TO 700
630 PRINT AT 11,20; FLASH 1;S
640 PRINT AT 12,6;" A NEW HIGH
SCORE!!! "
645 FOR I=1 TO 5: FOR J=5 TO 10
: BEEP .05,J+I: NEXT J: NEXT I
650 DIM N$(6): INPUT "Enter you
r name (max 6 letters):";N$
660 POKE USR "Q",S-256*INT (S/2
56): POKE USR "Q"+1,INT (S/256)
670 FOR I=1 TO 6
680 POKE USR "Q"+1+I,CODE N$(I)
690 NEXT I
700 PRINT AT 19,0; FLASH 1;"
Enter RUN for another game.  ":
GO TO 16000
900 INK 0: PAPER 7: BORDER 7: C
LS
```

```
  905 PRINT AT 1,0; PAPER 1;TAB 3
1;"
  910 FOR I=2 TO 3: PRINT AT I,0;
  PAPER 1;"    ";AT I,5;"
  920 PRINT AT I,13; PAPER 1;"
    ";AT I,21,"          ";AT I,29;"
    ": NEXT I
  930 PRINT AT 0,0;"SCORE:0"
  940 PRINT AT 0,12; INK 4;"
  "
  950 FOR I=4 TO 10: PRINT AT I,0
; PAPER 5;TAB 31;" ": NEXT I
  960 FOR I=12 TO 18: PRINT AT I,
0; PAPER 0; INK 7;TAB 31;" ": NE
XT I
  965 PRINT AT 11,0; BRIGHT 1;TAB
 31;" ";AT 19,0;TAB 31;" "
  970 FOR I=76 TO 28 STEP -16
  975 FOR J=0 TO 249 STEP 8
  980 PLOT J,I: DRAW INK 7;5,0
  985 NEXT J: NEXT I
  990 LET T=0: LET S=0: LET F=4
  995 LET H5=PEEK USR "0"+256*PEE
K (USR "0"+1)
1000 DIM N$(6): FOR I=1 TO 6: LE
T N$(I)=CHR$ PEEK (USR "0"+1+I):
 NEXT I
1005 PRINT AT 20,0;"TIME";AT 21,
0;"HIGH SCORE:";H5;" by ";N$
1010 DIM A$(13,3): DIM X(6): DIM
 Y(6): DIM P$(6,160)
1020 FOR I=1 TO 13
1030 READ J,K: LET A$(I)=CHR$ 16
+CHR$ J+CHR$ K
1040 NEXT I
1050 FOR I=1 TO 6
1055 LET P=5: IF I>3 THEN LET P=
0
1060 FOR J=1 TO 32
1070 READ A: LET P$(I,J*5-4 TO J
*5)=CHR$ 17+CHR$ P+A$(A)
1075 BEEP .01,(J+32*I)/10
1080 NEXT J: LET Y(I)=2*I+3+2*(I
>3)
1090 NEXT I
1120 LET Q$=""
1130 FOR I=1 TO 6
1135 BEEP .3,I*3
1140 LET Q$=Q$+"CHR$ 22+CHR$ "+S
TR$ Y(I)+"+CHR$ 0+P$("+STR$ I+"
X("+STR$ I+") TO )+P$("+STR$ I+"
, TO X("+STR$ I+")-1)"
1150 IF I<>6 THEN LET Q$=Q$+"+"
1160 NEXT I
1165 GO SUB 500
1170 GO TO 20

