GAMES TO PLAY ON YOUR ZX SPECTRUM

Martin Wren-Hilton

SHIVA's
micro puzzle books

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INTRODUCTION

The ZX Spectrum, whether it be 16K or 48K, is a very impressive machine. By that, I mean that it has great potential — potential for doing more than you may think. In writing this book, I have brought together a number of games and utilities which should amuse or amaze you, from the brilliant BREAKOUT program to the mind-boggling MASTERMIND game. As well as being fun to run, these programs will also teach you some interesting programming techniques as well as a couple of commands which were left out of the *Manual* altogether!

In learning how to use the machine, through the machine, I believe that it is up to you to modify any of the programs listed by adding extra lines where you want to. That is not to say that these programs have errors which need correcting, but a quick alteration here or there may help to "personalise" the program.

It should be noted that *all* of these programs will run on either model of the Spectrum. If you do not feel up to entering all of them, you may like to know that some of the games are available on cassette, for further details contact Shiva Publishing Limited.

Finally, I hope that you enjoy programming your Spectrum with these listings, and that you gain many hours of pleasure playing the games.

<div align="right">

Martin Wren-Hilton
Blackpool, August 1982

</div>

Note the following conventions used to represent graphics in the program listings:

Small g means "graphics character": it is followed by the letter or number of the right key, so "g6" is   . ▞

Characters accessed by CAPS SHIFT get a "c" added on the end, so "g6c" is ▛ .

A box □ is used to represent a space when one is not otherwise obviously needed.

Boxes around characters denote inverse video.

1 BREAKOUT

This game, based upon the pub game of the same name, seems to be extremely popular, judging by the reaction of my friends when they see it. For those of you unfortunates that have never played BREAKOUT before, the game involves knocking bricks out of a wall with a bat (which you control). It may seem easy in principle, but in practice, it is much more of a challenge.

