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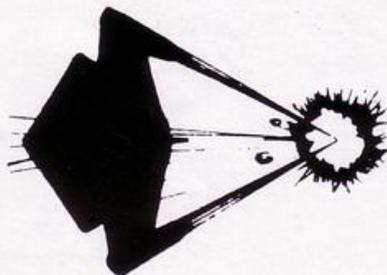
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Contents

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Sinclair Programs is published bi-monthly by ECC Publications Ltd.

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If you would like to contribute to any of the Sinclair User group of publications please send programs, articles or ideas for hardware projects to:
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We pay £10 for the copyright of each program published and £50 per 1,000 words for each article used.

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Sinclair Programs
ISSN No 0263-0265

Printed and typeset by
Cradley Print PLC,
Warley,
West Midlands

Distributed by
Spotlight Magazine Distribution Ltd,
1 Benwell Road,
Holloway,
London N7
01-607 6411

- | | | | |
|-------|----------------------------------|-----------------|------------------------------|
| 7 | LETTERS
ERRORS AND
MISHAPS | 38 | RALLY
1K INVADERS |
| 30 | PROGRAM OF THE
MONTH | 40 | CAVE ADVENTURE |
| ZX-80 | | 47 | SET RAGGED
AQUA ATTACK |
| 12 | PONTOON | 49 | HIGH POWERS
CALENDAR |
| ZX-81 | | 52 | SLUG SLITHER
ALIEN ATTACK |
| 9 | HAZARD | 53 | CURVE FIT |
| 11 | FRUIT COLLECTOR | SPECTRUM | |
| 13 | MINIPEDE | 8 | PLING |
| 19 | ZAPMAN | 13 | STAR PATTERNS |
| 20 | SYMMETRY
FAST DISPLAY | 14 | SPINVADERS |
| 21 | DIAGONO | 22 | SPECTRUM FILE |
| 24 | EVASION | 25 | PILOT |
| 25 | PLAGUE | 28 | SPECTRUM MORSE |
| 26 | PICMAN | 30 | PIPELINE |
| 27 | TAKE OFF | 34 | APPOINTMENTS |
| 29 | CLIMBER
1K LINK | 36 | UNDERSTANDING
EVOLUTION |
| 33 | GUNSIGHT | 39 | DEMOLITION |
| 34 | OLYMPICS | 41 | ZX DEFENDER |
| 35 | DODGER | 48 | REVERSI |
| | | 50 | SUBMARINE |

To help with entering graphics characters we have adopted a system of writing the characters for the ZX-81. We indicate inverse characters by the letter i and graphics by g, so that an inverse letter W is shown as iW and the graphics character on key 6 is denoted by g6.

Spaces are shown by sp and inverse spaces are isp. If some occur together, for instance a row of six spaces, they are shown by 6*sp and where there is a combination of characters each one is divided by a colon, thus sp:isp:6*g6 means a space followed by an inverse space and then six characters on the 6 key.

Where whole words are written in inverse letters they appear in the listings as lower-case letters.

In the Spectrum listings the characters are shown as they appear in a game with instructions included in the accompanying text.

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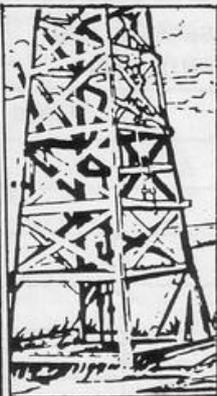
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SU

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16K ZX81
Spectrum



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LETTERS

Machine balance

AS AN enthusiastic ZX-81 16K user and subscriber to *Sinclair Programs* and *Sinclair Projects*, I must call your attention to the trend apparent in the following table — approximate number of programs per issue of *Sinclair Programs*:

	Nov/ Dec	Jan/ Feb	Mar/ Apr
Spectrum	7	10	14
ZX-80	2	3	2
ZX-81 — 1K	15	18	18
ZX-81 — 16K	16	9	6

I am alarmed by the collapse of the service to the 16K user, in favour of the Spectrum, while maintaining that to the 1K user.

I suggest that you favour the 1K program to achieve the 40 program figure as economically as possible.

The ZX-81 is the most widely-sold micro and the 16K RAM the most useful

and popular accessory. Without it the ZX-81 can only just demonstrate its ability.

The Spectrum, while being a superior machine, is still not so widespread as the ZX-81 and with the growing competition and delivery delays, may never be so.

In this field things are maturing fast and it is time you reconsidered your 40-program policy and opted for quality instead of quantity.

Why not offer readers a budget 16K RAM pack as a special offer and thus get into the hardware side?

I hope you find this useful as I mean my criticism to be constructive. We share the common aim, albeit for different reasons, of wanting a better, more comprehensive *Sinclair Programs* with even wider circulation.

Stanley McKeown,
Belfast.

Shortage of 1K listings

I AM writing to congratulate you on the decision to publish *Sinclair Programs* monthly. I have, however, one complaint. I have a ZX-81 and when I open this excellent magazine, to my dismay I find one-third of the programs are for the Spectrum.

I am sure many Spectrum owners feel the same, so why can we not have two magazines, one for each machine produced bi-monthly?

Chris Calvert,
Barrow-in-Furness.

Good worm

I WOULD like to say that the programs in your magazines are most enjoyable. I like especially *The Worm*

game in *Sinclair Programs*. My dad and I enjoy playing the game. We became involved in the game when we first programmed it in that we nearly forgot to record it. I reached stage seven but did not succeed the jump.

T Calhoun (age 12),
Gillingham, Kent.

16K plea

I BOUGHT the March/April *Sinclair Programs*, only to discover that very few of the long 16K programs have been written for the ZX-81. I would be most grateful if you could include more long and complex games for the 16K ZX-81 as I am sure more people would like them.

Neil Churchill,
Wirral,
Merseyside.

ERRORS AND MISHAPS

THE GREMLINS worried our printer again last month. Unfortunately what many regarded as the best program in the magazine, **Worm Game**, did not escape trouble. Lines 9008 and 9009 were in the incorrect order. Line 9009 found its way to the bottom of column two on page 27. The other problem with the game was that line 6050 should

read BEEP 3.3,X: NEXT X: GOTO 9000.

Blob Muncher had "=" missing at line 70. It should read 70 IF Y=40 THEN LET Y=40.

Frogger had line 1 missing from it. The line is 1 LET H=0.

Jackpot was the worst offender. Five lines were missing. They are:

```
75 PRINT AT 4, 12; F-10; " "  
120 PRINT AT 1, 7;A  
190 LET F=F-10  
220 IF F=0 THEN STOP  
221 GOTO 50
```

Unfortunately our reviewer claimed that **Beach Comber** and **Tank Attack** were 1K programs for the ZX-81. They are, in fact, 16K programs.

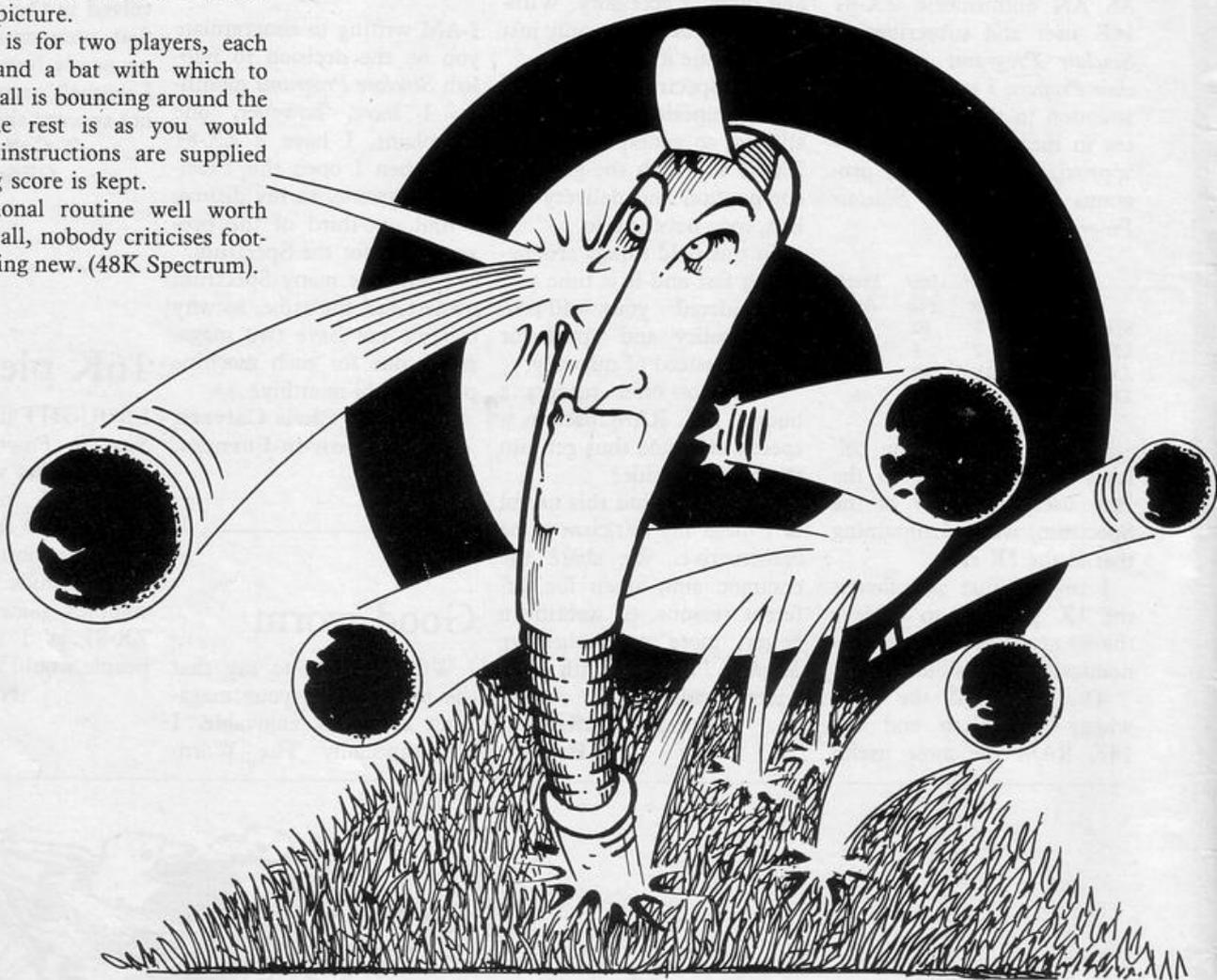


PLING!

PLING is an old routine. Its author, Ken Rylett of Manchester, reports it as very similar to the first video game he played and we believe him. It is worth taping, since nobody criticises the Mona Lisa for being an old picture.

The game is for two players, each with a goal and a bat with which to defend it. A ball is bouncing around the court and the rest is as you would expect. Full instructions are supplied and a running score is kept.

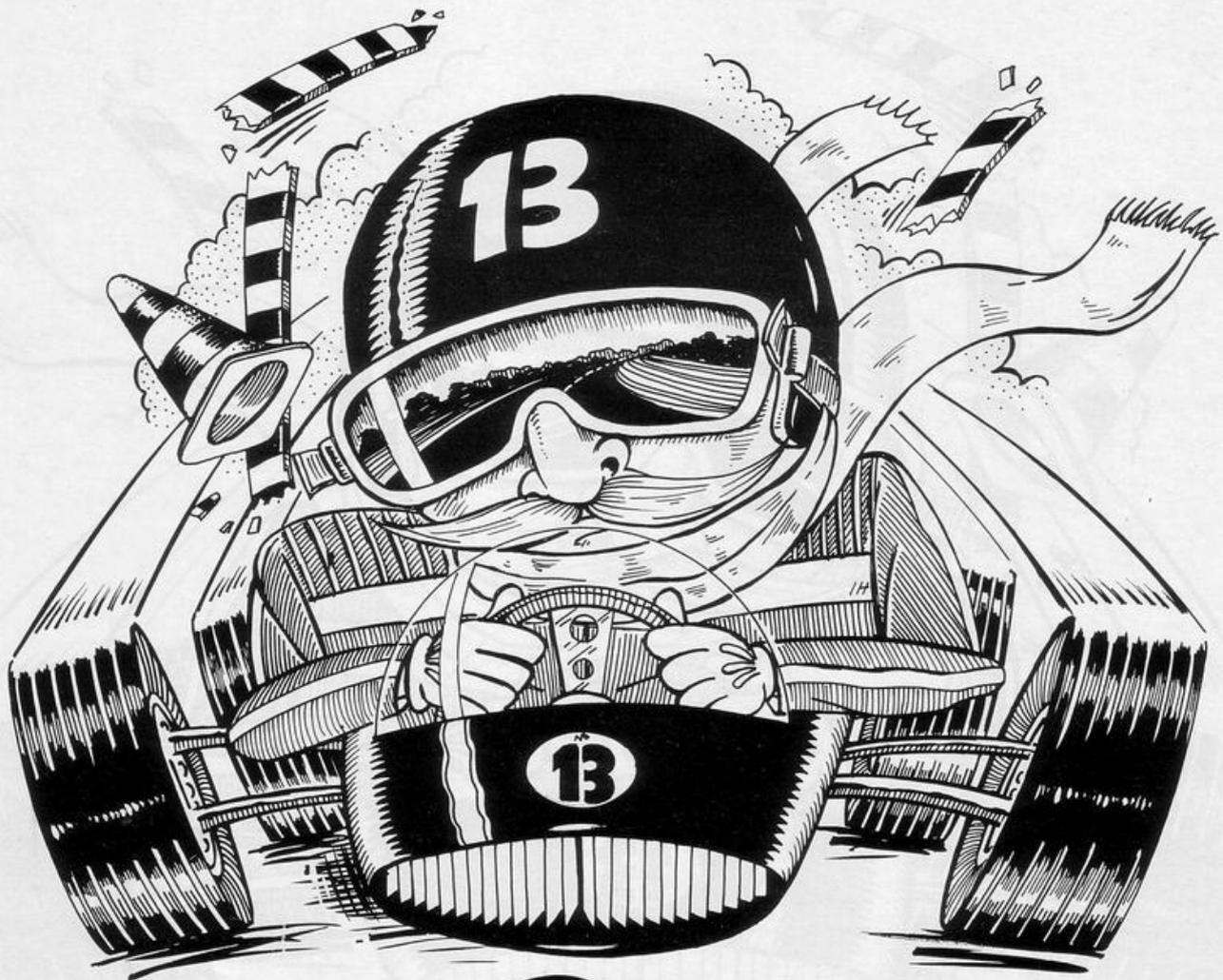
A conventional routine well worth having. After all, nobody criticises football for not being new. (48K Spectrum).



```

1000 REM      PLING-ALONG
1010
1020 POKE 23656,8: GO SUB 9500:
30 SUB 9000
1030
2000 REM      SET BALL ROLLING
3010
3020 LET b=30: LET w=-1
3030 LET y=INT (RND*6+1)
3040 IF RND<.5 THEN LET y=y+12
3050 LET z=1
3060 IF RND<.5 THEN LET z=-z
3070 PRINT INK 1;AT y,b:
3080 IF IN 63486=254 THEN GO SUB
3020: GO TO 2120
3090 IF IN 64510=254 THEN GO SUB
3030: GO TO 2120
3100 IF IN 61438=254 THEN GO SUB
3040: GO TO 2120
3110 IF IN 57342=254 THEN GO SUB
3050: GO TO 2120
3120 PRINT AT y,b: " "
3130 IF ATTR (y+z,b)=64 THEN LET
z=-z: BEEP .1,10
3140 IF ATTR (y+z,b+w)=64 THEN L
ET w=-w: BEEP .1,10
3150 LET y=y+z: LET b=b+w
3160 IF b=0 OR b=31 THEN GO TO 4
300
3170 GO TO 2070
3000 REM      MOVE EXT
3010
3020 IF lt>1 THEN PRINT AT lt,2;
" ";AT lb,2; " ": LET lt=lt-1: LE
T lb=lb-1: PRINT PAPER 0;AT lt,2
" ";AT lb,2; " ": RETURN
3030 IF lb<0 THEN PRINT AT lt,2
; " ";AT lb,2; " ": LET lt=lt+1: L
ET lb=lb+1: PRINT PAPER 0;AT lt,
2; " ";AT rb,2; " ": LET rt=rt-1:
" ";AT rb,2; " ": RETURN
3050 IF rb<20 THEN PRINT AT rt,2
; " ";AT rb,2; " ": LET rt=rt+1:
LET rb=rb+1: PRINT PAPER 0;AT r
t,2; " ";AT rb,2; " ": RETURN
3060 RETURN
3070
4010
4020 IF b=0 THEN LET gr=gr+1: LE
T b=30: GO TO 4040
4030 LET gl=gl+1: LET b=1
4040 PRINT FLASH 1; BRIGHT 1; PA
PER 6, INK 0;AT 4,5;yl;AT 4,25;g
r: IF gl=5 OR gr=5 THEN GO TO 40
50
4060 FOR n=1 TO 500: NEXT n
4070 PRINT AT 4,5; " ";AT 4,25; "
4080 PRINT FLASH 1;AT 10,5;"ANY
KEY TO PLAY AGAIN.":AT n=1 TO
500: NEXT n
4090 IF INKEY$="" THEN GO TO 409
3
4100 PRINT AT 10,5; "
";AT 4,5; " ";AT 4,25; "
": LET gl=0: LET gr=0: GO TO 20
30
4110
3000 REM      USR
3020 FOR n=0 TO 7
3030 READ a: POKE USR "A"+n,a
3040 NEXT n
5050 DATA 60,126,255,255,255,255
,126,60
3060
3100 LET lt=10: LET lb=11
3110 LET rt=10: LET rb=11
3120 BORDER 2: PAPER 5: BRIGHT 1
INK 0: CLS
3130 PRINT PAPER 0;AT lt,2; " "
3140 PRINT PAPER 0;AT lb,2; " "
3150 PRINT PAPER 0;AT rt,2; " "
3160 PRINT PAPER 0;AT rb,2; " "
3170 PRINT PAPER 0;AT 0,0; " ";AT
21,0; " "
3180 FOR n=1 TO 8
3190 PRINT PAPER 0;AT n,0; " ";AT
n+10,0; " ";AT n,31; " ";AT n+10,
31; " "
3200 NEXT n
3210 LET gl=0: LET gr=0
3220 RETURN
3230
3500 REM      SUBROUTINES
3510
3520 BORDER 1: PAPER 1: INK 0:
CLS
3530 PRINT PAPER 6; BRIGHT 1;AT
1,12;" PLING "
3540 PAPER 7
3550 PRINT AT 4,0;" This is a 2
player game. ";AT 10,0;" Left pl
ayer: - 1 for up ";AT 12,15;" 0
- - down";AT 16,0;" Right player
- - 0 for up ";AT 18,15;" P d
own "
3560 INPUT "ENTER TO PLAY "; LIN
E A$: RETURN

```



HAZARD

HAZARD is a game of the surround type, in which two players take turns in steering their way among scattered obstacles in an attempt to corner an opponent. The game is very well laid out, full instructions being given to players and successive turns being indicated by a flashing of the PLOT position. Moves are entered with keys 5 to 8.

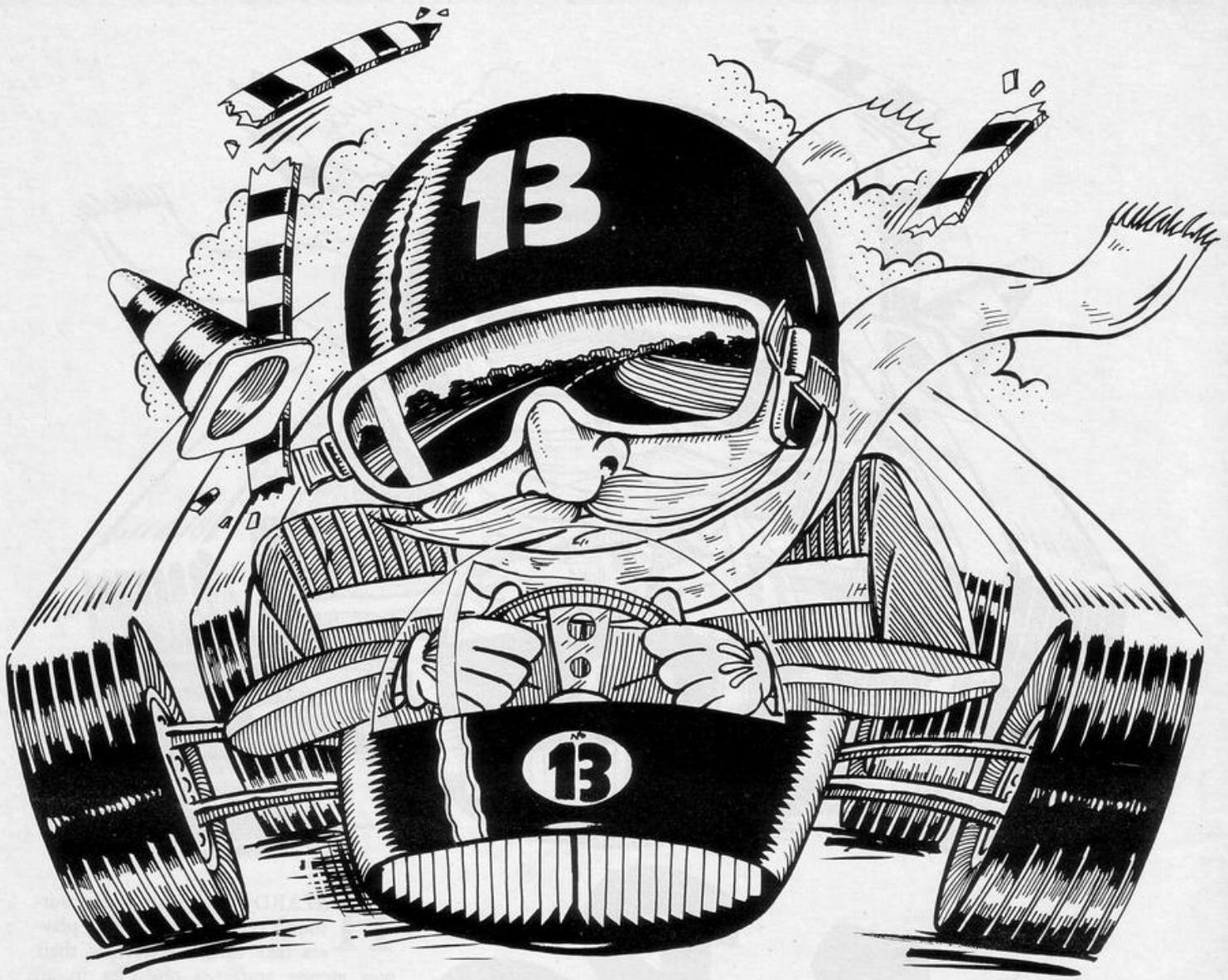
This diverting routine was sent by J Temperton of Market Weighton, Yorkshire. In our listing, lower-case letters indicate inverse video except when appearing in brackets, when they are graphics instructions. (16K ZX-81).

```
27 PRINT " YOU ARE BOTH CARRYI
NG FRAGILE EXPLOSIVES. ANY CONT
ACT WITH ANYBLOCK AND YOURE DEAD
, YOU MUST STALK EACH OTHER UNT
ILL YOU CAN APPLY THE EXPLOSIVES
TO YOUR OPPONENT SAFELY.
TO HELP CORNER THE
ENEMY YOU LAY BLOCKS ALSO."
28 PRINT " PLAYERS TAKE TURNS,
WITH FIVE BLOCKS A GO."
30 PRINT
32 PRINT " THE NORMAL KEYS (5
TO 8) ARE USED FOR CONTROL OF
YOUR VEHICLE
PRESS ""NEW LINE""
```

```
TO START."
34 INPUT A#
35 LET W=0
37 LET U=0
38 LET J=0
40 LET Z=0
45 FAST
```

```
50 CLS
51 DIM A(34,38)
52 FOR N=0 TO 80
53 LET A=INT (RND*34)+1
55 LET B=INT (RND*38)+1
60 LET A(A,B)=1
62 PLOT A+13,B+1
65 NEXT N
67 SLOW
70 LET Z=Z+1
72 LET S=0
73 LET Y=(Z/2)-INT (Z/2)
75 PRINT AT 0,0;" *1* BE
CAREFULL *2*"
77 PRINT
78 PRINT "BLOCKS";TAB 26;"BLOC
KS"
80 PRINT "LEFT";TAB 26;"LEFT"
82 PRINT "=0";TAB 26;"=0"
88 PRINT AT 20,0;"GAMES"
89 PRINT AT 20,26;"GAMES"
90 FOR N=2 TO 20
```

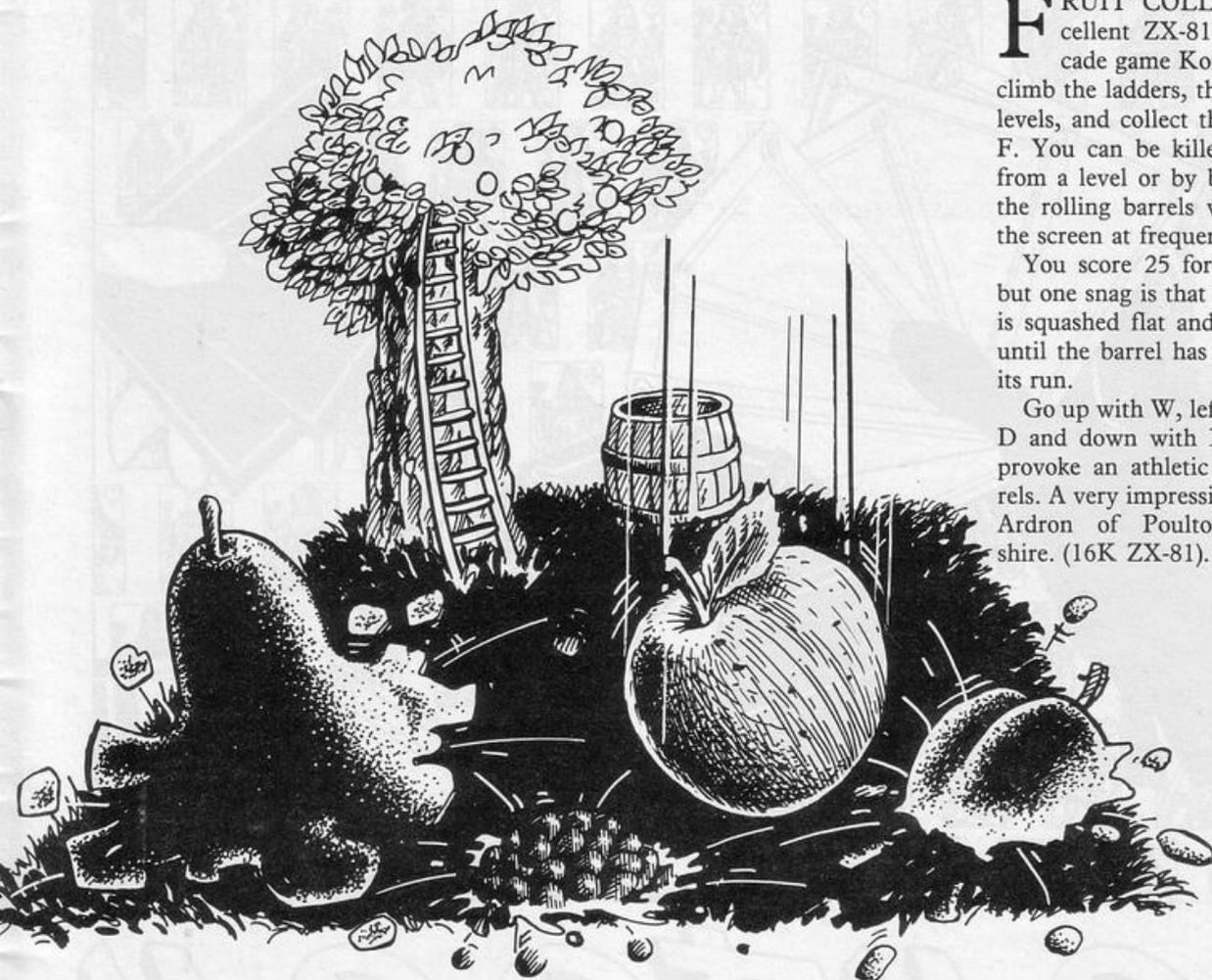
```
92 PRINT AT 1,N+4;"(Graphic H)
";AT 21,N+4;"(Graphic H)"
94 PRINT AT N,6;"(Graphic H)";
AT N,24;"(Graphic H)"
96 NEXT N
98 PRINT AT 21,2;W;AT 21,28;U
102 LET A=14
104 LET B=21
106 LET C=47
108 LET D=21
112 IF Y<>0 THEN GOTO 600
115 LET H=5
117 PLOT A,B
118 PRINT AT 4,27;H
119 IF INKEY#("<")" THEN GOTO 119
120 PLOT C,D
125 IF INKEY#="5" AND C<>14 THE
N GOTO 310
135 IF INKEY#="7" AND D<>39 THE
N GOTO 330
145 IF INKEY#="6" AND D<>2 THEN
GOTO 350
```



```

155 IF INKEY#="8" AND C<>47 THE
N GOTO 370
160 UNPLOT C,D
230 LET A<C-13,D-1>=1
235 IF H=0 THEN GOTO 600
240 GOTO 120
300 LET A=A-1
305 GOTO 400
310 LET C=C-1
315 GOTO 410
320 LET B=B+1
325 GOTO 400
330 LET D=D+1
335 GOTO 410
340 LET B=B-1
345 GOTO 400
350 LET D=D-1
355 GOTO 410
360 LET A=A+1
365 GOTO 400
370 LET C=C+1
375 GOTO 410
400 IF A=C AND B=D THEN GOTO 75
0
401 IF A<A-13,B-1>=1 THEN GOTO
500
402 LET G=G-1
403 PRINT AT 4,1;G;" "
406 GOTO 650
410 IF C=A AND D=B THEN GOTO 70
0
413 IF A<C-13,D-1>=1 THEN GOTO
440
415 LET H=H-1
417 PRINT AT 4,2;H;" "
430 GOTO 200
440 LET R=ABS (C-30)
442 LET T=ABS (D-18)
444 IF R>T THEN GOTO 448
446 LET P=T
447 GOTO 449
448 LET P=R
449 IF P>14 THEN LET P=14
450 FOR M=1 TO 16-P
452 PLOT C,D+M
453 PLOT C,D-M
454 PLOT C+M,D
455 PLOT C-M,D
456 PLOT C+M,D+M
457 PLOT C-M,D+M
458 PLOT C-M,D-M
459 PLOT C+M,D-M
460 UNPLOT C,D+M
461 UNPLOT C,D-M
462 UNPLOT C+M,D
463 UNPLOT C-M,D
464 UNPLOT C+M,D+M
465 UNPLOT C-M,D+M
466 UNPLOT C-M,D-M
467 UNPLOT C+M,D-M
470 NEXT M
473 IF S=3 THEN GOTO 760
474 IF S=2 THEN GOTO 705
475 IF S=1 THEN GOTO 530
476 LET J=157
477 LET W=W+1
480 PRINT AT 1,6;"Player 2 cr
ashed"
482 PRINT AT 21,2;W;" game
to Player";CHR# J;" " ;J
484 LET C#="STR$(W+U)
486 PRINT AT 21,11;CHR# (VAL C#
(1)+156)
488 IF (U+W)>9 THEN PRINT AT 21
,12;CHR# (VAL C#(2)+156)
490 PRINT AT 0,4;"PRESS "G" F
OR NEXT GAME"
492 IF INKEY#="G" THEN GOTO 45
495 PRINT AT 0,4;"
"
498 GOTO 486
500 LET C=A
505 LET D=B
508 LET U=U+1
510 LET S=1
515 LET J=158
520 GOTO 440
530 PRINT AT 1,6;"Player 1 cr
ashed"
535 GOTO 482
600 LET G=5
602 PLOT C,D
603 PRINT AT 4,1;G
604 IF INKEY#<>" " THEN GOTO 600
605 PLOT A,B
607 IF INKEY#="5" AND A<>14 THE
N GOTO 300
610 IF INKEY#="7" AND B<>39 THE
N GOTO 320
615 IF INKEY#="6" AND B<>2 THEN
GOTO 340
620 IF INKEY#="8" AND A<>47 THE
N GOTO 360
630 UNPLOT A,B
650 LET A<A-13,B-1>=1
660 IF G=0 THEN GOTO 115
680 GOTO 605
700 LET S=2
702 GOTO 440
703 GOTO 440
705 LET U=U+1
710 LET J=158
713 PRINT AT 1,6;" mission o
ver"
715 GOTO 482
750 LET S=3
755 GOTO 440
760 LET W=W+1
765 LET J=157
770 PRINT AT 1,6;" mission o
ver"
775 GOTO 482

```



FRUIT COLLECTOR is an excellent ZX-81 version of the arcade game Kong. The object is to climb the ladders, through the different levels, and collect the fruit—an inverse F. You can be killed either by falling from a level or by being hit by one of the rolling barrels which career across the screen at frequent intervals.