1500 DATA 5,144,6,146,0,147,0,14
4,0,148
1510 DATA 6,149,6,150,3,159,3,15
8
1520 DATA 6,153,6,157,6,156,7,32
1530 DATA 13,13,8,9,13,13,8,9,13
,13,13,13,8,9,13,13,8,9,13,13,13
,8,9,13,13,13,8,9,13,13,13,13
1540 DATA 13,13,3,4,5,13,13,13,3
,4,4,4,5,13,13,13,13,3,5,13,13,1
3,3,4,5,13,13,3,4,5,13,13
1550 DATA 13,8,9,13,13,13,8,9,13
,8,9,13,13,8,9,13,13,13,8,9,13,1
3,13,8,9,13,8,9,13,13,8,9
1560 DATA 13,6,7,13,13,6,7,13,13
,13,6,7,13,13,13,6,7,13,13,13,13
,13,6,7,13,13,6,7,13,13,6,7
1570 DATA 13,13,13,11,12,13,13,1
3,13,10,1,13,13,13,11,12,13,13,1
3,11,12,13,13,13,13,10,1,1,13,13
,13,13
1580 DATA 13,1,1,2,13,13,13,6,7,
13,13,13,13,13,13,1,1,1,2,13,13,
13,13,13,13,13,6,7,13,13,13,13
2000 RESTORE 2500
2010 FOR I=USR "A" TO USR "0"+7
2020 READ A: POKE I,A
2030 NEXT I
2040 RUN
2500 DATA 255,255,255,255,255,25
5,255,255
2510 DATA 153,189,126,126,126,60
,165,195
2520 DATA 0,124,247,247,247,247,
124,0
2530 DATA 63,127,127,255,255,127
,127,63
2540 DATA 252,254,254,255,255,25
4,254,252
2550 DATA 56,255,255,255,255,255
,255,56
2560 DATA 56,255,159,159,159,159
,255,56
2570 DATA 0,0,0,0,1,11,7,7
2580 DATA 0,0,0,0,128,208,224,22
4
2590 DATA 0,62,239,239,239,239,6
2,0
2600 DATA 7,3,10,12,0,0,0,0
2610 DATA 224,192,80,48,0,0,0,0
2620 DATA 28,255,255,255,255,255
,255,28
2630 DATA 28,255,249,249,249,249
,255,28
2640 DATA 12,208,240,252,240,240
,208,12
2650 DATA 12,7,15,127,127,15,7,1
2
2660 DATA 0,0,78,79,45,79,78,69
```



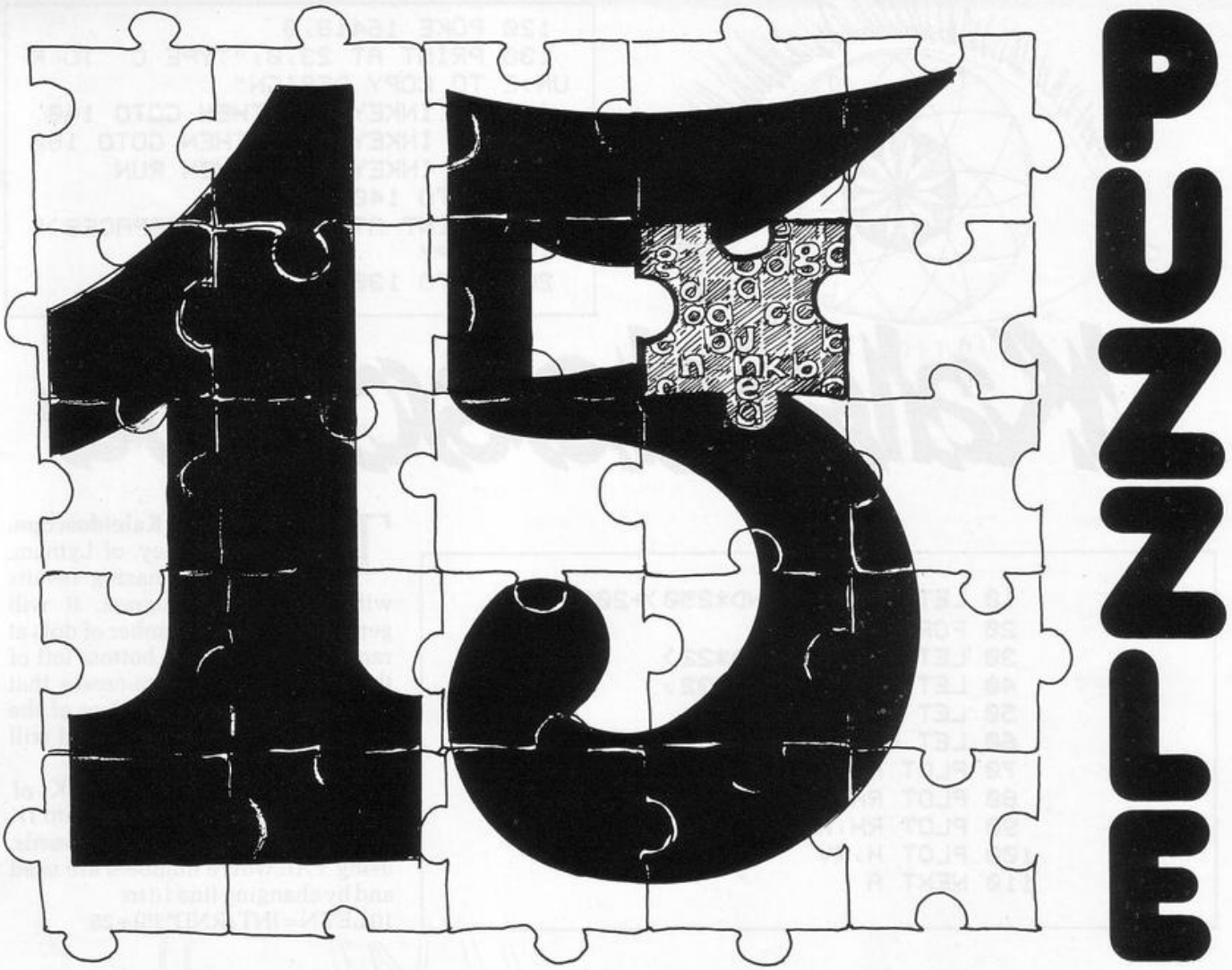
SCROLL is a machine code program to move the display across the screen in any one of eight directions. Enter Listing 1, keying 126 characters in the REM statement in line 1. The variables S1 to S9 correspond to the compass points NW, N, NE, W, E, SW, S and SE. RUN the program and the machine code will 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 111111111122222222222333
3333333444444444445555555555566666
6666677777777778888888888899999999
9990000000000111111111122222222222
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$="2A0C40E511210019D10
1D602EDB0C92A1040114300ED52E5112
100ED52D101B502EDB82A0C400620233
60010FBC92A0C4011D6021906162B4E3
6002B7EFE762802180310F2C9714F18F
12A0C400616234E3600237EFE7628021
80310F2C9714F18F1CDCC40CD9140C9C
DB040CD9140C9CDB040CD8240C9CDCC4
0CD8240C9"
  19 FAST
  20 LET I=16514
  30 FOR J=1 TO LEN A$ 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

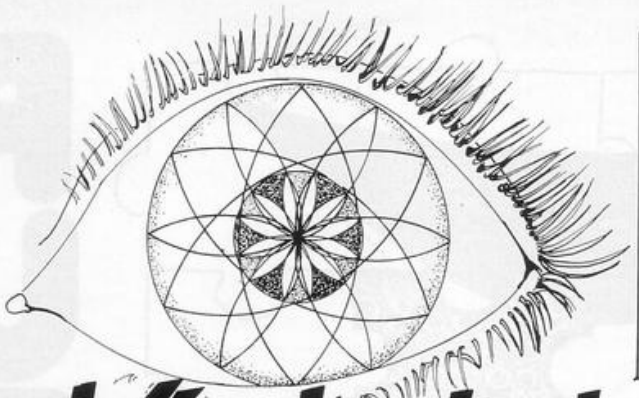
```
  10 LET A$="S0"
  20 LET A$(2)=STR$ (VAL A$(2)+1
)
  30 IF A$(2)="5" THEN GOTO 20
  40 FOR I=1 TO 22
  50 PRINT "===SINCLAIR USER AND
PROGRAMS==="
  60 NEXT I
  70 FOR I=1 TO 32
  80 RAND USR VAL A$
  90 NEXT I
 100 CLS
 110 GOTO 20
```



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,
5;"Best score so far:";l;"  ":
RETURN
```



```
 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

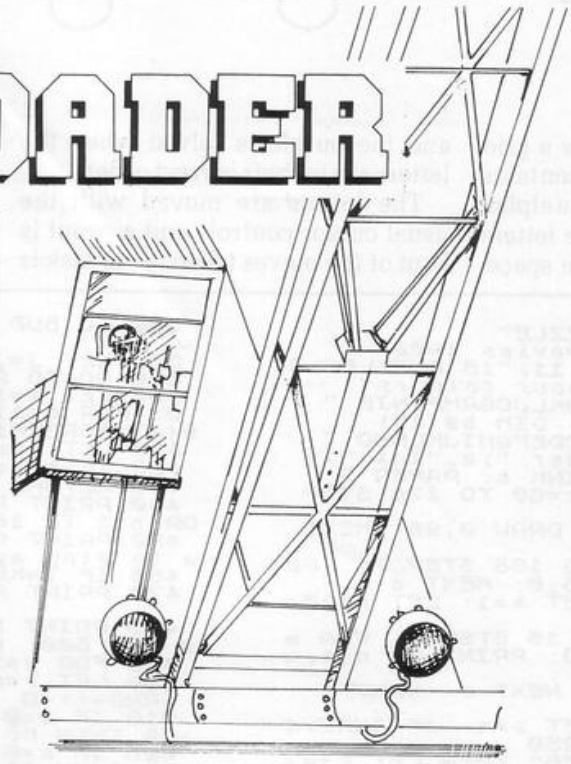
```
 10 LET N=INT (RND*250)+200
 20 FOR A=1 TO N
 30 LET V=INT (RND*22)
 40 LET H=INT (RND*32)
 50 'LET RV=21+(22-V)
 60 LET RH=31+(32-H)
 70 PLOT H,V
 80 PLOT RH,V
 90 PLOT RH,RV
100 PLOT H,RV
110 NEXT A
```

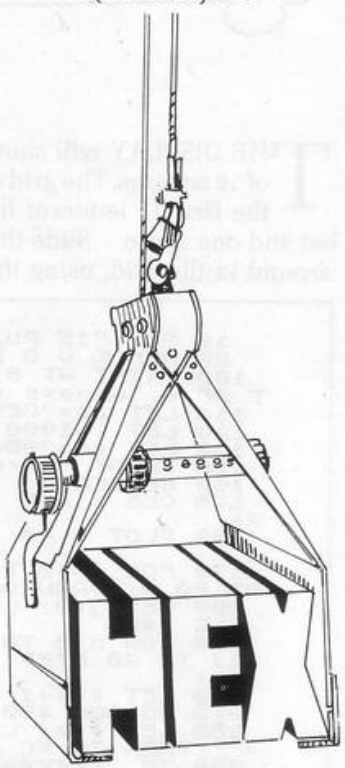
THE AUTHOR of **Kaleidoscope,** Matthew Calveley, of Lytham, Lancs, claims amazing results with this ZX-81 program. It will generate a random number of dots at random points on the bottom left of the screen and then re-create that pattern on the other quarters of the screen. All the patterns created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

Kaleidoscope occupies 1.2K of 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 A$
20 IF A$ = "S" THEN STOP
30 PRINT A$; "**";
40 POKE I, 16*(CODE (A$) - 28) + CODE
(TL$ (A$)) - 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.

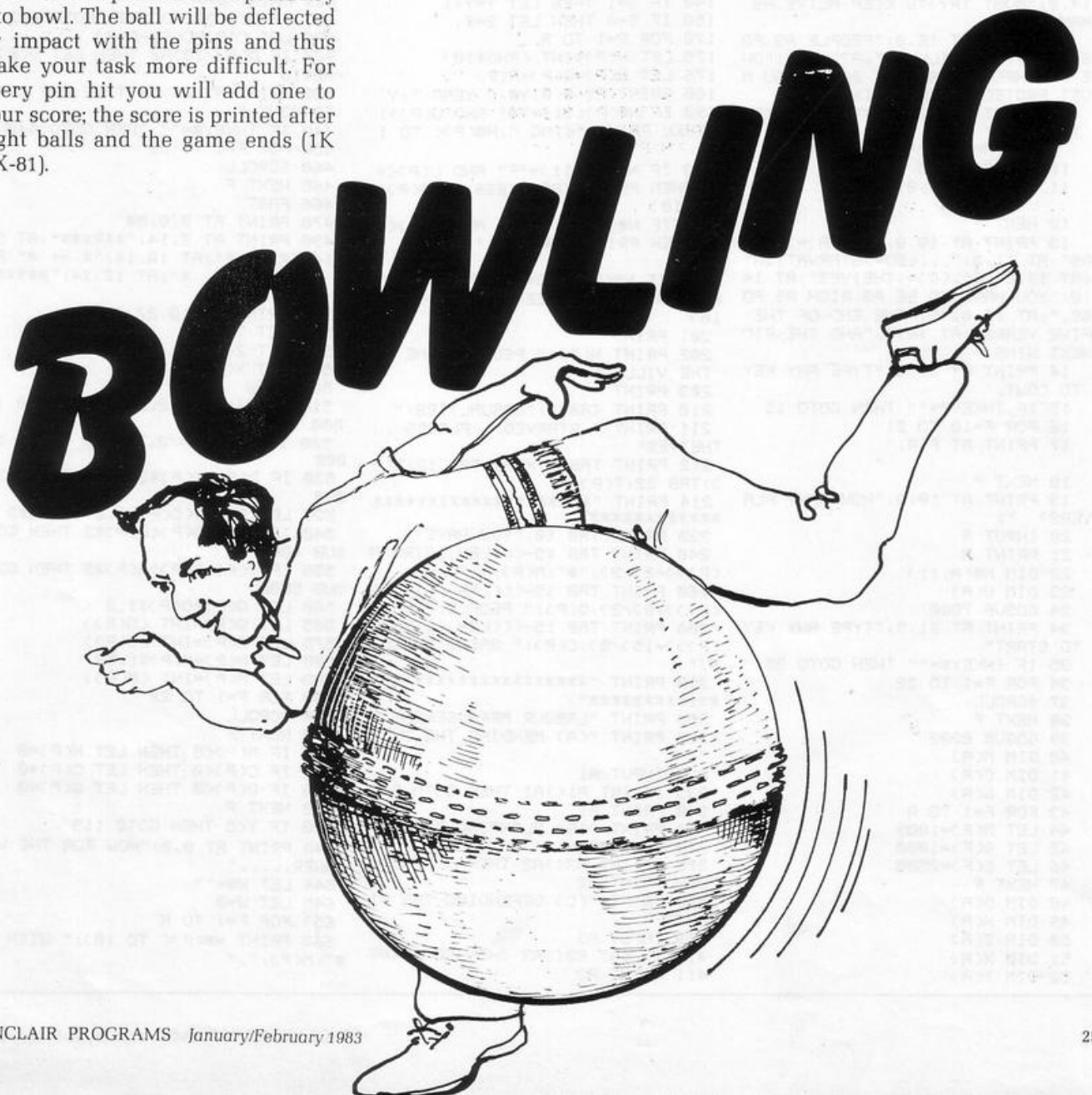
To remove the REM statement from line one, POKE 16403, 10. This program will help many people who still own a ZX-80 to obtain more power from it using machine code. Machine code programming is something which has not been entered into any great depth with the ZX-80.

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

```
  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;" 0 "
 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;"0";AT Y,X+M
;"(inverse 0)";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



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);","
```

FIVE-YEAR PLANS, monetarism, the green revolution, laissez faire and the dictatorship of the people. You can try them all.

Kingdom gives you a rural realm to regulate and five years in which to increase your personal wealth and protect your people against flood, famine and the depredations of the ruthless local banditry.

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
```