The program should be entered as it is listed, but it is worth noting that the lines in 100 and 115 are actually underline characters — four of them in each program line.

The 5 key moves your bat left and the 8 moves it right. Can you beat my high score of 243?
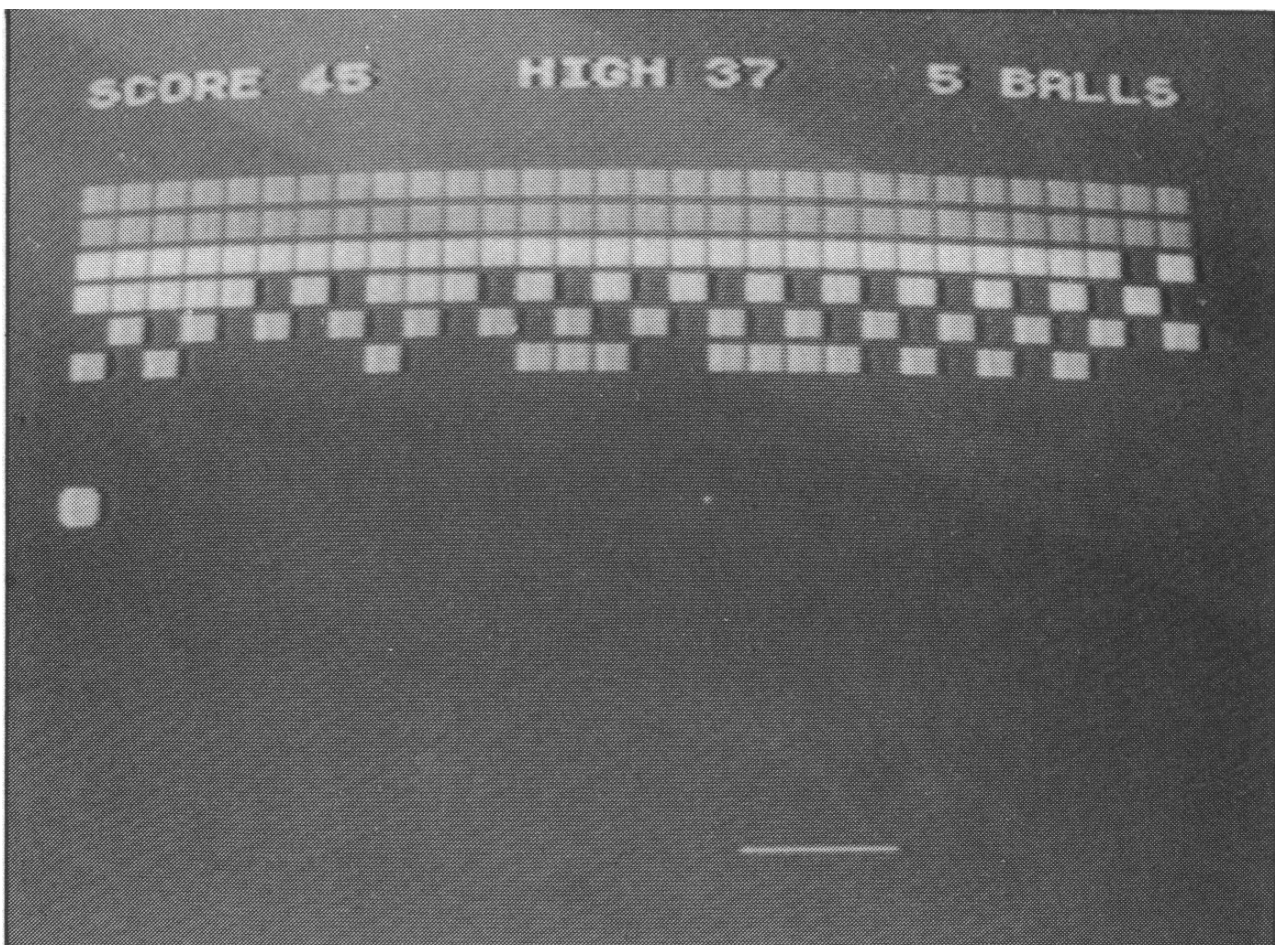
```
10    LET HS = 0: OVER 0

20    LET SC = 0: RESTORE: BORDER 0: PAPER 0: INK 1: BRIGHT 1: CLS:
      LET S = INT (RND * 5 + 16): LET X = 10: LET Y = 5: LET A1 =
      -1: LET B1 = 1: LET N = 9

30    FOR B = USR "A" TO USR "A" + 15: READ C: POKE B, C: NEXT B

50    PRINT INK 6; "□ SCORE □"; SC; TAB 13; "HIGH □";  HS;  TAB  24;
      "9 BALLS" ' ' '

60    FOR A = 1 TO 6: READ B: INK B

70    PRINT "□ gB [30 times]"

80    NEXT A

85    INK 1

90    LET Z = ATTR (X, Y) < > 65 AND ATTR (X, Y) < > 67

95    PRINT AT X, Y; INK 5; "gA"

100   LET S = S + (INKEY$ = "8") - (INKEY$ = "5"): LET S = S + (S =
      -1) - (S = 26): PRINT AT 21, S; INK 3; "□ _ _ _ _ □"

110   LET A1 = A1 - 2 * A1 * Z - 2 * (X = 21) + 2 * (X = 2): LET B1
      = B1 + 2 * (Y = 1) - 2 * (Y = 30): IF Z THEN LET SC = SC + 1:
      BEEP .01, 45 - 2 * x: PRINT AT 0, 7; INK 6; SC

115   LET S = S + (INKEY$ = "8") - (INKEY$ = "5"): LET S = S + (S =
      -1) - (S = 26): PRINT AT 21, S; INK 3; "□ _ _ _ _ □"

120   PRINT AT X, Y; "□": LET X = X + A1: LET Y = Y + B1: IF (Y < S
      + 1 OR Y > S + 4) AND X = 21 THEN GO TO 140

125   IF SC = 180 THEN PRINT AT 3, 0; : RESTORE 1020: GO TO 60

130   GO TO 90

140   PRINT AT 10, 11; INK 2; PAPER 7; "□ MISSED! □"; AT X, Y; INK
      2; PAPER 0; "gA": BEEP 1, -10

150   LET N = N - 1

160   IF N = 0 THEN GO TO 200

170   PRINT AT 0, 24; INK 6; N

180   FOR Q = 1 TO 250: NEXT Q: PRINT AT 10, 11; "[10 spaces]"; AT
      X, Y; "□"

185   LET X = 10
```

```
 190   GO TO 90

 200   PRINT AT 10, 7; INK 6; PAPER 1; "YOUR SCORE IS □"; SC

 205   IF SC > HS THEN LET HS = SC

 210   PRINT AT 0, 18; INK 6; HS; AT 12, 3; INK 3; PAPER 7; FLASH 1;
       "HIT ANY KEY TO PLAY AGAIN"

 215   IF INKEY$ < > " " THEN GO TO 215

 220   IF INKEY$ = " " THEN GO TO 220

 230   GO TO 20

1010   DATA 126, 255, 255, 255, 255, 255, 255, 126, 0, 0, 127, 127,
       127, 127, 127, 127

1020   DATA 2, 2, 6, 6, 4, 4
```
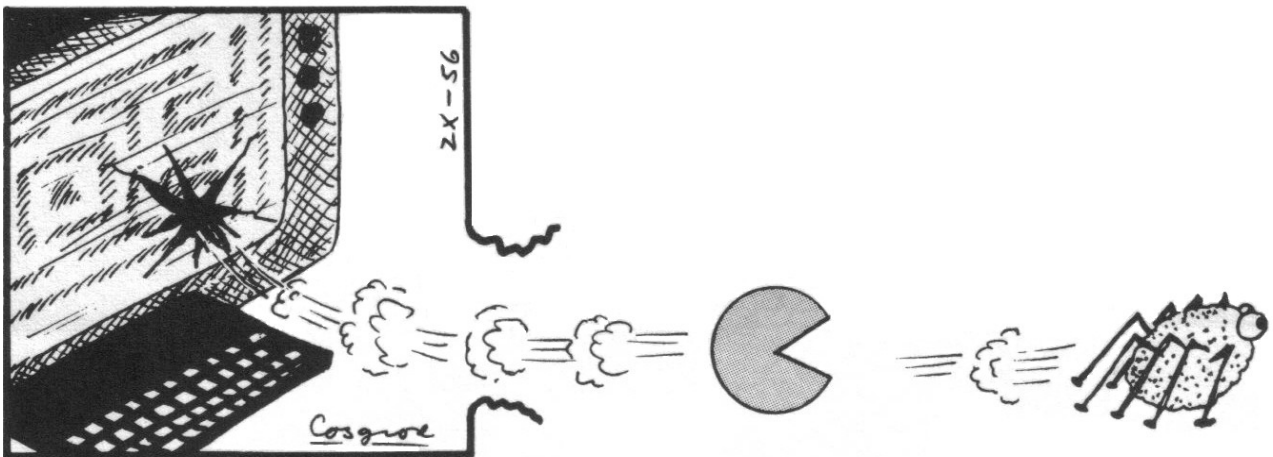
2 STRING ART