You score 25 for every fruit picked but one snag is that fruit hit by a barrel is squashed flat and will not re-appear until the barrel has reached the end of its run.

Go up with W, left with A, right with D and down with X. The E key will provoke an athletic leap over the barrels. A very impressive listing from R N Ardron of Poulton-le-Fylde, Lancashire. (16K ZX-81).

FRUIT COLLECTOR

```

10 LET S=0
30 LET A=19
40 LET B=10
45 LET E=INT (RND*22)+2
46 CLS
50 LET D=INT (RND*4)
51 IF D=0 THEN LET F=10
52 IF D=1 THEN LET F=13
53 IF D=2 THEN LET F=16
54 IF D=3 THEN LET F=19
56 PRINT AT F,E;"(inverse F)"
70 PRINT AT 11,2;"(24*graphic
A)"
72 PRINT AT 14,2;"(5*graphic A
;SPACE;18*graphic A)"
74 PRINT AT 17,2;"(16*graphic
A;SPACE;7*graphic A)"
76 PRINT AT 11,2;"(24*graphic
A)"
78 FOR C=25 TO 1 STEP -1
80 PRINT AT 12,13;"H"
90 PRINT AT 13,13;"H"
100 IF A=F AND E=B THEN GOTO 50
00
110 PRINT AT 15,7;"H"
120 PRINT AT 16,7;"H"
140 PRINT AT 19,18;"H"
150 PRINT AT 19,18;"H"
190 PRINT AT A,B;"*"
200 PRINT AT 16,C;"0 "
201 IF C=8 THEN GOTO 4000
202 IF C=2 THEN GOTO 4400
203 IF INKEY#="E" THEN GOSUB 20
25

```

```

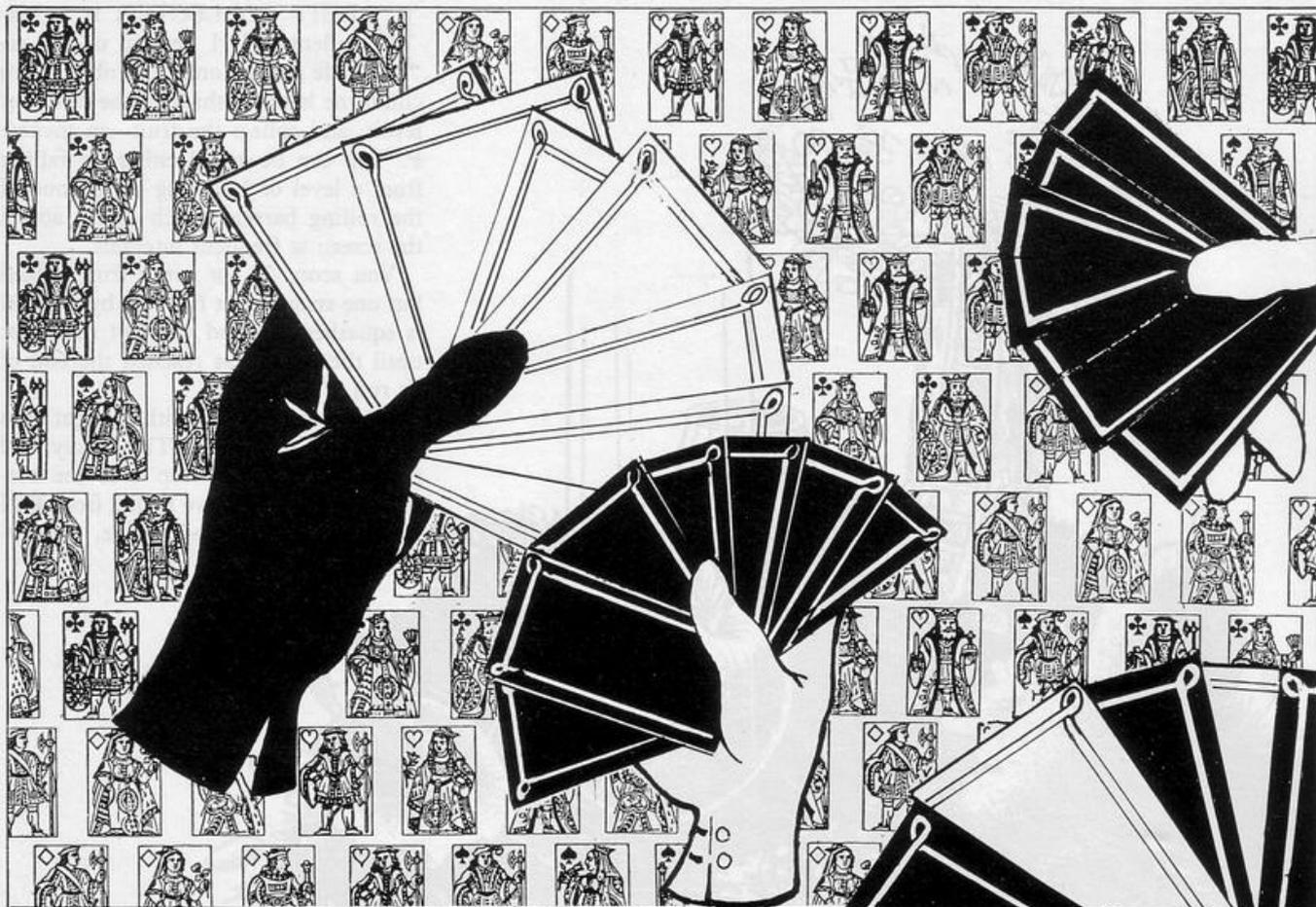
204 PRINT AT 19,C;"0 "
205 PRINT AT 10,C;"0 "
206 PRINT AT 13,C;"0 "
210 IF INKEY#="W" THEN GOSUB 10
00
220 IF INKEY#="D" THEN GOSUB 10
20
230 IF INKEY#="A" THEN GOSUB 10
40
240 IF INKEY#="X" THEN GOSUB 10
80
290 NEXT C
300 GOTO 80
1000 IF A=19 AND B<>18 THEN RETU
RN
1001 IF A=16 AND B<>7 THEN RETUR
N
1002 IF A=13 AND B<>13 THEN RETU
RN
1010 PRINT AT A,B;" "
1012 LET A=A-1
1019 RETURN
1020 IF B=25 THEN GOTO 2000
1030 PRINT AT A,B;" "
1031 LET B=B+1
1032 IF B=C THEN GOTO 4020
1039 RETURN
1040 IF B=2 THEN GOTO 2000
1050 PRINT AT A,B;" "
1051 LET B=B-1
1059 RETURN
1080 IF A=10 AND B<>13 THEN RETU
RN

```

```

1081 IF A=13 AND B<>7 THEN RETUR
N
1082 IF A=16 AND B<>18 THEN RETU
RN
1083 IF A=19 THEN RETURN
1090 PRINT AT A,B;" "
1091 LET A=A+1
1100 RETURN
2000 PRINT "FELL OFF EDGE"
2010 PRINT AT 0,0;"SCORE=";S
2020 GOTO 4020
2025 PRINT AT A,B;" "
2030 LET A=A-1
2035 LET B=B+1
2040 PRINT AT A,B;"*"
2050 PRINT AT A,B;" "
2060 LET B=B+1
2070 PRINT AT A,B;"*"
2080 PRINT AT A,B;" "
2090 LET A=A+1
2095 LET B=B+1
2100 PRINT AT A,B;"*"
2110 PRINT AT A,B;" "
2120 RETURN
4010 PRINT "HIT BY A BARREL"
4015 PRINT AT 0,0;"SCORE=";S
4020 PRINT "ANOTHER GAME?(Y/N)"
4030 INPUT A#
4040 IF A#="Y" THEN GOTO 1
4050 IF A#="N" THEN STOP
4060 GOTO 4030
4450 GOTO 56
5000 LET S=S+50
5010 GOTO 45

```



PONTOON

80

PONTOON

```

1 LET C=0
10 PRINT "HOW MANY
  PLAYERS?"
20 INPUT A
30 DIM F (A)
40 LET B=RND(11)
50 LET C=C+B
60 IF C>21 THEN GOTO 80
70 GOTO 40
80 LET C=C-B
90 FOR D=1 to A
95 CLS
100 PRINT "YOUR TURN
  PLAYER"; D
105 PRINT
110 IF F(D-1)>21 THEN PRINT
  "PLAYER"; D-1; " BUST"
115 LET E = RND (10)
120 IF E=1 THEN GOSUB 260
125 LET F(D)=F(D) + E
130 PRINT
135 PRINT "(3×gW)"
140 PRINT
145 PRINT F(D)
150 PRINT "(3×gW)"
155 PRINT
160 IF F(D)>21 THEN GOTO 185

```

WE ARE becoming short of ZX-80 programs. Are all you oldie owners running out of steam?

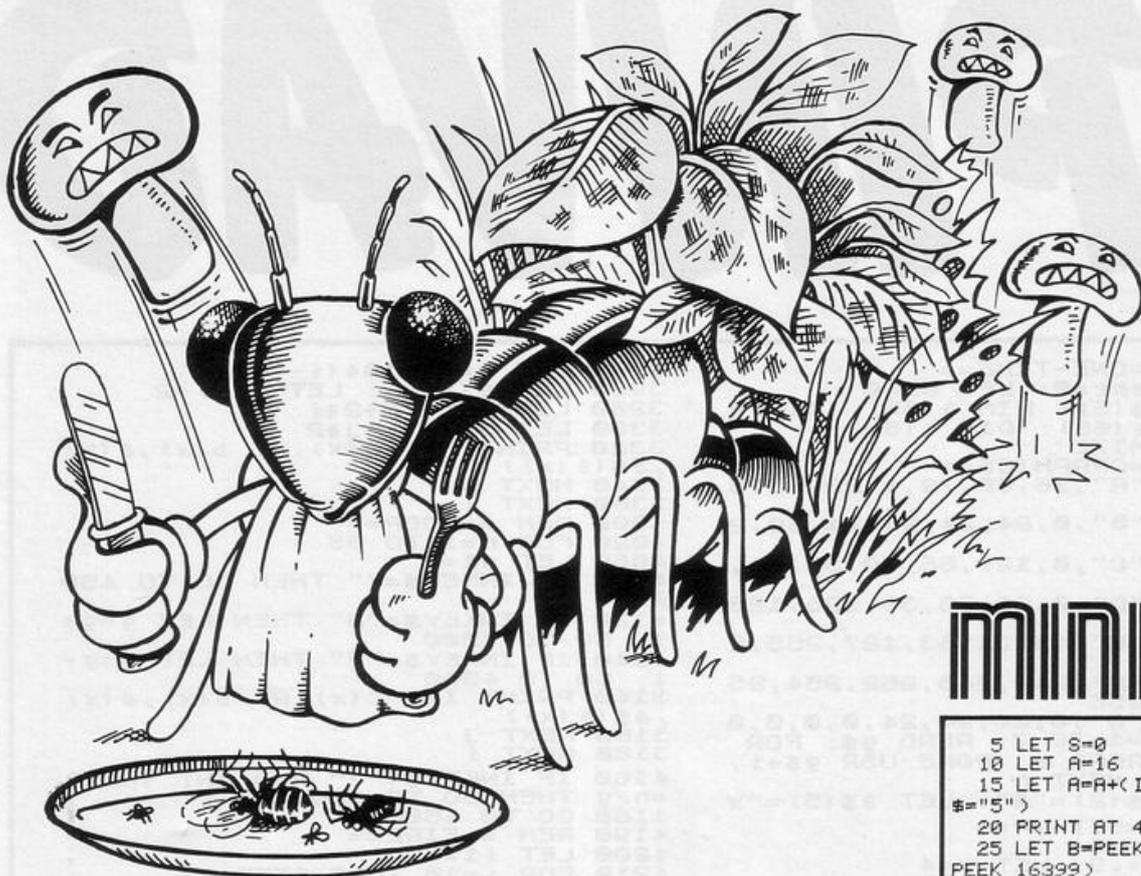
Pontoon 80 does what you would expect, enabling you to play the computer and other humans. Lines 40 to 80 determine the computer score and are arranged so that it cannot bust; perhaps readers might be able to find a more equitable method?

The routine is very straightforward, each player being supplied with prompts and the computer score being revealed at the end of the game. G Gill of Westerham, Kent wrote the listing. (1K ZX-80).

```

165 PRINT " ANOTHER CARD?
  (Y OR N)"
170 INPUT G$
175 CLS
180 IF G$="Y" THEN GOTO 115
185 NEXT D
190 CLS
200 FOR D= 1 to A
201 IF F(D)>21 THEN PRINT
  "PLAYER"; D; "BUST"
205 IF F(D)<22 THEN PRINT
  "PLAYER"; D; "SCORED";
  F(D)
210 PRINT
215 NEXT D
220 PRINT "I'VE GOT"; C
225 PRINT
230 PRINT "ANOTHER GAME?
  (Y OR N)"
235 INPUT H$
240 CLS
245 IF H$="Y" THEN RUN
250 STOP
260 PRINT "ACE-1 or 11?"
265 INPUT X
270 LET E=X
275 RETURN

```



MINIPEDE

MINIPEDE is a quick and easy program for the 1K ZX-81. You are the multi-legged insect creeping through the undergrowth, munching the flavoursome flies (W), crunching the savoury spiders (asterisks) and avoiding the murderous mushrooms (T).

Score one point for the flies and five for the spiders. Squirm left with the 5, turn right with the 8, and your score will be displayed when you die.

G Creasy of Ashford, Kent, who wrote the program, reports a personal best of 152.

```

5 LET S=0
10 LET A=16
15 LET A=A+(INKEY#="8")-(INKEY
#="5")
20 PRINT AT 4,A;
25 LET B=PEEK (PEEK 16398+256*
PEEK 16399)
30 LET S=S+(1 AND B=60)+(5 AND
B=23)
35 IF B=57 THEN GOTO 100
40 PRINT "(inverse quotation m
ark";AT 11,RND*27;"*";AT 11,RND*
27;"W";AT 11,RND*27;"W";AT 11,RN
D*27;"TTTTT"
45 SCROLL
50 GOTO 15
100 PRINT AT 4,A;"(graphic A)";
AT 18,0:S

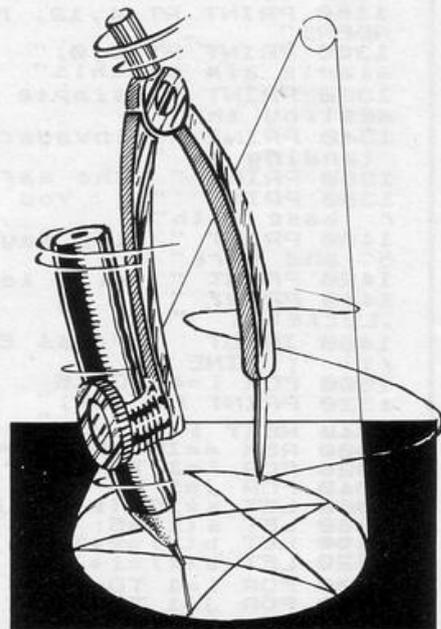
```

STAR

YOU KNOW the intervals in the cinema when they sell ice-cream? You know when you walk into a lamp-post? You know those moments for which Channel 4 cannot find advertisements? This program for the 16K Spectrum makes patterns like that.

As a demonstration of the Spectrum high-resolution graphics, **Star** is very impressive, producing multi-faceted

polygons to order by means of the mathematics in lines 70 to 190. The program proceeds by dividing a circle into n parts to obtain the angle at the centre, finding the co-ordinates of those n points—where s is the radius and cx, cy the centre of the circle—and then drawing a line from every point to every other point. The listing was submitted by L J Wilkinson of Stockton-on-Tees.



```

1: 2 CLS : PRINT AT 10,8; FLASH
1; "STOP THE TAPE "
4 PAUSE 300: CLS
5 BORDER 4: INK 1: PAPER 6
6 PRINT AT 4,2; "This program
a draws regular"
7 PRINT AT 5,7; "n-sided figur
25"
20 PRINT AT 7,0; "To stop the p
icture at any time press a key
. Pressing another key will begi
n the drawing again"
26 PRINT AT 15,3; FLASH 1; "To
continue press any key"
27 PAUSE 0
30 CLS
40 INPUT "Type in how many poi
nts you want the star to have- th
en press the enter key";n
45 IF n<=1 THEN CLS : GO TO 40
50 DIM x(n): DIM y(n)
65 PRINT AT 0,8;n; " - sided fig
ure"

```

```

70 LET a=2*PI/n
80 LET cx=120: LET cy=90: LET
s=70
100 FOR i=1 TO n
110 LET t=a*(i-1)
120 LET x(i)=cx+s*COS t
130 LET y(i)=cy+s*SIN t
140 NEXT i
150 FOR j=1 TO n-1
170 FOR k=j+1 TO n
175 PLOT x(j),y(j)
180 DRAW x(j)-x(i),y(j)-y(i)
185 PAUSE 30
186 IF INKEY#(c) THEN PAUSE 0
190 NEXT j: NEXT i
220 PRINT AT 20,0; "press x to e
xit otherwise press any key"
222 PAUSE 0
225 IF INKEY#="" THEN GO TO 225
230 IF INKEY#="x" THEN CLS : PR
INT AT 10,10; FLASH 1; "** BYE **
": STOP
240 GO TO 30

```

SPINWAD

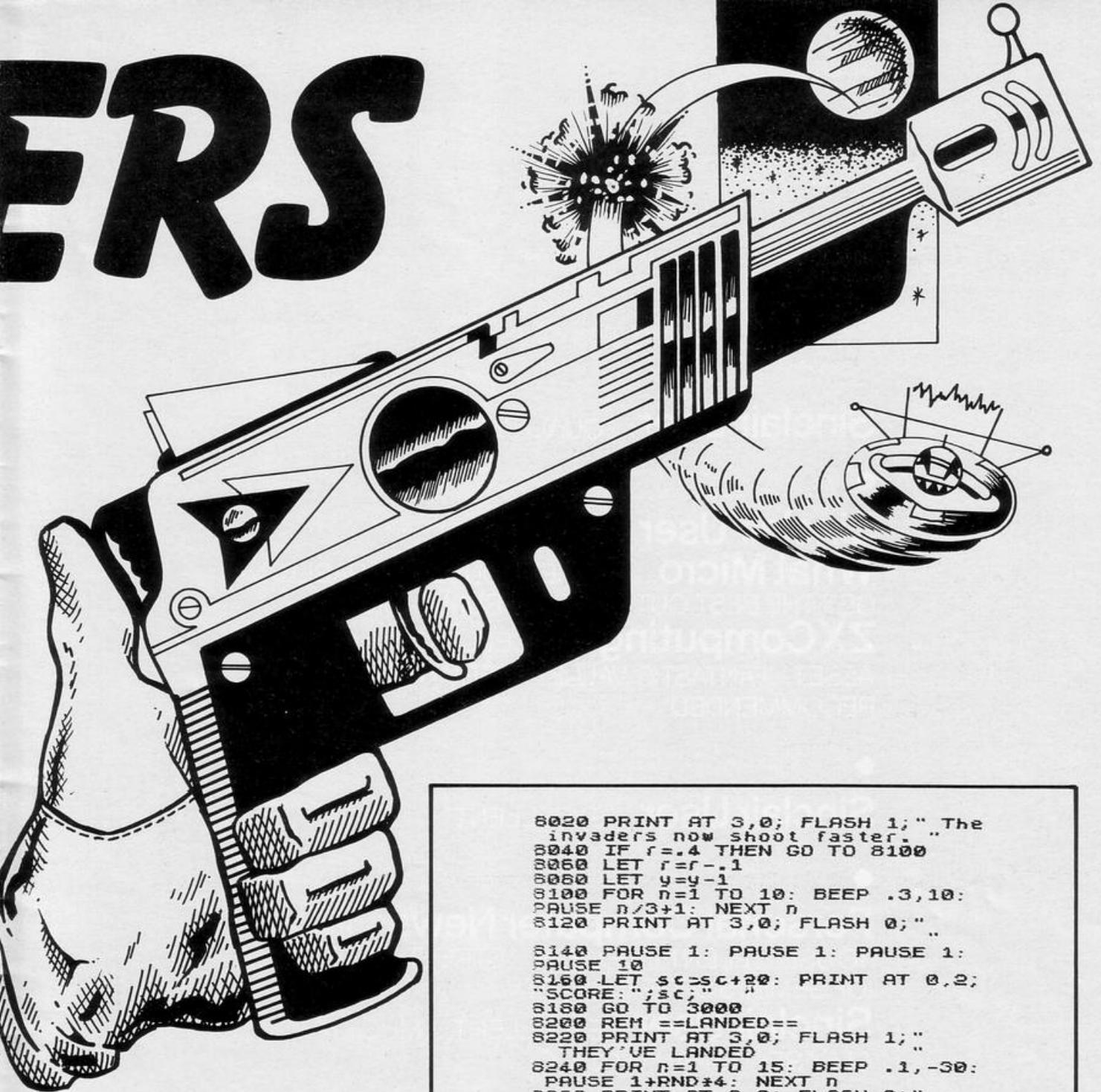
```

100 REM ==ONE-TIME==
120 LET game=0: LET hs=0
140 DIM a$(5): DIM a(65): DIM b
(65): DIM s(65): DIM c(65)
160 RANDOMIZE
500 REM ==GRAPHICS==
510 DATA "A",16,66,72,1,20,68,8
520 DATA "B",0,24,24,24,24,60,2
530 DATA "C",0,129,66,60,36,24,
540 DATA "D",0,36,60,36,126,126
550 DATA "E",15,31,63,127,255,2
560 DATA "F",240,248,252,254,25
570 DATA "G",0,24,24,24,0,0,0,0
600 FOR n=1 TO 7: READ g$: FOR
i=0 TO 7: READ a: POKE USR g$+i,
a: NEXT i: NEXT n
620 LET a$(2)="#": LET a$(5)="X"
700 REM ==SET-UP==
720 LET sc=0
740 LET r=.9: LET y=4
760 LET s=0: LET g=15
800 BORDER 0: CLS
820 PRINT AT 16,0;"
840 PRINT AT 17,0;"
860 PRINT AT 18,0;"
880 PRINT AT 20,g;"
900 PRINT AT 0,2;"Score:";sc
910 PRINT AT 0,23; INK 1;"y"; I
NK 0;"=5 "; INK 2;"#"; INK 0;"=
920 IF game<>0 THEN GO TO 3000
980 REM ==INTRO==
1020 FOR j=1 TO 3: FOR n=30 TO 6
0: BEEP .01,n: NEXT n: NEXT j
1020 PRINT AT 10,3; FLASH 1;" Do
you want instructions?"
1040 IF INKEY$="" THEN GO TO 104
0
1060 PRINT AT 10,0;"
1080 IF INKEY$="y" OR INKEY$="Y"
THEN GO TO 1140
1100 IF INKEY$="n" OR INKEY$="N"
THEN GO TO 3000
1120 GO TO 1020
1160 PRINT AT 4,12; FLASH 1;"INV
ADERS"
1300 PRINT AT 6,0;" The very
simple aim of this"
1320 PRINT " simple game is to
destroy the"
1340 PRINT " invaders that are
landing on"
1360 PRINT " the earth."
1380 PRINT " You control you
r base with"
1400 PRINT " the keys '5' and '
8' and fire"
1420 PRINT " with key '7'."
1440 PRINT " © R
.Luckett."
1460 INPUT " Press ENTER to sta
rt. "; LINE x$
1500 FOR i=4 TO 15
1520 PRINT AT i,0;"
1540 NEXT i
3000 REM ==INVADERS==
3020 FOR i=1 TO 2
3040 FOR j=1 TO 13
3060 LET x=13*(i-1)+j
3080 LET s(x)=5: LET c(x)=1
3100 LET b(x)=2+2*i
3120 LET a(x)=i+j*2
3200 FOR i=1 TO 3
3220 FOR j=1 TO 13
3240 LET x=26+13*(i-1)+j
3260 LET s(x)=2: LET c(x)=2
3280 LET b(x)=6+2*i
3300 LET a(x)=i+j*2
3320 PRINT INK c(x);AT b(x),a(x)
; a$(s(x))
3340 NEXT j
3360 NEXT i
4000 REM ==LOOP==
4020 FOR n=1 TO 65
4060 LET g1=g
4100 IF INKEY$="" THEN GO TO 450
0
4120 IF INKEY$="8" THEN LET g=g+
1: GO TO 4300
4140 IF INKEY$="5" THEN LET g=g-
1: GO TO 4300
3140 PRINT INK c(x);AT b(x),a(x)
; a$(s(x))
3160 NEXT j
3180 NEXT i
4160 IF INKEY$="7" AND INT (n/y)
=n/y THEN GO TO 4200
4180 GO TO 4500
4190 REM ==FIRE==
4200 LET i1=19
4210 FOR i=18 TO 3 STEP -1
4220 IF POINT (g*8+2,(21-i)*8+4)
=1 THEN GO TO 4240
4230 PRINT AT i1,g;" ": PRINT AT
i,g; INK 3;"*": LET i1=i: NEXT
i: GO TO 4280
4240 IF POINT (g*8,(21-i)*8)=1 T
HEN GO TO 4280
4250 IF POINT (g*6,(21-i)*6+6)=1
THEN LET sc=sc+3
4260 LET sc=sc+2: PRINT AT 0,8;s
c
4270 IF sc=208 OR sc=436 OR sc=6
64 OR sc=892 THEN PRINT AT i1,g;
" ": PRINT AT i,g; INK 2;"*": BE
EP .5,-50: PRINT AT i,g;" ": GO
TO 8000
4280 PRINT AT i1,g;" ": PRINT AT
i,g; INK 2;"*": BEEP .5,-50: PR
INT AT i,g;"
4290 GO TO 4500
4300 REM ==MOVE==
4320 PRINT AT 20,g1;" "
4340 IF g>29 OR g<2 THEN LET g=g
1
4360 PRINT AT 20,g;"
4500 REM ==INVADERS==
4520 IF a(n)=0 THEN GO TO 7000
4540 IF POINT (a(n)*8+2,(21-b(n)
)*8+4)=0 THEN LET a(n)=0: GO TO
7000
5440 PRINT AT b(n),a(n);" "
5460 LET a(n)=a(n)+1
5480 IF a(n)=30 THEN LET b(n)=b(
n)+2: LET a(n)=2: IF b(n)=18 THE
N GO TO 8400
5520 PRINT INK c(n);AT b(n),a(n)
; a$(s(n))
5000 REM ==ATTACK==
5020 IF AND(r THEN GO TO 7000
5040 LET h=INT (RND*65)+1
5100 IF POINT (a(h)*8+2,(21-b(h)
)*8+4)=0 THEN LET h=n
5140 PRINT FLASH 1; INK c(h);AT
b(h),a(h); a$(s(h))
5160 FOR i=16 TO 18
5180 IF POINT (a(h)*8,(21-i)*8)=
1 THEN GO TO 6240
5200 NEXT i
6220 LET i=20
6240 PRINT AT i,a(h); INK 2;"*":
BEEP .1,-30: PRINT AT i,a(h);"
5260 IF i=20 AND a(h)=g THEN GO
TO 8300
6280 PRINT FLASH 0; INK c(h);AT
b(h),a(h); a$(s(h))
5300 GO TO 7000
7000 NEXT n: GO TO 4000
6000 REM ==WIN==

```



ERS



WE HEREBY inaugurate a new quest for the Sinclair Programmer Our Spacman project is, we think, approaching its triumphant conclusion—we can feel you all closing-in on that elusive muncher—so it is just the time to implant a new ambition in your heads.

Send us an arcade-quality Invaders game. Fast moving, colourful, with all appropriate effects.

R Lockett of Stratford-on-Avon has provided all you need to begin the project. His program gives you the laser base, the rows of descending aliens and the disintegrating bunkers to lurk behind. It is a little slow, however, and the power beams from the aliens are invis-

ble. Race right with 8, lurch left with the 5, and 7 shoots your blaster beam. (48K Spectrum). Graphics notes:
620—Graphic D, graphic C

820—Graphic E, inverse space, graphic F.
880—Graphic B
4230—Graphic G.

```
6020 PRINT AT 3,0; FLASH 1;" The
invaders now shoot faster."
6040 IF r=.4 THEN GO TO 8100
6060 LET r=r-.1
6080 LET y=y-1
6100 FOR n=1 TO 10: BEEP .3,10:
PAUSE n/3+1: NEXT n
6120 PRINT AT 3,0; FLASH 0;"

6140 PAUSE 1: PAUSE 1: PAUSE 1:
PAUSE 10
6160 LET sc=sc+20: PRINT AT 0,2;
"SCORE:";sc;
6180 GO TO 3000
6200 REM ==LANDED==
6220 PRINT AT 3,0; FLASH 1;"
THEY'VE LANDED
6240 FOR n=1 TO 15: BEEP .1,-30:
PAUSE 1+RND*4: NEXT n
6260 PRINT AT 3,0; FLASH 0;"

6300 REM ==LOSE==
6320 FOR n=1 TO 10: BEEP RND,60:
PAUSE (RND*3)+1: NEXT n
6340 BORDER 7: CLS
6360 PRINT AT 6,0;" To
o Bad!
6380 PRINT "" Better luck nex
t time! ""
6400 PRINT ;"" Score:";
sc;
6420 IF sc>hs THEN LET hs=sc
6440 PRINT ;"" High score:";
hs;
6500 PRINT AT 18,0; FLASH 1;"
Do you want another game? ""
6540 IF INKEY$="" THEN GO TO 854
0
6560 IF INKEY$="y" OR INKEY$="Y"
THEN LET game=1: GO TO 700
6580 IF INKEY$="n" OR INKEY$="N"
THEN CLS : GO TO 9900
6600 GO TO 8540
```

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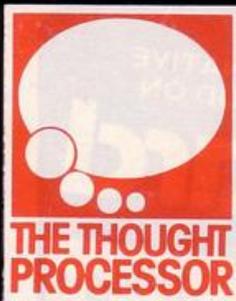
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THE SPACMAN craze has spread. Adam Peel of Wylam, Northumberland is the latest victim of this mental epidemic and has sent a version of the game for the ZX-81.

Steer the gobbler round the maze and collect points by consuming dots, asterisks and ghosts. You can only get the ghosts if your power is above nought, otherwise you are vulnerable. Your power is decreasing all the time but you

boost it by 15 when you eat an asterisk and your score is also increased by 10. One score point is gained for every dot demolished.

Finish the phantom and you pull 20 points and win a wraith. The game ends when a ghost grabs you, when your power is nought, or when you wallop a

wall. Throughout the game your power is displayed; at the end of the game your score is displayed.