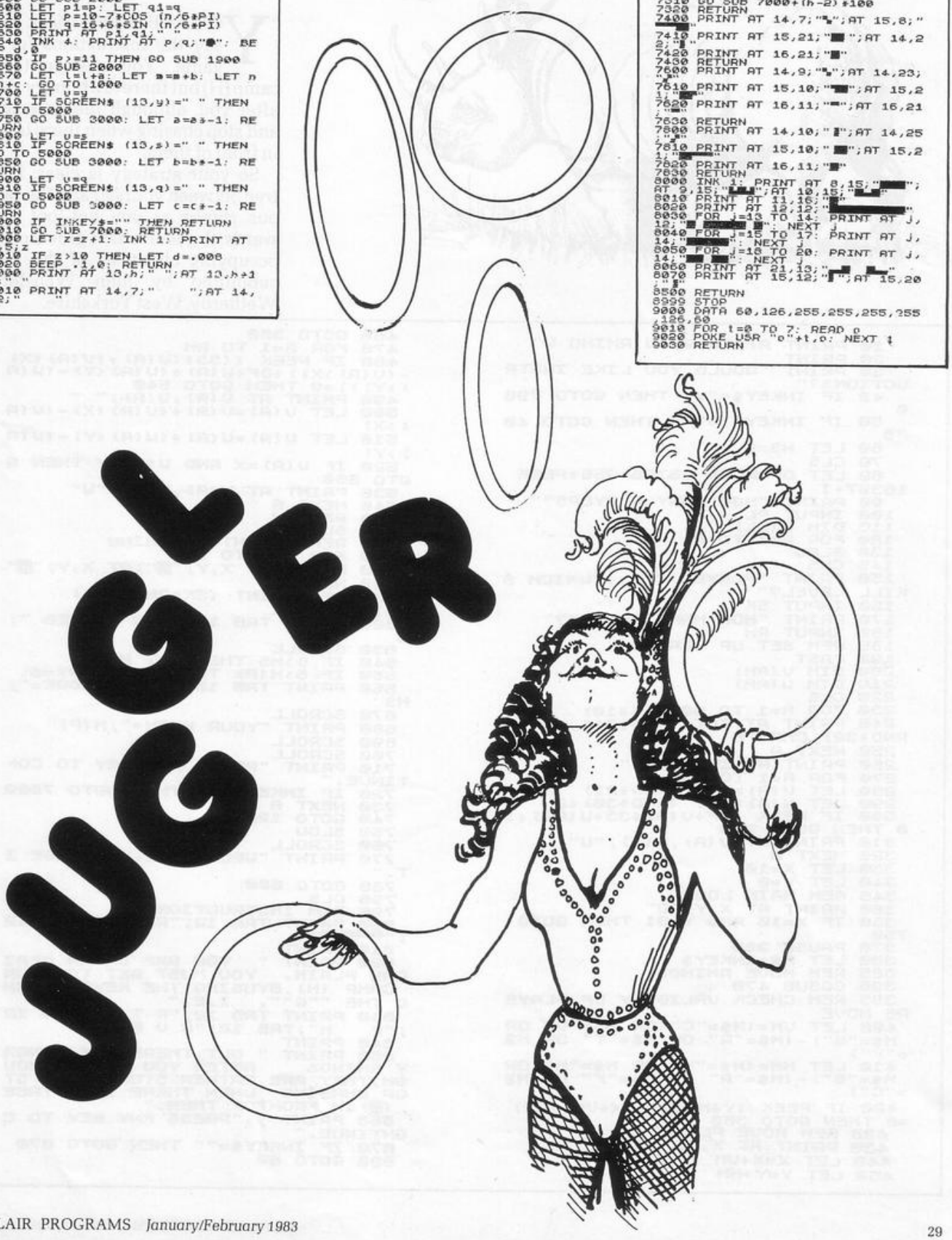
```
2020 LET K=INT (RND*10)+5
2025 IF K*6>Q(P) THEN LET K=INT
(Q(P)/6)
2030 FOR F=27 TO 16 STEP -1
2040 PRINT AT 10,F;"T "
2050 NEXT F
2060 FOR F=1 TO K
2070 PRINT AT 10,16;"(graphic 4)
"
2080 PRINT AT 10,16;"(graphic 1)
"
2090 PRINT AT 10,16;"(graphic 2)
"
2100 PRINT AT 10,16;"(graphic 3)
"
2110 NEXT 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
```

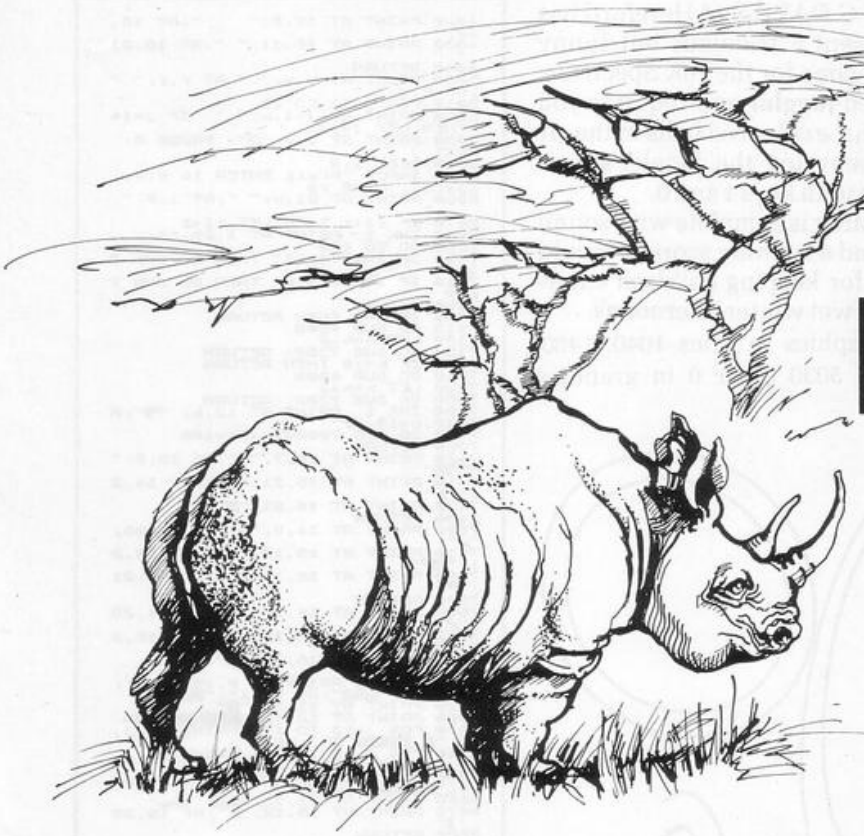
```
  100 REM  Juggler  © W G Davies
1982
  150 REM Use 1 & 0 keys to cont-
rol robot's arms
  200 GO SUB 9000
  300 LET h=8: LET z1=0: GO SUB 8
000
  400 LET z=0: PRINT AT 1,5;z
  450 PLOT 0,0: DRAW 255,0
  500 LET a=.4: LET b=.333: LET c
=.5
  550 LET l=9: LET m=9: LET n=9
  600 LET x=3: LET y=0: LET 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 ((/6*PI)
 1020 LET y=16+10*SIN ((/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 1800
 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=y
 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$="" THEN RETURN
 2010 GO SUB 7000: RETURN
 3000 LET z=z+1: INK 1: PRINT AT
1,5;z
 3010 IF z>10 THEN LET d=.008
 3020 BEEP .1,0: RETURN
 4000 PRINT AT 13,h;" ";AT 13,h+1
6;" "
 4010 PRINT AT 14,7;"    ";AT 14,
22;"  "
 4020 PRINT AT 15,8;"    ";AT 15,
22;"  "
 4030 PRINT AT 16,11;" ";AT 16,21
;" "
 4040 RETURN
 5000 PRINT AT x,y;" ";AT r,s;" "
;AT p,q;" "
 5010 FOR j=13 TO 21
 5020 PRINT AT j-1,v;" ": IF j=14
 THEN LET j=j+3
 5030 PRINT AT j,v;"☺": PAUSE 5:
NEXT j
 5040 BEEP 1,0
 5050 INPUT "Press ENTER to play
again"; LINE z$
 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=8 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
1;"▀▀"
 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
1;"▀▀"
 7820 PRINT AT 16,11;"▀"
 7830 RETURN
 8000 INK 1: PRINT AT 8,15;"▄▄";
AT 9,15;"▐▌▌";AT 10,15;"▀▀"
 8010 PRINT AT 11,16;"▀"
 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=16 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 "o"+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.





RHINO

"YOU ARE on an African plain," say the instructions for this game. "You must get to your camp (H) but there are hungry rhinos after you, although they are stupid and stop chasing when there is a tree in front of them."

So your strategy is clear; keep a tree between yourself and the ravenous rhinos as you hot-foot homewards. A game which grows on you, occupying about 4K of the ZX-81, submitted by John Webster of Wetherby, West Yorkshire.