This short program is a most entertaining graphical demonstration of the Spectrum's ability to generate "string art". For the uninitiated, string art involves hammering nails into a cloth-covered board, in a series of lines, and subsequently joining the nails with a coloured thread. This simple technique produces quite attractive results, considering the materials used. In this simulation, the computer draws a series of lines which gradually grow, shrink, change directions and bounce off the sides of the screen. For those who have played the arcade game *Qix*, this sort of movement of lines will be familiar.

There are no fundamental peculiarities in this program although a line which randomly changed the colour of the "thread" might improve the overall effect.
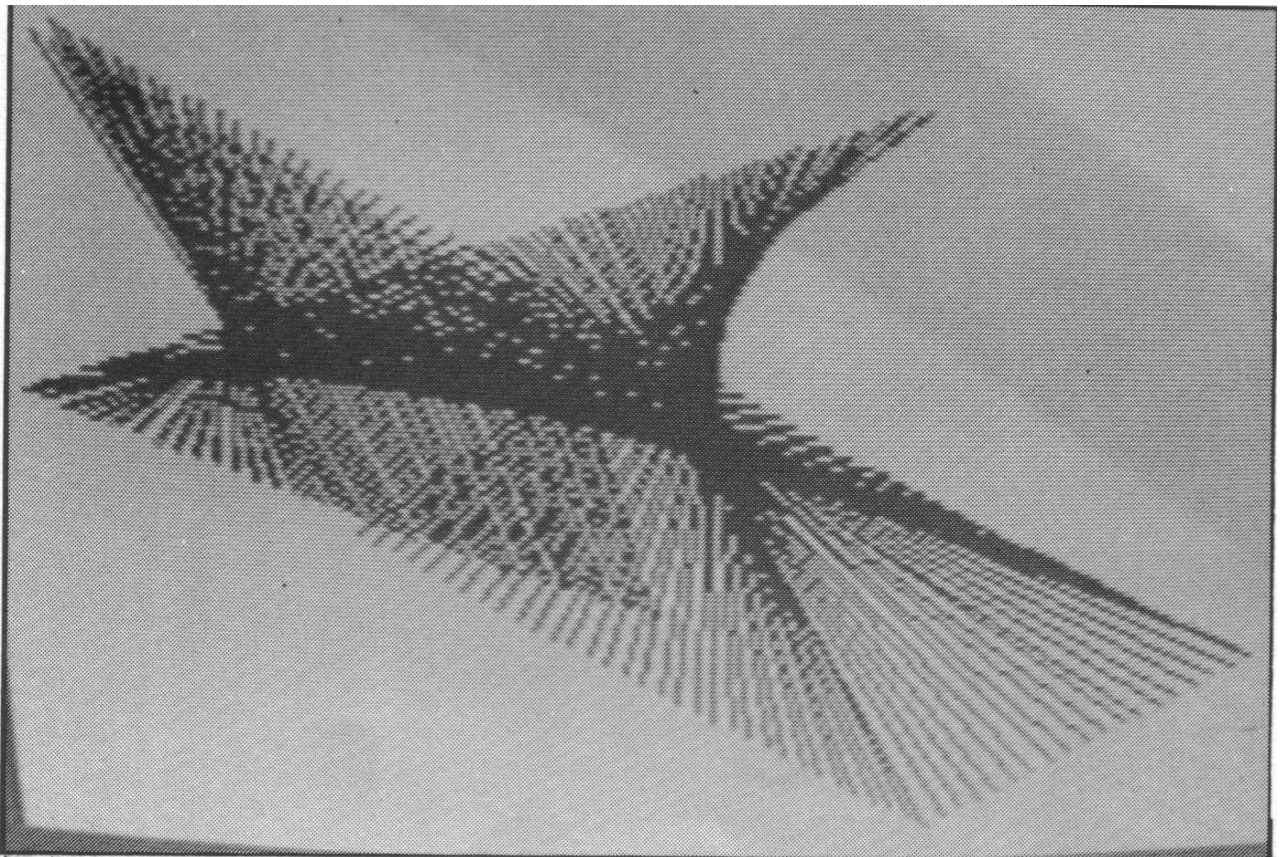
```
 10    BORDER 1: PAPER 7: INK 0: CLS

 20    LET X = RND * 255: LET Y = RND * 175

 30    LET L = RND * 255: LET M = RND * 175

 40    LET U = 4 - RND * 8

 50    LET V = 4 - RND * 8

 60    LET P = 4 - RND * 8

 70    LET Q = 4 - RND * 8

120    FOR K = 1 TO 150

130    BEEP .02, L/5: PLOT X, Y: DRAW L - X, M - Y

140    IF L + P > 250 OR L + P < 5 THEN LET P = -P

150    IF M + Q > 170 OR M + Q < 5 THEN LET Q = -Q

160    IF X + U > 250 OR X + U < 5 THEN LET U = -U

170    IF Y + V > 170 OR Y + V < 5 THEN LET V = -V

180    LET X = X + U

190    LET Y = Y + V

200    LET L = L + P

210    LET M = M + Q

230    NEXT K

240    IF INKEY$ = " " THEN GO TO 240

250    RUN
```

3 HELICOPTER

Ever piloted a helicopter? No? Well neither have I, but here's your chance. The game's aim is to land your helicopter on the landing pad of a ship, without running out of fuel. You start with 500 gallons and this is represented by a green band. As the amount in your tanks falls, the band becomes yellow, at 200 gallons, and red at 100. If you leave the controls alone, your helicopter loses ground and its height above sea-level decreases. Try the game for yourself, using the keys 1 and 0. But don't forget that the computer cannot sense if you are pressing two keys simultaneously, so remember, one at a time! At first, you will probably sink a number of times, but as you pick up the knack, you should aim to use as little fuel as possible. Definitely, a challenging game!