Gobbler is steered with the cursor keys; there are five levels of difficulty and as the game progresses it becomes more challenging. Zapman was submitted by Adam Peel of Wylam, Northumberland. In our listing, 'IS' signifies inverse space and lower-case letters are graphic instructions. (16K ZX-81).

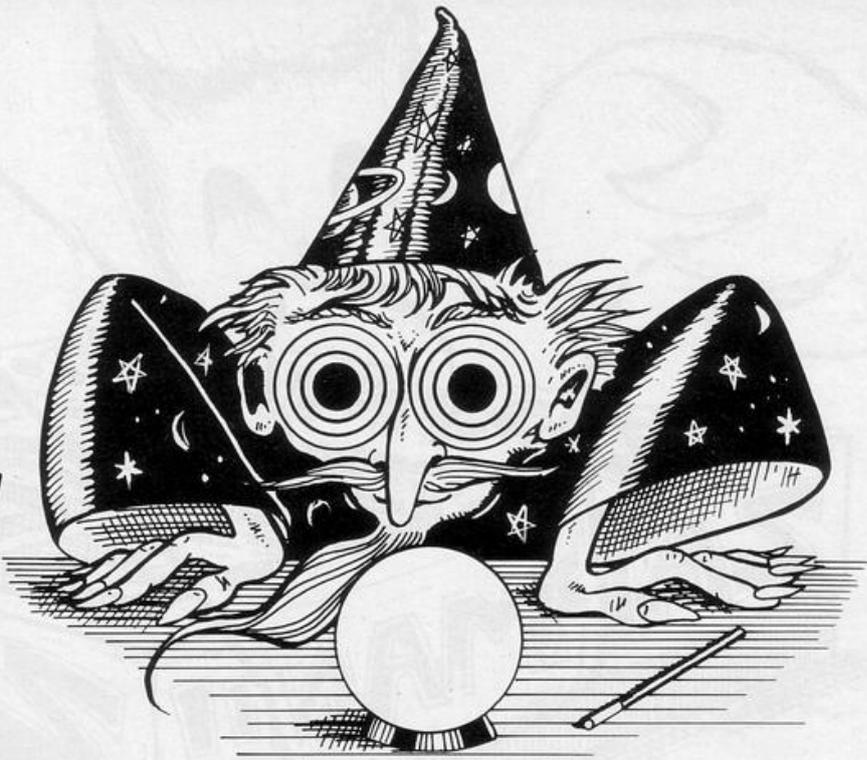
ZAPMAN

```

2 LET P=0
3 LET AA=14
4 LET S=0
6 DIM C$(11,15)
9 LET BB=9
10 PRINT AT 14,0;"SKILL LEVEL?
(1,2,3,4 OR 5)"
11 INPUT SK
12 PRINT AT 13,0;"
"
13 IF SK>5 OR SK<0 THEN GOTO 1
0
15 PRINT AT 20,0;"TOUCH "R"
TO START"
20 IF INKEY$(<)"R" THEN GOTO 20
25 LET A=2
30 CLS
35 LET B=10
40 LET C$(1)="(15*IS)"
45 LET C$(2)="IS*.....*I
S"
50 LET C$(3)="IS.IS.IS.IS.IS.I
S.IS.IS"
55 LET C$(4)="IS.IS.IS.IS.IS.I
S.IS.IS"
60 LET C$(5)="IS.IS.IS.IS.IS.I
S.IS.IS"
65 LET C$(6)="IS.....I
S"
70 LET C$(7)="IS.ISISIS.ISIS.I
S..IS.IS"
75 LET C$(8)="IS.....*IS....
IS"
80 LET C$(9)="IS.IS.IS.ISIS...
ISIS.IS"
85 LET C$(10)="IS...IS.....
.IS"
90 LET C$(11)="(15*IS)"
91 FOR N=1 TO 11
93 PRINT AT N,1;C$(N)
95 NEXT N
110 FOR N=1 TO 500
111 LET P=P-1
112 LET D=0
113 IF P<0 THEN LET P=0
114 PRINT AT 12,6;" ",AT 12,0;
"POWER=";P
118 PRINT AT B,A;" "
120 LET A=A+(INKEY$(="B")-(INKEY
$(="5"))
130 LET B=B+(INKEY$(="6")-(INKEY
$(="7"))
140 LET A#=CHR$(PEEK (PEEK 1639
6+256*PEEK 16397+1+A+(B*33))
150 IF A#="(IS)" THEN GOTO 250
160 IF A#="." THEN GOTO 3000
163 IF A#="*" THEN GOTO 1000
168 IF A#="(inverse quotation m
ark)" THEN GOTO 4000
169 PRINT AT B,A;"C"
170 PRINT AT BB,AA;C$(BB,AA)
171 IF B=BB THEN GOTO 5000
172 GOTO 6000
174 IF AA=A AND BB=B THEN GOTO
4000
180 PRINT AT B,A;"C";AT BB,AA;"
!"
190 LET SK=SK+.5
200 GOTO 100
250 PRINT AT B,A;"C"
260 PRINT AT 13,0;"YOUR SCORE I
S ";S
270 PAUSE 30
280 GOTO 1
1000 LET P=15
1010 LET S=S+10
1020 GOTO 165
2000 PRINT AT BB,AA;"(inverse qu
otation mark)"
2010 PRINT AT 20,0;"SCORE=";S
2020 GOTO 1
3000 LET S=S+1
3040 GOTO 170
4000 IF P=0 THEN GOTO 2000
4005 LET S=S+20
4010 LET AA=14
4020 LET BB=9
4040 GOTO 100
5000 IF INT (RND*SK)=0 THEN GOTO
100
5005 IF AA>A THEN LET AA=AA-1
5010 IF AA<A THEN LET AA=AA+1
5020 GOTO 174
6000 IF INT (RND*SK)=0 THEN GOTO
100
6010 IF BB>B THEN LET BB=BB-1
6020 IF BB<B THEN LET BB=BB+1
6030 GOTO 100

```

Fast Display



```

1 REM .....
....
2 DIM A$(704)
3 LET A$="ED 5B 10 40 06 06 1
3 10 FD 2A 0C 40 06 16 23 7E FE
76 20 04 12 13 18 F6 10 F4 C9"
4 FOR A=0 TO 26
5 POKE 16514+A,16*(CODE A$(A*
3+1)-28)+CODE A$(A*3+2)-28
6 NEXT A
10 DIM B$(10,704)
20 FOR J=1 TO 10
30 FOR I=0 TO J*12
40 PLOT 32+J*2*SIN (I/(J*6)*PI
),22+J*2*COS (I/(J*6)*PI)
50 NEXT I
60 RAND USR 16514
70 LET B$(J)=A$
80 NEXT J
90 FOR J=1 TO 10
100 PRINT AT 0,0;B$(J)
110 NEXT J
120 GOTO 90

```

DANIEL FREEMAN of Rams-gate, Kent, writes: "On page 12 of the printer manual is a Basic routine which puts the contents of the screen into the array A\$ so that it can be recalled instantly by using PRINT AT 0,0;A\$. Although very useful, even in FAST mode it takes a long time to RUN. My machine code version does the same job instantly."

In the listing displayed, the first six lines are the loader listing which can be

put at the beginning of your program and will POKE the machine code into the REM statement, so that it can be recalled by a line like LET A=USR 16514.

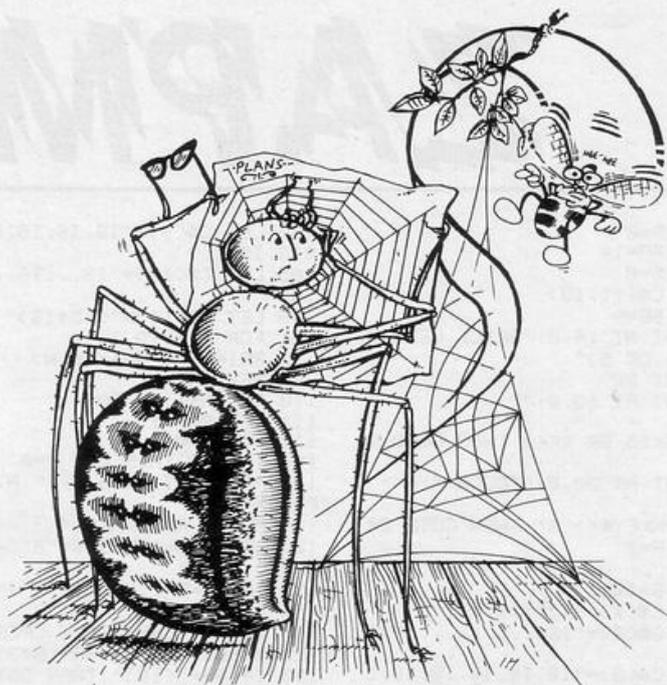
The rest of the listing is a demonstration of what the routine can achieve. Ten concentric circles are drawn very slowly and the display saved after every circle. The computer then replays the pictures at machine code speed. (16K ZX-81).

SYMMETRY

SYMMETRY is a useful subroutine to create a symmetrical pattern, acting as if a mirror has been placed vertically and horizontally across the screen. The routine should therefore be useful in creating mazes or crossword puzzles.

Listing 1 is entered first, then RUN; then lines 20 to 80 are deleted and the following command is then entered: POKE 16510,0. The demonstration program should then be entered. It will generate random characters at random positions in the top left-hand quarter, and then echo them at top right, bottom right and bottom left.

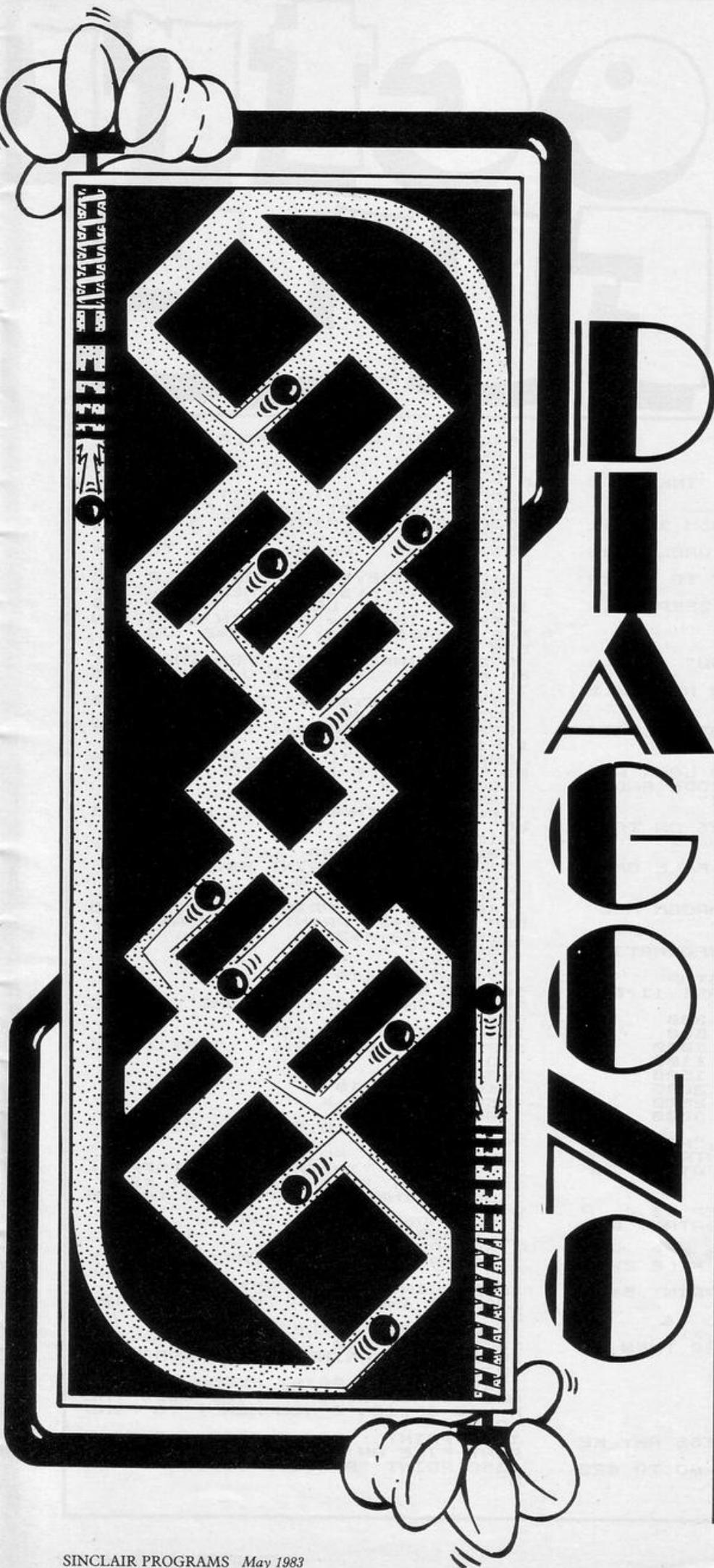
Symmetry was submitted by Paul Mott of Spalding, Lincolnshire. It manipulates the 16K display file and is therefore unsuitable for the unexpanded machine. (16K ZX-81).



```

10 REM (72 0s)
20 LET A$="2A0C400E160610545D3
E21133DFE0020FA231B7E1210FA3E112
33DFE0020FA0D20E32A0C400E0B545D1
4143EB5133DFE0020FA062023137E121
0FA233E411B3DFE0020FA0D20ECC9"
30 LET A=16514
40 FOR B=1 TO LEN A$ STEP 2
50 POKE A,(CODE A$(B)-28)*16+C
ODE A$(B+1)-28
60 LET A=A+1
70 NEXT B
10 REM DEMO
20 PRINT AT RND*10,RND*15;CHR#
(RND*255)
30 LET Z=USR 16514
40 GOTO 20

```



ANDREW KEY of Witney, Oxfordshire, sent **Diagono**, this intriguing man versus computer routine for the 16K ZX-81. In conception, it is a kind of low-tech version of our Program of the Month, requiring you to move the graphic A across the board from 0 to 0, the loser being the player who is forced to play into the top right-hand corner. You may move up (I), across (-), or diagonally (/), illegal moves being rejected.

As listed, the game is not too difficult but it will certainly interest readers exploring man/machine interaction. Lower-case letters in brackets are graphic instructions.

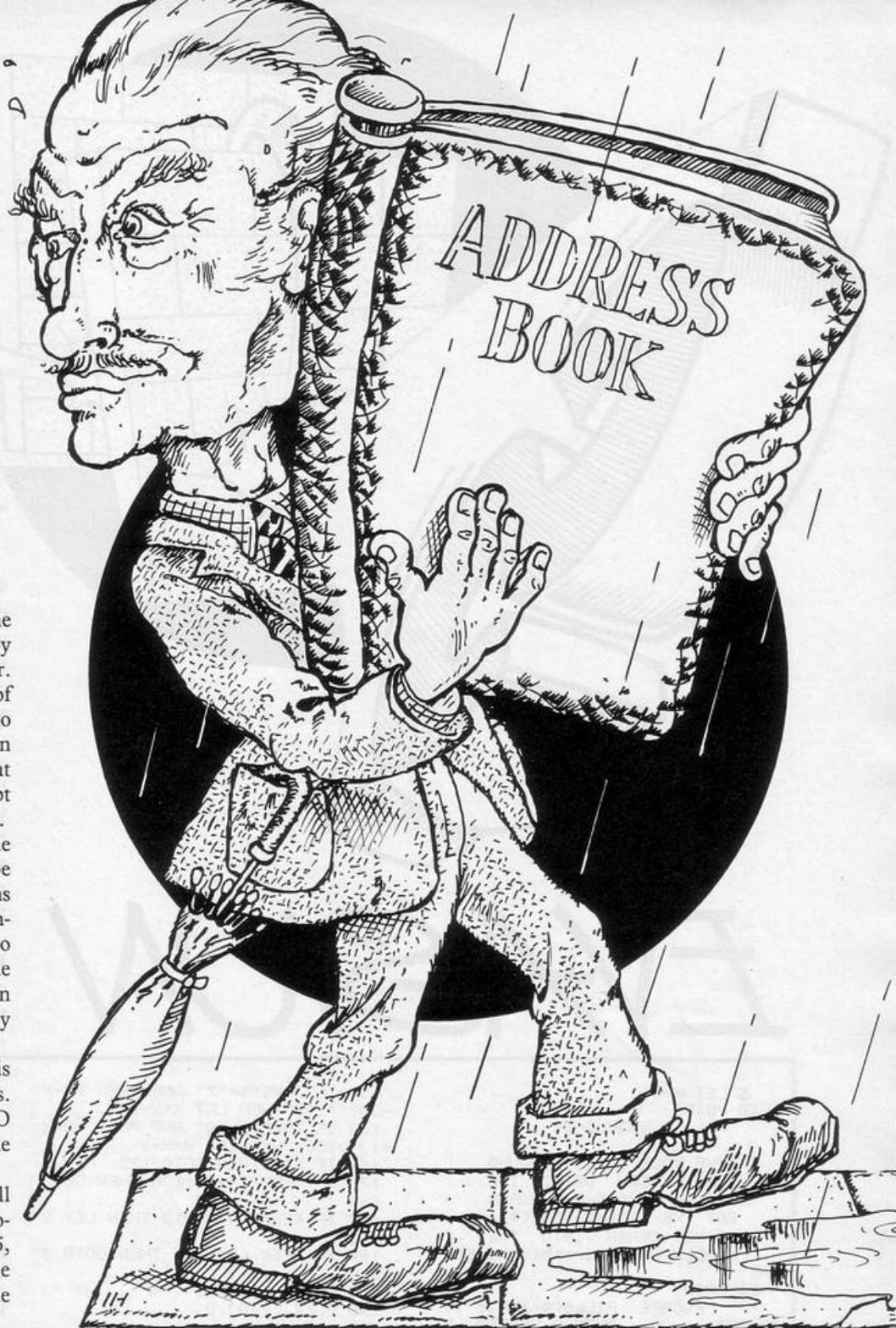
```

100 PRINT "DIAGONO",,"-----"
1000 FOR N=1 TO 9
1010 PRINT TAB 5;"0-0-0-0-0-0-0-0-0-0"
1020 IF N<9 THEN PRINT TAB 5;"I/
I/I/I/I/I/I/I/I"
1030 NEXT N
1040 PRINT AT 2,21;"<inverse 0>"
1050 LET Y=9
1060 LET X=1
2000 PRINT AT Y*2,X*2+3;"<graphic
c A>"
2010 PRINT AT 20,0;"YOUR MOVE?..
.I,/,-"
2020 INPUT M#
2030 IF M#<>"I" AND M#<>"/" AND
M#<>"-" THEN GOTO 2020
2040 IF ((M#="-" OR M#="/") AND
X=9) OR ((M#="I" OR M#="/") AND
Y=1) THEN GOTO 2020
2050 LET NX=X+(M#="-" OR M#="/")
2060 LET NY=Y-(M#="I" OR M#="/")
2070 PRINT AT Y*2,X*2+3;"0"
2080 LET X=NX
2090 LET Y=NY
2100 PRINT AT Y*2,X*2+3;"<graphic
c A>"
2110 IF X=9 AND Y=1 THEN GOTO 5E
3
2125 LET C#="0"
2130 IF X<9 AND Y>1 AND (M#="-"
OR M#="I") THEN LET C#="/"
2140 IF C#="/" THEN GOTO 3000
2150 IF (Y<X AND X<9) OR (Y>X A
ND Y=1) THEN LET C#="-"
2160 IF (Y>X AND Y>1) OR (Y<X A
ND X=9) THEN LET C#="I"
3000 PRINT AT 20,0;"I MOVE ";C#;
"
3003 LET QW=RND**RND**RND
3005 PRINT AT Y*2,X*2+3;"0"
3010 LET X=X+(C#="-" OR C#="/")
3020 LET Y=Y-(C#="I" OR C#="/")
3030 PRINT AT Y*2,X*2+3;"<graphic
c A>"
3040 IF X=9 AND Y=1 THEN GOTO 6E
3
3050 GOTO 2E3
5000 PRINT AT 20,0;"I WIN THIS G
AME
"
5010 GOTO 9999
6000 PRINT AT 20,0;"YOU WIN THIS
GAME
"
9999 STOP

```

Spectru FILE

```
2 REM © WAEL SABBAGH
3 DIM A$(30,8,20)
4 LET FCF=1
10 BORDER 1: PAPER 1: INK 6: C
LS
15 POKE 23656,8
20 PRINT AT 10,8; FLASH 1;"FIL
E"
25 PRINT AT 11,3;"BY WAEL SABB
AGH"
40 INPUT "SECRET CODE TO ENTER
TO FILES";B$
50 IF B$(>"PMP" THEN BEEP .3,-
10: GO TO 40
60 CLS
70 BEEP .1,10
80 PRINT AT 0,10;"MENU"
90 PRINT
100 PRINT "1 TO OPEN A NEW FILE
105 PRINT
110 PRINT "2 TO LOOK AT A CERTA
IN FILE"
115 PRINT
120 PRINT "3 TO HAVE A LOOK AT
EACH FILE (ON LY FILE CODE AND N
AME) AT THE SAME TIME"
125 PRINT
130 PRINT "4 SAVE FILES ON TAPE
135 PRINT
140 PRINT "5 LPRINT A FILE ON T
HE PRINTER"
145 PRINT
150 PRINT "6 SEARCH THROUGH ALL
FILES"
155 PRINT
160 PRINT "7 CHANGE INFORMATION
FROM FILE"
175 PRINT : PRINT "8 STOP"
180 INPUT "CHOICE PLEASE (1/8)"
C
190 IF C=1 THEN GO TO 300
200 IF C=2 THEN GO TO 500
210 IF C=3 THEN GO TO 1000
220 IF C=4 THEN GO TO 1100
230 IF C=5 THEN GO TO 1500
240 IF C=6 THEN GO TO 2000
250 IF C=7 THEN GO TO 2500
260 IF C=8 THEN GO TO 3000
270 GO TO 180
300 DATA "FILE CODE ","NAME ","
ADDRESS ","TOWN ","COUNTRY ","PO
STCODE ","TELEPHONE ","OTHER INF
O"
310 CLS : RESTORE 300
315 IF FCF>30 THEN BEEP .1,4: P
RINT "NO PLACE FOR DATA": GO
TO 410
317 LET A$(FCF,1)=STR$ FCF
320 PRINT AT 0,8;"NEW FILE ENTR
Y"
330 PRINT : READ B$: PRINT B$;F
CF
340 FOR X=2 TO 8: READ B$
350 INPUT (B$),A$(FCF,X)
360 IF LEN A$(FCF,X)>20 THEN GO
TO 350
370 PRINT B$:A$(FCF,X)
380 BEEP .2,X*5
390 PRINT
400 NEXT X
405 LET FCF=FCF+1
410 PRINT FLASH 1;"PRESS ANY KE
Y TO GO TO MENU"
420 IF INKEY$="" THEN GO TO 420
430 GO TO 60
500 CLS
510 PRINT AT 0,7;"FILE DISPLAY"
: PRINT
530 PRINT "HIT 1 IF YOU KNOW TH
E FILE CODE"
535 PRINT : PRINT "HIT 2 IF YOU
KNOW NAME (NOT ADVISBLE)"
536 PRINT : PRINT "HIT 3 IF YOU
KNOW TEL (NOT ADVISBLE)"
537 PRINT : PRINT "HIT 4 TO MEN
U"
540 IF INKEY$="" THEN GO TO 540
550 IF INKEY$="1" THEN INPUT "F
ILE CODE ";F: LET U=1: GO TO 700
560 IF INKEY$="2" THEN INPUT "N
AME PLEASE ";F$: LET U=2: GO TO
575
570 IF INKEY$="3" THEN INPUT "T
EL PLEASE ";F$: LET U=7: GO TO 5
75
571 IF INKEY$="4" THEN GO TO 60
572 GO TO 540
575 FOR X=LEN F$+1 TO 20: LET F
$=F$+" ": NEXT X
600 FOR X=1 TO FCF: IF A$(X,U)=
F$ THEN LET F=X: GO TO 700
590 NEXT X
595 CLS
600 PRINT "NAME / TEL NOT IN FI
LE"
610 GO TO 520
700 RESTORE 300: CLS
710 READ B$: PRINT B$;F
720 FOR X=2 TO 8
730 PRINT
740 READ B$: PRINT INK 6;B$: B
EEP .02,X*2: PRINT INK 7;A$(F,X)
: BEEP .02,X*3
750 NEXT X
760 PRINT
770 GO TO 410
1000 CLS
1005 PRINT FLASH 1;"NAME","FILEC
ODE"
1010 FOR X=1 TO FCF
1020 PRINT A$(X,2);" ";A$(X,1) (
TO 3)
1030 NEXT X
1040 GO TO 410
1055 BEEP .03,X
1100 CLS
1110 PRINT AT 0,5;"SAVE FILE ON
TAPE"
1120 PRINT : PRINT
1130 PRINT "INSERT BLANK TAPE"
1140 PRINT "THEN PRESS ANY KEY"
1150 IF INKEY$="" THEN GO TO 115
0
1160 SAVE "FILE" LINE 10
1170 BEEP .3,-10
1180 PRINT
1190 PRINT "REWIND TAPE TO VERIF
Y"
1200 PRINT "THEN PRESS ANY KEY"
1210 IF INKEY$="" THEN GO TO 121
0
1220 VERIFY "FILE"
1230 GO TO 410
1500 CLS : PRINT AT 0,4;"PRINTER
DISPLAY"
1520 PRINT : PRINT FLASH 1;"IF Y
OU ARE NOT SURE OF FILE CODE THE
N USE OPTION 3 (ON MENU) TO FIND
OUT"
1540 PRINT : PRINT "PRESS P TO P
RINT FILE ON PRINTER"
1550 PRINT "PRESS M TO GO TO MEN
U"
```



A VERY USEFUL routine for the 16K Spectrum has been sent by Wael Sabbagh of Colchester. **Spectrum File** provides a method of storing the names and addresses of up to 30 individuals. Only 20 characters can be handled on each line of input but that should be no disadvantage, except perhaps on the Other Information line.

Since some of the information in the file may be confidential, the files can be accessed only when the secret code has been entered. STOP and LIST commands would allow the Sinclair user to crack that deadlock quickly. The code as listed is PMP but can be altered in line 50. The routine is served by a very useful menu.

As with all filing routines, the user is well-advised to avoid RUN commands. If the program is broken into, then GO TO 60 will return you safely to the menu.

On a 48K machine, the routine will handle details on 150 individuals provided the number 30 in lines 3, 315, 1590 and 2520 is altered to 160. If the program is to be saved, option 4 of the menu should be used.

```

1560 IF INKEY$("<" OR "P") AND INKEY$(">" OR "M") THEN GO TO 1560
1570 IF INKEY$="M" THEN GO TO 410
1580 INPUT "ENTER FILE CODE ";F
1590 IF F<1 OR F>30 THEN GO TO 1580
1600 RESTORE 300: LPRINT "SABBAGH SOFTWARE FILE PROG"
1610 LPRINT
1620 FOR X=1 TO 8
1630 READ K$: LPRINT K$;A$(F,X)
1640 LPRINT
1650 NEXT X
1660 LPRINT "

```

```

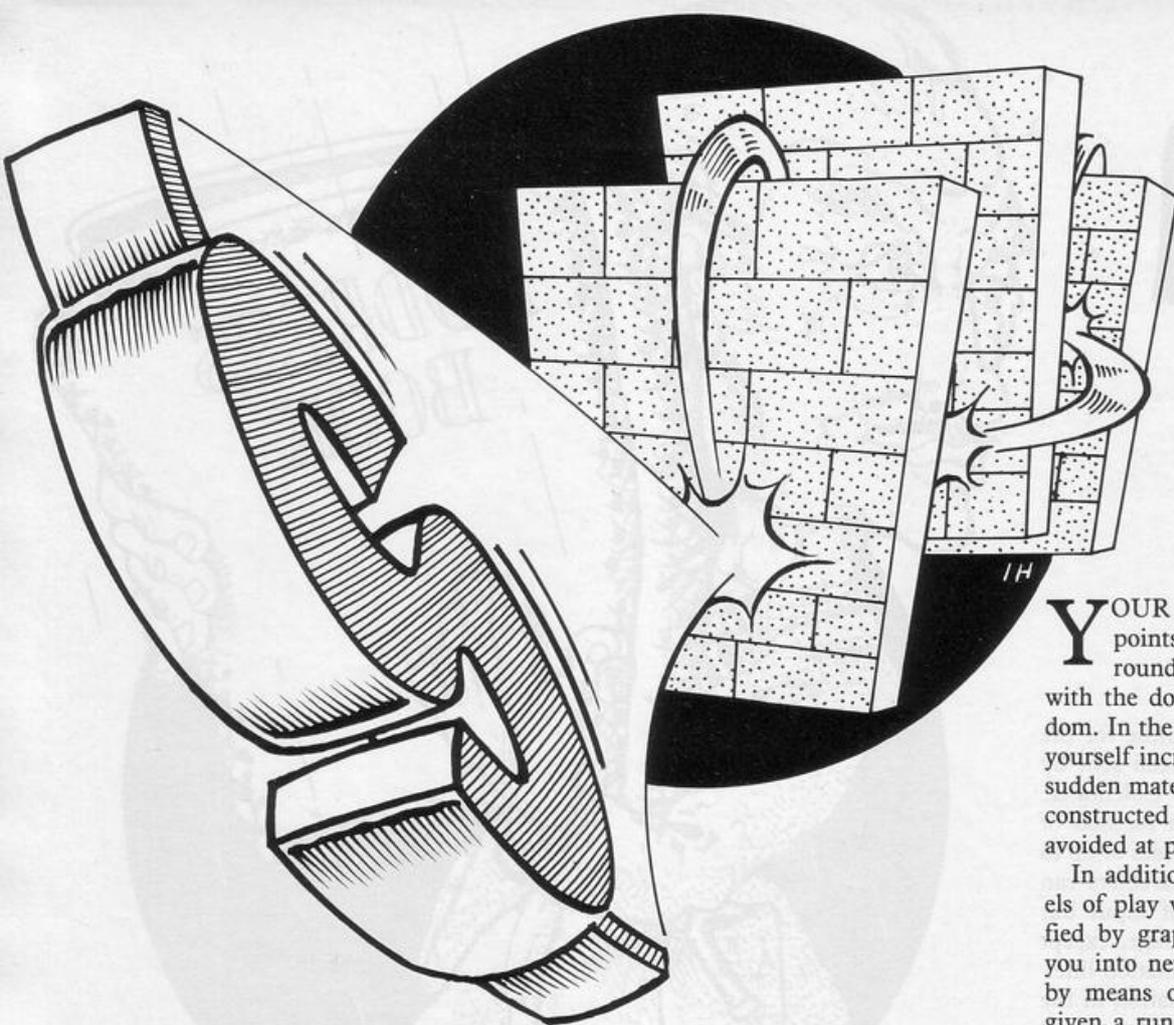
1670 GO TO 60
2000 CLS
2010 FOR X=1 TO FCF-1
2020 RESTORE 300
2030 FOR K=1 TO 8
2040 READ B$
2050 PRINT B$;A$(X,K)
2060 PRINT : NEXT K
2100 PRINT FLASH 1;"PRESS ANY KEY TO CON (M TO MENU)"

```

```

2110 IF INKEY$="" THEN GO TO 2110
2120 IF INKEY$="M" THEN GO TO 60
2130 CLS : NEXT X
2140 GO TO 410
2500 RESTORE 300: CLS
2510 INPUT "WHAT FILE WOULD YOU LIKE TO CHANGE INFO FROM ";F
2520 IF F<1 OR F>30 THEN GO TO 2510
2530 PRINT FLASH 1;"WHAT WOULD YOU LIKE TO CHANGE"
2540 PRINT "INPUT 9 TO GO TO MENU"
2550 FOR C=1 TO 8
2555 READ B$
2560 PRINT FLASH 1,C; FLASH 0;B$;A$(F,C)
2570 NEXT C
2580 INPUT "CHANGE (9 TO MENU)";D
2590 IF D=9 THEN GO TO 60
2600 INPUT "THE NEW VERSION";A$(F,D)
2610 CLS : RESTORE 300: GO TO 2530
3000 CLS : PRINT AT 10,4; FLASH 1;"FILE CLOSED"

```



YOUR TASK is to collect as many points as possible by moving round the playing area colliding with the dollar signs appearing at random. In the course of play you will find yourself increasingly constrained by the sudden materialisation of deadly walls—constructed of graphic H. They must be avoided at peril of your life.