```
  10 PRINT AT 10,9;"W RHINO W"
  20 PRINT
  30 PRINT "WOULD YOU LIKE INSTR
UCTIONS?"
  40 IF INKEY$="Y" THEN GOTO 790
0
  50 IF INKEY$<>"N" THEN GOTO 40
30
  60 LET HS=0
  70 CLS
  80 LET DF=PEEK 16396+256*PEEK
16397+1
  90 PRINT "HOW MANY PLAYERS?"
 100 INPUT PL
 110 DIM H(PL)
 120 FOR P=1 TO PL
 130 SLOW
 140 CLS
 150 PRINT "PLAYER ";P,,"WHICH S
KILL LEVEL?"
 160 INPUT SK
 170 PRINT "HOW MANY RHINOS?"
 180 INPUT RH
 185 REM SET UP SCREEN
 190 FAST
 200 DIM V(RH)
 210 DIM W(RH)
 220 CLS
 230 FOR A=1 TO 90-(SK*10)
 240 PRINT AT INT (RND*21),INT (
RND*32);CHR$ 8
 250 NEXT A
 260 PRINT AT 10,31;"H"
 270 FOR A=1 TO RH
 280 LET V(A)=INT (RND*21)
 290 LET W(A)=INT (RND*30)+2
 300 IF PEEK (DF+V(A)*33+W(A))<>
0 THEN GOTO 280
 310 PRINT AT V(A),W(A);"W"
 320 NEXT A
 330 LET X=10
 340 LET Y=0
 345 REM MAIN LOOP
 350 PRINT AT X,Y;"O"
 360 IF X=10 AND Y=31 THEN GOTO
750
 370 PAUSE 200
 380 LET M$=INKEY$
 385 REM MOVE RHINOS
 390 GOSUB 470
 395 REM CHECK VALIDITY OF PLAYE
RS MOVE
 400 LET VM=(M$="C" OR M$="V" OR
 M$="B")-(M$="R" OR M$="T" OR M$
="Y")
 410 LET HM=(M$="Y" OR M$="H" OR
 M$="B")-(M$="R" OR M$="F" OR M$
="C")
 420 IF PEEK (Y+HM+DF+(X+VM)*33)
=8 THEN GOTO 350
 425 REM MOVE PLAYER
 430 PRINT AT X,Y;" "
 440 LET X=X+VM
 450 LET Y=Y+HM
 460 GOTO 350
 470 FOR A=1 TO RH
 480 IF PEEK ((33*(V(A)+(V(A)<X)
-(V(A)>X))+DF+W(A)+(W(A)<Y)-(W(A
)>Y)))=8 THEN GOTO 540
 490 PRINT AT V(A),W(A);" "
 500 LET V(A)=V(A)+(V(A)<X)-(V(A
)>X)
 510 LET W(A)=W(A)+(W(A)<Y)-(W(A
)>Y)
 520 IF V(A)=X AND W(A)=Y THEN G
OTO 560
 530 PRINT AT V(A),W(A);"W"
 540 NEXT A
 550 RETURN
 560 SLOW
 565 REM CAUGHT BY RHINO
 570 FOR A=1 TO 10
 580 PRINT AT X,Y;"■";AT X,Y;"■"
 590 NEXT A
 600 LET S=INT (SK*RH*Y/31)
 610 SCROLL
 620 PRINT TAB 10;"YOU SCORED ";
S
 630 SCROLL
 640 IF S>HS THEN LET HS=S
 650 IF S>H(P) THEN LET H(P)=S
 660 PRINT TAB 10;"HIGH SCORE=";
HS
 670 SCROLL
 680 PRINT "YOUR HIGH=";H(P)
 690 SCROLL
 700 SCROLL
 710 PRINT "PRESS ANY KEY TO CON
TINUE."
 720 IF INKEY$="" THEN GOTO 7200
 730 NEXT A
 740 GOTO 120
 750 SLOW
 760 SCROLL
 770 PRINT "WELL DONE.YOU MADE I
T."
 780 GOTO 600
 790 CLS
 795 REM INSTRUCTIONS
 800 PRINT TAB 12;"RHINO";TAB 12
;"■■■■■"
 810 PRINT
 820 PRINT "  YOU ARE ON AN AFRI
CAN PLAIN.  YOU MUST GET TO YOUR
 CAMP (H),BYUSING THE KEYS AROUN
D THE ""G"".  I.E."
 830 PRINT TAB 12;"R T Y";TAB 12
;"F   H";TAB 12;"C V B"
 840 PRINT
 850 PRINT " BUT,THERE ARE HUNGR
Y RHINOS    AFTER YOU (W),ALTHOU
GH,THEY ARE RATHER STUPID AND ST
OP CHASING  WHEN THERE IS A TREE
 (■) IN FRONTOF THEM."
 860 PRINT ,,"PRESS ANY KEY TO C
ONTINUE."
 870 IF INKEY$="" THEN GOTO 870
 880 GOTO 60
```

√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).

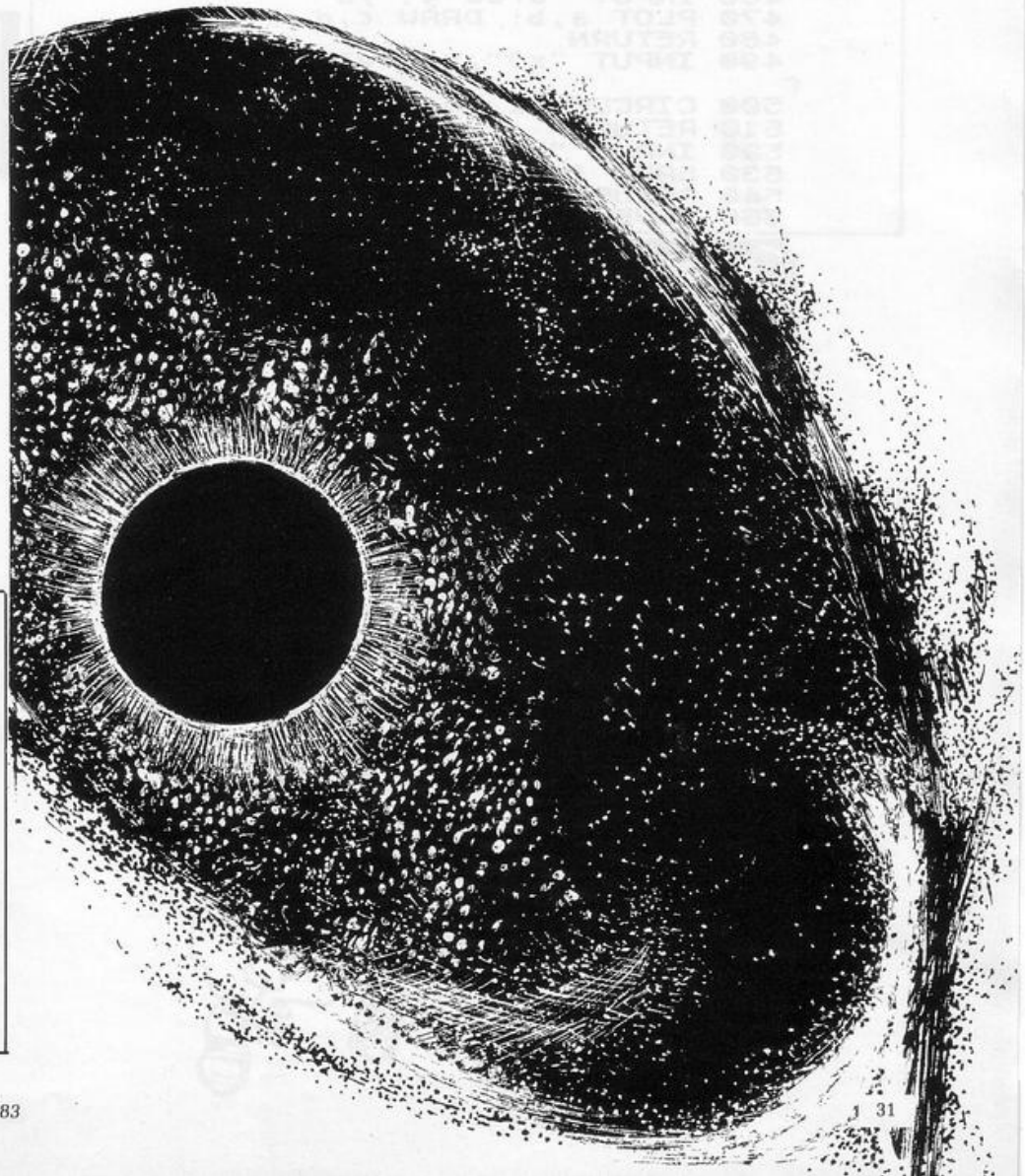
```
 5~REM FACTORS
 10 FAST
 20 INPUT A
 30 PRINT A;
 40 FOR B=A-1 TO 1 STEP -1
 50 IF A/B=INT (A/B) THEN PRINT
",";B;
 60 NEXT B
 70 PRINT "."
 80 RUN


 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
```



```
  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 o;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).

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"
```

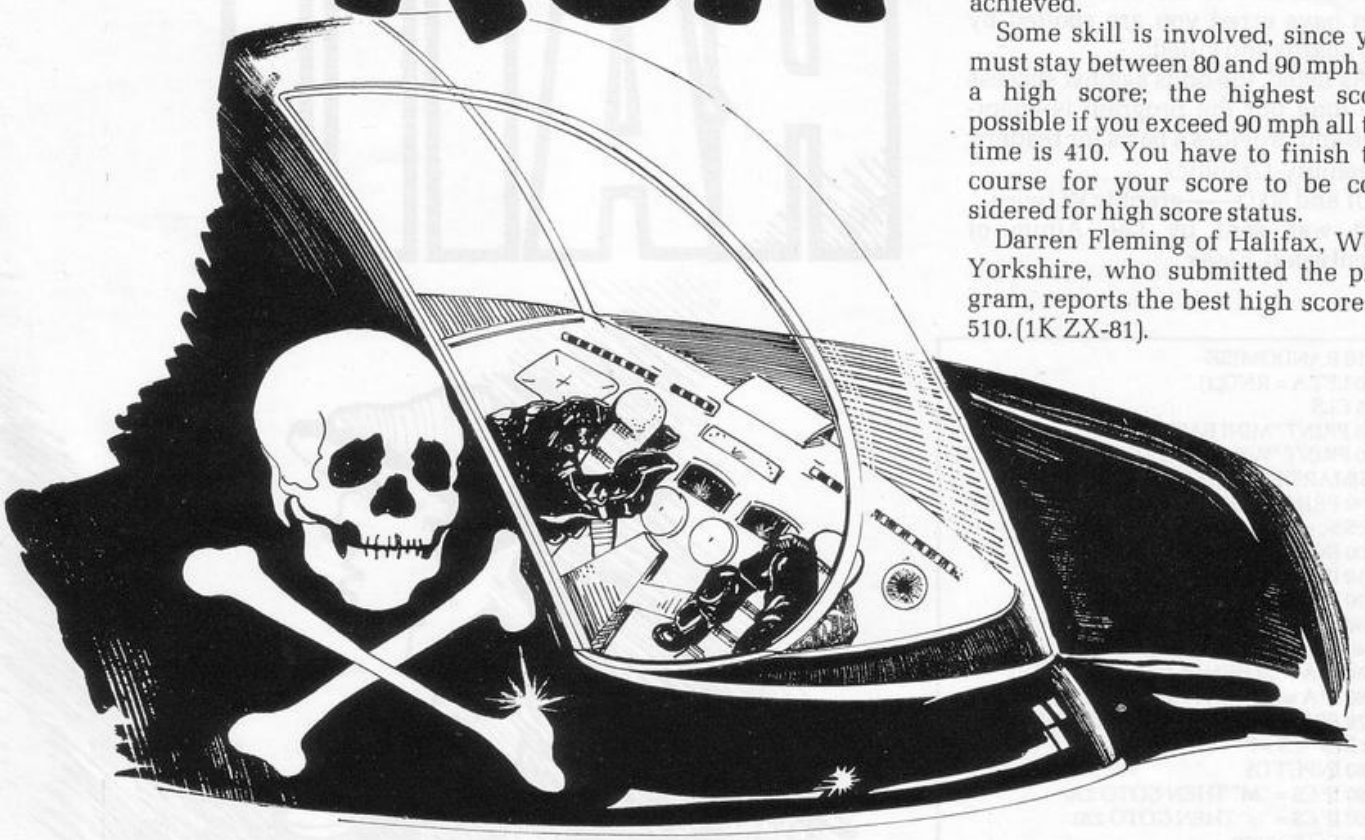
DEATH RUN

DEATH RUN just about fills 1K of the ZX-81. Your speed is displayed in miles per hour, starting at zero and rising in tens. When it reaches 80 your score begins to rise in tens. Be careful; if your speed exceeds 90 and 'OILY ROAD' is displayed in the top left-hand corner you are very likely to add to the accident statistics.

So slow down by pressing 1. You can also increase speed by inputting Ø. When you exceed 90mph the variable Q increases by one, and when Q reaches 40 you have finished and your score is displayed, along with high score and the highest speed achieved.

Some skill is involved, since you must stay between 80 and 90 mph for a high score; the highest score possible if you exceed 90 mph all the time is 410. You have to finish the course for your score to be considered for high score status.

Darren Fleming of Halifax, West Yorkshire, who submitted the program, reports the best high score as 510. (1K ZX-81).