Apart from the actual messages printed, all the other letters in PRINT statements are graphic symbols. If you enter lines 1000 to 1060 first, then 10 to 30 and press RUN, the graphic symbols should make more sense.

```
10   LET S = 500: RESTORE: PAPER 5: BORDER 3: CLS

15   LET F$ = "g3c [28 times]"

20   FOR A = 1 TO 7: READ A$

30   FOR B = 0 TO 7: READ C: POKE USR A$ + B, C: NEXT B

40   NEXT A

50   INK 0

60   PRINT AT 0, 0; INK 2; PAPER 7; "FUEL" ' ' ' ' ' ' ' '

70   PRINT "□ □ □ □ □ □ g4c g3 g7 [28 spaces] g2c g8c g8c g8c g1c
     [24 spaces] g5 □ □ g8c gD gD gD g8c □ □ □ g7 g3 g4c [18
     spaces] gB g8c HMS g8c SPECTRUM g8c [18spaces] gB g8c gD g8c
     gD g8c gD g8c gD g8c gD g8c gD gA [19 spaces] gB g8c [10
     times] gA"

80   PRINT AT 14, 0; INK 1; "gC gC gC gC"; AT 14, 16; "gC [16
     times]"; PAPER 1; INK 0; AT 14, 4; "gB"; AT 14, 15; "gA"
```

```
90    FOR A = 1 TO 7

100   PRINT PAPER 1; "[32 spaces]"

110   NEXT A

120   PRINT AT 13, 5; PAPER 6; "gD g8c gD g8c gD g8c gD g8c gD g8c
      gD"

130   LET X = 5: LET Y = 30

135   IF SCREEN$ (X, Y) < > "□" THEN GO TO 400

140   PRINT AT X, Y; "gE gF"

145   IF INT (X + .5) = 10 AND (INT Y = 14 OR INT Y = 13 OR INT Y =
      12) THEN GO TO 500

150   PAUSE 10

155   PRINT AT 14, 0; INK 1; "gG gG gG gG"; AT 14, 16; "gG [16
      times]"

160   PRINT AT 0, 5; INK 4; (CHR$ 16 AND S < 200); (CHR$ 6 AND (S <
      200 AND S > = 100)); (CHR$ 2 AND S < 100); F$ (TO S/18.6);
      "[29 spaces]": IF S = 0 THEN GO TO 600

165   LET S = S − 4

170   PRINT AT X, Y; "□ □"

175   LET X = X - (INKEY$ = "1") + (INT X = 2): LET Y = Y - (INKEY$
      = "0") 180 LET Y = Y + .25 - (INT Y = 30): LET X = X + .5
```
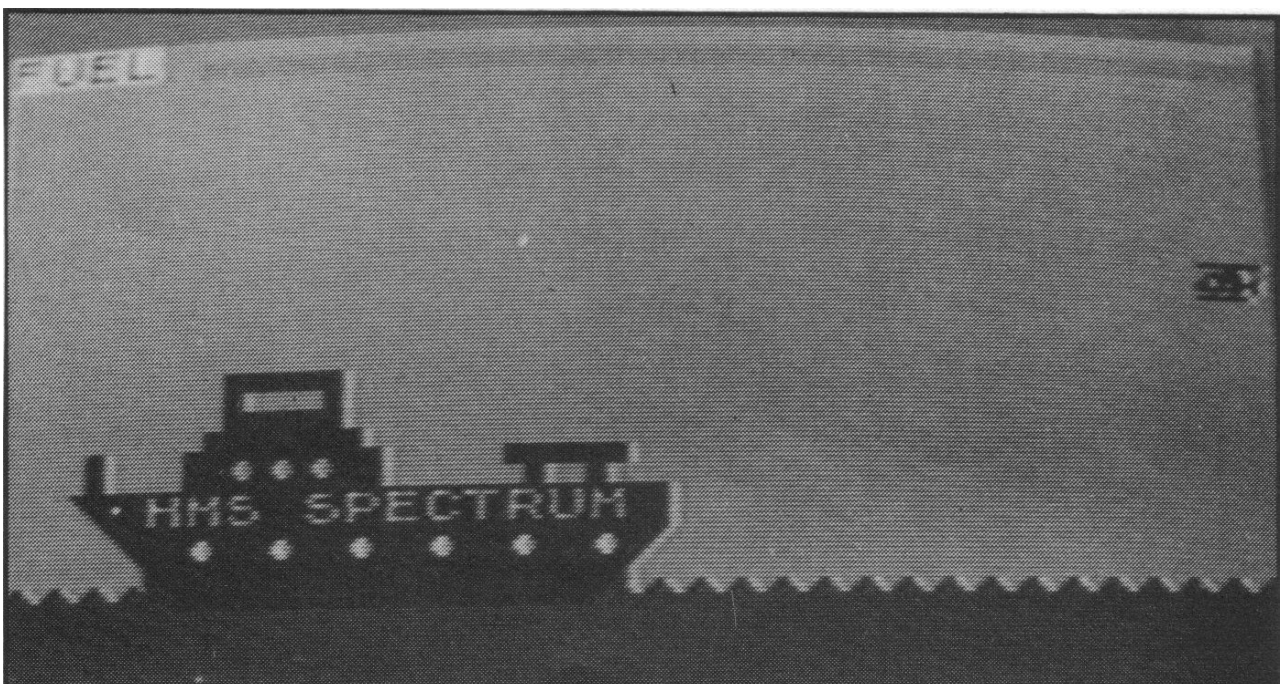
```
180   LET Y = Y + .25  - (INT Y = 30): LET X = X + .5

190   PRINT AT 14, 0; INK 1; "gC gC gC gC"; AT 14, 16; "gC [16
      times]"

200   GO TO 135

300   PRINT AT X, Y; INK 1; "gC gC"

310   FOR A = 1 TO 7

320   PRINT AT 14 + A, Y; PAPER 1; INK 7; "gE gF"

325   IF A > 1 THEN PRINT AT 13 + A, Y; PAPER 1; "□ □"

330   BEEP .25, 1 - A: PAUSE 10

340   NEXT A

350   PRINT AT 2, 0; "Oh dear, you've just sunk to the bottom of
      the ocean."
360   INPUT "HIT ENTER TO TRY AGAIN □"; Q$

370   RUN

400   IF INT X = 13 THEN GO TO 300

410   FOR A = 1 TO 10

420   PAUSE 5: PRINT AT X, Y; INK 2; "gE gF"

430   PAUSE 5: PRINT AT X, Y; "□ □"

440   NEXT A

450   PRINT AT X, Y - 1; INK 2; PAPER 7; BRIGHT 1; "BOOM!"

460   PRINT AT 2, 0; "That's no way to treat a heli- □ □ copter!"

470   GO TO 360

500   PRINT AT 2, 0; "Well done! You have successfully landed your
      helicopter, with □ □ □ □"; S; "□ gallons of fuel left"

510   FOR A = 1 TO 3

520   BEEP .2, 6: PAUSE 10

530   NEXT A

540   GO TO 360

600   PRINT AT 2, 0; "Sorry, you're out of fuel."
```

```
 610  GO TO 360

1000  DATA "A", 255, 254, 252, 248, 240, 224, 192, 128

1010  DATA "B", 127, 63, 31, 15, 7, 3, 1, 0

1020  DATA "C", 0, 0, 0, 96, 240, 249, 255, 255

1030  DATA "D", 255, 255, 231, 195, 195, 231, 255, 255

1040  DATA "E", 127, 1, 31, 39, 100, 127, 8, 127

1050  DATA "F", 252, 128, 192, 200, 248, 200, 128, 224

1060  DATA "G", 0, 0, 0, 6, 15, 159, 255, 255
```

4 WORM RACE

This was the first program that I ever wrote on a computer (a ZX81
actually). It appeals to me because it is just so daft! The aim —
well there isn't one really — is to back one of four worms, and
watch it race across a lawn, towards its own tulip. Try giving them
names of relatives/friends/teachers/bosses etc... and watch them
wind their way up the lawn. The sound effects are particularly
good, although simple, and give the game a whole new meaning. A
night at the Worm Races is highly recommended.