In addition, gateways on to new levels of play will appear. They are signified by graphic Ts and will transport you into new playing areas. You move by means of the cursor keys and are given a running score of your achievements. Full instructions are given with the listing.

16K Evasion was submitted by Peter Hawkin of Leeds. In our listing, lower-case lettering indicates graphics instructions; IS signifies Inverse Space. (16K ZX-81).

EVASION

```

5 LET H=0
10 PRINT "SURROUND-81"

MOVE YOUR MAN(X) AROUND
THE SCREEN USING THE
CURSOR KEYS(5,6,7,8)AND
EAT THE POINT-PODS(#).
DO NOT CRASH INTO THE
DEADLY WALLS(®raphic H).EAT
THE"
20 PRINT "ESCAPE PILLS(®raphic T)
TO GET ONTO A HARDER LEV
EL."
INPUT DIFFICULTY
LEVEL (1-4)"
25 LET A$=INKEY#
30 IF A$="" THEN GOTO 25
35 IF A$<>"1" AND A$<>"2" AND
A$<>"3" AND A$<>"4" THEN GOTO 25
40 LET L=VAL A$#8
45 LET S=0
50 CLS
60 LET A=1+PEEK 16396+PEEK 163
97*256
65 PRINT "(2*IS)SURROUND-81(7*
IS)SCORE=(6,IS)"
70 PRINT "(32*IS)"
80 FOR F=1 TO 19
90 PRINT "(IS)";TAB 31;"(IS)"
100 NEXT F
110 PRINT "(32*IS)"
120 LET X=345
123 LET Y=336
130 IF INKEY#="5" AND PEEK (A+X
-1)<>128 THEN LET X=X-1
140 IF INKEY#="6" AND PEEK (A+X
+33)<>128 THEN LET X=X+33
150 IF INKEY#="7" AND PEEK (A+X
-33)<>128 THEN LET X=X-33
160 IF INKEY#="8" AND PEEK (A+X
+1)<>128 THEN LET X=X+1
165 IF X=Y THEN GOTO 125
170 IF PEEK (X+A)=136 THEN GOTO
360
175 IF PEEK (X+A)=13 THEN LET S
=S+100
180 IF PEEK (X+A)=6 THEN GOTO 3
00
185 POKE (X+A),61
190 POKE (Y+A),0
200 LET Y=X
210 IF (RND(L) AND (PEEK (A+X+2
)<>128) AND (PEEK (A+X+1)<>128)
THEN POKE (A+X+INT (RND*2)+1),13
6
220 IF (RND(L) AND (PEEK (A+X-6
)<>128) AND (PEEK (A+X-33)<>128)
) THEN POKE (A+X-((INT (RND*2)+1
)*33)),136
230 IF (RND(L) AND (PEEK (A+X+6
)<>128) AND (PEEK (A+X+33)<>128
) THEN POKE (A+X+((INT (RND*2)+1
)*33)),136
240 IF (RND(L) AND (PEEK (A+X-2
)<>128) AND (PEEK (A+X-1)<>128)
THEN POKE (A+X+INT (RND*2)-2),13
6
250 IF RND<.1 THEN PRINT AT INT
(RND*19)+2,INT (RND*30)+1;"#"
260 IF RND<.03 THEN PRINT AT IN
T (RND*19)+2,INT (RND*30)+1;"(®r
aPhic T)"
270 LET S=S+10
280 PRINT AT 0,26;S
290 GOTO 125
300 LET S=S+300
305 POKE (A+Y),0
310 FOR F=1 TO 25
313 POKE X+A,61
315 POKE X+A,6
317 POKE A+X,134
320 NEXT F
325 CLS
330 PRINT "WELL DONE. YOU HAVE COMPLETED
ROUND ONE AND HAVE BEEN AWARDED
300 BONUS POINTS FOR DOING SO.
PRESS ANY KEY TO GET ONTO A
HARDER LEVEL."
335 LET L=L+.125
340 IF INKEY#="" THEN GOTO 340
350 GOTO 50
360 POKE A+Y,0
365 FOR F=1 TO 25
370 POKE X+A,61
375 POKE A+X,136
380 POKE A+X,0
390 NEXT F
400 CLS
410 PRINT "YOU CRASHED INTO A W
ALL. YOUR FINAL SCORE WAS ";S;
"
420 IF S>H THEN LET H=S
425 PRINT
430 PRINT "THE HIGH SCORE IS ";
H;"
435 PRINT
440 PRINT "PRESS ANY KEY FOR AN
OTHER GAME."
450 IF INKEY#="" THEN GOTO 450
460 CLS
470 GOTO 10
9000 SAVE "SURR"
9010 RUN

```



PILOT

```

1 BORDER 0: PAPER 0: CLS : IN
< 7: LET S=0
2 RESTORE
3 DIM t(10): FOR n=1 TO 10: R
=>AD P: LET t(n)=P: NEXT n
10 DIM a(51): DIM b(51)
20 INPUT "Which level (1-4)? "
; t: IF t(1 OR t>4 THEN GO TO 20
30 PRINT AT 1,0:"LEVEL ";t
40 LET X=35-4.5*t
50 LET a(1)=75: LET b(1)=75+X
55 RANDOMIZE : PRINT AT 0,0;"S
CORE "S
60 FOR n=2 TO 51: LET a(n)=a(n
-1)+(INT (RAND*3)-1)*5: LET a(n)=
9(n)+a(n) (0) *5-(a(n)+X>175)*5:
LET b(n)=a(n)+X: NEXT n
70 PLOT 0,75: DRAW 5,0: FOR n=
2 TO 51: DRAW 5,a(n)-a(n-1): NEX
T n
80 PLOT 0,75+X: DRAW 5,0: FOR
n=2 TO 51: DRAW 5,b(n)-b(n-1): N
EXT n
90 FOR n=1 TO 10 STEP 2: BEEP
t(n),t(n+1): NEXT n
110 PLOT 0,INT ((75+75+X)/2): L
ET b=0
120 FOR n=1 TO 51: LET b=0+(INK
EY$="7")*5-(INKEY$="6")*5: DRAW
INK 6;5,0: PRINT AT 21,0;"
": BEEP .01,n-10: IF PEEK 236
78<=b(n) OR PEEK 23678<=a(n) THE
N GO TO 140
130 LET S=S+1: PRINT AT 0,6;S:
NEXT n
135 CLS : GO TO 30
140 LET F=S+LEN STR$ S: PRINT A
T 13,0: FLASH 1: INK 1: PAPER 6:
" YOU CRASHED!"; AT 0,0: OVER 1;"
( TO F)
145 FOR n=30 TO 4 STEP -.5: BEE
P .005,n: NEXT n
150 INPUT "another go y/n? ";a$
: IF a$="y" THEN RUN
300 DATA .3,-.5,.4,0,.12,0,.1,0,
.4,7

```

P ILOT is the simplest possible version of a popular arcade routine. In the arcade version you are required to steer through a scrolled-down tunnel, nailing assorted aliens along the way. There are no aliens to zap in this listing and your ship is signified only by its vapour trail but the

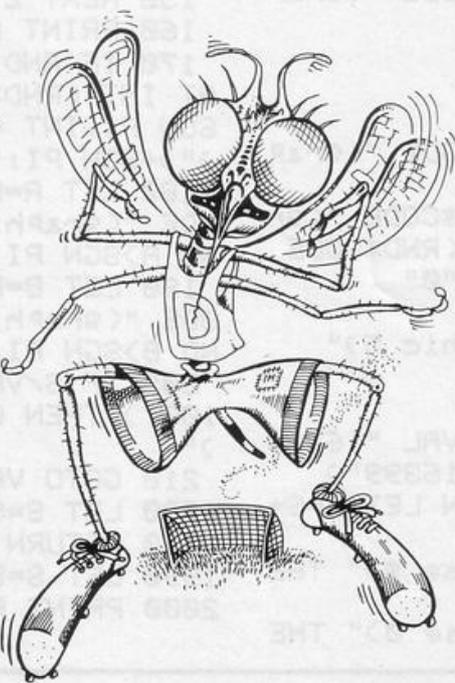
game can still hook the average arcade addict. You have four levels of difficulty from which to choose; manoeuvre up with 7 and down with 6. The game was submitted by M Simper of Histon, Cambridgeshire. (16K Spectrum).

PLAGUE

PLAGUE is 30 to the difficult side of impossible. You and your eight brave comrades are attempting to take supplies to a medical team which is battling to combat an outbreak of mosquito-carried plague. Unfortunately, a cloud of the infested insects is hovering between you and your goal.

Use the cursor keys to manoeuvre your men between the deadly flies and if you manage to reach the medical team and return—unlikely—you will be awarded 10 points.

As a measure of its difficulty, the author, Denis McCarthy of Todmorden, Lancashire, has a personal best score of 30. In our listing, lower-case letters are graphics instructions. (1K ZX-81).



```

1 LET K=0
2 LET S=K
3 FOR N=K TO 9
4 LET T=K
5 LET J=CODE "<"
6 LET A=VAL "9"
7 LET D=VAL "4"
8 CLS
9 PRINT AT 4,K;"(inverse SPAC
E;inverse M)";"(inverse S;invers
e SPACE)";"(two inverse SPACES)"
;"(two inverse SPACES)";AT D,J;"
"
10 PRINT AT RND*A,5;" + + "
;AT RND*A,5;" + + ";AT RND*A,
5;" + + ";AT RND*A,5;" + +
"
11 LET D=D+(INKEY$="6" AND D<A
)-(INKEY$="7" AND D>K)
12 LET J=J+(INKEY$="8" AND J<1
6)-(INKEY$="5" AND J>K)
13 PRINT AT D,J
14 LET Q=PEEK (PEEK 16398+256*
PEEK 16399)
15 PRINT "(inverse 0)"
16 LET T=T+(Q=CODE "<(inverse M
)");
17 IF Q=CODE "<(inverse S)" AND
T>=1 THEN GOTO 21
18 IF Q<>CODE "+" THEN GOTO A
19 NEXT N
20 PRINT S;Z
21 LET S=S+10
22 GOTO 4

```

PIC MAN



PIC-MAN is a game for the unexpanded ZX-81 requiring speed and luck. The playing area comprises zeros and there are five inverse zeros. Move your man with keys 5 to 8 and score one for every zero and 10 for

an inverse zero. Instead of ghosts there are inverse dollar signs which appear at random, surrounding you and your food. Therefore you must act with cunning and despatch to consume as many of the tasty morsels as you can before

you are trapped in the money cage. Your score is displayed at the end of the game and a new playing area is made every 100 points. **Pic-man** was composed by Michael Porter of Harrogate.

```

1 LET S=SIN PI
10 FOR A=SGN PI TO CODE "<graphic
hic S)"
20 FOR B=SGN PI TO CODE "<graphic
hic S)"
30 PRINT AT A,B,"0"
40 NEXT B
50 NEXT A
60 FOR A=SGN PI TO CODE "<graphic
hic 5)"
70 PRINT AT INT (RND*CODE "<graphic
S)")+SGN PI,INT (RND*CODE
"<graphic S)")+SGN PI,"0"
80 NEXT A
90 LET A=CODE "<graphic 5)"
100 LET B=A
110 PRINT AT B,A)
120 LET P=PEEK (PEEK VAL "16398
"+VAL "256"*PEEK VAL "16399")
130 IF P=CODE "0" THEN LET S=S+
SGN PI
135 IF P=CODE "<inverse $)" THE
N GOTO VAL "2E3"
140 IF P=CODE "<inverse 0)" THE

```

```

N GOTO VAL "1E3"
150 PRINT "<"
155 FOR Z=1 TO 10
156 NEXT Z
160 PRINT AT B,A)"- "
170 IF RND>VAL ".4" THEN PRINT
AT INT (RND*CODE "<graphic S)")+
SGN PI,INT (RND*CODE "<graphic S
)")+SGN PI,"<inverse $)"
180 LET A=A+(INKEY#="8" AND A<C
ODE "<graphic S)")-(INKEY#="5" A
ND A>SGN PI)
190 LET B=B+(INKEY#="6" AND B<C
ODE "<graphic S)")-(INKEY#="7" A
ND B>SGN PI)
205 IF S/VAL "100"=INT (S/VAL "
100") THEN GOTO CODE "<graphic 2
)"
210 GOTO VAL "110"
1000 LET S=S+CODE "<graphic S)"
1020 RETURN
1990 LET S=S+CODE "<graphic 5)"
2000 PRINT AT 0,0)S

```

```

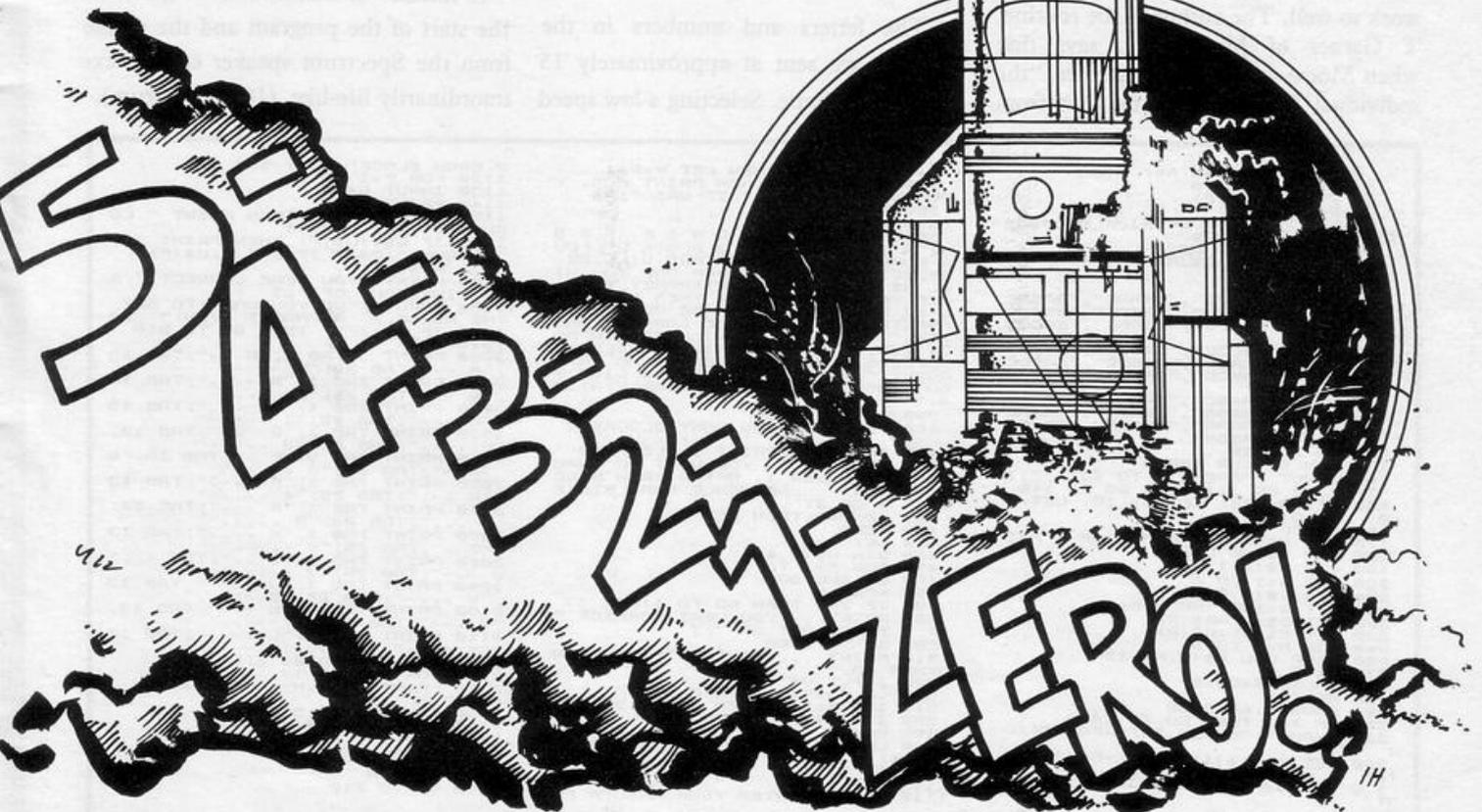
20 LET T=120
50 PRINT AT 15,21;"A"
60 PRINT TAB 21;"(inverse space)"
70 PRINT TAB 21;"(inverse space)"
80 PRINT TAB 20;"(graphic T,space,graphic Y)"
85 PRINT "(inverse space,twenty two graphic Gs)"
100 FOR N=0 TO 19
105 PRINT AT 19,N;"(inverse space)"
110 LET A=INT (RND*10)
120 LET B=INT (RND*100)
130 PRINT AT 21,6,A+B;" - ";B;" = "
140 PRINT AT 19,27,T;" "
150 LET A#=INKEY#
160 PRINT ,,A#;"(inverse space)" AND A#=""
170 IF A#=STR# A THEN NEXT N
180 LET T=T-1
190 IF N<>20 THEN GOTO 140+(T<0)*140
200 FOR N=1 TO 50
210 PRINT AT 18,21;" "
220 PRINT AT 18,21;"V"
230 NEXT N
240 POKE 16418,5
250 FOR N=1 TO 19
260 SCROLL
270 NEXT N

```

TAKE OFF for the 1K ZX-81, which was sent by C Robinson of Slough, Berkshire challenges your mathematical speed and accuracy. A rocket is on the launch pad and time is ticking away. Fuel must be delivered to the rocket along the underground pipeline by answering 20 questions correctly before the time reaches zero.

If your skill at subtraction is good enough for the test the rocket will blast into outer space; if not, it will be left stranded. Lower-case letters in brackets indicate graphics instructions.

TAKE OFF





SPECTRUM MORSE

SPECTRUM MORSE, an excellent Morse code training program, must be one of the most effective educational listings we have published. It is difficult to think of any other method of home tuition which could work so well. The author of the routine, T Garner of Manchester, says that when Morse code is being studied "the individual letters should be sent from

the start at the speed the student wishes to attain. The space between the letters can be long at first, then reduced gradually, keeping the letters at the same speed and thus reducing the thinking time.

"The letters and numbers in the program are sent at approximately 15 words per minute. Selecting a low speed

gives longer thinking time. Proficiency at speed 10 should ensure that the student will have no difficulty with the receiving part of the Morse section in the radio amateurs' examinations."

A full list of instructions is given at the start of the program and the morse from the Spectrum speaker sounds extraordinarily life-like. (16K Spectrum).

```

0>REM @ Tom Garner 1983
10 POKE 23650,8
20 DIM A$(36,5)
30 DIM B$(36)
40 LET C$="ABCDEFGHIJKLMNPOQRS
RUUVXYZ1234567890"
50 FOR N=1 TO 36
60 LET B$(N)=C$(N)
70 READ A$(N)
80 NEXT N
90 DATA "ABCCC","BAAAC","BABAC
","BAACC","ACCCC","AABAC","BBACC
","AAAA","AACCC","ABBCC","BABCC
","BAAAC"
100 DATA "BBCCC","BACCC","BBBCC
","BBACC","BBABC","ABACC","BAACC
","BCCCC","ABCCC","AAABC","ABBCC
"
110 DATA "BAAAC","BABBCC","BBAAC
","ABBBB","AABBB","AAABB","AAAA
","AAAA","BAAAA","BAAA","BBBB
","BBBB"
120 GO TO 360
130 REM SET UP SPEED
140 INPUT "SPEED 1 TO 10 :";I
: IF I>10 OR I<1 THEN GO TO 140
150 LET A=.05: LET B=.18: LET C
=0: LET D=10/I
160 GO TO 490
170 REM GENERATE BLOCK OF 4 FIG
URES AND SOUND CODE
180 DIM E$(4,1)
190 FOR M=1 TO 4
200 DIM D$(4,5)
210 LET R=INT (RND*36+1)
220 LET D$(M)=A$(R)
230 LET E$(M)=B$(R)
240 FOR N=1 TO 5
250 BEEP VAL D$(M,N),15
260 NEXT N
270 NEXT M
280 PAUSE B*D*50
290 NEXT M
291 PAUSE .42*D*50
300 IF Z=2 THEN GO TO 1000
310 INPUT "ENTER INTERPRETATIO
N :";Q$
320 LET P$=E$(1)+E$(2)+E$(3)+E$
(4)
330 IF Q$=P$ THEN PRINT F;" RIG
HT"
340 IF Q$=P$ THEN LET P=P+1
350 IF Q$(2)P$ THEN PRINT F;" Y
OU ENTERED "Q$;" IT WAS ";P$
360 PAUSE 200
370 RETURN
380 PRINT " M O R S E T R A
I N E R
R NUMBERS AND "LETTERS WILL BE
SELECTED AT "RANDOM AND YOU WI
LL BE ASKED "TO INTERPRET THEM
IF YOU ARE "WRONG THEN YOU WI
LL BE ABLE "TO COMPARE YOUR INTE
RPRETATION WITH THE CORRECT ANS
WER " "SPEED 10 WILL GIVE APPR
OX 15 "WORDS PER MINUTE. SLOWER
SPEEDS "WILL INCREASE THE INTE
RVAL "BETWEEN LETTERS TO GIVE Y
OU "MORE TIME FOR INTERPRETATIO
N."
390 GO SUB 130
400 PRINT "HOW MANY BLOCKS ?"
410 INPUT I: PRINT I: LET Z=0
420 INPUT "DO YOU WANT TO INPU
T YOUR ANSWER 1 AFTER EACH BLOC
K 2 WHEN "SEQUENCE COMPLETE (E
NTER 1 OR 2)";J
440 IF J=2 THEN LET Z=2
450 CLS
460 LET P=0
465 DIM U$(I,4)
470 FOR F=1 TO I
480 GO SUB 170
490 NEXT F
495 IF Z=2 THEN GO TO 1100
500 PRINT "YOU WERE CORRECT "
P;" TIMES OUT OF ";I
505 GO TO 1900
510 PRINT "ENTER 'Y' FOR AN
OTHER GO."
520 INPUT U$
530 IF U$="Y" THEN CLS
540 IF U$="Y" THEN GO TO 380
550 IF U$="Y" THEN STOP
1000 REM
1010 LET U$(F)=E$(1)+E$(2)+E$(3)
+E$(4)
1020 GO TO 490
1100 CLS
1110 PRINT "ENTER YOUR ANSWER FO
R EACH BLOCK": LET S=0
1120 FOR F=1 TO I
1130 INPUT Q$
1140 PRINT F;
1150 IF Q$=U$(F) THEN PRINT " CO
RRECT." : LET S=S+1
1160 IF Q$(2)U$(F) THEN PRINT " Y
OU GAVE "Q$;" IT WAS ";U$(F)
1170 NEXT F
1180 PRINT "YOU WERE CORRECT ";S
;" TIMES OUT OF ";I
1900 INPUT "DO YOU WANT TO SEE
THE MORSE "ALPHABET (Y/N)?" : I$
1910 IF I$="Y" THEN GO TO 510
1920 CLS
2000 PRINT "TAB 1;"A " ;TAB 13
;"M " ;TAB 25;"Y "
2010 PRINT TAB 1;"B " ;TAB 13
;"N " ;TAB 25;"Z "
2020 PRINT TAB 1;"C " ;TAB 13
;"O " ;TAB 25;"1 "
2030 PRINT TAB 1;"D " ;TAB 13;
;"P " ;TAB 25;"2 "
2040 PRINT TAB 1;"E " ;TAB 13;"0
" ;TAB 25;"3 "
2050 PRINT TAB 1;"F " ;TAB 13
;"R " ;TAB 25;"4 "
2060 PRINT TAB 1;"G " ;TAB 13;
;"S " ;TAB 25;"5 "
2070 PRINT TAB 1;"H " ;TAB 13
;"T " ;TAB 25;"6 "
2080 PRINT TAB 1;"I " ;TAB 13;"
" ;TAB 25;"7 "
2090 PRINT TAB 1;"J " ;TAB 13
;"U " ;TAB 25;"8 "
2100 PRINT TAB 1;"K " ;TAB 13;
;"V " ;TAB 25;"9 "
2110 PRINT TAB 1;"L " ;TAB 13
;"X " ;TAB 25;"0 "
2120 FOR M=0 TO 24 STEP 12
2130 FOR N=1 TO 12
2140 PRINT AT N,M; FLASH 1;"
PAUSE 50
2150 FOR P=1 TO 5
2160 BEEP VAL A$(M+N),P,15
2170 NEXT P
2180 PRINT AT N,M;" "
2190 NEXT N
2200 NEXT M
2210 GO TO 510

```



CLIMBER is a reaction game guaranteed to test the co-ordination of the most lightning-fingered operator. You must make your way through a series of parallel walls in which a magical gateway appears at random positions. You are represented on-screen by A and manoeuvre yourself with keys 1 and 0.

If you are quick enough to position yourself under an opening you can proceed to the next level by pressing E. When you reach screen-top your time will be displayed.

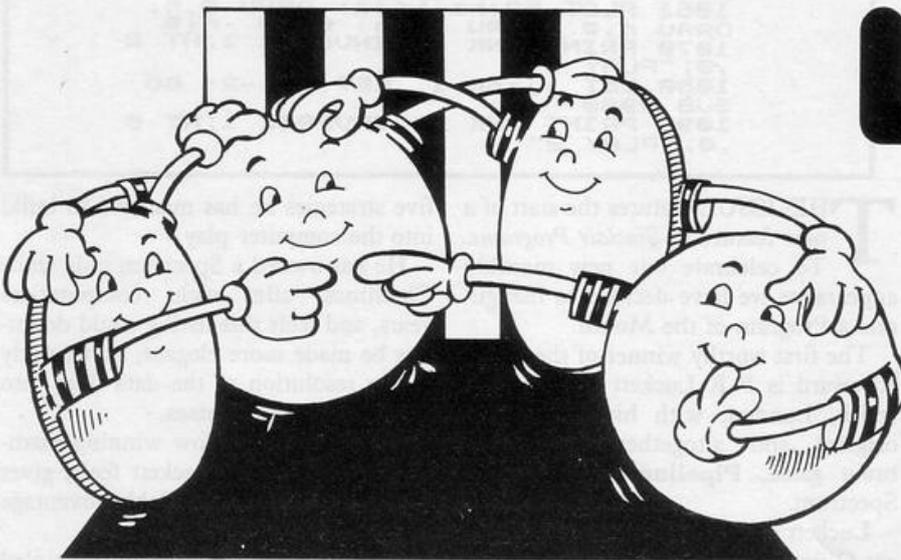
Climber was written by David Cockburn of Manchester. (1K ZX-81).

CLIMBER

```

4 REM "A CLIMBER"
5 LET S=VAL "0"
10 LET X=VAL "19"
20 LET Y=1
25 LET Q=INT (RND*18)+1
30 FOR A=1 TO 9
40 PRINT AT A*2,1;"(eighteen i
nverse SPACES)"
50 NEXT A
65 FOR W=0 TO 15
66 LET S=S+1
80 LET Y=Y+(INKEY#="0")-(INKEY
#="1")
90 PRINT AT X-1,Q;" "
100 IF INKEY#="E" AND Y=Q THEN
LET X=X-2
110 PRINT AT X,Y-1;" A "
112 IF X=1 THEN GOTO 300
115 IF INKEY#="E" AND Y=VAL "Q"
THEN GOTO 21
120 NEXT W
130 GOTO 25

```



LINK4

CELIA SIMS of Gt Yarmouth, Norfolk has managed to squeeze a **Link 4** game on to an unexpanded ZX-81. The display is surprisingly complete, even to the extent that the counters can be seen falling down-screen into position on the frame.

Link 4 is a version of the parlour game for two people in which you are required to place four counters in a row before your opponent. In this listing, the frame for the counters is represented by the numbers 1 to 8 and you are requested to enter the number appropriate to the column you wish to occupy.

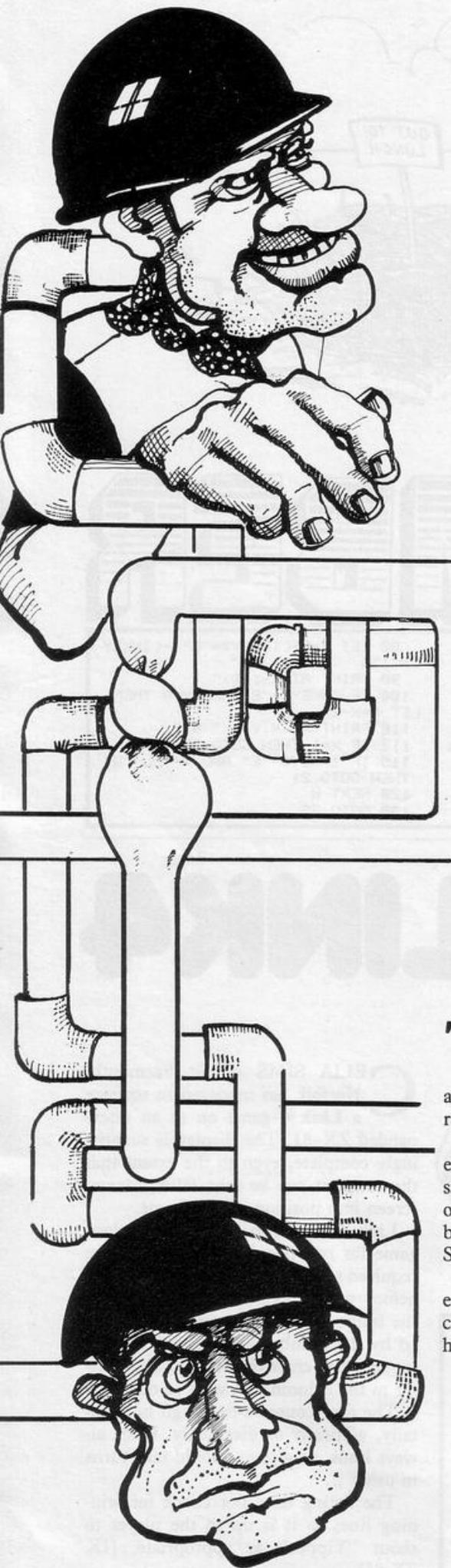
The four counters can align horizontally, vertically or diagonally. Black always leads, so players should take turns in using it.