```
  1 LET E=0
  2 LET H=0
  4 LET Q=0
  6 LET D=0
 10 LET S=0
 20 LET J=INT (RND*5)
 21~IF S>80 THEN LET D=D+10
 22 IF S>90 THEN LET Q=Q+1
 23 IF Q=40 THEN GOTO 400
 40 LET K=INT (RND*14)
 41 LET S=S+10
 42 IF INKEY$="1" THEN LET S=S+
5
 43~IF INKEY$="0" THEN LET S=S-
15
 44 IF S>E THEN LET E=S
 50~IF K<6 THEN PRINT AT 0,0;"O
ILY ROAD"
 51 IF K>6 THEN PRINT AT 0,0;"
 55 IF K<6 AND S>90 AND J=3 THE
N GOTO 300
 100 PRINT AT 10,14;"MPH=";S;" "
 130 GOTO 20
 300 CLS
 310 PRINT "***CRASH BANG WALLOP
***","SCORE";D
 315 PAUSE 200
 316~CLS
 320 GOTO 4
 400 CLS
 410 IF D>H THEN LET H=D
 420 PRINT AT 10,0;"***FINISH***
SCORE=";D,"HIGH SCORE=";H,,"HIGH
 SPEED=";E
 421 PAUSE 200
 422 CLS
 430 GOTO 4
```

MINI BANK RAID

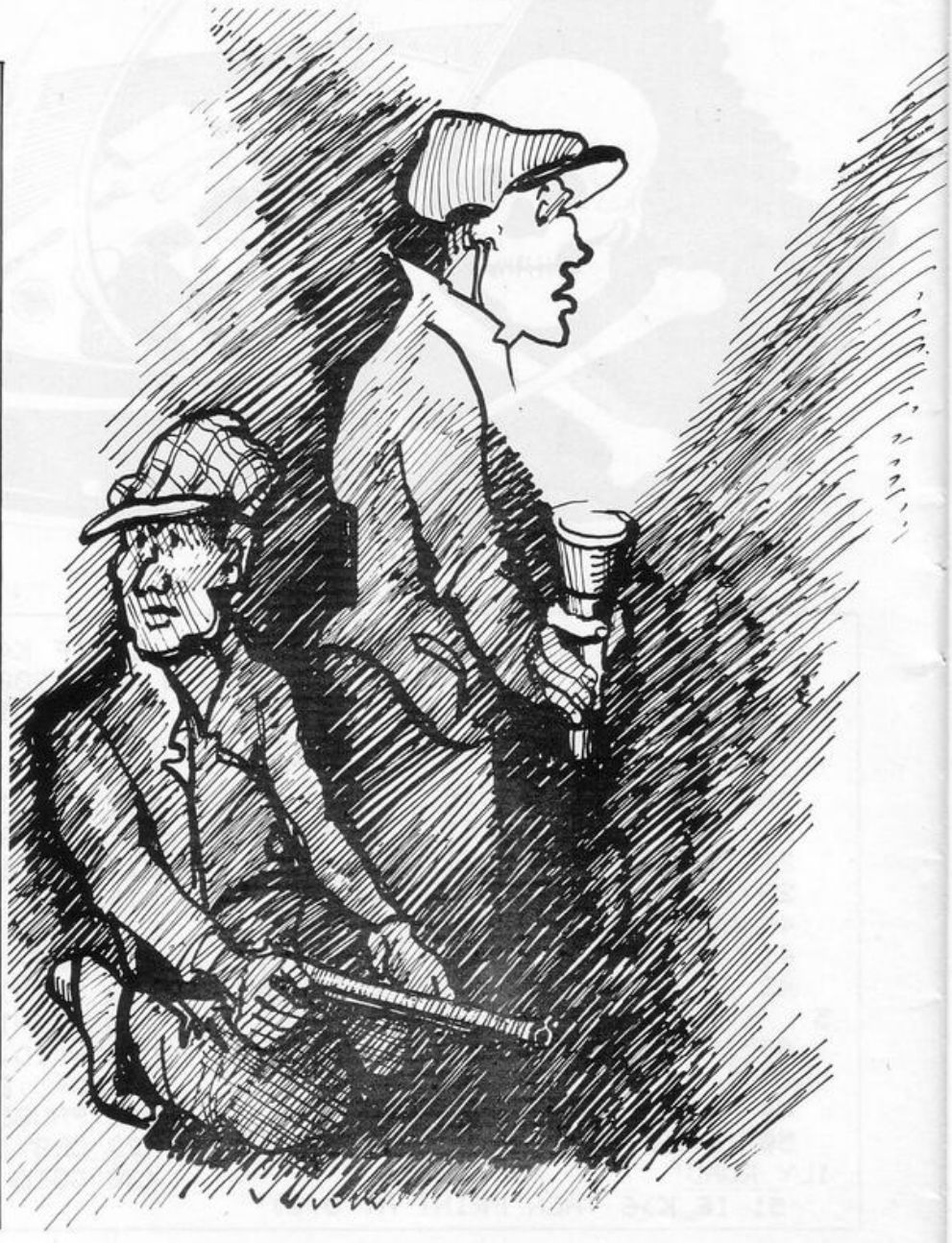
MINI BANK RAID is the basis of an adventure game for the ZX-80. You are equipped with weapons and can choose to use one of them or to run. If you manage to beat the odds and gain entry to the bank, you must use your torch, T, to look into one of the three vaults. If you have erred you are spotted by the guards and killed.

As listed, the odds against success are long but the program is adaptable and provides a basis for readers' ingenuity. Graphics:
5001 and 5003——graphic W twice.

It was sent by Lee Allum of Brentwood, Essex.

```
 10 RANDOMISE
 20 LET A = RND(3)
 25 CLS
 30 PRINT "MINI BANK RAID"
 50 PRINT "WEAPONS ARE (S)HOOT, (R)UN,
(S)MART BOMB, (M)YSTERY."
 90 PRINT "YOU ARE ABOUT TO BE SHOT
<S> <R>?"
100 INPUT B$
110 IF B$ = "S" THEN GOTO 140
120 IF B$ = "R" THEN GOTO 140
130 GOTO 5000
140 IF A = 1 THEN GOTO 5000
150 IF A = 2 THEN GOTO 5000
160 IF A = 3 THEN PRINT "YOU ESCAPED"
170 PRINT "TWO GUARDS APPROACHING
<M> <S>?"
180 INPUT C$
190 IF C$ = "M" THEN GOTO 220
200 IF C$ = "S" THEN GOTO 220
210 GOTO 5000
215 LET A = RND(3)
220 IF A = 1 THEN GOTO 5000
230 IF A = 2 THEN GOTO 5000
235 IF A = 3 THEN PRINT "YOU ESCAPED"
240 PRINT "YOU ARE IN THE BANK <T>"
250 INPUT D$
260 IF D$ = "T" THEN GOTO 280
270 GOTO 5000
280 FOR I = 1 TO 3
290 PRINT I; "<**>"
300 NEXT I
310 INPUT E
320 IF NOT E = RND(3) THEN GOTO 5000
330 IFE = RND(3) THEN GOTO 350
350 CLS
360 LET X = RND (100)
379 LET Z = RND (100)
380 PRINT "WELL DONE, YOU HAVE RUN
AWAY WITH £"; X*Z
990 STOP
5000 CLS
5001 PRINT "□■O■□"
5002 PRINT "□□■□□"
5003 PRINT "□■□■□"
5004 PRINT "YOU HAVE BEEN KILLED."
5010 INPUT G$
5020 IF G$ = "R" THEN GOTO 25
```

□IS A SPACE

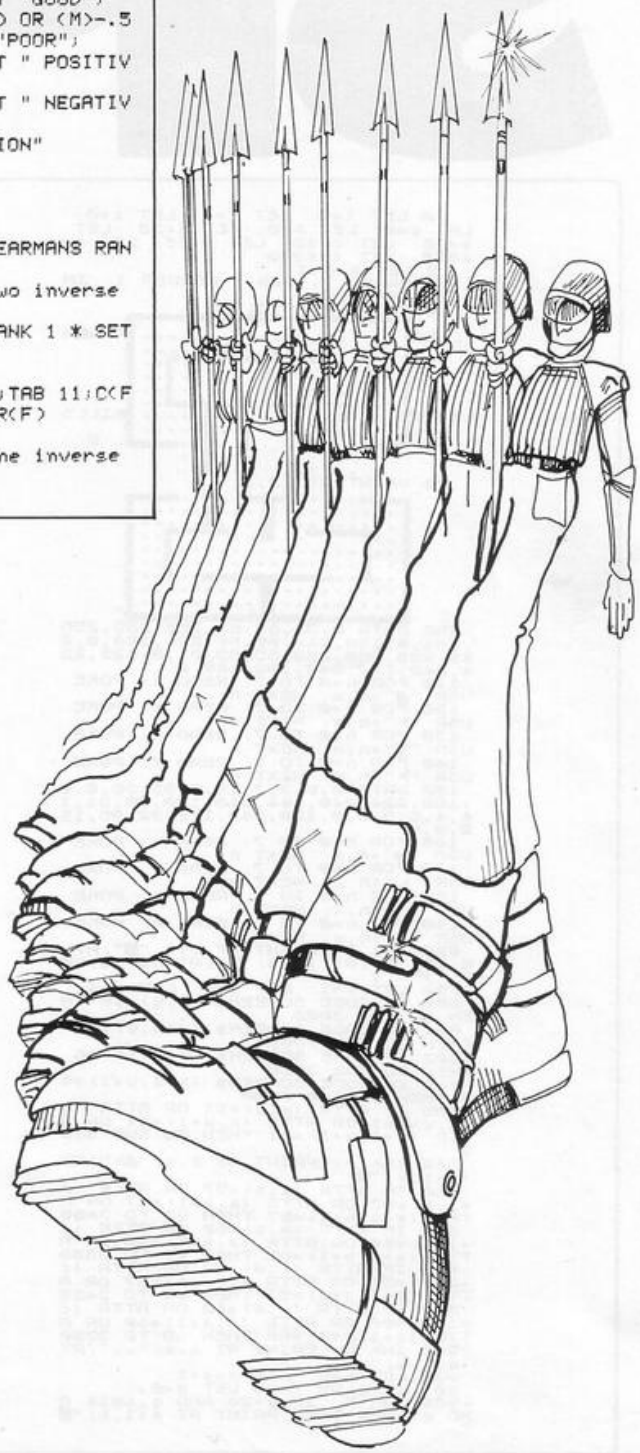


```
  1 REM SPEARMAN
 50 PRINT AT 21,0;"  SPEARMANS
RANK COEFFICIENT"
 52 PAUSE 50
 55 SCROLL
 56 SCROLL
 60 PRINT AT 21,0;"NO. OF VALUE
S?"
 70 INPUT I
 75 SCROLL
 76 IF I>=10 THEN PRINT CHR$ 15
7;CHR$ (I+146)
 77 IF I<10 THEN PRINT CHR$ (I+
156)
 78 SCROLL
 82 LET J=0
 83 LET K=0
 85 LET B=0
 87 DIM 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
SPACESs)"
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).