See if you can work out how the sounds are produced.
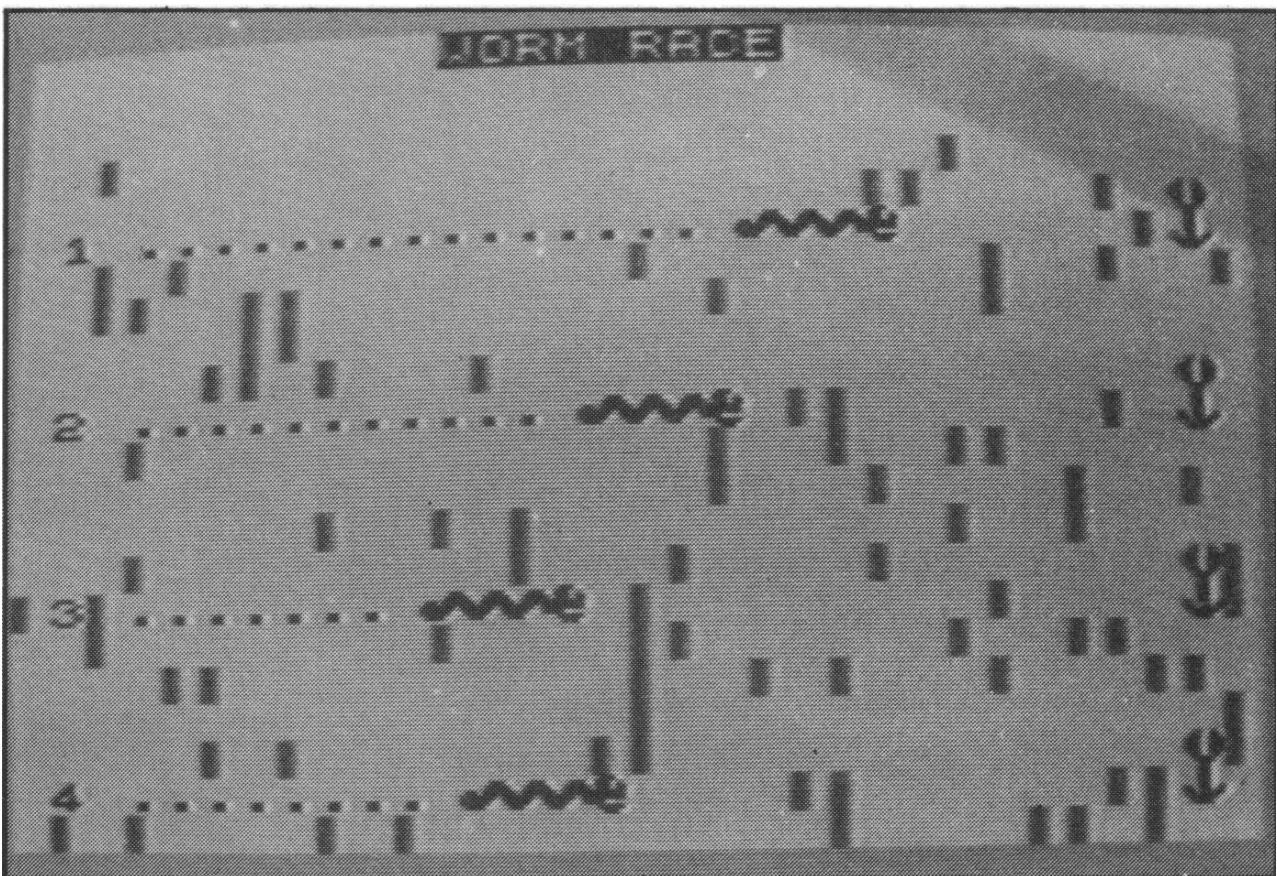
```
 10   DIM L (4): DIM N$ (4, 7): RESTORE: INK 1: PAPER 7: BORDER 6:
      CLS

 20   PRINT AT 0, 11; INK 1; FLASH 1; "WORM RACE" ' ' '

 30   FOR A = 1 TO 5

 40   READ A$

 50   FOR N = 0 TO 7: READ B: POKE USR A$ + N, B: NEXT N

 60   NEXT A

 70   FOR A = 1 TO 19

 80   PRINT "[33 spaces]"

 90   NEXT A

100   FOR A = 1 TO 100

110   PRINT AT 3 + INT (RND * 19), INT (RND * 32); INK 4; "g5"

120   NEXT A

130   FOR A = 1 TO 4

140   PRINT AT A * 5, 3; INK 0; "gB gA gA gA gC"; AT A * 5, 1; A;
      AT A * 5, 30; "gD"; INK 2; AT A * 5 - 1, 30; "gE"

150   INPUT "Enter name (7 letters)"; N$ (A)

160   LET L (A) = 2

170   NEXT A

180   LET M = 1 + INT (RND * 4)

190   LET L (M) = L (M) + 1

200   IF L (M) = 25 THEN GO TO 240

210   PRINT AT M * 5, L (M); INK 0; PAPER 7; ". gB gA gA gA gC"

220   BEEP .03, L (M)

230   GO TO 180

240   PRINT AT M * 5, 3; PAPER 7; "WINNER — □"; N$ (M)

250   FOR A = 1 TO 4

260   PRINT AT M * 5 - 1, 30; INK 5; "gE"
```

```
 270   BEEP .5, 10

 280   PRINT AT M * 5 - 1, 30; INK 2; "gE"

 290   PAUSE 25

 300   NEXT A

 310   INPUT "HIT ENTER TO RACE AGAIN!"; Q$

 320   RUN

1000   DATA "A", 0, 14, 31, 191, 251, 241, 224, 0

1010   DATA "B", 0, 0, 0, 1, 3, 3, 1, 0

1020   DATA "C", 56, 116, 118, 254, 254, 224, 62, 28

1030   DATA "D", 24, 24, 24, 24, 153, 219, 126, 60

1040   DATA "E", 36, 102, 231, 231, 231, 102, 60, 24
```

5 FLOWER

The ability of the Spectrum to DRAW arcs quickly is rarely used in programs. FLOWER draws a flower on the screen, using this facility. By changing lines in the program, you can vary the number, size and shape of the leaves. I won't tell you which variables to change, as you can get some very interesting results by accident!

```
 5     BORDER 0: PAPER 0: INK 1 + RND * 7: CLS: FOR t = 124 TO 136
       STEP 4

10     FOR a = 0 TO 2 * PI STEP 2 * PI / 12

15     LET x = t + SIN a * 80: LET y = 85 + COS a * 80

20     PLOT x, y

30     LET a1 = a - 2 * PI / 3

35     LET x1 = t + SIN a1 * 80: LET y1 = 85 + COS a1 * 80

40     BEEP .03, y1 / 8: DRAW x1 - x, y1 - y, - 2 * PI / 3

50     NEXT a

55     NEXT t
```
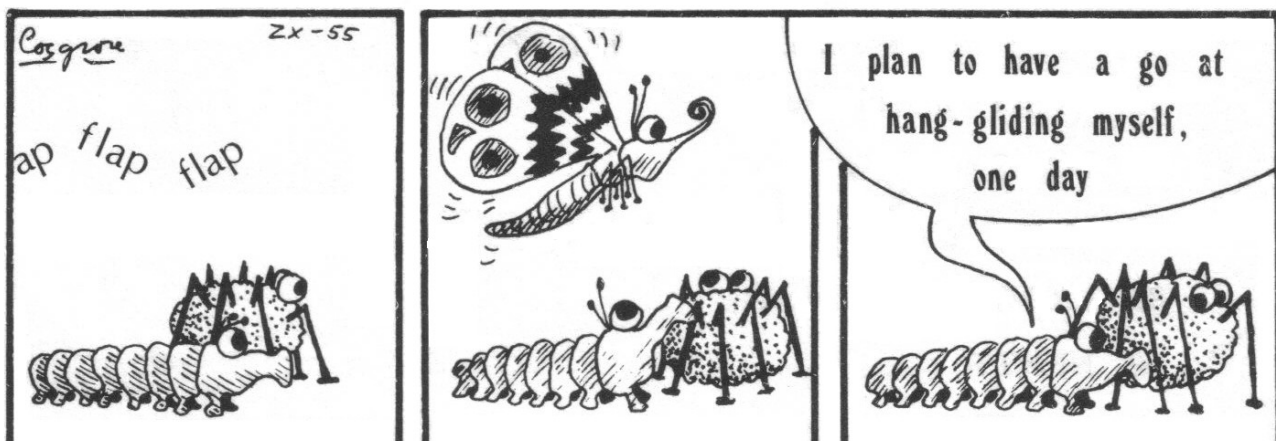
6 MASTERMIND

This one is particularly suited for use on colour televisions, as the ability to tell the difference between a number of hues is desirable (well, necessary really). If you have never played *Mastermind* before, then here is your opportunity. Your opponent — the Spectrum — guesses a series of four colours out of the first six and by guessing (and hopefully using some powers of deduction!), you must match the computer's code in eight goes or less. For every 'peg' (pegs are used in the original game of the same name), you have in the right column, and (of course) the right colour, you get a black mark and every right colour but in the wrong place you get a white mark. The computer does not repeat any colours in its code, nor does it leave any holes blank. Confused? If so, you should find that the game unravels as you play it. If you are still having difficulty, it might be worth asking around if any friends have played the game.