The listing does not check for winning lines so it is up to the player to shout "Yippee" as appropriate. (1K ZX-81).

```

10 CLS
20 PRINT "CONNECT 4"
30 PRINT AT 21,1;"12345678"
40 FOR X=6 TO 1 STEP -1
50 PRINT AT X+14,0;7-X
60 NEXT X
70 LET G=0
80 LET C#="66666666"
100 IF G<>0 THEN GOTO 200
110 LET G#="(inverse SPACE)"
120 GOTO 300
200 LET G#="(Graphic H)"
300 LET G=NOT G
310 PRINT AT 2,0;G#;" COLUMN?"
400 INPUT C
410 IF C<=0 OR C>=9 THEN GOTO 4
80
420 IF C#(C)="0" THEN GOTO 400
430 PRINT AT 2,0;" "
500 FOR X=5 TO VAL (C#(C))+13 S
TEP 1
510 PRINT AT X,C;G#
520 PRINT AT X,C;" "
530 NEXT X
540 PRINT AT X,C;G#
600 LET C#(C)=STR# (VAL (C#(C))
-1)
700 GOTO 100

```



```

1 REM      PIPELINE
2 REM
3 REM      © P R LUCKETT (1983)
4 REM
5 REM
10 PRINT AT 0,12;"PIPELINE"
20 PRINT AT 2,0;"AIM we must e
ach try to finish the pipeline
by playing into the upper right f
ield; or to force our opponent
off the board"
30 PRINT AT 7,0;"RULES a) playe
rs alternate moves- b) each move
must extend the pipeline int
o an adjacent field"
40 PRINT AT 12,0;"I WILL LET Y
OU CHOOSE ""PLAY ORDER"" (1=Y
OU FIRST, 2=HE FIRST)"
50 PRINT AT 14,0;"YOU CAN ALSO
PICK ""PLAY LEVEL"" (1=BEGINNE
R, 2=ADVANCED) BUT BE CAREFUL WI
TH LEVEL 2 !! I'M VERY GOOD!!!!"
60 PRINT AT 21,0;"PRESS ANY KE
Y TO CONTINUE"
999 IF INKEY$="" THEN GO TO 999
1000 CLS : PAUSE 50
1001 DIM d(4,3): DIM e(13,13)
1002 RESTORE 9000: FOR i=1 TO 4:
FOR j=1 TO 3
1003 READ d(i,j): NEXT j: NEXT i
1005 BORDER 5
1010 PRINT INK 3; INVERSE 1;"PIP
ELINE": INPUT "PLAY ORDER(1or2)
";p0;"PLAY LEVEL(1or2)";p1;
1011 PRINT INK 5; INVERSE 1; AT 0
,24;"ADVANCED"
1012 IF p1=1 THEN PRINT INK 3; I
NVERSE 1; AT 0,24;"BEGINNER"
1013 PRINT INK 4; AT 18,26; INVER
SE 1;"PLEASE"
1014 PRINT INK 4; AT 19,26; INVER
SE 1;"WAIT"
1015 PRINT INK 4; AT 20,26; INVER
SE 1;"FOR"
1016 PRINT INK 4; AT 21,26; INVER
SE 1;"PROMPT"
1020 PLOT 49,0: DRAW 157,0: DRAW
0,157: DRAW -157,0: DRAW 0,-157
1030 LET nn=12+(p1<>p0): LET lw=
4+(p1<>p0): LET bd=12+(p1=p0)
1040 LET jj=1: LET ii=1
1050 GO SUB 2000
1060 LET n=(nn-1): LET hs=nn*(bd
-1)
1061 PLOT 50+hs,hs+1: DRAW 0,n:
DRAW n,0: DRAW 0,-n: DRAW -n,0
1070 PRINT INK 1; INVERSE 1; AT 2
,0;"PLAY 1"
1080 LET jj=bd-1: LET ii=-2: GO
SUB 2000
1090 PRINT INK 1; INVERSE 1; AT 8
,0;"PLAY 2"

```

THIS ISSUE features the start of a new feature in *Sinclair Programs*.

To celebrate our new monthly appearance we have decided to inaugurate a Program of the Month.

The first worthy winner of the coveted award is P R Lockett of Hammer-smith, London, with his enthralling, original and altogether outstanding brain game, **Pipeline**, for the 48K Spectrum.

Lockett works at the European Patent Office in Munich, examining applications on digital signalling techniques; his mathematical bias is apparent in the

five strategies he has managed to build into the computer play.

He has owned a Spectrum only since Christmas, after eight computerless years, and feels this listing could doubtless be made more elegant, particularly in the resolution of the data lines into their mathematical bases.

The ability to follow winning mathematical strategies, Lockett feels, gives the computer an unassailable advantage in this type of game.

Pipeline casts you as an unprincipled pipe-laying engineer. You are shown the playing area and the choice of three

PIPE

```

1100 LET jj=7: GO SUB 4000
1110 PRINT INK 1; INVERSE 1; AT 1
5,0; "PLAY 3"
1120 LET jj=2: GO SUB 6000
1130 LET ii=1: LET jj=1
1140 DIM b(15,15)
1150 FOR i=1 TO bd+2: FOR j=1 TO
bd+2
1160 LET b(i,j)=- (i=1)- (j=1)- (i=
bd+2)- (j=bd+2)
1170 NEXT j: NEXT i
1175 INPUT "SOLO? (y=yes,n=no)"; s
$
1180 LET b(2,2)=1: LET move=1
1190 LET move=move+1
1500 IF (po=1 AND (move/2=INT (m
ove/2))) OR (po=2 AND (move/2<>I
NT (move/2))) THEN GO TO 3000
1520 GO TO 5000
1999 STOP
2010 LET iii=nn*(ii-1)+50: LET j
jj=nn*(jj-1)+1
2020 FOR i=1 TO 4
2030 PLOT iii+i-1,jjj: DRAW 0,4
2040 PLOT iii+i-1,jjj+lw+4: DRAW
0,4
2050 PLOT iii+lw+3+i,jjj: DRAW 0
,4
2060 PLOT iii+lw+3+i,jjj+lw+4: D
RAW 0,4
2070 NEXT i
2080 RETURN
3000 IF s$="y" THEN GO TO 3091
3010 IF pl=2 THEN GO TO 8000
3020 IF move<>2 THEN GO TO 3060
3030 LET ii=1+(RND>0.5): LET jj=
0-ii
3050 LET eg=3-2*(jj=2)
3060 LET play=((ii=1)*(eg=4)+(ii
=bd)*(eg=3)+(jj=1)*(eg=2)+(jj=bd
)*(eg=1))*(2+(RND<0.5))+(ii=1)*(
eg=1)+(jj=1)*(eg=3)+(ii=bd)*(eg
=2)+(jj=bd)*(eg=4))*(1+(RND<0.5)
)+(ii=1)*(eg=2)+(jj=1)*(eg=4)+(
ii=bd)*(eg=1)+(jj=bd)*(eg=3))*(1
+2*(RND<0.5))
3070 IF (ii<>1) AND (ii<>bd) AND
jj<>1 AND jj<>bd THEN LET play=
INT (1+RND*2.999)
3080 GO SUB 7000
3090 GO TO 1190
3091 INPUT "MY PLAY(1,2or3)"; pla
y
3092 IF move<>2 THEN GO TO 3080
3093 LET ii=1+(RND>0.5): LET jj=
0-ii: LET eg=3-2*(jj=2)
3094 GO TO 3080
4010 LET iii=nn*(ii-1)+50: LET j
jj=nn*(jj-1)+1
4020 FOR i=1 TO 4
4030 PLOT iii+i-1,jjj: DRAW nn-i
,nn-i
4040 PLOT iii+i-1,jjj+nn: DRAW 1
-i,1-i
4050 PLOT iii+lw+3+i,jjj: DRAW 4
-i,4-i
4060 PLOT iii+lw+3+i,jjj+nn: DRA
W -(nn-5+i),-(nn-5+i)
4070 NEXT i
4080 RETURN
5001 IF move<>2 THEN GO TO 5015
5002 INPUT "play right(r) or up(
u)"; r$;
5003 LET ii=2
5004 IF r$="u" THEN LET ii=1
5005 LET jj=3-ii
5010 LET eg=3-2*(jj=2)
5015 INPUT "YOUR PLAY(1,2or3)"; p
lay
5020 GO SUB 7000
5999 GO TO 1190
6010 LET iii=nn*(ii-1)+50: LET j
jj=nn*(jj-1)+1
6020 FOR i=1 TO 4
6030 PLOT iii+i-1,jjj: DRAW 1-i,
i-1
6040 PLOT iii+i-1,jjj+nn: DRAW (
nn-i),-(nn-i)
6050 PLOT iii+lw+3+i,jjj: DRAW 5
-ii,-(5-ii)
6060 PLOT iii+lw+3+i,jjj+nn: DRA
W 4-i,i-4
6070 NEXT i
6080 RETURN
7010 LET b(jj+1,ii+1)=play
7020 GO SUB 2000*play
7030 LET eg=d(eg,play)
7040 LET jj=jj+(eg=1)-(eg=2)
7050 LET ii=ii+(eg=3)-(eg=4)
7060 IF b(jj+1,ii+1)=0 THEN GO T
O 7150
7070 IF b(jj+1,ii+1)<0 THEN GO T
O 7100
7080 LET play=b(jj+1,ii+1)
7090 GO TO 7030
7100 IF ((move/2)=INT (move/2))
AND (po=1) OR (move/2<>INT (m
ove/2) AND po=2) THEN GO TO 7130
7110 PRINT INK 2; AT 1,9; FLASH 1
; "SAD LUCK-YOU LOST"
7120 GO TO 7500
7130 PRINT INK 1; AT 1,9; FLASH 1
; "WELL DONE-YOU WIN"
7140 GO TO 7500
7150 IF jj<>bd OR ii<>bd THEN RE
TURN
7160 IF ((move/2)=INT (move/2))
AND (po=1) OR (move/2<>INT (m
ove/2) AND po=2) THEN GO TO 7130
7170 GO TO 7110
7500 INPUT "LIKE ANOTHER GO?(yes
=y,no=n)"; r$
7505 IF r$="n" THEN STOP
7510 CLS
7520 GO TO 1010
8000 IF move=2 THEN GO TO 8100

```

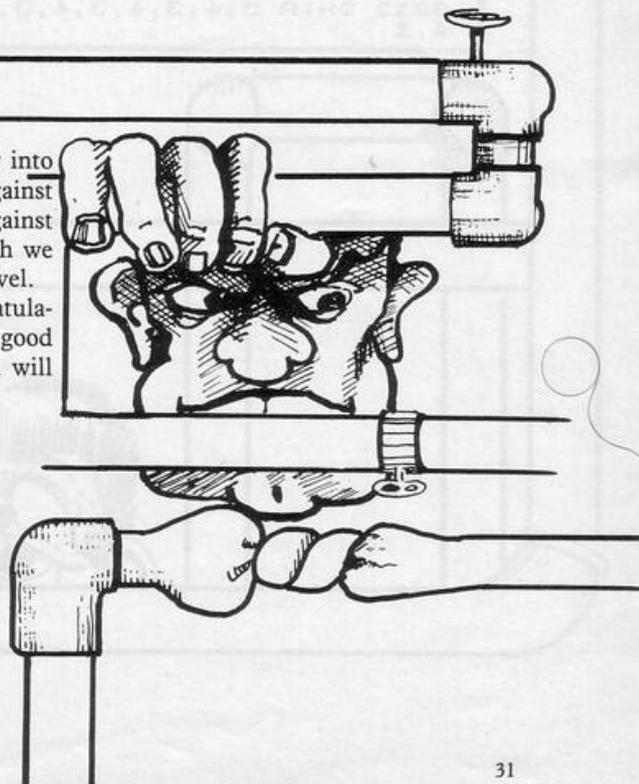
types of tiles which you can use to continue the pipe. Each tile is traversed by two white lines and a sharp eye must be kept to trace the twisting path of the pipe as it coils and flexes across the board.

The winner is the one who plays into the top right-hand corner of the screen,

or who forces an opponent to play into the side of the board. Play against another Sinclair programmer or against the Grand Master Spectrum, which we have not yet beaten at advanced level.

An astounding listing. Congratulations to our cunning author and good luck to our fortunate readers—you will love this one. (48K Spectrum).

LINE



```

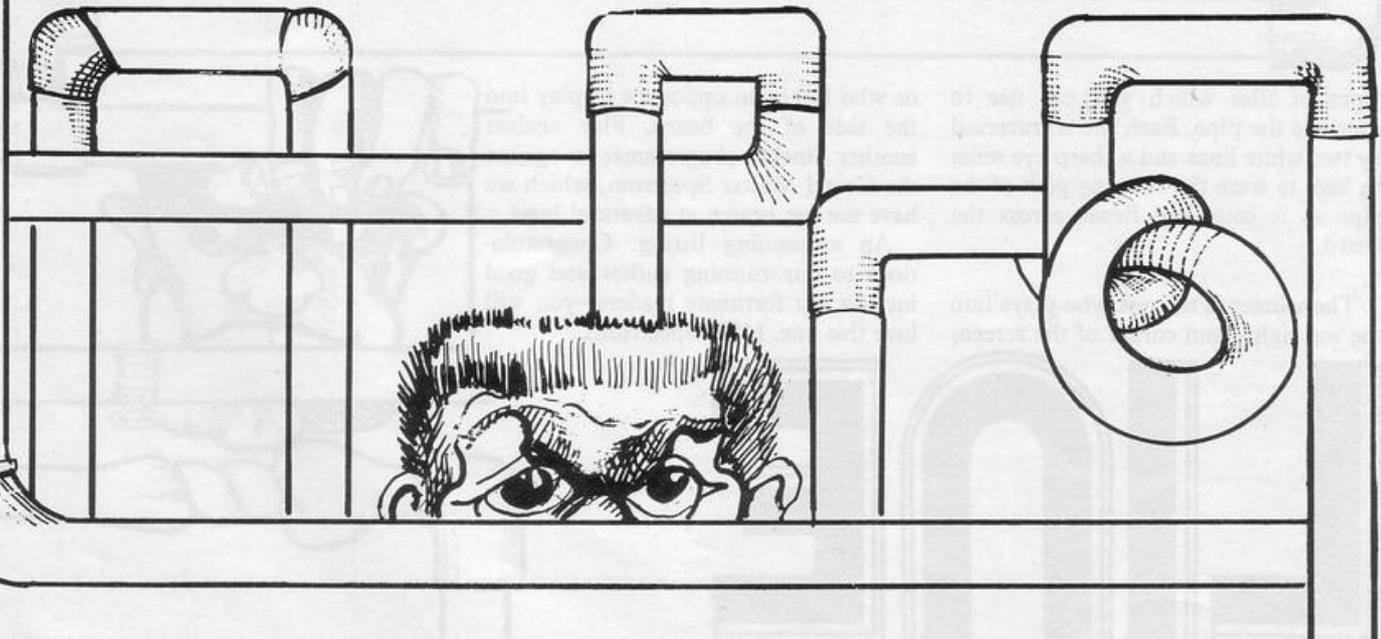
8010 IF move<>3 AND move<>4 THEN
  GO TO 8070
8020 LET rest=9300+100*(b(3,3)=2
)+200*(b(3,3)=3)
8030 IF move=3 THEN LET rest=910
0+100*(b(3,2)=0)
8040 RESTORE rest
8050 FOR i=1 TO bd: FOR j=1 TO b
d
8060 READ e(i,j): NEXT j: NEXT i
8070 LET play=1
8080 IF d(eg,play)=e(j,j,i) THEN
  GO TO 8110
8090 LET play=play+1: GO TO 8080
8100 LET ii=1: LET jj=2: LET eg=
1: LET play=2
8110 GO SUB 7000
8120 GO TO 1190
9000 DATA 1,3,4,2,4,3,3,1,2,4,2,
1
9100 DATA 1,1,1,1,1,1,1,1,1,1,1,
1
9101 DATA 2,2,2,2,2,2,2,2,2,2,2,
2
9102 DATA 1,1,1,1,1,1,1,1,1,1,1,
1
9103 DATA 2,2,2,2,2,2,2,2,2,2,2,
2
9104 DATA 1,1,1,1,1,1,1,1,1,1,1,
1
9105 DATA 2,2,2,2,2,2,2,2,2,2,2,
2
9106 DATA 1,1,1,1,1,1,1,1,1,1,1,
1
9107 DATA 2,2,2,2,2,2,2,2,2,2,2,
2
9108 DATA 1,1,1,1,1,1,1,1,1,1,1,
1
9109 DATA 2,2,2,2,2,2,2,2,2,2,2,
2
9110 DATA 1,1,1,1,1,1,1,1,1,1,1,
1
9111 DATA 2,2,2,2,2,2,2,2,2,2,2,
2
9112 DATA 3,4,3,4,3,4,3,4,3,4,3,
4
9201 DATA 3,4,3,4,3,4,3,4,3,4,3,
4
9202 DATA 3,4,3,4,3,4,3,4,3,4,3,
4
9203 DATA 3,4,3,4,3,4,3,4,3,4,3,
4
9204 DATA 3,4,3,4,3,4,3,4,3,4,3,
4
9205 DATA 3,4,3,4,3,4,3,4,3,4,3,
4
9206 DATA 3,4,3,4,3,4,3,4,3,4,3,
4
9207 DATA 3,4,3,4,3,4,3,4,3,4,3,
4
9208 DATA 3,4,3,4,3,4,3,4,3,4,3,
4
9209 DATA 3,4,3,4,3,4,3,4,3,4,3,
4
9210 DATA 3,4,3,4,3,4,3,4,3,4,3,
4
9211 DATA 3,4,3,4,3,4,3,4,3,4,3,
4
9212 DATA 3,4,3,4,3,4,3,4,3,4,3,
4
9213 DATA 3,4,3,4,3,4,3,4,3,4,3,
4

```

```

9301 DATA 1,1,1,1,1,1,1,1,1,1,1,
1
9302 DATA 2,2,2,2,2,2,2,2,2,2,2,
2
9303 DATA 1,2,1,1,1,1,1,1,1,1,1,
1
9304 DATA 2,1,2,2,2,2,2,2,2,2,2,
2
9305 DATA 1,2,1,1,1,1,1,1,1,1,1,
1
9306 DATA 2,1,2,2,2,2,2,2,2,2,2,
2
9307 DATA 1,2,1,1,1,1,1,1,1,1,1,
1
9308 DATA 2,1,2,2,2,2,2,2,2,2,2,
2
9309 DATA 1,2,1,1,1,1,1,1,1,1,1,
1
9310 DATA 2,1,2,2,2,2,2,2,2,2,2,
2
9311 DATA 1,2,3,4,3,4,3,4,3,4,3,
3
9312 DATA 2,3,4,3,4,3,4,3,4,3,4,
4
9401 DATA 1,1,3,4,3,4,3,4,3,4,3,
3
9402 DATA 2,1,4,3,4,3,4,3,4,3,4,
4
9403 DATA 1,1,1,1,1,1,1,1,1,1,1,
1
9404 DATA 2,2,2,2,2,2,2,2,2,2,2,
2
9405 DATA 1,1,1,1,1,1,1,1,1,1,1,
1
9406 DATA 2,2,2,2,2,2,2,2,2,2,2,
2
9407 DATA 1,1,1,1,1,1,1,1,1,1,1,
1
9408 DATA 2,2,2,2,2,2,2,2,2,2,2,
2
9409 DATA 1,1,1,1,1,1,1,1,1,1,1,
1
9410 DATA 2,2,2,2,2,2,2,2,2,2,2,
2
9411 DATA 1,1,1,1,1,1,1,1,1,1,1,
1
9412 DATA 2,2,2,2,2,2,2,2,2,2,2,
2
9501 DATA 1,3,4,1,1,1,1,1,1,1,1,
1
9502 DATA 2,1,4,2,2,2,2,2,2,2,2,
2
9503 DATA 1,2,1,1,1,1,1,1,1,1,1,
1
9504 DATA 2,1,2,2,2,2,2,2,2,2,2,
2
9505 DATA 1,2,1,1,1,1,1,1,1,1,1,
1
9506 DATA 2,1,2,2,2,2,2,2,2,2,2,
2
9507 DATA 1,2,1,1,1,1,1,1,1,1,1,
1
9508 DATA 2,1,2,2,2,2,2,2,2,2,2,
2
9509 DATA 1,2,1,1,1,1,1,1,1,1,1,
1
9510 DATA 2,1,2,2,2,2,2,2,2,2,2,
2
9511 DATA 1,2,3,4,3,4,3,4,3,4,3,
4
9512 DATA 2,3,4,3,4,3,4,3,4,3,4,
3

```



GUNSIGHT



YOU ARE defending London against the droning hordes of Dorniers during a night raid in World War Two. The bombers swoop

and dive to evade you and you must adjust the elevation of your anti-aircraft gun to outwit their evasive manoeuvres. Since your gun is truck-mounted, you are able to follow the bombers by pressing keys 5 and 8 to travel left and right. When the reading on your altimeter corresponds to the height of the

aircraft and your gun is aligned correctly, press F to let loose the AA shell. The elevation of the gun barrel is controlled by 7 for up and 6 for down.

Gun-Sight was submitted by Tom Meagher of Cork, Ireland. Lower-case letters indicate graphics instructions. (16K ZX-81).

```

1 REM "GUN-SIGHT"
10 LET H=15
20 LET D=17
30 LET K=5
40 LET O=5
50 FOR W=1 TO 19
60 PRINT AT W,0;"-"
70 NEXT W
80 PRINT AT 5,0:"(graphic 4)";
AT 10,0:"(graphic 4)";AT 15,0:"(
graphic 4)"
90 FOR M=1 TO 20
100 PRINT AT 20,0:"(graphic D)"
105 FOR I=30 TO 0 STEP -1
110 IF INKEY#="8" THEN LET D=D+
2
120 IF INKEY#="5" THEN LET D=D-
2
121 GOSUB 450
122 PRINT AT 21,5:"HEIGHT=";H;"
00 FEET "
130 PRINT AT 20,D:"(two graphic
Ds;inverse I;two graphic Ds)"
140 PRINT AT K,I:"(graphic F) "
145 GOSUB 300
150 GOSUB 450
155 PRINT AT 21,5:"HEIGHT=";H;"
00 FEET "
156 PRINT AT K+1,I:" "AT K-1,I
;" "
160 NEXT I
300 LET A=INT (RND*3)+1
310 IF A=2 THEN GOSUB 400
320 IF A=1 THEN GOSUB 430
330 RETURN
400 LET K=K+1
410 RETURN
430 LET K=K-1
440 RETURN
450 IF INKEY#="6" THEN GOSUB 50
0
460 IF INKEY#="7" THEN GOSUB 54
0
470 IF INKEY#="F" THEN GOSUB 60
0
480 RETURN
500 LET H=H-1
510 LET O=O+1
520 RETURN
540 LET H=H+1
550 LET O=O-1
560 RETURN
600 IF O=K AND I+2=D THEN GOTO
650
610 PRINT AT O,D+2:"(inverse X)
"
620 RETURN
650 PRINT AT O,I:"(inverse HIT)
"

```



OLYMPICS

```

1 REM "OLYMPICS"
2 RAND
5 DIM A(6)
20 PRINT AT 8,9;"WHO WILL WIN?"
"
26 PRINT
30 PRINT TAB 12;"6 RUN"
35 INPUT A#
45 INPUT B#
55 CLS
56 PRINT A#,B#
60 LET B=INT (RND*6+1)
70 PRINT AT 3*B,A(B);" O";TAB
A(B);" X";AT 0,27;"(inverse W)"
75 LET A(B)=A(B)+1
76 PRINT AT 3*B,A(B);" O";TAB
A(B);" I";AT 3*B,0;B
80 IF A(B)<27 THEN GOTO 60
85 PRINT AT 20,0;"WINNER ";B

```

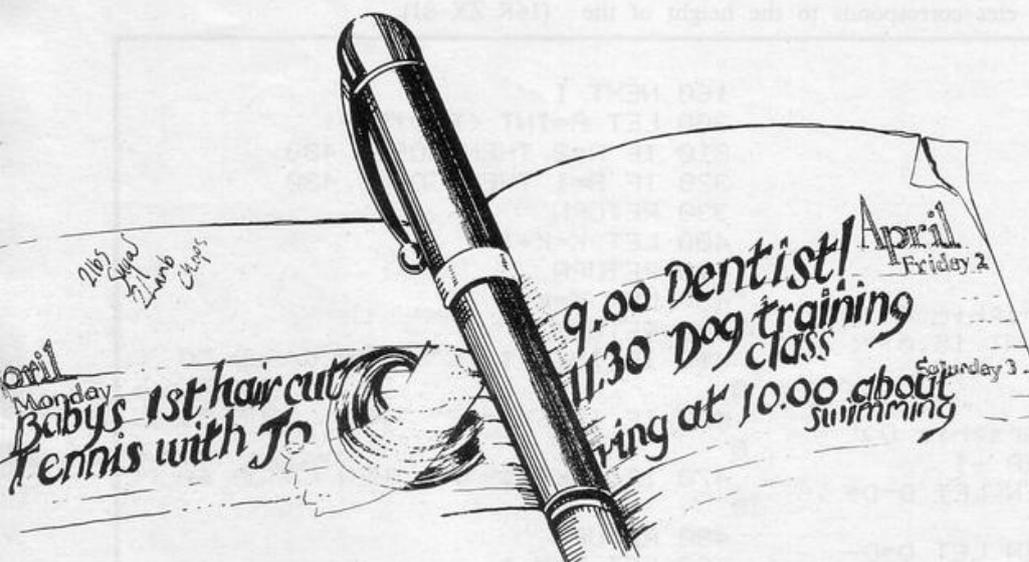
PLACE YOUR BETS. This is a foolish but funny listing for the unexpanded ZX-81 which invites you to place bets on a field of knock-kneed athletes competing in the next Olympics. The runners are repre-

sented by an O for their bodies and an alternate I and X for their lop-sided legs.

Wagers are made by entering your name and the number of the chosen competitor. There are two input state-

ments, executed one after another, so that up to eight punters could gamble by using only their initials.

Olympics was written by T Vaskevichus of St Ives, Cornwall. (1K ZX-81).



APPOINTMENTS

AM TUCKER of Dorchester, Dorset, has sent a helpful program which will enable the user to fix the dates of future appointments. If, for example, you have an appointment on every third Friday, enter the date of the first Friday, then 21, then the number of dates required.

The program should be suitable for all reasonable requirements, though the author cautions that leap centuries are not catered for. Immortals, therefore, should write their own programs. (16K Spectrum).

```

10 PRINT "Dates at stated inte
vals"
20 INPUT "Enter date: -" "Day -
" "d" "Month - " "m" "Year - " "y
"
30 INPUT "Enter no. of days be
tween dates: - " "b
"
40 INPUT "How many times? - " "
c
"
45 PRINT d;" "m;" "y
"
50 FOR n=1 TO c

```

```

50 LET d=d+b
70 IF m=2 AND y/4=INT (y/4) TH
EN LET m=m+(d>29): LET d=d-29*(d
>29)
80 IF m=2 AND y/4<>INT (y/4) T
HEN LET m=m+(d>28): LET d=d-28*(
d>28)
90 IF m=4 OR m=6 OR m=9 OR m=1
1 THEN LET m=m+(d>30): LET d=d-3
0*(d>30)

```

```

100 LET m=m+(d>31): LET d=d-31*(
d>31): IF d>31-(m=4 OR m=6 OR m
=9 OR m=11)-2*(m=2 AND y/4=INT y
/4)-3*(m=2 AND y/4<>INT y/4) THE
N GO TO 70
110 IF m>12 THEN LET m=m-12: LE
T y=y+1
120 PRINT d;" "m;" "y
"
130 NEXT n

```



THIS UNUSUAL routine enables you to play that old street-corner routine with the pea and the three cups. This time, however, you are playing against the computer and no cheating is allowed.

You have a stake of £100 and are told

under which cup the pea is hidden. Three dots are shown in the centre of the screen and after you have pressed a key they are moved around according to the difficulty level you have selected.

The difficulty level increases automatically with each gamble. When the

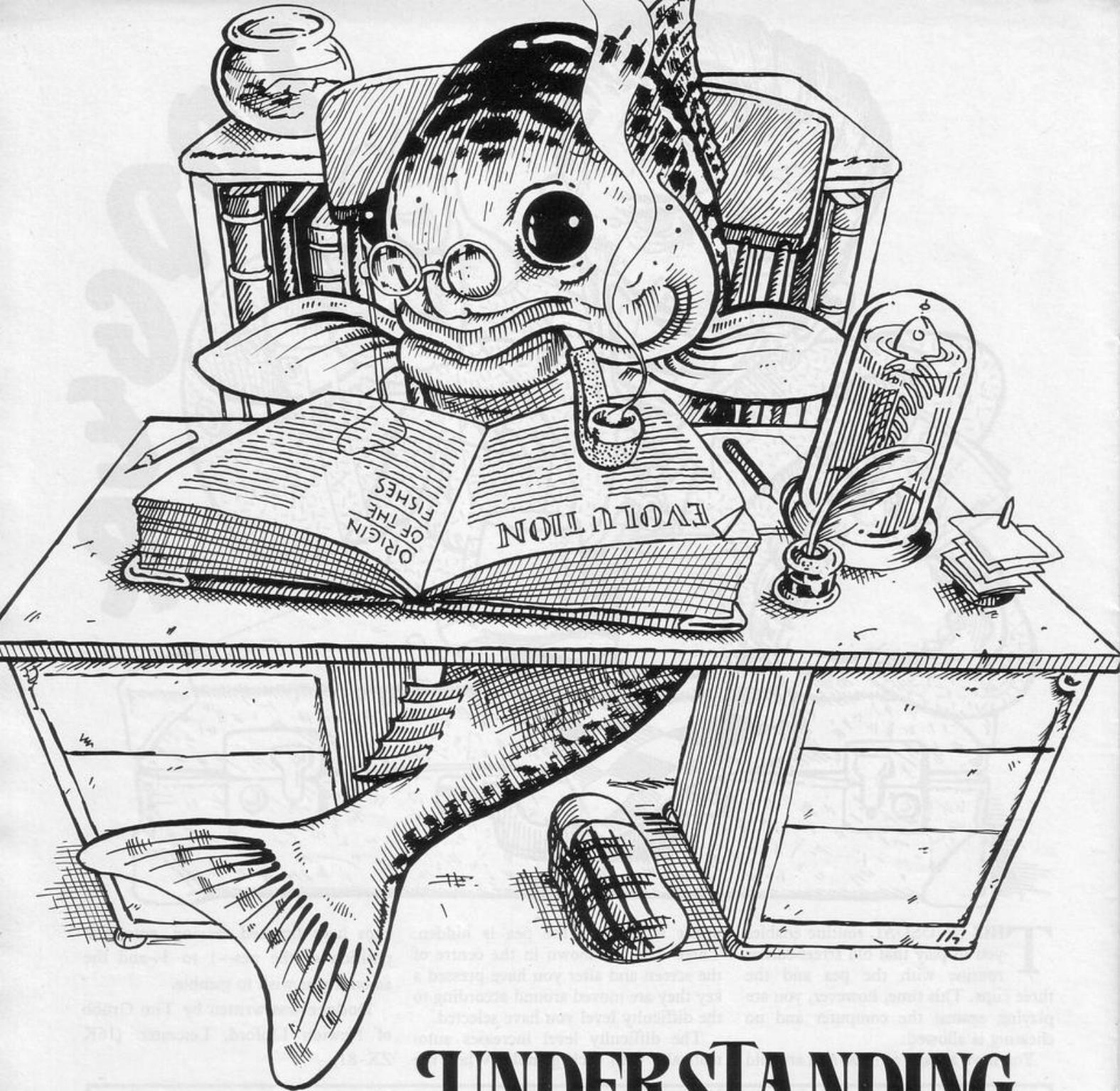
cups have finished moving, enter the position of the pea—1 to 3—and the amount you wish to gamble.