SPACE

```
   2 LET t=0: LET l=4: LET k=0:
LET g=0: LET p=0: LET a=10: LET
b=15: LET c=10: LET d=15: LET e=
4000: LET f=4200
   5 LET g=g+1
   6 PAPER 7: CLS : BORDER 1: IN
K 2: PAPER 7
  10 PRINT AT 0,5;
"
SCORE                    POWER
                  .
                  .
                  .
                  .
                  .
LIVES                    KILLS
  4                        0
                  .
                  .
                  .
                  .
                  .
                  "
  20 PRINT AT 12,5;
"
                  .
                  .
                  .
                  .
                  .
```

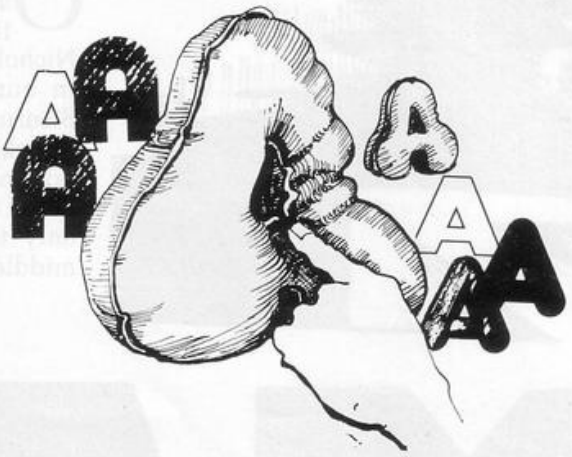
OUR TIRELESS quest for that arcade-quality Pacman continues, this time led by Nicholas Lock of Faversham, Kent. In our last issue we showed S J Stearn's version, but pointed out that it lacked exits and power pills. The missing items are both supplied here but at the cost of a listing that needs only to be tied around a puppy's middle to look like something out of an Andrex advertisement. Now the bad news. Pacman's jaws do not move. The maze is rather simple and the ghosts have no hunter-killer capability and can therefore be toyed with in a way which would amount to committing Atari-kiri on the arcade version.

We seek him here, we seek him there—that cursed, elusive Pacman (16K Spectrum).

MAN2

```
3415 PRINT AT a,b;"  ";AT a+1,b;
"  "
3420 LET t=t+250: LET e=4000
3430 LET k=k+1: PRINT AT 9,29;k
3440 GO TO 910
3450 FOR n=30 TO 50: BEEP .1,n:
NEXT n
3465 PRINT AT c,d;"  ";AT c+1,d;
"  "
3470 LET t=t+250: LET f=4200
3475 LET k=k+1: PRINT AT 9,29;k
3480 GO TO 940
4000 LET a=9: LET b=15: RETURN
4001 LET a=8: LET b=15: RETURN
4002 LET a=7: RETURN
4003 LET b=14: RETURN
4004 LET b=13: RETURN
4005 LET b=12: RETURN
4006 LET a=8: RETURN
4007 LET a=9: RETURN
4008 LET a=10: RETURN
4009 LET a=11: RETURN
4010 LET a=12: RETURN
4011 LET a=13: RETURN
4012 LET b=13: RETURN
4013 LET a=14: RETURN
4014 LET a=15: RETURN
4015 LET a=16: RETURN
4016 LET b=12: RETURN
4017 LET b=11: RETURN
4018 LET b=10: RETURN
4019 LET b=9: RETURN
4020 LET a=17: RETURN
4021 LET a=18: RETURN
4022 LET a=19: RETURN
4023 LET b=10: RETURN
4024 LET b=11: RETURN
4025 LET b=12: RETURN
4026 LET b=13: RETURN
4027 LET b=12: RETURN
4028 LET b=11: RETURN
4029 LET b=10: RETURN
4030 LET b=9: RETURN
4031 LET b=8: RETURN
4032 LET b=7: RETURN
4033 LET b=6: RETURN
4034 LET a=18: RETURN
4035 LET a=17: RETURN
4036 LET a=16: RETURN
4037 LET a=15: RETURN
4038 LET a=14: RETURN
4039 LET a=13: RETURN
4040 LET b=7: RETURN
4041 LET b=8: RETURN
4042 LET b=9: RETURN
4043 LET a=12: RETURN
4044 LET a=11: RETURN
4045 LET a=10: RETURN
4046 LET a=9: RETURN
4047 LET a=8: RETURN
4048 LET a=7: RETURN
4049 LET b=8: RETURN
4050 LET b=7: RETURN
4051 LET b=6: RETURN
4052 LET a=6: RETURN
4053 LET a=5: RETURN
4054 LET a=4: RETURN
4055 LET a=3: RETURN
4056 LET a=2: RETURN
4057 LET a=1: RETURN
4058 LET b=7: RETURN
4059 LET b=8: RETURN
4060 LET b=9: RETURN
4061 LET b=10: RETURN
4062 LET b=11: RETURN
4063 LET b=12: RETURN
4064 LET b=13: RETURN
4065 LET b=14: RETURN
4066 LET b=15: RETURN
4067 LET b=16: RETURN
4068 LET b=17: RETURN
4069 LET b=18: RETURN
4070 LET b=19: RETURN
4071 LET b=20: RETURN
4072 LET b=21: RETURN
4073 LET a=2: RETURN
4074 LET a=3: RETURN
4075 LET a=4: RETURN
4076 LET b=20: RETURN
4077 LET b=19: RETURN
4078 LET b=18: RETURN
4079 LET b=17: RETURN
4080 LET a=5: RETURN
4081 LET a=6: RETURN
4082 LET a=7: RETURN
4083 LET b=16: RETURN
4084 LET e=4000: RETURN
4085 LET e=4000: RETURN
4200 LET c=9: LET d=15: RETURN
4201 LET c=8: LET d=15: RETURN
4202 LET c=7: RETURN
4203 LET d=14: RETURN
4204 LET d=13: RETURN
4205 LET c=6: RETURN
4206 LET c=5: RETURN
4207 LET c=4: RETURN
4208 LET d=12: RETURN
4209 LET d=11: RETURN
4210 LET d=10: RETURN
4211 LET d=9: RETURN
4212 LET c=3: RETURN
4213 LET c=2: RETURN
4214 LET c=1: RETURN
4215 LET d=10: RETURN
4216 LET d=11: RETURN
4217 LET d=12: RETURN
4218 LET d=13: RETURN
4219 LET d=14: RETURN
4220 LET d=15: RETURN
4221 LET d=16: RETURN
4222 LET d=17: RETURN
4223 LET d=18: RETURN
4224 LET d=19: RETURN
4225 LET d=20: RETURN
4226 LET d=21: RETURN
4227 LET d=22: RETURN
4228 LET d=23: RETURN
4229 LET d=24: RETURN
4230 LET c=2: RETURN
4231 LET c=3: RETURN
4232 LET c=4: RETURN
4233 LET c=5: RETURN
4234 LET c=6: RETURN
4235 LET c=7: RETURN
4236 LET d=23: RETURN
4237 LET d=22: RETURN
4238 LET d=21: RETURN
4239 LET c=8: RETURN
4240 LET c=9: RETURN
4241 LET c=10: RETURN
4242 LET c=11: RETURN
4243 LET c=12: RETURN
4244 LET c=13: RETURN
4245 LET d=22: RETURN
4246 LET d=23: RETURN
4247 LET d=24: RETURN
4248 LET c=14: RETURN
4249 LET c=15: RETURN
4250 LET c=16: RETURN
4251 LET c=17: RETURN
4252 LET c=18: RETURN
4253 LET c=19: RETURN
4254 LET d=23: RETURN
4255 LET d=22: RETURN
4256 LET d=21: RETURN
4257 LET d=20: RETURN
4258 LET d=19: RETURN
4259 LET d=18: RETURN
4260 LET d=17: RETURN
4261 LET d=18: RETURN
4262 LET d=19: RETURN
4263 LET d=20: RETURN
4264 LET d=21: RETURN
4265 LET c=18: RETURN
4266 LET c=17: RETURN
4267 LET c=16: RETURN
4268 LET d=20: RETURN
4269 LET d=19: RETURN
4270 LET d=18: RETURN
4271 LET d=17: RETURN
4272 LET c=15: RETURN
4273 LET c=14: RETURN
4274 LET c=13: RETURN
4275 LET d=18: RETURN
4276 LET c=12: RETURN
4277 LET c=11: RETURN
4278 LET c=10: RETURN
4279 LET c=9: RETURN
4280 LET c=8: RETURN
4281 LET c=7: RETURN
4282 LET c=10: LET d=15: RETURN
4283 LET f=4200: RETURN
```

INDEXER



```
  10 LET A$="ABCDEFGHIJKLMNOPQRS
TUVWXZ"
  20 PRINT AT 11,5;"TYPE IN INDE
X REQUIRED"
  30 INPUT W$
  40 LET P=500
  50 FOR J=1 TO 26
  60 IF A$(J)=W$ THEN GOSUB P
  80 NEXT J
  90 STOP
```

THIS USEFUL routine for the unexpanded ZX-81 can be added to a program which contains a list of names in alphabetical order. The list can start at line 500 with a list of the As, then on to line 850 for the Bs, and so on, adding 350 to reach the start line of each letter.

All the user has to do is enter the list index letter required and the program will print-out names or addresses starting with that letter. **Indexer** was sent by M A Wood of Garston, Liverpool.

Streamers

YOUR COMPUTER club stand at local microfairs need no longer look grey and dull—because of **Streamer**. The program, which was sent by John Hague of Sheffield, will print any string of characters less than 32 characters long in large letters on the printer.

The program uses three inverse spaces at line 160 (16K Spectrum).

```
  10 REM "SPECTRAL STREAMERS"
  20 REM © JOHN HAGUE 1982
  25 CLS
  30 REM Set up colours here for
 display
  35 PRINT FLASH 1;AT 2,7;"SPECT
RAL STREAMERS"
  40 PRINT AT 5,2;"ENTER YOUR WO
RDING - NO MORE"
  50 PRINT AT 7,1;"THAN 32 CHARA
CTERS AT ONE TIME"
  60 PRINT AT 9,3;"THE PRINTER W
ILL PRODUCE A"
  70 PRINT AT 11,1;"STREAMER WHI
CH YOU CAN ADD TO."
  80 PRINT AT 13,4;"PRESS ENTER
TO CONTINUE"
  90 INPUT R$
 100 CLS
 110 INPUT "ENTER WORDING";A$
 120 PRINT AT 21,0;A$
 125 IF LEN A$>32 THEN GO TO 110
 130 FOR C=0 TO (LEN A$*8+1)
 140 FOR N=1 TO 2
 150 FOR L=0 TO 7
 160 IF POINT (C,L)=1 THEN LPRIN
T "■■■■";
 170 IF POINT (C,L)=0 THEN LPRIN
T "    ";
 180 NEXT L
 190 NEXT N
 200 NEXT C
 210 PRINT AT 10,1;"Do you want
any more? (y or n)": INPUT R$: G
O TO (R$="y")*100+(R$="n")*220+(
R$<>"y")*(R$<>"n")*210
 220 PRINT FLASH 1;AT 12,14;"BYE
!": STOP
```

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)="58682"
 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 ▒OLLE
▒▒"
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
```

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"
```