There is only the graphic A used in this program, to represent a peg. This graphic (as you might expect), appears in the PRINT statements, including the inverse graphics in line 70, which are used to represent the holes that the pegs go in. To help you sort the program out, the lines 235-245 set up the four random colours and lines 310-350 work out your score.

```
 10  DIM G (4): BORDER 4: INK 0: PAPER 7: CLS: RESTORE: LET X = 8

 20  FOR A = 0 TO 7: READ B: POKE USR "A" + A, B: NEXT A

 30  PRINT "g8C [15 times]"

 40  PRINT "g8c g8c MASTERMIND! g8c g8c"

 50  PRINT "g8c [15 times]"

 60  FOR F = 1 TO 8

 70  PRINT "g8c gA g8c gA g8c gA g8c gA g8c g8c □ □ □ □ g8c"

 80  PRINT "g8c [15 times]"

 90  NEXT F

220  PRINT AT 1, 16; INK 6; PAPER 1; "□"; X; "□ GOES LEFT □"
```

```
230   PRINT AT 3, 16; INK 7; PAPER 2; FLASH 1; "□ PRESS A COLOUR □"

235   DIM A (4): FOR N = 1 TO 4

240   LET A (N) = INT (RND * 6) + 1: FOR M = 1 TO 4: IF A (M) = A
      (N) AND N < > M THEN GO TO 240

245   NEXT M: NEXT N

250  FOR N = 1 TO 4

260   LET I$ = INKEY$: IF I$ = " " THEN GO TO 260

270   IF I$ < "1" OR I$ > "6" THEN GO TO 260

280   PRINT AT X * 2 + 1, N * 2 - 1; PAPER VAL I$; " gA ": LET G (N)
      = VAL I$

290   IF INKEY$ < > " " THEN GO TO 290

300   NEXT N

310   LET B = 0: LET W = 0

320   FOR N = 1 TO 4: IF G (N) = A (N) THEN LET B = B + 1: GO TO
      350

330   FOR M = 1 TO 4: IF N < > M AND G (N) = A (M) THEN LET W = W +
      1: GO TO 350

340   NEXT M
```
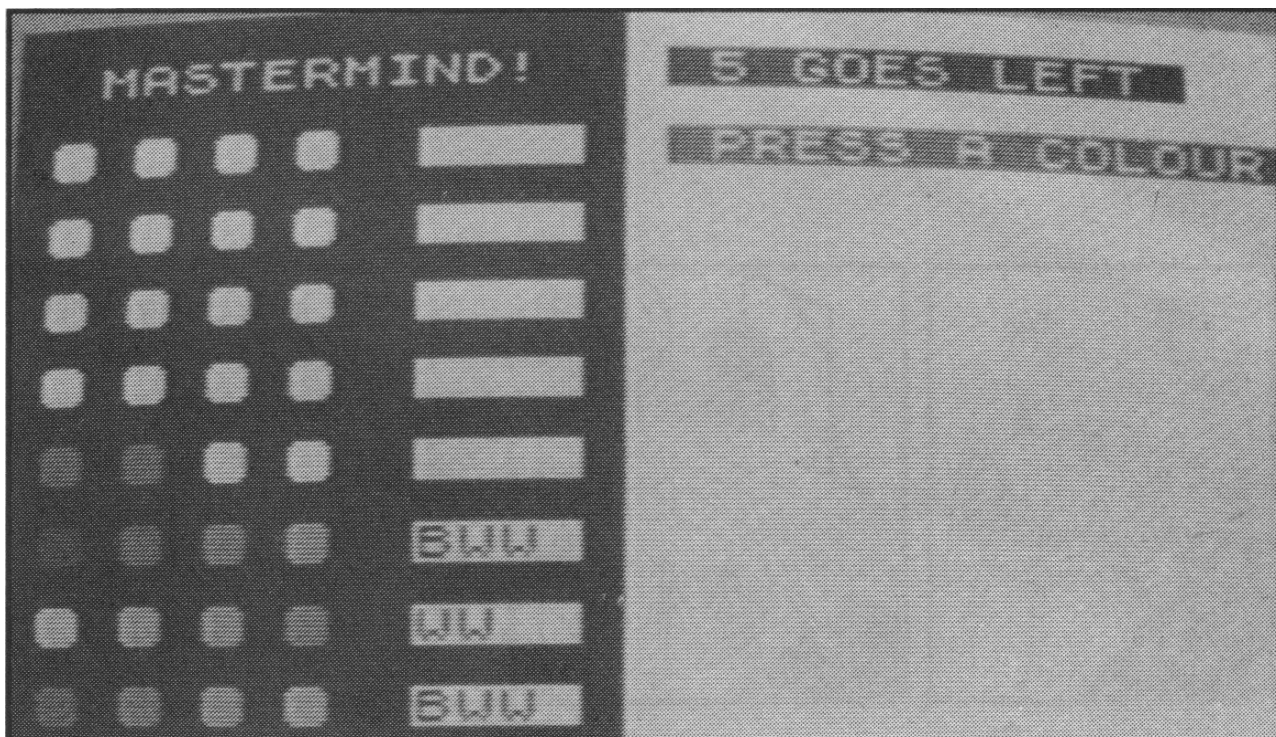
```
350   NEXT N

360   PRINT AT X * 2 + 1, 10;

370   FOR A = 1 TO B: PRINT "B"; : NEXT A

380   FOR A = 1 TO W: PRINT "W"; : NEXT A

390   IF B = 4 THEN GO TO 420

400   LET X = X - 1

405   PRINT AT 1, 17; INK 6; PAPER 1; X: IF X = 0 THEN GO TO 500

410   GO TO 250

420   PRINT AT 3, 16; INK 3; PAPER 7; "You've got it! □ □"

430   INPUT "HIT [ENTER] TO PLAY AGAIN □"; Q$

440   RUN

500   PRINT AT 20, 0; "THE ANSWER WAS □";

510   FOR A = 1 TO 4

520   PRINT INK A (A); "gA □";

530   NEXT A

540   GO TO 430

1000  DATA 126, 255, 255, 255, 255, 255, 255, 126
```

A program to help you write
your own games...