Dodger was written by Tim Grubb of Newton Linford, Leicester. (16K ZX-81).

```

1 LET I=1
10 LET DO=INT (RND*3)+1
15 PRINT AT 20,4;"THE DODGE IS
IN";DO
20 LET MO=100
30 PRINT AT 10,10;"LEVEL?"
35 INPUT L
36 CLS
50 PRINT AT 0,9;"**DODGE**"
95 LET K=0
100 DIM A(3)
115 PRINT AT 20,4;"PRESS ANY KE
Y TO START"
117 IF INKEY#="" THEN GOTO 115
120 FOR J=1 TO 3
130 LET A(J)=25+J*2
150 PLOT A(J),21
160 NEXT J
165 LET J=3
167 FOR H=1 TO L
170 PLOT A(J),21
175 PLOT A(I),21
200 LET J=INT (RND*3)+1
210 LET I=INT (RND*3)+1
211 IF I=J THEN GOTO 210
214 IF J<>DO THEN GOTO 217
215 IF J=DO THEN LET DO=I
216 GOTO 220
217 IF I=DO THEN LET DO=J
220 UNPLOT A(J),21
225 UNPLOT A(I),21
230 IF A(J)>A(I) THEN GOTO 400
290 FOR G=0 TO A(I)-A(J)
320 PLOT A(J)+G,22
323 PLOT A(I)-G,20
325 UNPLOT A(J)+G,22
327 UNPLOT A(I)-G,20
330 NEXT G
340 NEXT H
415 LET X=A(J)-A(I)
420 FOR G=X TO 0 STEP -1
425 PLOT A(J)-G,22
430 PLOT A(I)+G,22
440 UNPLOT A(I)+G,22
445 UNPLOT A(J)-G,22
450 NEXT G
470 NEXT H
471 FOR J=1 TO 3
472 LET A(J)=25+J*2
473 PLOT A(J),21
474 NEXT J
475 GOSUB 1000
479 FOR Q=1 TO 20
480 PLOT A(DO),21
490 UNPLOT A(DO),21
500 NEXT Q
550 LET L=L+1
560 GOTO 165
1000 PRINT AT 1,0;"YOU HAVE ";MO
;" POUNDS"
1010 PRINT AT 2,0;"HOW MUCH?"
1020 INPUT M
1030 IF M>MO THEN GOTO 1010
1050 PRINT "WHICH DODGE? (1 TO 3
)"
1060 INPUT S
1070 IF DO=S THEN LET MO=MO+M
1080 IF DO<S THEN LET MO=MO-M
1090 IF MO<=0 THEN PRINT 11,10;"
YOU'RE BUST"
2000 PRINT "YOU NOW HAVE ";MO;"
POUNDS"
2010 RETURN

```



UNDERSTANDING EVOLUTION

DR ELIOT GINGOLD, lecturer in genetics at Hatfield Polytechnic, has sent a Spectrum program to simulate the development of mixed populations under evolutionary pressures. He believes that the use of computers for the purpose has the great advantage over mathematical equations that random influences can be included in the model.

The listing sets up a small, local population of black and yellow mice

and follows it for successive generations. The variation in colour is controlled by two variant forms of a single gene, with the black-inducing gene dominant over yellow.

The user is invited to fix the population size and the differing selection pressures on the two types. An interesting finding is that small populations suffering no selection pressure eventually will resolve into entirely black or yellow types. Such results show the

importance of the random element.

"This so-called 'genetic drift' is an important factor in discussions of evolutionary theory. Many scientists believe that such random events are the basis for many of the observed differences between species," he says.

The listing is aimed at A level students but its avoidance of technical terms should assure it wider usefulness. In the listing, the mice should be entered as graphic M. (48K Spectrum).

```

1 DIM a$(250): DIM b(51)
20 GO SUB 9000
24 BORDER 7: PAPER 7: CLS
25 PRINT INK 1;"This program s
imulates a local population of
mice. Two types are found, bla
ck mice -- " and yellow m
ice -- "; INK 6;" and INK 2;"Th
difference is due to a gene"
with two alleles. Y(black) is"
dominant over y(yellow). "This
means that " YY -- black" " Y
y -- black" " yy -- yellow"
INK 1;"Remember a mouse could
be YY," "or Yy, a carrier of yel
low." "Yellow alleles can hide i
n black mice!" INK 0; INVER
SE 1;" Press any key to continue
"
26 IF INKEY$="" THEN GO TO 26
27 CLS: PRINT INK 2;"You may
follow the changes in" "this pop
ulation during up to 50" "genera
tions." INK 1;"Each generation
the population will at first
double. But not" "all can surviv
e. You will be" "asked to fix th
e maximum numbers" "capable of s
urviving."
28 PRINT INK 2;"Three situati
ons are possible," "selection ag
ainst yellow ---" "i.e., black m
ore fit to survive" "selection a
gainst black ---" "i.e., yellow
more fit to survive" "or no sele
ction ---" "i.e., both types equ
ally fit"
29 PRINT INK 2;"You can try an
y of these," "and if you have se
lection you" "may determine its
strength." INK 0; INVERSE 1;"
Press any key to start."
30 IF INKEY$="" THEN GO TO 30
40 BORDER 7: PAPER 7: CLS
50 PRINT AT 7,0; INK 2;"Input
the maximum population" "that th
e environment can hold." "(can be
up to 125)"
52 INPUT p0: IF p0<1 OR p0>125
THEN PRINT INK 0;"Must be bet
ween 0 and 125." GO TO 52
55 CLS: PRINT AT 7,0; INK 1;"
selection could be" "Against
yellow" INPUT 0;" Against bl
ack" INPUT 1;" Or no select
ion" INPUT 2"
57 INPUT d: IF d<>0 AND d<>1 A
ND d<>2 THEN PRINT INK 0;"Must
be 0, 1 or 2." GO TO 57
58 IF d=2 THEN GO TO 75
60 CLS: PRINT AT 7,0; INK 2;"
What is the strength of" "select
ion measured as a %?" "{100% w
ould mean that the unfit" "type
is lethal}" "Input a number up
to 100"
62 INPUT sp: IF sp<0 OR sp>100
THEN PRINT INK 0;"Must be betw
een 0 and 100." GO TO 62
70 LET s=100-sp
75 CLS: PRINT AT 7,0; INK 1;"
What is the starting % of" "yell
ow alleles? -- {xy}" "(Remembe
r that many will" "be hidden in
black mice!)" "Input a number u
p to 100"
77 INPUT y: IF y<0 OR y>100 TH
EN PRINT INK 0;"Must be between
0 and 100." GO TO 77
100 LET n=1: LET p=p0
110 LET y=y/100: LET b(1)=y
200 LET sb=1: LET sy=1: IF d=0
THEN LET sy=s/100
201 IF d=1 THEN LET sb=s/100
215 BORDER 7: PAPER 7: CLS
220 LET n=n+1: GO SUB 1000
265 GO SUB 2000
266 IF n=51 THEN PAUSE 120: GO
TO 310
270 POKE 23692,255
280 PRINT BRIGHT 1; INVERSE 1;
INK 0;"PRESS M FOR MORE ,G FOR G
RAPH"
285 GO SUB 5000
290 IF I$="M" OR I$="m" THEN GO
TO 215
300 IF I$="g" OR I$="G" THEN GO
TO 310
305 GO TO 285
310 GO SUB 6000
311 GO SUB 5000
315 IF I$="M" OR I$="m" THEN GO
TO 215
320 IF I$="n" OR I$="N" THEN GO
TO 40
325 IF I$="s" OR I$="S" THEN PA
PER 7: STOP
350 GO TO 311
1000 PRINT AT 0,7; INK 2; BRIGHT

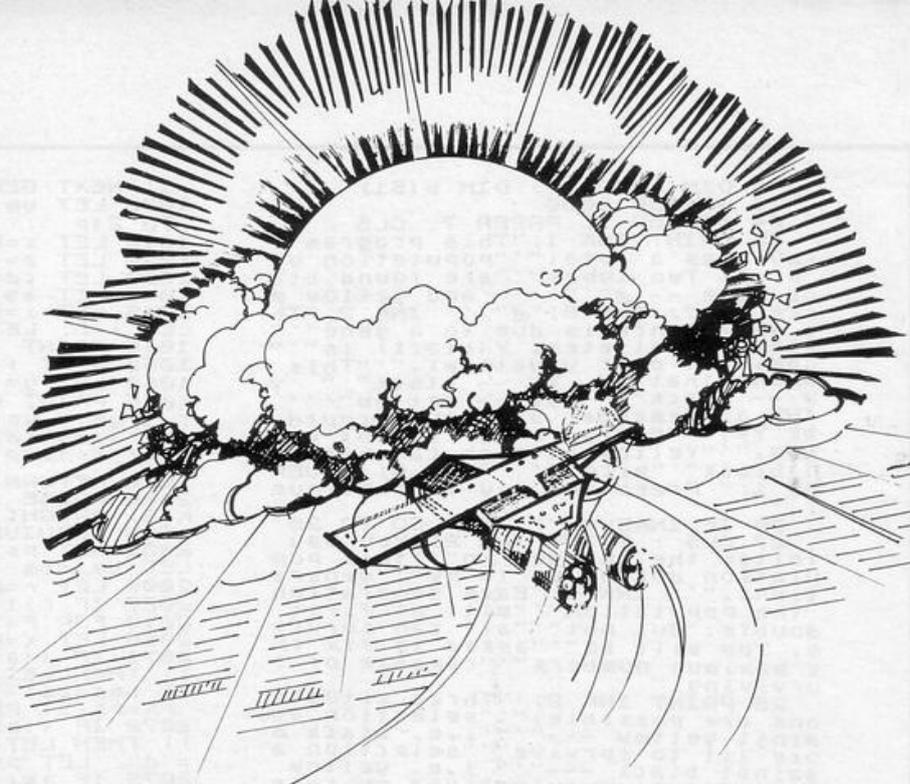
```

```

1;"NEXT GENERATION (";n-1;)"
1005 LET ym=0: LET cd=0: FOR f=1
TO 2*p
1010 LET x=RND: LET v=RND
1020 LET z=(x>y)+(v>y)
1030 LET cd=cd+z
1040 LET a$(f)=STR$(z)
1045 LET i=0: IF a$(f)="0" THEN
LET i=6: LET ym=ym+1
1046 PRINT INK i;" ";
1050 NEXT f
1055 LET y=(4*p-cd)/(4*p)
1065 PRINT AT 19,0; INK 2; BRIGHT
1;ym;" yellow mice out of ";(2
*p)-(4*p-cd);" yellow alleles ou
t of ";4*p
1070 RETURN
2000 PAUSE 150: PRINT AT 0,7; IN
K 2; BRIGHT 1; FLASH 1;" NOT ALL
CAN SURVIVE"
2005 LET ps=2*p: LET bm=2*p-ym:
LET bm1=bm: LET ym1=ym
2006 LET r=P0/(sb*bm+sy*ym)
2007 IF r>1 THEN LET r=1
2010 FOR f=1 TO 2*p
2050 LET x=RND
2071 IF (a$(f)>"0") AND (x>r*sb
) THEN LET cd=cd-VAL(a$(f)): L
ET bm1=bm1-1: LET a$(f)="d": LET
ps=ps-1: PRINT "
2072 IF (a$(f)="0") AND (x>r*sy
) THEN LET ym1=ym1-1: LET a$(f)
="d": LET ps=ps-1: PRINT "
2075 IF a$(f)<>"d" THEN PRINT OU
TER 1; INK 0;" ";
2080 NEXT f
2082 PRINT AT 20,31;" "
2083 PRINT AT 0,0;" "
2084 IF bm=0 THEN PRINT AT 19,0;
"
2085 IF bm>0 THEN PRINT AT 19,0;
BRIGHT 1; INK 2;bm1;" BLACK SU
RVIVED FROM ";bm; INK 1;TAB (28)
;INT (100*bm1/bm+.5);"%"
2086 IF ym>0 THEN PRINT AT 20,0;
BRIGHT 1; INK 2;ym1;" YELLOW SU
RVIVED FROM ";ym; INK 1;TAB (28)
;INT (100*ym1/ym+.5);"%"
2090 LET y=(2*ps-cd)/(2*ps): PRI
NT BRIGHT 1; INK 1;"%y="; (INT (y
*1000+.5))/10;" (Last Generati
on="; (INT (b(n-1)*1000+.5))/10;
)"
2095 LET b(n)=y
2098 LET p=p0: IF ps<=p0 THEN LE
T p=ps
2100 RETURN
5000 IF INKEY$="" THEN GO TO 500
0
5020 LET I$=INKEY$: RETURN
6000 BORDER 1: PAPER 1: CLS: IN
K 7: PLOT 47,156: DRAW 0,-120: D
RAW 200,0
6010 FOR f=36 TO 156 STEP 24: PL
OT 45,f: DRAW -3,0: NEXT f
6020 FOR f=47 TO 247 STEP 40: PL
OT f,36: DRAW 0,-4: NEXT f
6030 PRINT AT 9,0;"%y";AT 2,2;"1
00";AT 5,3;"80";AT 8,3;"60";AT 1
1,3;"40";AT 14,3;"20";AT 17,4;"0
"
6040 PRINT AT 18,6;"0 10 20
30 40 50";AT 19,15;"Genera
tion"
6050 PRINT AT 1,6; INVERSE 1;"Po
pulation #ax. ";p0
6060 IF d=2 THEN PRINT AT 0,10;
INVERSE 1;"No selection "
6070 IF d=1 THEN PRINT AT 0,2; I
NVERSE 1;INT (sp);"% selection a
gainst black"
6080 IF d=0 THEN PRINT AT 0,1; I
NVERSE 1;INT (sp);"% selection a
gainst yellow"
6100 PLOT 46,120*b(1)+36: DRAW 0
OVER 1,3,0
6110 FOR f=2 TO n: PLOT OVER 1,4
2+4*f,120*b(f)+36: NEXT f
6115 IF n=51 THEN GO TO 6200
6120 PRINT AT 20,0; INVERSE 1;"P
ress # for more";"n for new star
t. s to stop"
6130 INK 0: RETURN
6200 LET n=1: LET b(1)=y
6210 PRINT AT 19,0; INVERSE 1; F
LASH 1;"GRAPH FULL " FLASH 0;"P
ressing # continues run, but" "r
estarts graph (n=newrun,s=stop)"
6215 INK 0: RETURN
9000 DATA 0,BIN 00001001,BIN 000
00110,BIN 00111110,BIN 01111100,
BIN 01111100,BIN 10000000,BIN 11
11110
9010 FOR f=0 TO 7
9015 READ gr
9020 POKE USR "M"+f,gr
9025 NEXT f: RETURN

```

1K INVADERS



THE INVADERS are coming. You are the doomed defender of Earth, bravely blasting at the overwhelming might of the venomous Venusians. They are unstoppable but you are determined to litter the skies with their smouldering carcasses. Manoeuvre left and right with 5 and 8 and fire your neutron bolts with 0.

1K Invaders was written by G Brooks of Knowsley Village, Merseyside. In lines 30 and 60, the brackets contain graphics instructions. Ignore the semi-colons, enter the As and 6s in graphic shifted mode, and for S read Space. (1K ZX-81).

```

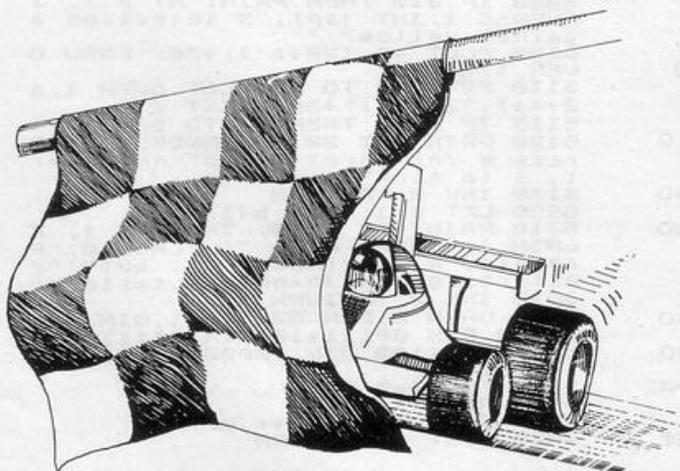
10 LET X=19
20 LET Y=7
30 PRINT AT 17,0;"(A;three S;A
;three S;A;three S;A;three S;A)"
40 FOR A=10 TO 17 STEP 0.02
50 PRINT AT A,RND*14+1;" 0 "
60 PRINT AT X,Y;"(S;6;inverse
S;6;S)"
90 IF INKEY#="5" THEN LET Y=Y-
1
100 IF INKEY#="8" THEN LET Y=Y+
1
110 IF INKEY#="0" THEN GOSUB 16
0
115 IF Y<0 THEN LET Y=0
120 NEXT A
130 PRINT "INVADERS HAVE LANDED
"
140 SCROLL
150 STOP
170 FOR X=18 TO 9 STEP -1
180 PRINT AT X,Y+2;"+"
190 PRINT AT X,Y+2;" "
200 NEXT X
210 LET X=19
220 RETURN

```

```

1 REM 000000
5 CLS
6 LET A=3
10 LET S=0
15 LET X=16514
16 LET L=INT (RND*100)
20 PRINT AT 21,0;" ";TAB 4+INT
(RND*2);" "
25 IF L<20 THEN PRINT AT 21,IN
T (RND*4);" "
30 PRINT AT 12,A;
40 IF USR X=128 THEN GOTO VAL
"150"
50 PRINT AT 12,A;"V"
60 LET A=A+(INKEY#="8" AND A<1
5)-(INKEY#="5" AND A>0)
70 LET S=S+1
80 SCROLL
90 GOTO 16
150 PRINT "GAME OVER ";S

```



RALLY

RALLY is a very traditional type of scrolling race-track game but its inclusion of machine code will make it of interest to novice programmers. First enter the listing as printed and then the following commands, with NEWLINE between each one—POKE 16514,42; POKE 16515,14; POKE 16516,64; POKE 16517,78; POKE 16518,6; POKE 16519,0; POKE 16520,201; POKE 16510,0.

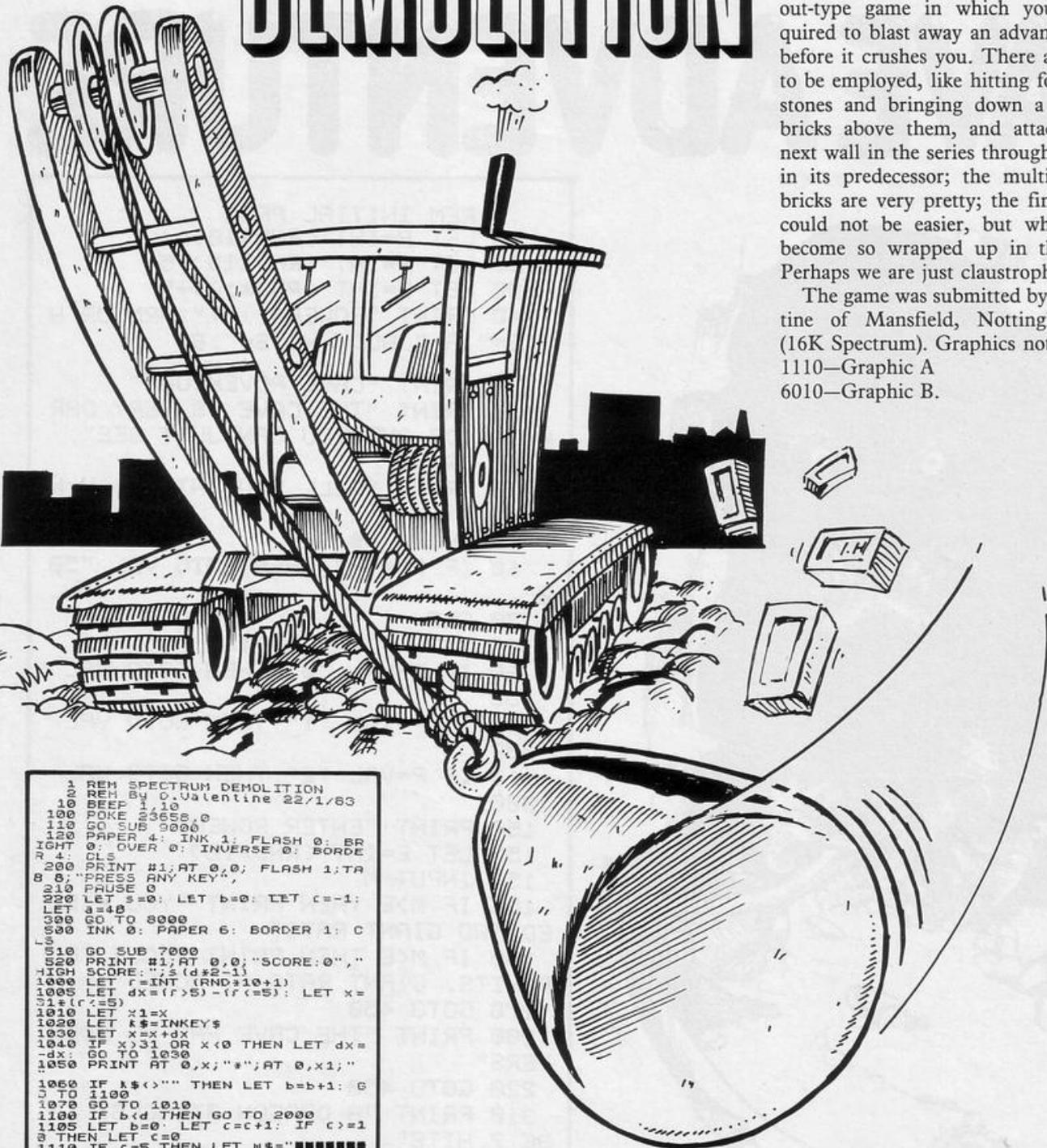
The program can then be RUN, your car appearing as V and requiring to be steered to avoid the side of the road and the occasional obstacles with keys 5 and 8.

The listing was composed by Damon Roberts of Romford, Essex. (1K ZX-81).

DEMOLITION

WE DO NOT understand how this game can be so addictive. The basic concept could scarcely be more simple. It is a Break-out-type game in which you are required to blast away an advancing wall before it crushes you. There are tactics to be employed, like hitting foundation stones and bringing down a series of bricks above them, and attacking the next wall in the series through the gaps in its predecessor; the multi-coloured bricks are very pretty; the finger work could not be easier, but why do we become so wrapped up in the thing? Perhaps we are just claustrophobics.

The game was submitted by D Valentine of Mansfield, Nottinghamshire. (16K Spectrum). Graphics notes: 1110—Graphic A 6010—Graphic B.



```

1 REM SPECTRUM DEMOLITION
2 REM BY D.VALENTINE 22/1/83
10 BEEP 1,10
100 POKE 23655,0
110 GO SUB 9000
120 PAPER 4: INK 1: FLASH 0: BR
IGHT 0: OVER 0: INVERSE 0: BORDE
R 4:
CLS
200 PRINT #1;AT 0,0; FLASH 1;TR
A 0; "PRESS ANY KEY";
210 PAUSE 0
220 LET s=0: LET b=0: LET c=-1:
LET a=40
300 GO TO 8000
500 INK 0: PAPER 6: BORDER 1: C
L 0
1010 GO SUB 7000
520 PRINT #1;AT 0,0;"SCORE:0";
HIGH SCORE:";s(d#2-1)
1000 LET r=INT (RND#10+1)
1005 LET dx=(r#5)-(r#5): LET x=
31+(r#5)
1010 LET x1=x
1020 LET k$=INKEY$
1030 LET x=x+dx
1040 IF x>31 OR x<0 THEN LET dx=
-dx: GO TO 1030
1050 PRINT AT 0,x;"*";AT 0,x1;"
1060 IF k$("<") THEN LET b=b+1: G
O TO 1100
1070 GO TO 1010
1100 IF b<d THEN GO TO 2000
1105 LET b=0: LET c=c+1: IF c=1
0 THEN LET c=0
1110 IF c=5 THEN LET w$="*****
*****"
1115 IF c=0 THEN LET w$=CHR$ 17+
CHR$ 6+CHR$ 16+CHR$ 0+CHR$ 6+CHR
$ 6
1120 POKE 23692,255: PRINT #1;AT
0,0;"#2;AT 2,0: PAPER 0: INK 1
NT (RND#5+1);w$;#1;AT 0,0;"SCORE
:";s;"HIGH SCORE:";s(d#2-1)
1125 PRINT AT 0,x;"*"
1130 LET t=USR USR "c": IF t<65
55 THEN GO TO 6000
2000 BEEP .03,-12
2005 LET y=0
2010 LET y1=y
2020 LET y2=y+1
2025 IF y2#y THEN PRINT AT y1,x;
" " : GO TO 1000
2030 IF ATTR (y,x) (>=) THEN GO TO
3000
2040 PRINT AT y,x;"*";AT y1,x;"
3050 GO TO 2010
3000 PRINT AT y1,x;" "
3010 LET lx=x: LET fx=x
3020 LET l=ATTR (y,lx)
3025 LET r=ATTR (y,fx)
3030 IF l=>= AND r=>= THEN GO TO 1
000
3035 IF l<> AND lx<>fx THEN LET
s=s+5: BEEP .01,10:lx-lx
3036 IF r<> THEN LET s=s+5: BEE
P .01,10:fx-fx
3037 PRINT #1;AT 0,6;s
3040 PRINT AT y,lx;"*";AT y,fx;"
3050 LET lx=lx-1:lx>0: LET fx=fx
+1:fx<31: LET y=y-1
3060 IF y<0 THEN GO TO 1000
3070 GO TO 3020
5000 FOR i=31 TO 33-1 STEP -1

```

```

5010 PRINT INK 2: PAPER 5; BRIGH
T 1;AT 0,1; OVER 0;"<
5020 BEEP .05,31-i
5030 NEXT i
5040 PRINT AT 0,1; BRIGHT 1; OVE
R 1: INK 0; PAPER 0; FLASH 1;"
5500 LET x=d#2: LET y=x-1
5505 IF s<=x THEN GO TO 6540
5508 POKE 23658,0
5510 INPUT PAPER 2: INK 9;AT 0,0
;"YOU MADE IT TO THE SCORE TABL
E";ENTER NAME (10 MAX)";AT 1,20
LINE w$
5515 POKE 23656,0
5520 IF s>=s(y) THEN LET s$(x)=s
$(y): LET s(x)=s(y): LET s$(y)=w
$: LET s(y)=s: GO TO 6540
5530 IF s>=s(x) THEN LET s$(x)=w
$: LET s(x)=s
5540 CLS
5550 PRINT FLASH 1;AT 2,10;"HIGH
SCORES:"
6550 PRINT AT 4,0;
6570 FOR i=1 TO 5: PRINT TAB 5;"
LEVEL "i": NEXT i
6580 PRINT AT 3,0;
6590 FOR i=1 TO 10 STEP 2: PRINT
OVER 1;TAB 14; BRIGHT 1,s$(i);T
AB 25;s(i) : NEXT i
6595 PRINT AT 4,0;
6600 FOR i=2 TO 10 STEP 2: PRINT
OVER 1;TAB 14;s$(i);TAB 25;s(i)
: NEXT i
5710 GO TO 200
7000 LET w$="*****
*****"
7010 FOR i=17 TO 21
7020 PRINT PAPER 0; INK INT (RND
#5+1);AT i,0:w$

```

```

7030 NEXT i
7040 RETURN
8000 PAPER 5: INK 0: BORDER 3: C
L 5
8010 PRINT AT 1,6; FLASH 1; BRIG
HT 1; INK 2; PAPER 6;"SPECTRUM D
EMOLITION"
8020 PRINT " " : The aim of this
game is to " " DEMOLISH the ad
vancing wall " " before it re
aches you. "
8030 PRINT " " : To launch th
e ball "
8040 PRINT " " press any key eg
"SPACE"
8050 PRINT #1;AT 0,0; INK 0; PAP
ER 4;"SELECT DIFFICULTY ? (1-5):
1-HARD"
8055 LET w$=INKEY$
8060 IF w$("<" OR w$(">") THEN GO
TO 8050
8070 LET d=VAL w$(1)
8080 PRINT #1;AT 0,0; INK 1; PAP
ER 6; " " PRESS ANY KEY TO START G
AME " : PAUSE 1: PAUSE 0
8090 GO TO 500
9000 RESTORE 9200: FOR i=USR "a"
TO USR "c"+17: READ x: POKE i,x
: NEXT i
9010 DIM s$(10,10): DIM s(10)
9020 FOR i=1 TO 10: LET s$(i)=",
. . . . .": NEXT i
9030 RETURN
9200 DATA 0,126,126,126,126,126,
126,0
9210 DATA 6,24,96,255,255,96,24,
9220 DATA 33,0,65,1,32,0,126,254
126,200,35,10,32,-6,1,255,255,2
61

```

CAVE ADVENTURE



```
5 REM INITIAL PROG
10 LET P=INT (RND*10)+4
20 LET A=INT (RND*15)+5
30 LET B=INT (RND*10)+5
40 PRINT "POWER=";P;" ARMOUR H
ITS=";A;" BODY HITS=";B

10 PRINT "CAVE ADVENTURE"
20 PRINT "THE CAVE IS VERY DAR
K INSIDE AND YOU CAN JUST SEE"
30 PRINT
40 PRINT "WILL YOU ENTER? (Y/N
)"
50 INPUT A$
60 IF A$="N" THEN GOTO VAL "50
0"
70 CLS
80 LET P=INT (RND*3)
90 IF P=VAL "0" THEN GOTO VAL
"150"
100 IF P=VAL "1" THEN GOTO VAL
"200"
110 IF P=VAL "2" THEN GOTO VAL
"300"
150 PRINT "ENTER POWER"
153 LET E=INT (RND*12)
155 INPUT M
156 IF M>E THEN PRINT "YOU KILL
ED TWO GIANT RATS"
160 IF M<E THEN PRINT "LOSE FOU
R HITS. GIANT RATS ATTACKED"
170 GOTO 450
200 PRINT "THE CAVE HAS NO MONS
TERS"
220 GOTO 450
310 PRINT "A DRAGON ATTACKS. LO
SE 7 HITS"
320 GOTO 455
450 PRINT "THERE IS $50"
455 PRINT "WILL YOU GO FURTHER?
"
460 INPUT S$
465 CLS
470 IF S$="Y" THEN GOTO 80
500 PRINT "YOU ARE AT THE ENTRA
NCE"
```

PAUL FRAVIGAR of Skegness, Lincolnshire has sent an adventure game for the 1K ZX-81. As you might expect, some of the work has to be done with pencil and paper and the short initial program must be used to set the random values of your power

reserves and the number of armour and body hits you can sustain. Your armour naturally must be destroyed before you suffer any body hits. Run the initial program, lines 5 to 40, note the given values, clear the lines, then enter the main listing.

As you explore the cave, note the treasure you find and the hits you sustain. When the damage inflicted by the various monsters is approaching the fatal level, you should turn and run. The game can be played by more than one person.

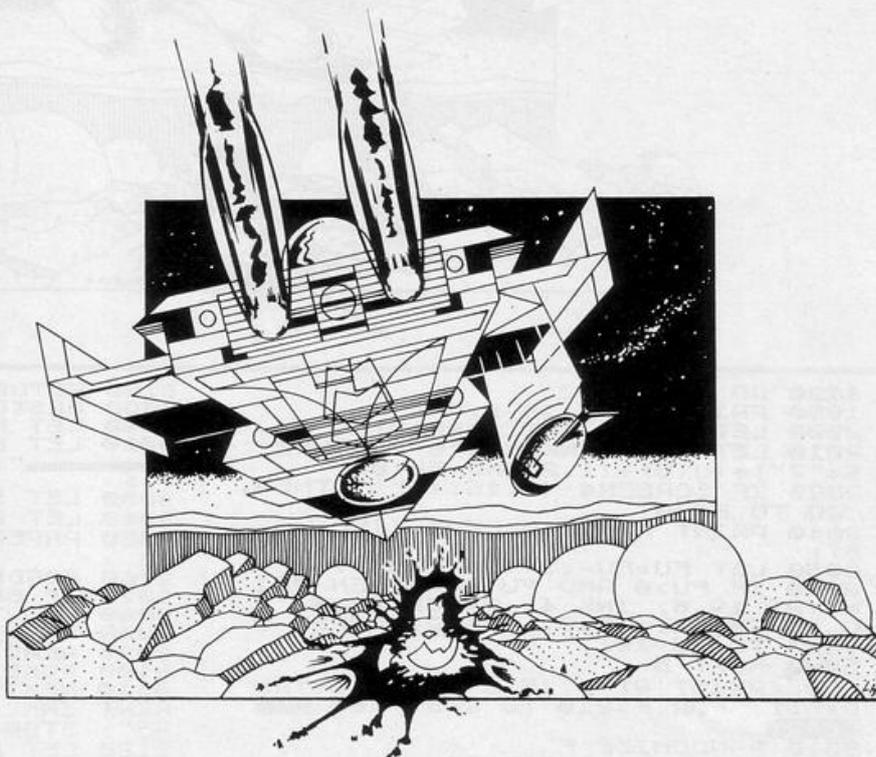
ZX DEFENDER

THIS EXCELLENT game for the 16K Spectrum sends you flying low over enemy territory armed with rockets and bombs, with orders to destroy as many enemy fuel dumps and aircraft as possible before your fuel—or your luck—runs out.