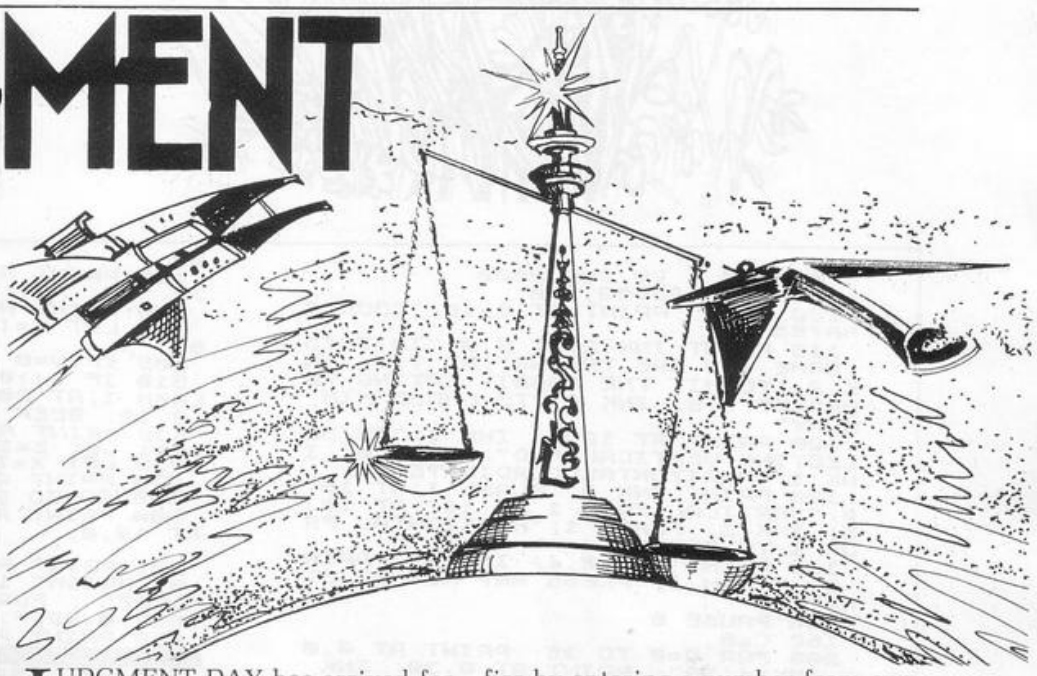
```
  5 DIM N(20)
 10 LET D=1
 20 FOR B=1 TO D
 30 LET N(B)=INT (RND*3)
 40 GOTO N(B)*50
 50 FOR A=1 TO 200
 60 SLOW
 70 FAST
 80 NEXT A
 90 GOTO 500
100 FOR A=1 TO 200
110 SLOW
115 FAST
130 NEXT A
140 GOTO 500
150 FOR A=1 TO 200
160 SLOW
170 FAST
175 FAST
180 NEXT A
190 GOTO 500
500 NEXT B
510~FOR C=1 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
```

SIMPLE SIMON

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.

RABBIT RUN

A RABBIT is in one of your fields eating your crops and you have to get rid of it by throwing objects at it. The game runs on the 16K Spectrum and uses user-defined graphics to create the field and our little furry friend.

You throw an object at the rabbit by putting into the computer the co-ordinates of where you think it is on the screen. If you are correct and your object hits the rabbit it will run away but if you are incorrect your crops will continue to disappear.

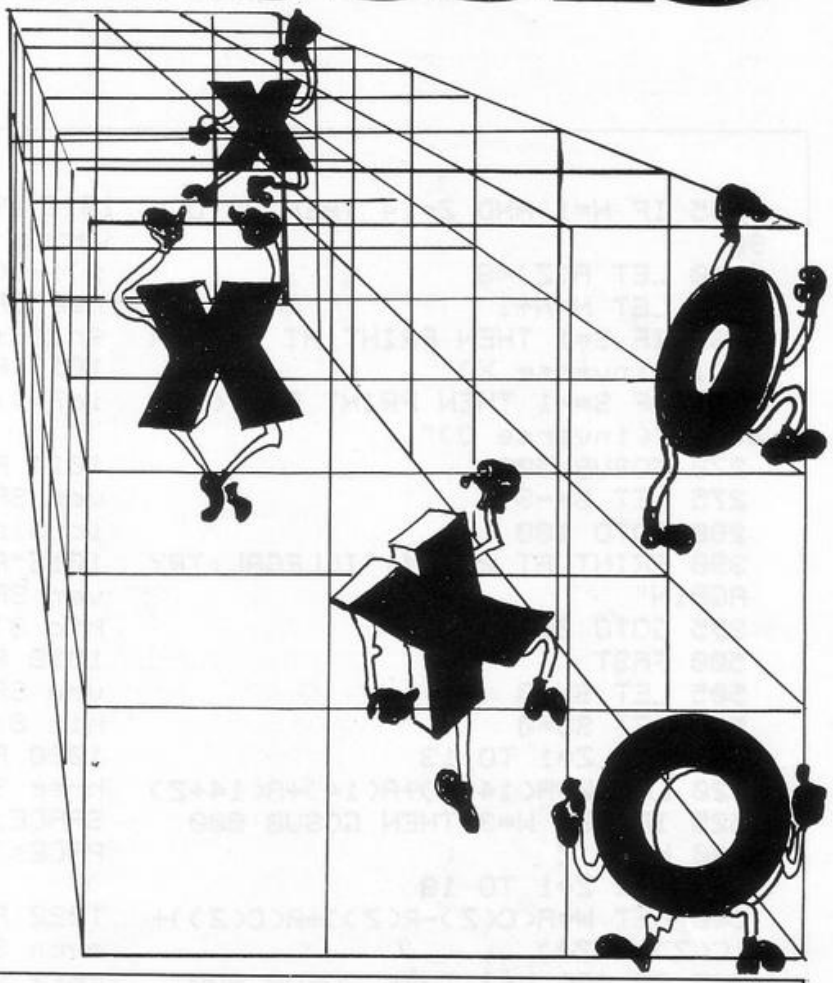
The user-defined graphics are set up using a subroutine at line 2000. The graphics characters used are:
Lines 200, 210 graphic A.
Lines 320, 535 graphic B.
Line 430, graphic C.

To set up the graphics, type RUN and then to run the game type RUN 50.

The program was sent by David Price, of Caerphilly, Glamorgan.

```
  10 CLS : GO SUB 2000
  50 POKE 23609,100
 100 CLS : PRINT AT 0,10;"COORDI
NATES"
 110 PRINT INK 2;AT 5,0;"IN THIS
 GAME YOU ARE TRYING";AT 7,0; IN
K 2;"TO HIT THE RABBIT EATING YO
UR";AT 9,0; INK 2;"TO CHASE HIM
AWAY"
 120 PRINT AT 12,0; INK 1;"BY SE
LECTING VERTICAL AND";AT 14,0; I
NK 1;"HORIZONTALCOORDINATES"
 130 PRINT INK 3; FLASH 1;AT 16,
0;"VERTICAL FROM 1 TO 14";AT 18,
0; INK 3; FLASH 1;"HORIZONTAL FR
OM 1 TO 29"
 140 PRINT AT 20,4; INK 7; PAPER
 0; FLASH 1;"PRESS ANY KEY TO ST
ART"
 150 PAUSE 0
 160 CLS
 200 FOR Q=0 TO 15: PRINT AT Q,0
; INK 4;"A": PRINT AT Q,30; INK
4;"A": NEXT Q
 210 FOR W=1 TO 29: PRINT AT 0,W
; INK 4;"A";AT 15,W; INK 4;"A":
NEXT W
 300 LET Z=INT (RND*14)+1
 310 LET X=INT (RND*29)+1
 320 PRINT AT Z,X; INK 1;"B"
 330 LET C=0
 340 INPUT "vertical (1-14)";A
 350 IF A<1 OR A>14 THEN GO TO 3
40
 355 LET C=C+1
 360 PRINT AT 17,1;"VERTICAL    "
;A;"  "
 400 INPUT "Horiz. (1-29)";B
 410 IF B<1 OR B>29 THEN GO TO 4
00
 420 PRINT AT 19,1;"HORIZONTAL "
;B;"  ";
 430 PRINT AT A,B; INK 2;"C"
 500 LET V=(Z-A)*(Z-A)+(X-B)*(X-
B)
 505 IF V=0 THEN GO TO 500
 510 IF V<>0 THEN PRINT INK 1; F
LASH 1;AT 20,14;"MISSED": BEEP 0
.2,12: BEEP 0.2,6
 530 PRINT AT Z,X;" "
 531 LET Z=INT (RND*14)+1
 532 LET X=INT (RND*29)+1
 535 PRINT AT Z,X;"B"
 550 GO TO 340
 600 PRINT AT 20,14;"          ";
AT 19,0;"
 601 PRINT AT 17,0; INK 7; PAPER
 0; BRIGHT 1;"YOU GOT ME IN ";C;
" GOES": FOR F=50 TO 1 STEP -1:
BEEP 0.02,F: NEXT F
 610 PRINT AT 19,0;"
                                "
 630 LET S$=INKEY$
 635 IF INKEY$="" THEN GO TO 630
 640 IF INKEY$<>"Y" THEN GO TO 1
000
 650 GO TO 160
1000 STOP
2000 FOR N=0 TO 7: READ A: POKE
USR "A"+N,A: NEXT N
2001 FOR N=0 TO 7: READ A: POKE
USR "B"+N,A: NEXT N
2002 FOR N=0 TO 7: READ A: POKE
USR "C"+N,A: NEXT N: RETURN
2010 DATA 24,124,90,153,60,90,15
3,24
2020 DATA 64,64,224,191,255,36,3
6,108
2030 DATA 0,0,50,60,60,0,0,0
```

3-D NOUGHTS & CROSSES

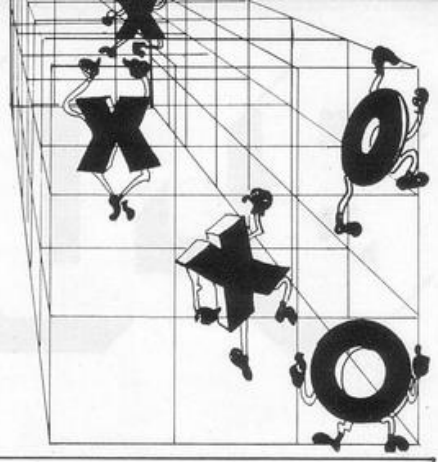


P R SCOTT of Goldalming, Surrey, has sent the kind of program Mr Spock plays on long, winter evenings. **3D Noughts and Crosses** displays a cube and 27 possible positions for the Xs and Os. Unlike the 2D version, the game must be continued until all the positions are filled, the object being not to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