7 MONITOR

Are you a Machine Code buff or HEX freak? If so, you will find this short monitor routine useful. It displays an address in HEX, the contents of that address in HEX and allows you to alter the contents by simply entering the new code. Or, you can skim through memory, quickly, looking for a particular instruction(s). If you are not too interested in Machine Code, then this program isn't for you. If you would like to learn about Machine Code, then I suggest you pick up a copy of *"Machine Code and better Basic"* by Ian Stewart and Robin Jones (a Shiva title).

Some interesting program lines here — 90 forces a scroll and 160 and 170 perform HEX to decimal/decimal to HEX conversions. No more PEEKing, no more POKEing and no more converting laboriously to and from hexadecimal.

```
 10    REM RUN WITH CAPS LOCK ON

 20    BORDER 1: PAPER 1: INK 7: CLS

 30    LET H$ = " ": LET A = 0

 40    PRINT AT 21, A; FLASH 1; "?"

 50    PAUSE 0: LET I$ = INKEY$

 60    PRINT AT 21, A; I$: LET H$ = H$ + I$

 70    IF A < > 3 THEN LET A = A + 1: GO TO 40

 80    GO SUB 160: LET D = X

 90    POKE 23692, 255: PRINT AT 21, 31; "□"

100    LET V = D: GO SUB 170

110    PRINT A$; "□ □"; : LET V = PEEK D

120    GO SUB 170

125    PRINT A$ (3 TO); "□ □";

130    PAUSE 0: LET I$ = INKEY$: IF I$ = " " THEN GO TO 130
```

```
135    IF I$ = CHR$ 13 THEN GO TO 155

140    PRINT I$;

145    PAUSE 0: LET J$ = INKEY$: IF J$ = " " THEN GO TO 145

150    PRINT J$: LET H$ = I$ + J$: GO SUB 160: POKE D, X

155    LET D = D + 1: GO TO 90

160    LET X = CODE H$ - 48 - 7 * (CODE H$ > 57): FOR N = 2 TO LEN
       H$: LET X = 16 * X + CODE H$ (N) - 48 - 7 * (CODE H$ (N) >
       58): NEXT N: RETURN

170    DIM A$ (4): FOR N = 1 TO 4: LET A$ (5 - N) = CHR$ (V - 16 *
       INT (V / 16) + 48 + 7 * (V - 16 * INT (V / 16) > 9)): LET V =
       INT (V / 16): NEXT N: RETURN
```



```
21AB    FF
21AC    2A
21AD    18
21AE    05
21AF    CD
21B0    FC
21B1    1F
21B2    CD
21B3    4E
21B4    20
21B5    CA
21B6    C1
21B7    20
21B8    C9
21B9    2A
21BA    61
21BB    5C
21BC    22
21BD    5D
21BE    5C
21BF    DF
21C0    FE
```
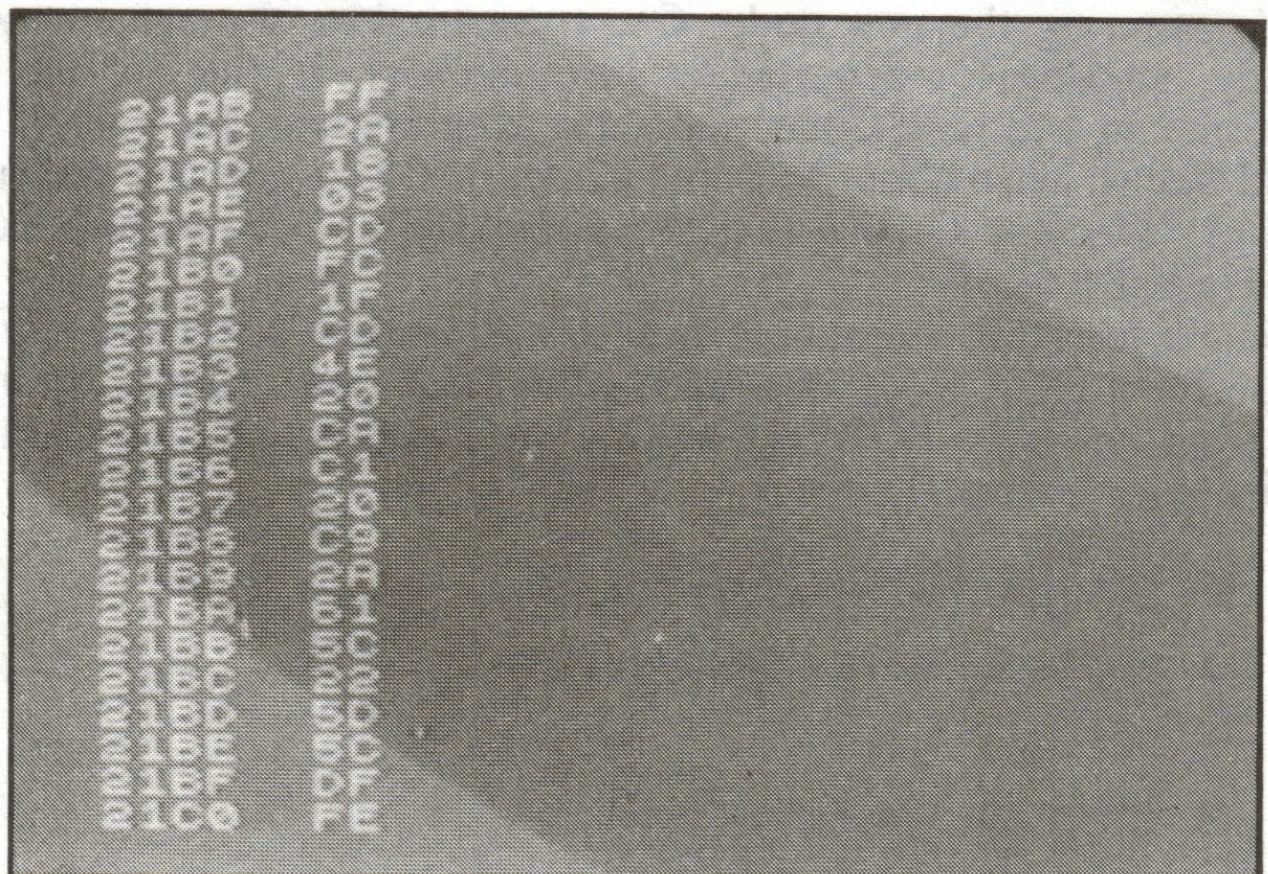
A dawn sky, the deep throb of engines...

8 BOMBER

This game is almost the opposite of HELICOPTER. Here, your aim is to bomb as many ships as you can, in the time available. One added bonus — the higher up you are when you drop a bomb, the greater the score when you hit. Using the keys 6 for down, 7 for up and 0 for fire, you have full control over the aeroplane's movements and actions.

Due to the large number of graphics characters used in BOMBER it is advisable to load the graphics by entering lines 10 to 80 and 905 to 985 and RUNning those parts. Note the use of ATTR in this program to detect whether the missile has hit anything or not. If you wish to change the sound generated when the ship blows up, then change the data in line 905.