Under the control of keys 5 to 8 you can climb, descend and fly left or right. You release bombs with 9 and fire rockets with 0. The program occupies only about 5K and there is therefore plenty of room for additions to the user-defined graphics.

ZX Defender is the kind of vivid, entertaining game you want to amend, adapt, expand and generally play around with. The only serious problem is that it is a little slow but there are so many hazards and targets on offer that any armchair pilot will find himself fully-occupied.

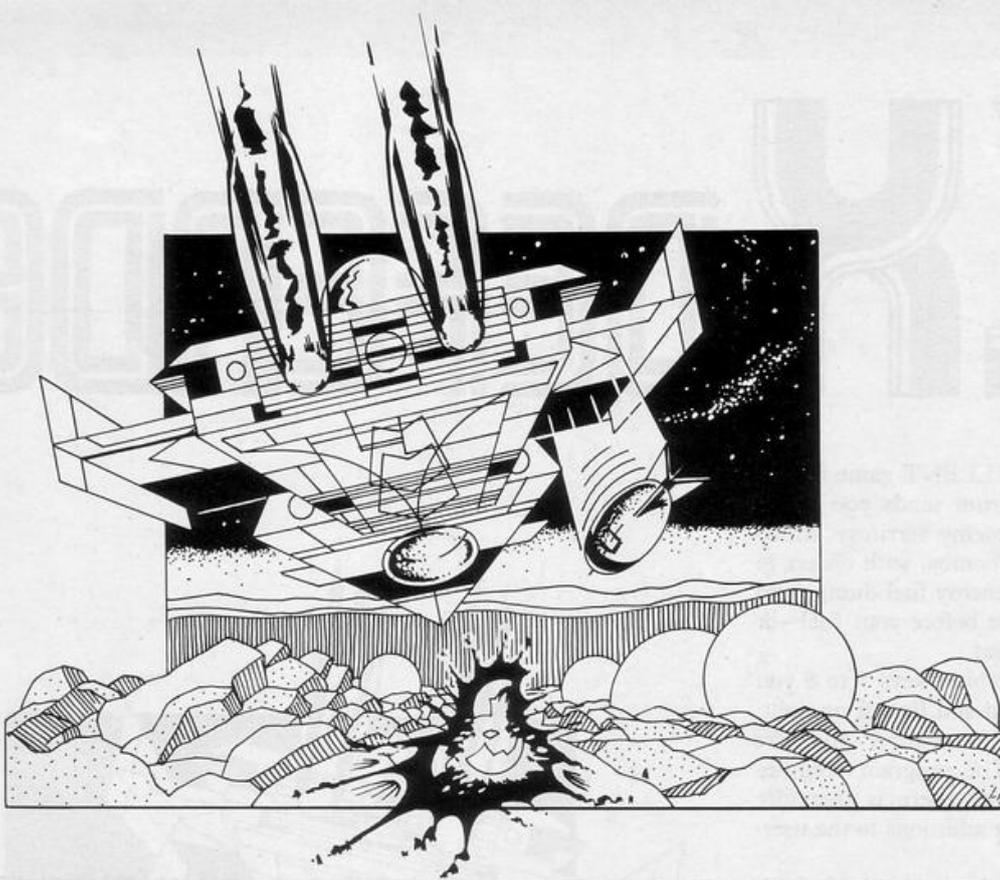
It is a first-class listing which all Sinclair programmers will enjoy. It was written by Stephen King of Kennington, Oxford, who has included a number of useful REM statements to help with the graphics.



```

1 REM ZX DEFENDER © S.KING
10 LET BE=0
20 GO SUB 9000
30 GO TO 1000
40 REM BOMB
50 LET FU=FU-2
60 FOR T=1 TO 15
70 LET I=15+(SGN S)*T
80 LET Q$=SCREEN$(U,I)
90 IF Q$=" " THEN PRINT AT U,I
; INK 0;" " : BEEP .005,T : PRINT
AT U,I; INK 1;" " : NEXT T : RETUR
N
100 IF Q$=">" OR Q$="<" THEN GO
SUB 8000 : RETURN
110 IF Q$="e" THEN LET FU=FU+17
: FOR F=1 TO 8 : RANDOMIZE F : LET
L=USR USR "a" : NEXT F : BEEP .1,
40 : RANDOMIZE 57 : LET L=USR USR
"a" : PRINT AT U,I;" " : RETURN
120 IF Q$="[" OR Q$="]" THEN LE
T SC=SC+7 : GO SUB 8000 : RETURN
130 PRINT AT U,I;" " : RETURN
200 BEEP .02,50
210 PRINT AT 21-(D/8), (31 AND S
=1); "e"; AT 22-(D/8), (31 AND S=1)
; " "
220 RETURN
500 LET fu=fu-1 : REM BOMBS
510 FOR t=1 TO 14-u
520 LET i=15+(SGN S)*t
530 LET R=U+T
540 IF SCREEN$(R,I)<>" " THEN
GO TO 570
550 PRINT AT R,I; INK 2;" " : BE
EP .005,T : PRINT AT R,I; INK 1;"
"
560 NEXT T : RETURN
570 IF SCREEN$(R,I)<>"e" THEN
PRINT AT R,I;" " : RETURN
580 LET FU=FU+11 : PRINT AT R,I;
CHR$(144+(RND*4))
590 FOR F=1 TO 18 : RANDOMIZE F
600 LET L=USR USR "A" : BEEP .00
5.F
610 NEXT F
620 RANDOMIZE 57 : LET L=USR USR
"A"
630 PRINT AT R,I;" "
640 RETURN
1000 FOR B=0 TO 1 STEP 0 : LET I$
=INKEY$ : IF I$="" THEN GO TO 103
0
1005 IF I$="8" THEN LET S=1
1010 IF I$="0" THEN GO SUB 50
1015 IF I$="5" THEN LET S=-1
1020 IF I$="9" THEN GO SUB 500
1030 IF S=-1 THEN FOR F=1 TO 8 :
RANDOMIZE USR USR "C" : PLOT 0,D :
DRAW 0,-D+48 : NEXT F : RANDOMIZ
E : IF RND>.7 THEN PRINT AT RND*(
21-(D/8)),0;">" : IF RND>.8 THEN
PRINT AT (RND*(21-(D/8))/2),0;"J
"
1040 IF S=1 THEN FOR F=1 TO 8 : R
ANDOMIZE USR USR "F" : PLOT 255,D
: DRAW 0,-D+48 : NEXT F : RANDOMIZ
E : IF RND>.7 THEN PRINT AT RND*(
21-(D/8)),31;"<" : IF RND>.8 THE
N PRINT AT (RND*(21-(D/8))/2),31
;"I"
1060 IF D>50 AND D<190 AND SC<50
0 AND RND>.1 THEN GO TO 1900
1100 LET d=d+(10 AND D<60)-(10 A
ND D>190)
1110 IF SC>500 THEN LET FI=FI+1 :
LET SC=0 : PRINT AT 21,30; INK 5
; PAPER 0; FI : PRINT AT 19,6;"
" : REM 20 space
s

```



```

1120 GO SUB 200
1990 PRINT AT U,15-S;" "
2000 LET D=D+3-INT (RND*7)
2010 LET U=U+(INKEY$="6")-(INKEY
$="7")+(U<0)+(1.2 AND FU<0)
2020 IF SCREEN$ (U,15)<>" " THEN
GO TO 6000
2040 PRINT AT U,15;CHR$ (153+(S>
0))
2080 LET FU=FU-.7-(INKEY$="7")
2090 IF FU>0 AND FU<240 THEN PRI
NT AT 19,6; INK 4; PAPER 0;e$( T
0 sc/25);AT 20,6; INK 2; PAPER 0
;E$( TO FU/10);" "
5000 NEXT B
6000 PRINT AT U,15;CHR$ (144+(RN
D*5)): FOR F=210 TO 255: REM 

6010 RANDOMIZE F
6020 LET L=USR USR "A"
6030 BEEP .05,F/5
6040 NEXT F: INK 9: PAPER 1: LET
SC=SC+(FI*500)
6050 CLS : PRINT AT 2,2;"YOU SCO
RED ";SC
6060 IF SC>BE THEN LET BE=SC
6070 PRINT AT 4,2;"BEST SCORE ";
BE
6080 PRINT TAB 10;"Controls"
6090 PRINT " 5,6,7 & 8 :-Cursor
keys"
6100 PRINT " 0:-Fire""9:-Drop
bombs"
6110 PRINT " e=Fuel, D=10 Point
s,<>=3"
6120 PRINT "" Hit any key for
a new game"
6130 FOR F=1 TO 56
6140 IF INKEY$<>" " THEN GO TO 20
6150 LET a=USR USR "c"
6160 NEXT f
6170 FOR F=1 TO 56
6180 IF INKEY$<>" " THEN GO TO 20
6190 LET a=USR USR "f"
6200 NEXT F
6210 GO TO 6130
7000 REM 

8000 PRINT AT U,I;CHR$ (144+(RND
*4))
8010 FOR F=1 TO 10
8020 RANDOMIZE F: LET L=USR USR
"A"
8030 BEEP .003,F: NEXT F: LET SC
=SC+3
8040 RANDOMIZE 57: LET L=USR USR
"A"
8050 PRINT AT U,I;" ": RANDOMIZE
8060 FOR G=I-5 TO I+5 STEP 5
8070 FOR H=U-(U>0) TO U+1
8080 IF RND>.7 THEN PRINT AT H,G
" "
8090 NEXT H: NEXT G

```

```

8100 RETURN
9000 RESTORE : REM 

9010 LET FU=200: LET S=1
9020 LET E$=""
9030 " : REM 20 graphic shift
S"
9030 LET SC=0: LET FI=0
9040 LET D=65: LET U=2
9050 PAPER 1: INK 1: BORDER 0: C
LS
9060 BORDER 0: CLS
9070 IF BE>0 THEN GO TO 9120
9080 LET TOT=0: FOR F=USR "A" TO
USR "M"+7
9090 READ A: LET TOT=TOT+A
9100 POKE F,A
9110 NEXT F: IF TOT<>9572 THEN P
RINT INK 9;"PROGRAM ERROR IN DAT
A5": STOP
9120 LET L=5
9130 FOR P=0 TO 31
9140 LET L=L+1-INT (RND*3)+(L<2)
-(L>5)
9150 FOR K=1 TO L
9170 PRINT AT 16-K,P;"■"
9180 NEXT K: PRINT AT 15-L,P;"■"
: NEXT P: REM GRAPHIC L
9190 RANDOMIZE 57: LET K=USR USR
"A"
9200 FOR P=0 TO 31
9210 PRINT AT 16,P; PAPER 6;"■":
REM G "M"
9220 NEXT P
9230 FOR f=17 TO 21
9240 PRINT AT f,0; INK 0;"
": NEX
T f
9470 IF BE<625 THEN PRINT AT 18,
1; INK 6; PAPER 0;"BEST "; INK 3
;e$( TO BE/25)
9480 PRINT AT 19,0; INK 6; PAPER
0;"SCORE"" FUEL"
9490 PAPER 7: INK 1
9500 RETURN
9500 DATA 62,90,237,75,118,92,33
,0
9510 DATA 88,113,35,188,200,24,-
6,0
9520 DATA 23,0,64,14,32,175,126,
31
9530 DATA 119,35,13,32,249,62,80
,188
9540 DATA 32,241,201,0,0,0,0,0
9550 DATA 33,31,64,22,0,30,65,14
9560 DATA 32,175,126,23,119,43,1
0,32
9570 DATA 249,25,62,80,188,40,3,
43
9580 DATA 24,235,201,0,0,0,0,0
9590 DATA 0,0,0,0,0,1,63,255,0,0
,0,0,0,128,252,255
9599 DATA 0,255,255,255,255,255,
255,255,255,255,255,255,255,
255,0

```

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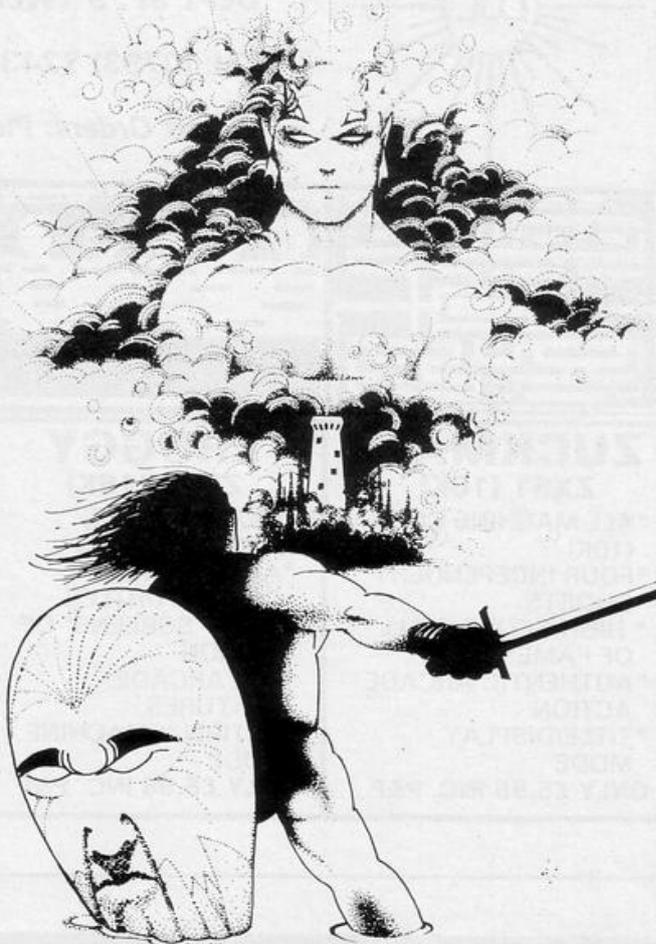
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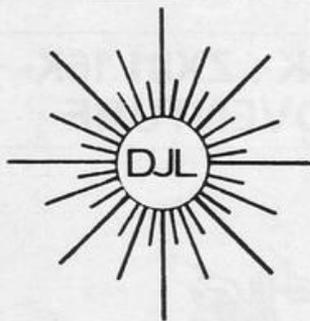
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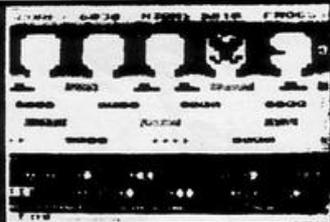
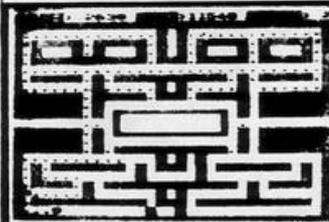


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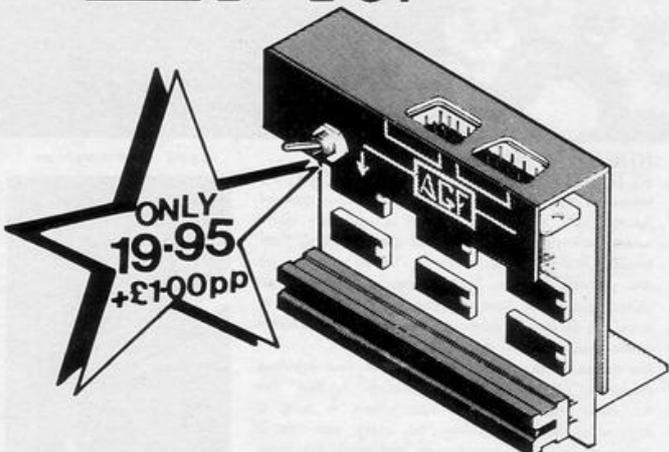
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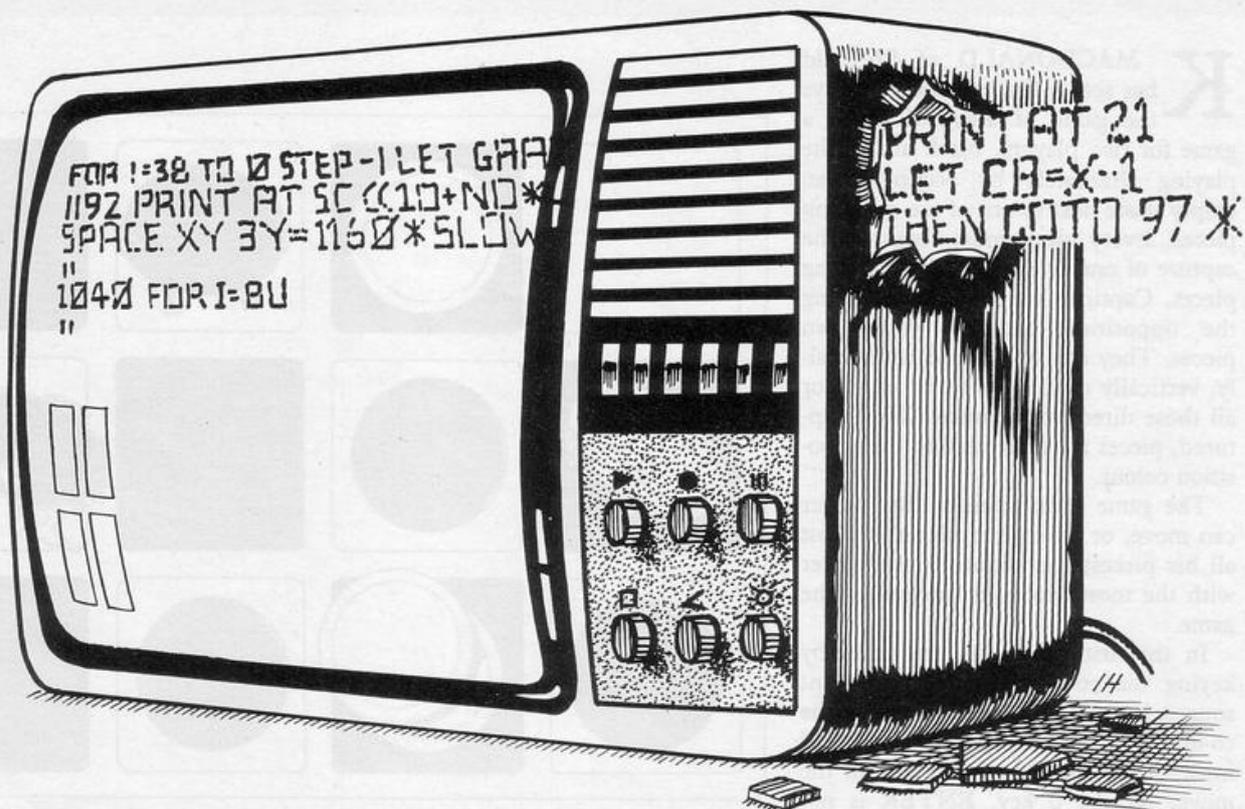
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PETER BEEFTINK of Calgary, Canada has written a short subroutine to cause any length of text to be displayed neatly without cutting-off words halfway. The text must be defined initially as BS and the routine reached through a GOSUB command.

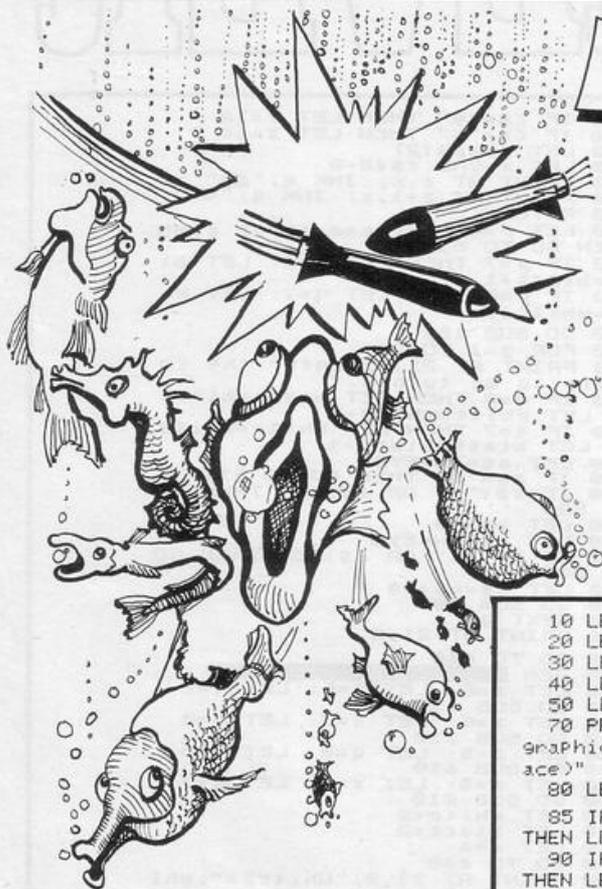
The listing checks for a space and ensures that it appears at the end of the line. (1K ZX-81).

SET RAGGED

```

1010 LET A=LEN B$
1020 IF A>32 THEN GOTO 1050
1030 PRINT B$
1040 RETURN
1050 LET B=A
1060 LET A=32
1070 IF CODE B$(A)=0 THEN GOTO 1
100
1080 LET A=A-1
1090 GOTO 1070
1100 PRINT B$( TO A)
1110 IF (B-A)>32 THEN GOTO 1140
1120 PRINT B$(A+1 TO B)
1130 RETURN
1140 LET B$=B$(A+1 TO B)
1150 GOTO 1010

```



AQUA-ATTACK

AQUA-ATTACK is an unpretentious program for the 1K ZX-81. You are a submariner lurking in the depths of the Atlantic. Your submarine appears on-screen at random positions and must launch its torpedo, with any key, to hit the passing passenger ships amidships.

When you succeed there is a satisfying explosion and the number of vessels which managed to evade your aggressive attentions is indicated alongside.

The program was submitted by Roy Spencer of Ilford, Essex.

In our listing, lower-case letters in brackets are graphics instructions.

```

10 LET S=PI-PI
20 LET A=CODE ">"
30 LET B=INT (RND*CODE "?")+5
40 LET C=CODE "<graphic 5)"
50 LET E=CODE ", "
70 PRINT AT C,E-2;"<graphic W;
graphic 6;graphic F;graphic Q;space)"
80 LET E=E-CODE "<graphic 1)"
85 IF E-CODE "<graphic 2)"<=1
THEN LET S=S+CODE "<graphic 1)"
90 IF E-CODE "<graphic 2)"<=1
THEN LET E=24
100 PRINT AT A,B;"<graphic V)"
110 IF INKEY#("<") THEN GOTO 400
111 PRINT AT 5,1;"-----"
120 GOTO 70
400 LET T=B
410 PRINT AT A,T;"<graphic T)"
411 PRINT AT A,T;" "
420 LET A=A-CODE "<graphic 1)"
430 IF A>C THEN GOTO 410
440 IF A=C AND T=E THEN GOTO 50
0
450 GOTO 20
500 PRINT AT C,E-CODE "<graphic
2)";"*XX*X";S;

```

K MACDONALD of Sheffield has sent a listing which displays the game of **Reversi**. It is a game for two players, black and white playing alternately by occupying an empty space next to one of the opposing pieces. Every move must result in the capture of one or more of the opposing pieces. Captures are made by trapping the opposition between your own pieces. They can be trapped horizontally, vertically or diagonally, or in any or all those directions at once. When captured, pieces are converted to the opposition colour.

The game ends when neither player can move, or when one player has lost all his pieces; the winner is the player with the most pieces at the end of the game.

In this listing, moves are input by keying the co-ordinates of the vacant square, in the form "d6". Likewise, the co-ordinates of the pieces to be turned must then be keyed. At the end of the move, hit the 0 key. ENTER is not required for those operations. It should be possible to devise a subroutine to turn the captured pieces automatically. Can our readers supply one? (16K Spectrum). Graphics notes:

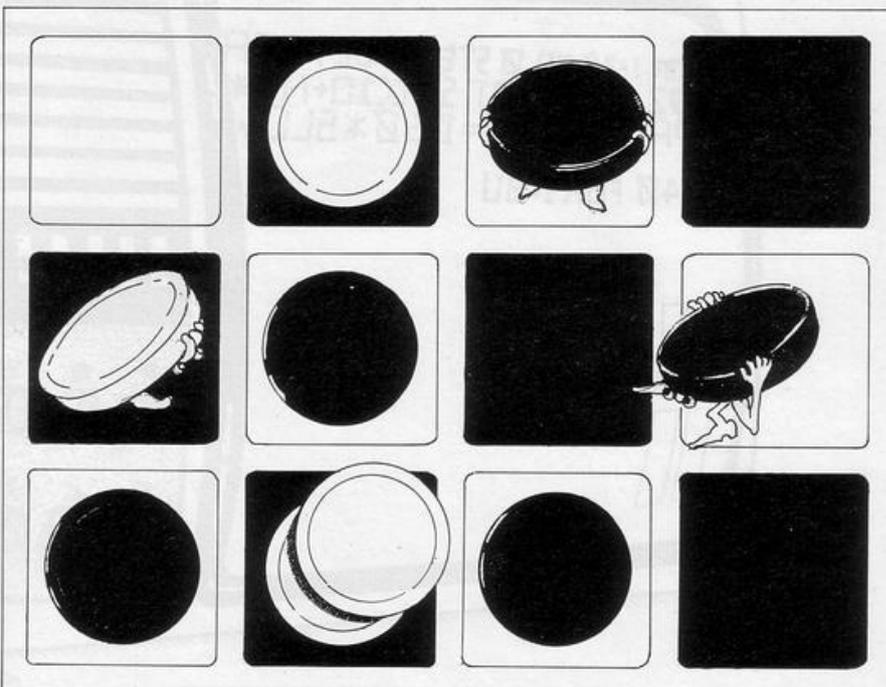
All user-defined graphics are entered in E mode 4 to produce a green background.

100—Graphic E, graphic F, graphic E, and so on.

110—Graphic H, graphic G, graphic H, and so on.

410—Graphic A, graphic B.

420—Graphic C, graphic D.



REVERSI IS REVER

```

5 BORDER 7: PAPER 7: CLS
7 LET q=0
10 FOR x=USR "a" TO USR "h"+7
20 READ a: POKE x,a: NEXT x
30 DATA 0,7,31,63,63,127,127,1
07,0,224,248,252,252,254,254,254
127,127,127,63,63,31,7,0,254,25
4,254,252,248,224,0
50 DATA 255,128,128,128,128,12
8,128,128
60 DATA 255,1,1,1,1,1,1,1
61 DATA 1,1,1,1,1,1,1,255
62 DATA 128,128,128,128,128,12
8,128,255
90 REM GREEN BOARD
100 LET a$=""
110 LET b$=""
120 PRINT INK 0: PAPER 4: a$; b$;
a$; b$; a$; b$; a$; b$; a$; b$; a$
b$; a$; b$
130 PRINT AT 16,0; "1 2 3 4 5 6
7 8"
140 FOR a=1 TO 8: PRINT AT a*2-
1,16,CHR$(54+a): NEXT a
150 GO TO 630
160 REM INPUT MOVE
170 BEEP .05,35
180 LET a$=INKEY$
190 IF q=0 THEN PRINT AT 4,18;"
Black to move"
200 IF q=7 THEN PRINT AT 4,18;"
White to move"
210 PRINT AT 5,18;"POSITION: "
220 IF a$<"a" OR a$>"h" THEN GO
TO 180
230 PRINT AT 5,27;a$
240 LET b$=a$
250 LET a$=INKEY$
260 IF a$>"8" OR a$<"1" THEN GO
TO 250
270 PRINT AT 5,28;a$
280 LET b$=b$+a$
290 REM MOVE
300 LET c$=b$(1)
310 IF c$="a" THEN LET z=0
320 IF c$="b" THEN LET z=2
330 IF c$="c" THEN LET z=4
340 IF c$="d" THEN LET z=6
350 IF c$="e" THEN LET z=8
360 IF c$="f" THEN LET z=10

```

```

370 IF c$="g" THEN LET z=12
380 IF c$="h" THEN LET z=14
390 LET c$=b$(z)
400 LET x=VAL c$*2-2
410 PRINT AT z,x; INK q;" "
420 PRINT AT z+1,x; INK q;" "
430 RETURN
440 LET p=q: LET e=e+1: IF e>65
THEN GO TO 810
450 IF p=7 THEN LET q=0: LET bl
ack=black+1
460 IF p=0 THEN LET q=7: LET wh
ite=white+1
470 GO SUB 160
480 FOR g=1 TO 20
490 PRINT AT 21,0;"Enter the co
unters to be turned."
500 IF q=0 THEN LET black=black
+1: LET white=white-1
510 IF q=7 THEN LET white=white
+1: LET black=black-1
520 LET a$=INKEY$
530 IF a$="0" THEN GO TO 610
540 IF a$<"a" OR a$>"h" THEN GO
TO 520
550 LET b$=a$
560 LET a$=INKEY$
570 IF a$<"1" OR a$>"8" THEN GO
TO 560
580 LET b$=b$+a$
590 GO SUB 290
600 NEXT g
610 PRINT AT 21,0;"..
620 GO TO 440
625 REM GREEN START POSITION
630 LET z=6: LET x=6: LET q=7
640 GO SUB 410
650 LET z=6: LET x=8: LET q=0
660 GO SUB 410
670 LET z=8: LET q=0: LET x=6
680 GO SUB 410
690 LET z=8: LET x=8: LET q=7
700 GO SUB 410
710 LET white=2
720 LET black=2
730 LET e=4
800 GO TO 440
810 PRINT AT 21,0;"Whites=";whi
te;" Blacks=";black

```

HIGH POWERS

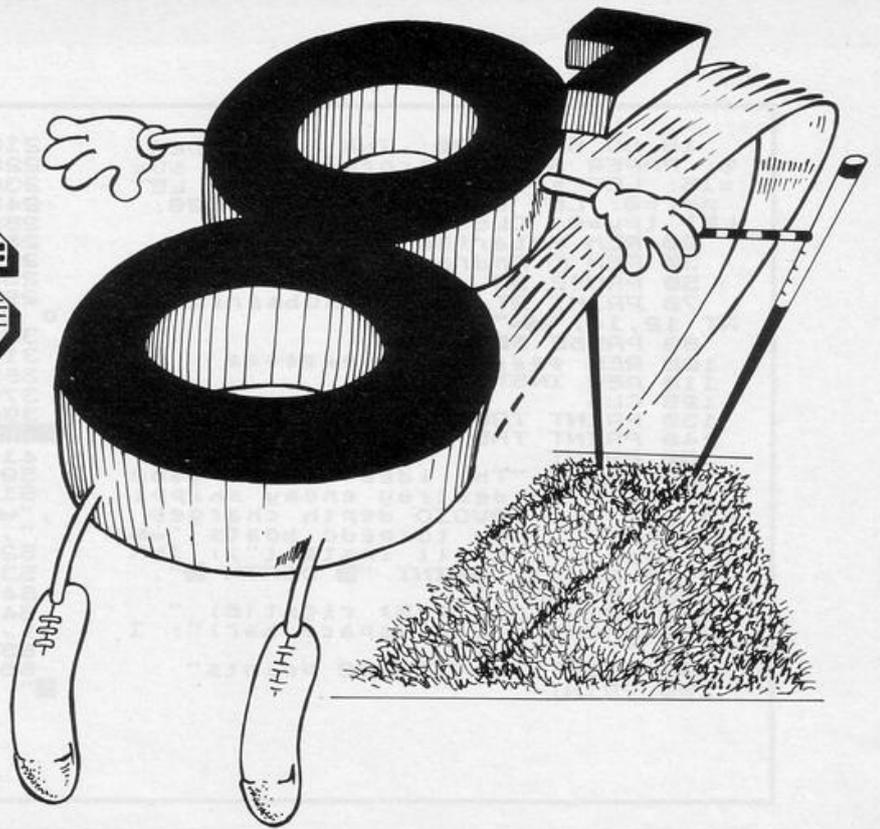
HIGH POWERS is designed to avoid the limitations of floating point arithmetic, which tackles only the first eight significant figures of a number.