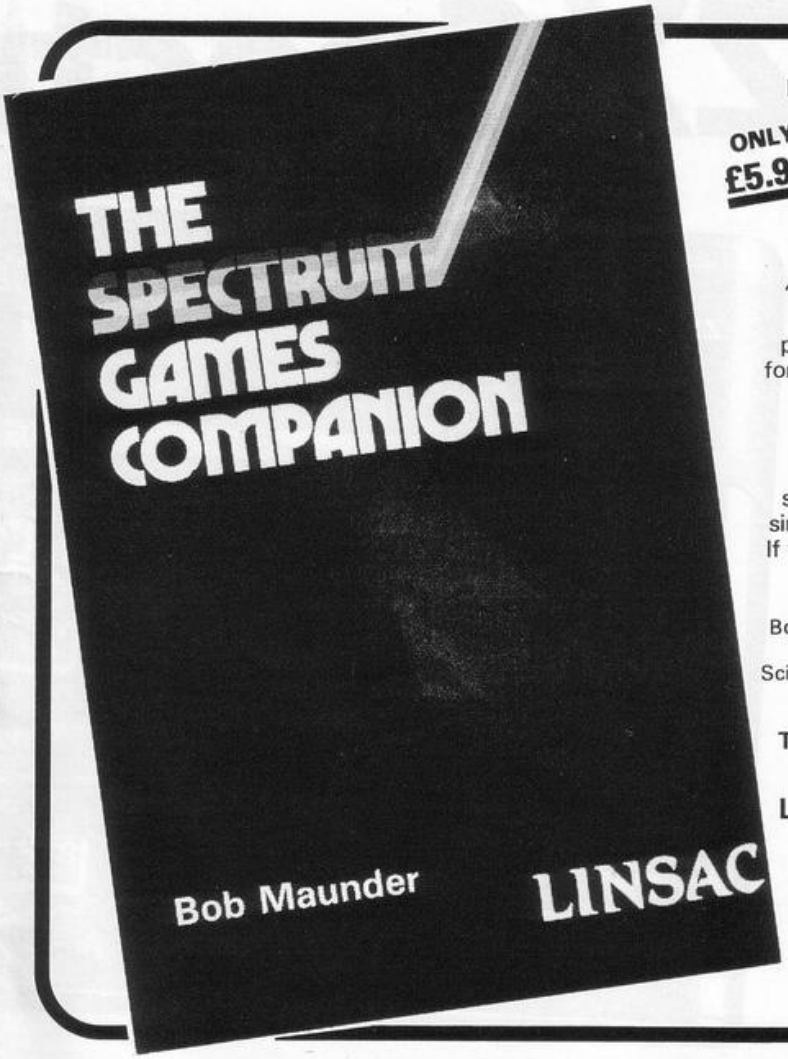
The player who starts has an advantage, as finally he occupies one space more than his opponent and so, to level matters, the first player is prevented from occupying the centre square on his first attempt.

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$="020814020814020814061218061218061218101622101622101622"
 35 LET Y$="060606121212181804040410101016161602020208080814141414"
 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$="020405050505060810111111112131313131"
 65 LET R$="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
```



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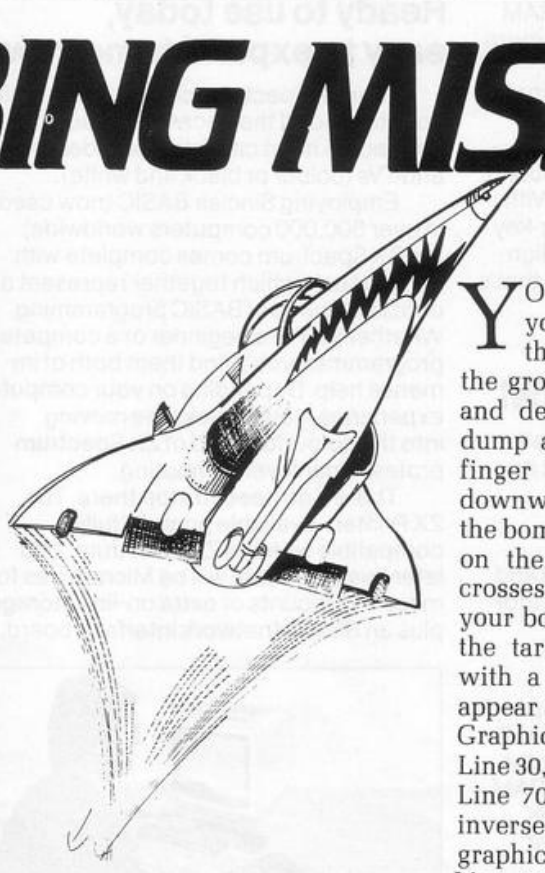
BOMBING MISSION



YOU SIT tensely in the seat of your cockpit, staring anxiously through your viewfinder at the ground. Your mission is to find and destroy the enemy munitions dump as quickly as possible. Your finger stabs at the key with the downward arrow marked on it and the bomb is released. The game runs on the 1K ZX-81; as the aircraft crosses the sky you must release your bomb using the 6 key to bomb the target on the ground marked with a graphic A. The target will appear randomly on each run.

Graphics notes:

Line 30, graphic S.

Line 70, graphics T, Y, T, 6, 2 '—', inverse space, graphic 6, /, space, 21 graphic Ts, inverse space.

Line 120, graphic T, 6, T, 8, space, graphic T.

Line 210 graphics graphics Y, 8, space, graphic T.

```
  10 LET A=SGN PI
  20 LET S=A-A
  30 LET G=CODE "GRAPHIC S"
  40 LET F=INT (RND*(G+G))+CODE
"£"
  50 LET Z=A-A
  60 LET X=A
  70 PRINT AT G,A-A;"TYT6- 6/ TT
TTTTTTTTTTTTTTTTTTT "
  80 PRINT AT G,F;CHR$ G
  90 PAUSE (G*G)
 100 FOR B=A-A TO CODE "0"
 120 PRINT AT A,B;CHR$ (A-A);"T6
T8 T"
 130 IF INKEY$="6" THEN LET Z=A
 140 IF Z=A THEN LET X=X+A
 150 IF Z=A THEN PRINT AT X,B+A;
"-"
 160 IF X=G THEN LET Z=A-A
 170 IF X=G AND B+A=F THEN GOTO
CODE "ABS"
 180 NEXT B
 190 LET S=S+A
 200 GOTO CODE "W"
 210 PRINT AT G-A,F-(A-A);"YBOOM
T";AT G-(A+A),F-A;"Y8 T";TAB G;S
;" BOMB"+("S" AND S>A)
```

Sinclair ZX Spectr

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rum

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We have asked all our top writers to give their impressions of the last 12 months and chosen the best articles and programs from past issues.

It will allow you to keep abreast of some of the things you may have missed and to assimilate the changes which have overtaken all of us so quickly.

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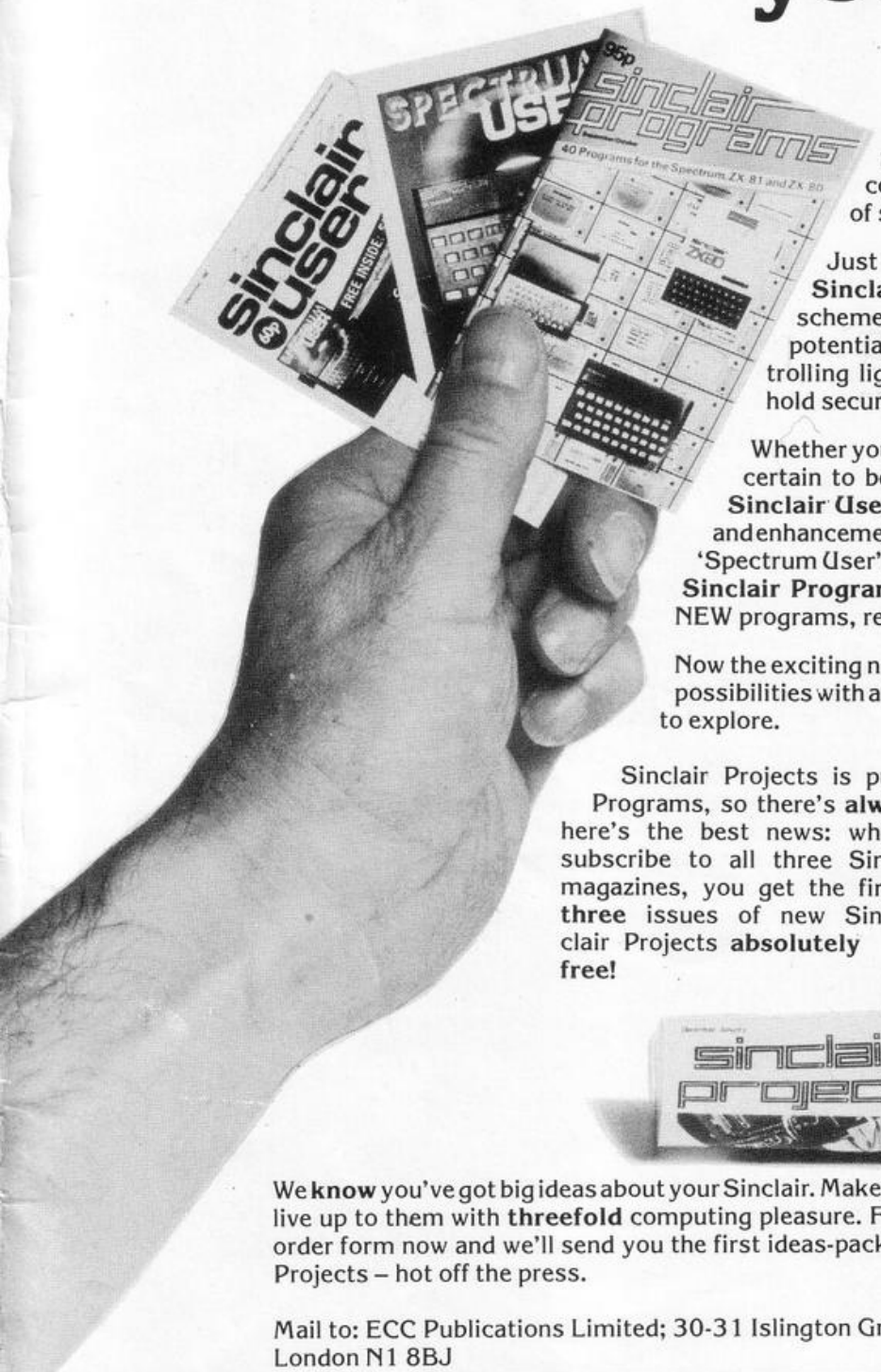

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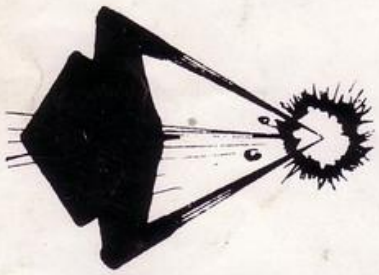

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