The program enables the user to raise a N to the power P and receive an answer correct to the last digit. Each digit of the answer is stored in a single dimension array and, to assist programming, is stored in reverse order.

Line 80 calculates the number of digits in the answer and DIMs D to that number. Lines 100 to 170 calculate the number, the variable F being used as a carry. Lines 180 to 240 print-out the final result.

The CHR\$ statement in line 230 increases the speed of the printing as the ROM routine for printing numbers is very slow. The program occupies only 461 bytes but an expanded machine is required because of the memory needed for the variables.

High Powers was submitted by J Stephenson of Bolton, Lancashire. (16K ZX-81).



```

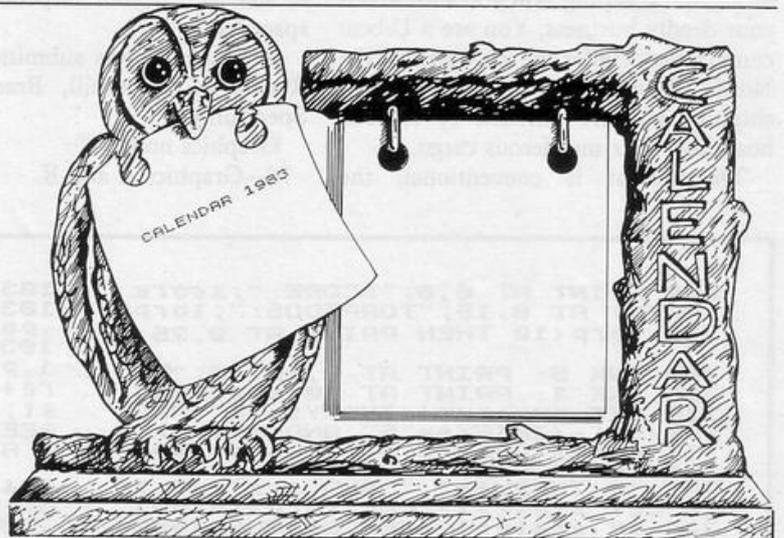
20 LET F=0
30 PRINT "ENTER NUMBER"
40 INPUT N
50 PRINT "ENTER POWER"
60 INPUT P
70 FAST
80 LET X=INT (P*(LN N/LN 10))+.1
90 DIM D(X)
100 LET D(1)=1
110 FOR A=1 TO P
120 FOR B=1 TO X
130 LET D(B)=D(B)*N+F
140 LET F=0
150 IF D(B)>9 THEN GOSUB 260
160 NEXT B
170 NEXT A
180 CLS
190 SLOW
200 PRINT N;" TO THE POWER ";P;
" IS"
210 PRINT
220 FOR A=1 TO X
230 PRINT CHR$(D(X+1-A)+28);
240 NEXT A
250 STOP
260 LET F=F+1
270 LET D(B)=D(B)-10
280 IF D(B)<10 THEN RETURN
290 GOTO 260

```

CALENDAR

IF YOU HAVE a printer and at least a 1K ZX-81, you can make a neat little calendar with this routine from Simon Kelly of South Croydon, Surrey.

As set up at present, the listing produces a calendar for 1983 but it can be changed by altering the year in line 20 and the value of Z in line 25. Z should be made to signify the first day of the year, on the convention that Sunday equals one, Monday is two, and so on.



```

10 LET M$="JANFEBMARAPR MAYJUNJ
ULAUGSEPOCTNOVDEC"
15 LET D$="3128313031303131303
13031"
20 LET Y=1983
25 LET Z=7
30 LPRINT TAB 9;"CALENDAR ";Y
35 LET Z=Z*4-1
40 FOR A=1 TO 12
45 LET D=VAL D$(A TO 2)
50 LET D$=D$(3 TO )
55 LPRINT "*****"
60 LET M$=M$(4 TO )
65 LPRINT "SUN MON TUE WED
THU FRI SAT"
70 FOR B=1 TO D
75 LPRINT TAB Z;B;
80 LET Z=Z+4
85 IF Z=31 THEN LET Z=3
90 NEXT B
95 LPRINT
99 NEXT A

```

```

10 GO SUB 8000: INK 0: BORDER
0: PAPER 5: LET score=0: LET sux
=15: LET state=0: LET sdc=0: LET
pdc=0: LET ddc=0: LET torp=20:
LET tpy=0: CLS
20 REM Subarine game
30 REM © Andrew D Russell
50 PAUSE 50
70 PRINT AT 10,11;"submarine";
AT 12,14;"█"
80 PAUSE 50
100 REM *****
110 REM INSTUCTIONS
120 CLS
130 PRINT TAB 11;"SUBMARINE"
140 PRINT TAB 11;"█"
150 PRINT
160 PRINT "The idea of the game
is to destroy enemy shippi
ng BUT AVOID depth charges
dropped by torpedo boats █
these spell instant"; INK
2: FLASH 1: PRINT "█ DEATH █":
FLASH 0: INK 1
165 PRINT "left(5) right(8) "
170 PRINT "fire (space bar)": I
NK 1
190 PRINT "█","1000 points"
200 PRINT

```

```

210 PRINT "█","250 points"
220 PRINT
230 PRINT "█","250 points"
240 PRINT
250 PRINT "█","500 points"
260 PRINT
270 PRINT "█","50 points"
280 INK 0: PRINT
290 PRINT " press any key t
o start"
300 PAUSE 0
310 CLS
365 INK 1
370 FOR a=10 TO 21
390 PRINT AT a,0;"█"
410 NEXT a
500 LET shx=25
510 DATA "█",50,"█",250
,"█",1000,"█",500,"█",
,"█",250
520 FOR a=1 TO (5*RND)+1
530 READ a$,val
540 NEXT a
545 LET step=.25+(INT (RND*6) +
1)/8)
550 RESTORE
560 INK 5: PRINT AT 9,0;"█"

```

SUBMARINE

THE SEA is cold and as clammy as a witch's kiss. Under its green and creeping skin you slide about your deadly business. You are a U-boat commander. Under the icy waters of the North Atlantic, you shadow assorted shipping and are pursued by torpedo boats and their murderous cargo. The format is conventional; the

graphics are excellent—see our listing. Power your craft left with 5, right with 8, and launch your torpedoes with the space bar. **Submarine** was submitted by A D Russell of Eccleshill, Bradford (16K Spectrum) Graphics notes: 70—Graphics A and B.

- 190—Graphics K and L.
- 210—Graphics C, D and E.
- 230—Graphics P, Q and R.
- 250—Graphics M, N and O.
- 270—Graphics F,G,H,I and j
- 1030—Graphic U
- 2510—Graphic S
- 2520—Graphic T.

```

600 PRINT AT 0,0;"SCORE:";score
: PRINT AT 0,16;"TORPEDOS:";torp
: IF torp<10 THEN PRINT AT 0,26;
"█"
700 INK 5: PRINT AT 9,shx+5;"█"
705 INK 1: PRINT AT 20,sux;"█"
710 LET sux=sux+(INKEY$="8" AND
sux<30)-(INKEY$="5" AND sux>0)
715 PRINT OVER 1;AT 20,sux;"█"
720 PRINT OVER 0;AT 9,shx;a$
725 IF INKEY$=" " AND state=0 T
HEN LET state=1: LET torp=torp-1
726 IF state=1 THEN GO SUB 1000
727 IF state=0 THEN GO SUB 900
728 IF torp<0 THEN GO TO 3000
729 IF sdc=1 THEN GO SUB 2500
730 IF sdc=0 AND val=1000 AND R
ND<.4 THEN GO SUB 2000
740 LET shx=shx-step
745 IF (shx<1 AND torp<1) THEN
GO TO 3000
750 IF shx<1 THEN GO TO 500
760 GO TO 600
900 LET pos t=sux
905 LET tpy=18
910 RETURN
1000 INK 1: PRINT AT tpy+1,pos t
:"█"
1030 PRINT OVER 1;AT tpy,post;"█"
1034 IF tpy>10 THEN GO TO 1040

```

```

1035 IF tpy=10 THEN LET state=0
1036 IF tpy=10 THEN PRINT AT tpy
,post;"█"
1037 IF tpy=10 AND SCREEN$ (tpy-
1,post)<>" " THEN LET score =sco
re+val: PRINT OVER 1;AT tpy-1,po
st;"█": PAUSE 50: FOR y=1 TO 8: PRIN
BEEP .05,10*RND+20: NEXT y: PRIN
T AT tpy-1,0;" " : GO TO 500
1040 LET tpy=tpy-.5: BEEP .06,-1
0: RETURN
2000 REM **release depth charge*
2010 LET pdc=shx
2010 LET pdc=shx
2020 LET ddc=10
2030 LET sdc=1
2040 BEEP .1,-20
2050 RETURN
2500 INK 1: PRINT AT ddc-1,pdc;"█"
2510 PRINT OVER 1;AT ddc,pdc;"="
2520 IF ddc=20 THEN PRINT OVER 1
;AT ddc,pdc;"█": PAUSE 25: BEEP
.25,-20: PRINT AT ddc,pdc;"█": L
ET sdc=0
2530 IF ddc=20 AND ABS (pdc-sux)
<5 THEN PRINT AT 20,sux;"█": BE
EP .25,-30: PAUSE 25: PRINT AT 2
0,sux;"█": GO TO 4000
2540 LET ddc=ddc+1

```

```

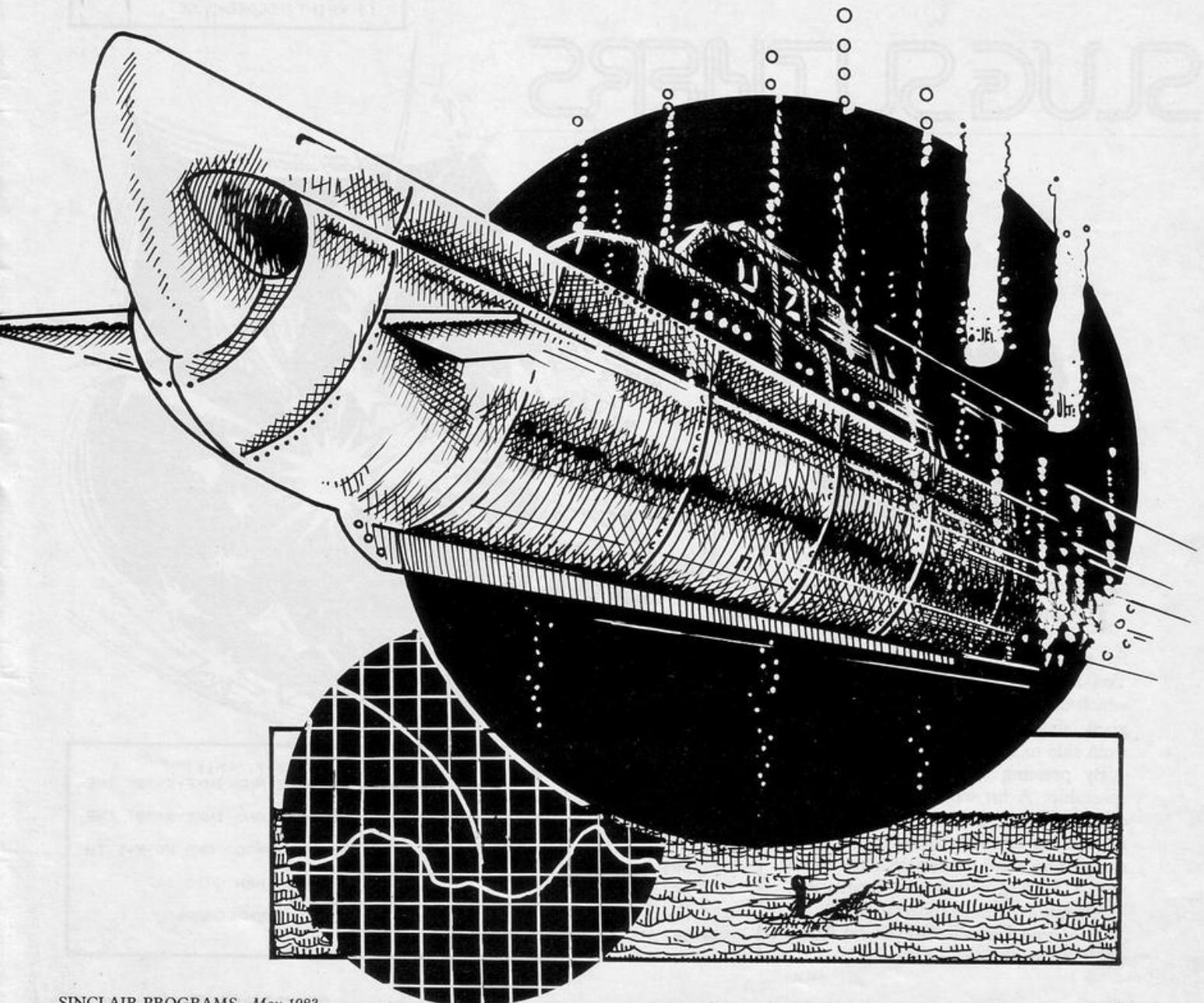
2550 RETURN
3000 CLS
3100 PRINT "GAME OVER      YOUR
SCORE IS      ";SCORE
3200 GO TO 5000
4000 INK 2: CLS : PRINT "DEPTH C
HARCE GOT YOU"
4010 INK 0: PRINT "YOUR SCORE WA
S: ";score
5000 PRINT "DO YOU WANT TO REPLA
Y (Y or N)"
5010 INPUT a$
5020 IF a$="y" OR a$="Y" THEN RU
N
5030 IF a$="n" OR a$="N" THEN ST
OP
5040 GO TO 5010
8000 RESTORE 9000
8010 FOR a=144 TO 164
8020 FOR b=0 TO 7
8030 READ c
8040 POKE (USR CHR$ a)+b,c
8050 NEXT b
8060 NEXT a
8070 RESTORE
8080 RETURN
9000 DATA 1,3,3,127,255,255,127,
0
9010 DATA 0,192,192,248,255,255,
248,0
9020 DATA 0,0,3,3,255,127,63,0

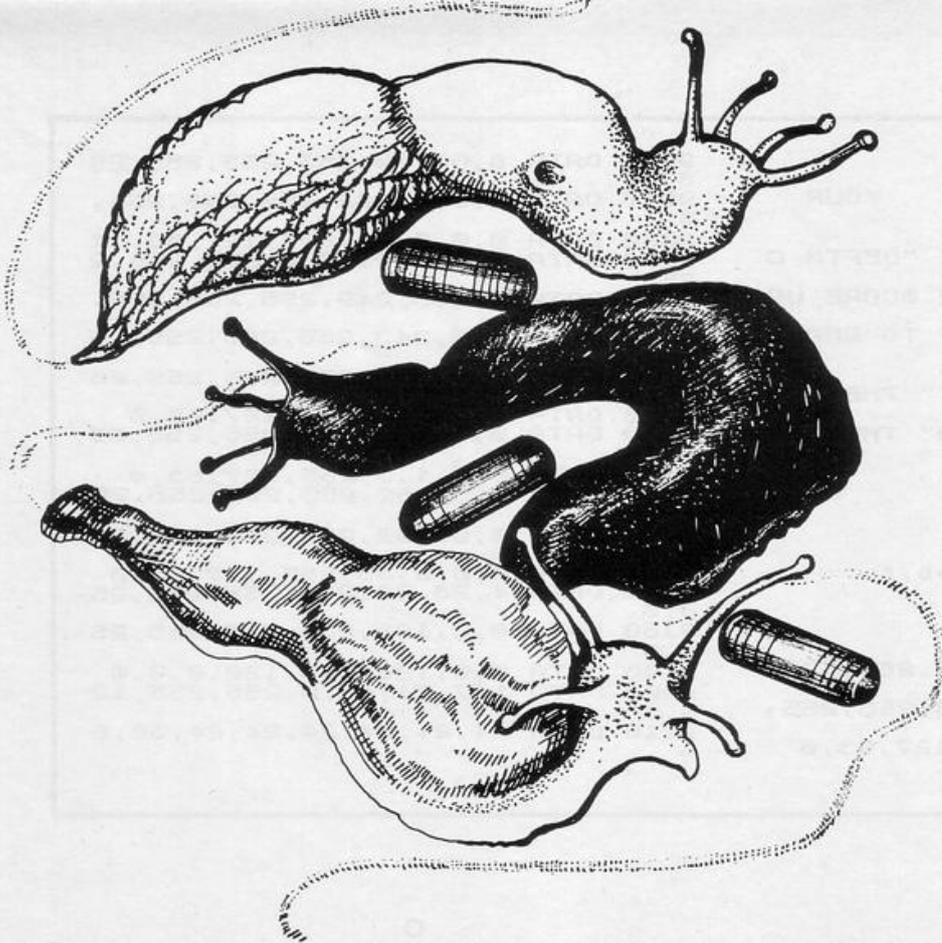
```

```

9030 DATA 0,60,60,253,255,255,25
0,0
9040 DATA 0,0,0,192,255,255,254,
0
9050 DATA 0,0,0,24,255,127,63,31
9070 DATA 0,0,1,15,255,255,255,2
55
9080 DATA 1,255,249,255,255,255,
255,255
9090 DATA 0,3,243,255,255,255,25
255
9100 DATA 0,0,192,236,255,255,25
4,252
9110 DATA 0,0,0,3,255,127,63,0
9120 DATA 0,0,192,224,255,255,25
4,0
9130 DATA 0,0,1,3,255,127,63,0
9140 DATA 4,30,62,255,255,255,25
0
9150 DATA 0,0,192,224,255,255,25
4,0
9160 DATA 0,0,3,55,255,127,63,0
9170 DATA 4,28,30,254,255,255,25
0
9180 DATA 0,0,192,230,255,255,25
4,0
9190 DATA 0,0,120,120,120,0,0,0
9200 DATA 137,74,42,0,255,255,12
0
9210 DATA 24,24,24,24,24,24,36,6

```





TRANSFORMED into a slug, you slither down your screen, trying to avoid death at the hands of the master gardener. The garden has been littered with slug pellets and the only way to survive is to slither around them, using cursor keys 5 and 8 to move to left and right.

The program was devised by Neil Martin of Callington, Cornwall for the 1K ZX-81. Graphics instructions are given in lower-case letters in brackets.

```

2 LET X=VAL "16"
3 LET E=VAL "5"
4 LET SC=PI/PI
5 LET R=INT (RND*VAL "30")+1
6 SCROLL
7 LET SC=SC+VAL "1"
8 PRINT AT VAL "13",R;"(inverse space)";AT VAL "11",R+1;"(inverse space)"
9 LET X=X+(INKEY#="8")-(INKEY#="5")
10 PRINT AT E,X;
11 IF PEEK (PEEK 16398+PEEK 16399*256)=128 THEN GOTO 14
12 PRINT AT E,X;"*"
13 GOTO E
14 PRINT AT VAL "19",PI/PI;"HAPPY...ZAPPED BY A SLUG PELLET"
15 PRINT "SCORE=";SC

```

SLUG SLITHERS

ALIEN ATTACK

YET ANOTHER alien ship is circling the earth and, once again, it is you who has the responsibility for saving civilisation as we know it. You have been provided with a craft which bears a startling resemblance to a giant slug, which moves relentlessly from side to side.

By pressing 0 you can fire at the spaceship. A hit will be acknowledged on the screen but the ship remains impervious to attack and the hits serve as warning shots rather than the usual scenes of destruction and mutilation. The game continues indefinitely.

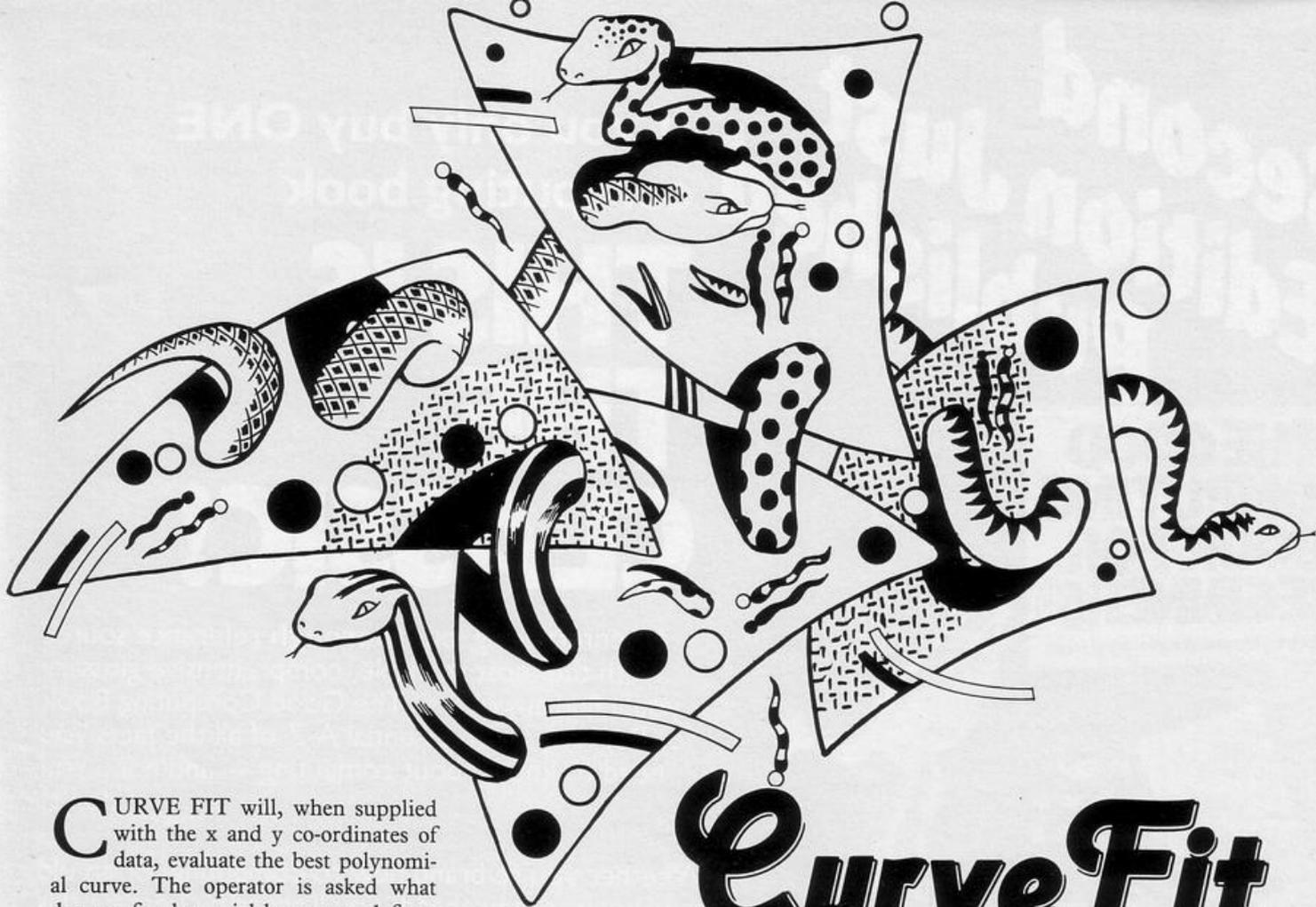
The program was written by Mark McLeod for the 1K ZX-81.



```

1 LET X=INT (RND*27)
2 LET Y=0
3 CLS
10 PRINT AT 1,X;"(9t'9d'94)"
20 PRINT AT 21,Y;"(93'9sSpace'94)"
21 PRINT AT 21,Y;" "
25 LET Y=Y+1
26 IF INKEY#="0" THEN PRINT AT 2,Y;"*"
27 IF Y=X+1 AND INKEY#="0" THEN
N PRINT AT 11,7;"(hit)"
28 IF Y=X+1 AND INKEY#="0" THEN
N PAUSE 10
29 IF Y=X+1 AND INKEY#="0" THEN
N GOTO 1
33 IF INKEY#="0" AND Y<>X+1 THEN
EN GOTO 1
34 IF Y=28 THEN GOTO 1
35 GOTO 20
36 SAVE "ALIEN COMBAT"

```



CurveFit

CURVE FIT will, when supplied with the x and y co-ordinates of data, evaluate the best polynomial curve. The operator is asked what degree of polynomial he wants—1 for a straight line, 2 for a parabola, and so on.

Although there are standard results for fitting straight lines and parabolas, we have not previously seen a generalised method—perhaps not surprising when one looks at the algebra involved. The sets of data are set up as a matrix of simultaneous equations and that is then

solved by Gaussian elimination. The matrix is reduced to a triangular one and back-substitution gives all the required values.

If the user wishes, he can try fitting another polynomial, so long as it is of lower order. The only limit on the order

is the capacity of memory but the number of operations increases exponentially with the order and above an order of about 7 becomes impossibly slow.

Curve Fit was written by I C Kemp of Abingdon, Oxfordshire. (16K ZX-81).

```

5 REM PROGRAM TO FIT A CURVE
  USING LEAST-SQUARES, BY I.C.KEMP
10 PRINT "TYPE ORDER OF POLYNOMIAL
  REQD."
15 INPUT N
16 LET N=N+1
19 DIM Z(N+1)
20 PRINT "TYPE NUMBER OF DATA
  POINT PAIRS"
25 INPUT ND
30 IF N<ND THEN GOTO 45
35 PRINT "POLYNOMIAL OF THIS ORDER
  CANNOT BE FITTED."
40 GOTO 10
45 FAST
46 DIM S(2*N-1)
47 DIM T(N-1)
49 REM SETTING VARIABLES TO 0
50 FOR D=1 TO N-1
51 LET S(D)=0
52 LET T(D)=0
53 LET S(D+N-1)=0
55 NEXT D
57 LET SY0=0
60 FOR C=1 TO ND
65 PRINT "TYPE IN X, THEN Y"
70 INPUT X
71 INPUT Y
75 REM DATA INPUT/CALCULATION
76 FOR F=1 TO N-1
77 LET W=ABS X**F
78 IF X<0 AND F/2<>INT (F/2) THEN
  LET W=-W
79 LET WW=ABS X**<F+N-1>
80 IF X<0 AND <F+N-1>/2<>INT (<F+N-1>/2)
  THEN LET WW=-WW
81 LET S(F)=S(F)+W
82 LET T(F)=T(F)+W*Y
83 LET S<F+N-1>=S<F+N-1>+W*Y
85 NEXT F
87 LET SY0=SY0+Y
90 NEXT C
92 REM FORMATION OF MATRIX OF
  SIMULTANEOUS EQUATIONS FOR THE
  COEFFICIENTS OF THE POLYNOMIAL
97 DIM A(N,N+1)
98 LET A(1,1)=ND
99 LET A(1,N+1)=SY0
100 FOR K=1 TO N
101 FOR J=1 TO N
102 IF K+J=2 THEN GOTO 110
105 LET A(K,J)=S<K+J-2>
110 NEXT J
111 IF K=1 THEN GOTO 115
112 LET A(K,N+1)=T<K-1>
115 NEXT K
120 GOSUB 716
121 REM PRINT-OUT OF RESULTS
122 PRINT "SOLUTION POLYNOMIAL
  IS:"
125 FOR L=1 TO N
126 PRINT " + ";Z<L>;" X**";L-1
127 NEXT L
135 PRINT "DO YOU WISH TO FIT A
  NOTHER POLYNOMIAL OF LOWER
  ORDER? TYPE 1 TO DO THIS."
140 INPUT G
141 IF G<>1 THEN STOP
145 PRINT "TYPE ORDER REQUIRED"
146 INPUT N
147 LET N=N+1
150 IF N<ND THEN GOTO 97
152 PRINT "POLYNOMIAL OF THIS ORDER
  CANNOT BE FITTED."
153 GOTO 145
700 REM GAUSSIAN ELIMINATION
SUBROUTINE TO SOLVE MATRIX
716 DIM B(N,N+1)
717 DIM C(N,N+1)
800 CLS
850 FOR L=1 TO N-1
855 GOSUB 978
860 FOR K=L TO N
862 LET C<K,L>=A<K,L>
865 FOR J=L TO N+1
868 IF C<K,L>=0 THEN GOTO 885
870 LET B<K,J>=A<K,J>/C<K,L>
872 IF K=L THEN GOTO 880
875 LET A<K,J>=B<K,J>-B<L,J>
880 NEXT J
885 NEXT K
890 NEXT L
910 LET Z<N>=A<N,N+1>/A<N,N>
920 FOR K=N-1 TO 1 STEP -1
925 FOR J=K+1 TO N
930 LET B<K,N+1>=B<K,N+1>-Z<J>*
  B<K,J>
935 NEXT J
940 LET Z<K>=B<K,N+1>
945 NEXT K
950 RETURN
978 LET MAX=ABS A<L,L>
980 FOR K=L+1 TO N
981 IF ABS A<K,L><=MAX THEN GOT
  O 998
983 LET MAX=ABS A<K,L>
985 FOR J=L TO N+1
986 LET Z<J>=A<K,J>
987 LET A<K,J>=A<L,J>
988 LET A<L,J>=Z<J>
990 NEXT J
998 NEXT K
999 RETURN

```

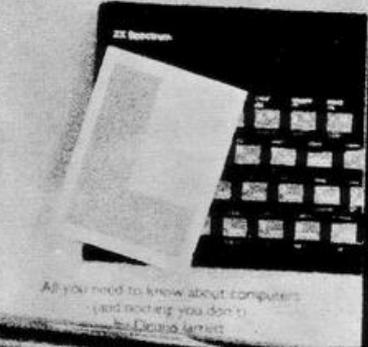
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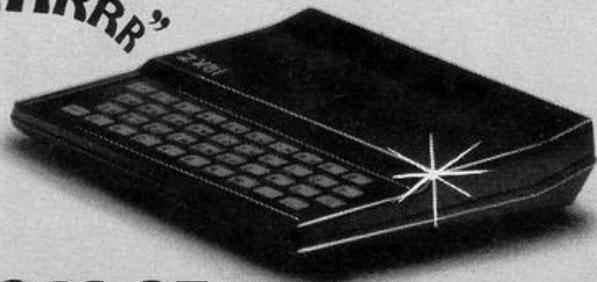
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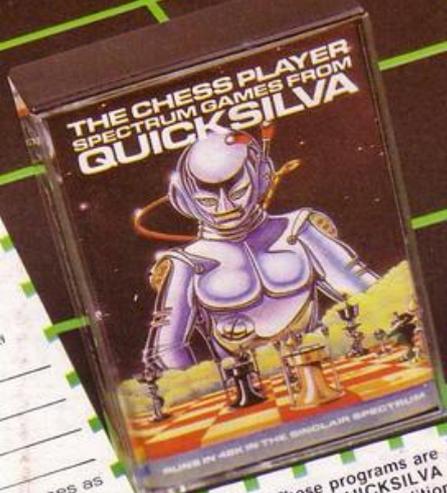
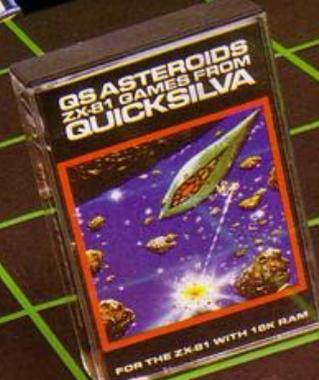
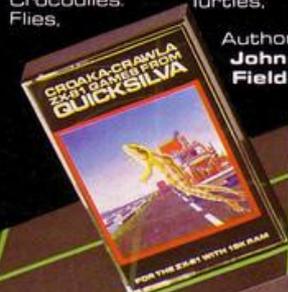
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