If you are interested in writing your own "action games", it is worthwhile remembering that ATTR (a, b) can be used to detect the colour attributes of the square at (a, b), hence telling what is actually in that square. Note that line 30 uses "truth values" to move the 'plane up and down.
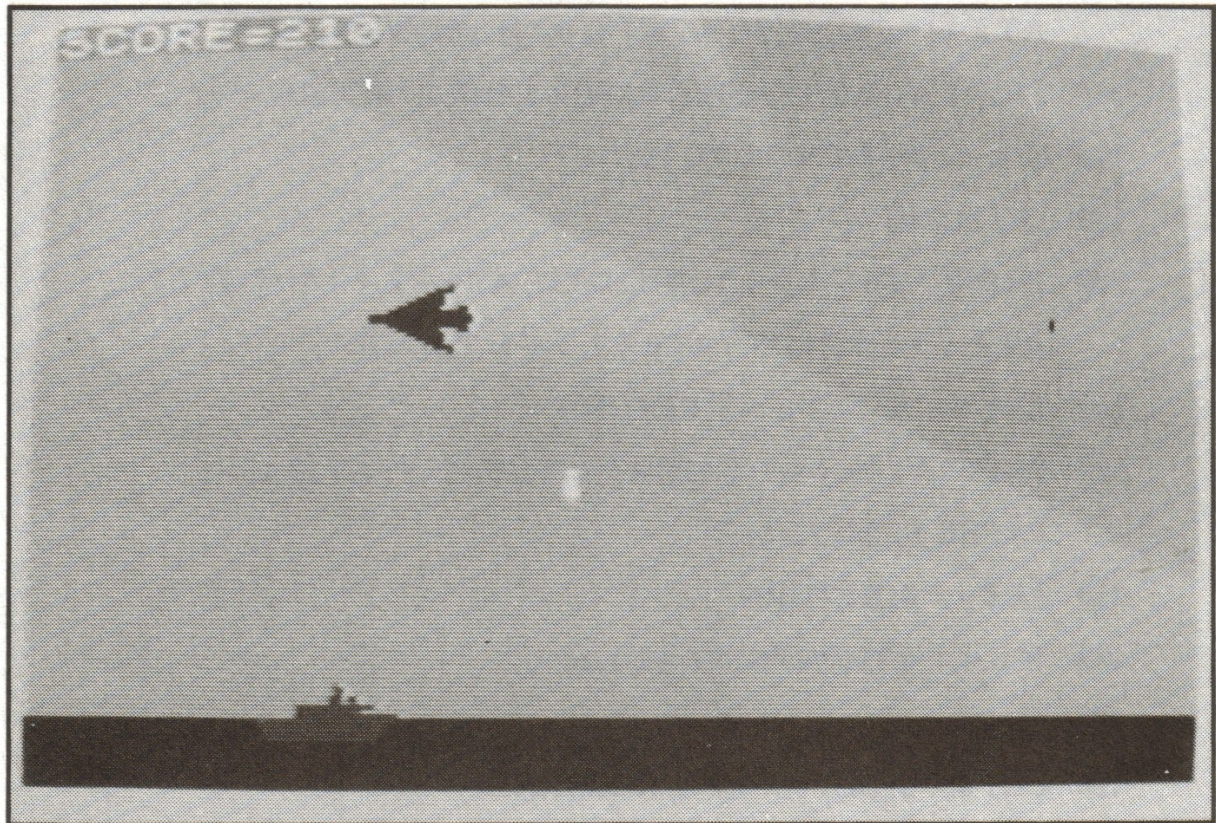
```
10    BORDER 6: INK 0: PAPER 5

20    CLS

30    RESTORE 905

40    FOR a = 0 TO 15: READ a$

50    FOR b = 0 TO 7: READ c

60    POKE b + USR a$, c

70    NEXT b

80    NEXT a

90    FOR a = 20 TO 21: PRINT AT a, 0; PAPER 1; "[32 spaces]": NEXT
      a

100   LET p = 0: LET x = 19: LET y = 0: LET u = 2: LET v = 29: LET
      a = 0: LET b = 0: LET s = 0

115   LET p = p + 1

120   PRINT AT x, y; INK 5; "□"; INK 2; "□ gB gC gD"; AT x + 1, y;
      PAPER 1; INK 2; "□ gE gF gF gH"

130   LET u = u + (INKEY$ = "6" AND U < 10) - (INKEY$ = "7" AND u >
      2): LET v = v - 1

140   IF v = 0 THEN GO SUB 200

150   LET y = y + 1: IF y = 27 THEN GO SUB 300

155   IF INKEY$ = "0" THEN GO SUB 400

157   IF b < > 0 THEN GO SUB 500

160   PRINT AT u - 1, v; "□ □ □ □"; AT u + 2, v; "□ □ □ □"; AT u,
      v; "gI gJ gK □"; AT u + 1, v; "gL gM gN □"

165   PRINT AT 0, 0; FLASH 1; PAPER 4; INK 7; "SCORE ="; s

170   IF p < 600 THEN GO TO 115

180   GO TO 800

200   PRINT AT u - 1, v + 1; "□ □ □ □"; AT u + 2, v + 1; "□ □ □ □";
      AT u, v + 1; "□ □ □"; AT u + 1, v + 1; "□ □ □"

210   LET v = 29: LET u = 2: RETURN
```

```
300   PRINT AT 19, y - 1; PAPER 5; "□ □ □ □ □"; AT 20, y - 1; PAPER
      1; "□ □ □ □ □"

310   LET y = 0: RETURN

400   IF b < > 0 THEN PRINT AT a, b; "□"

405   LET d = u

410   LET a = u: LET b = v + 1: RETURN

500   LET a = a + 1: IF a = 21 THEN LET b = 0: RETURN

503   PRINT AT a - 1, b; "□": IF a = 20 AND ATTR (a, b) < > 15 THEN
      RETURN

505   IF ATTR (a, b) = 42 THEN GO TO 530

510   PRINT AT a, b; INK 7; "gP"

515   BEEP .05, - a / 10

520   RETURN

530   PRINT AT a, b; ".": FOR z = 0 TO 20: NEXT z: PRINT AT a, b;
      "gR": FOR z = 0 TO 20: NEXT z: PRINT AT a, b; "gS": FOR z = 0
      TO 20: NEXT z

535   RESTORE 900: FOR z = 0 TO 5: READ c: BEEP .5, c: NEXT z

537   PRINT AT x, y; PAPER 5; "□ □ □ □ □"; AT x + 1, y; PAPER 1; "□
      □ □ □": LET y = 0

539   RESTORE

540   LET b = 0: LET s = s + (10 * (11 - d)): RETURN
```
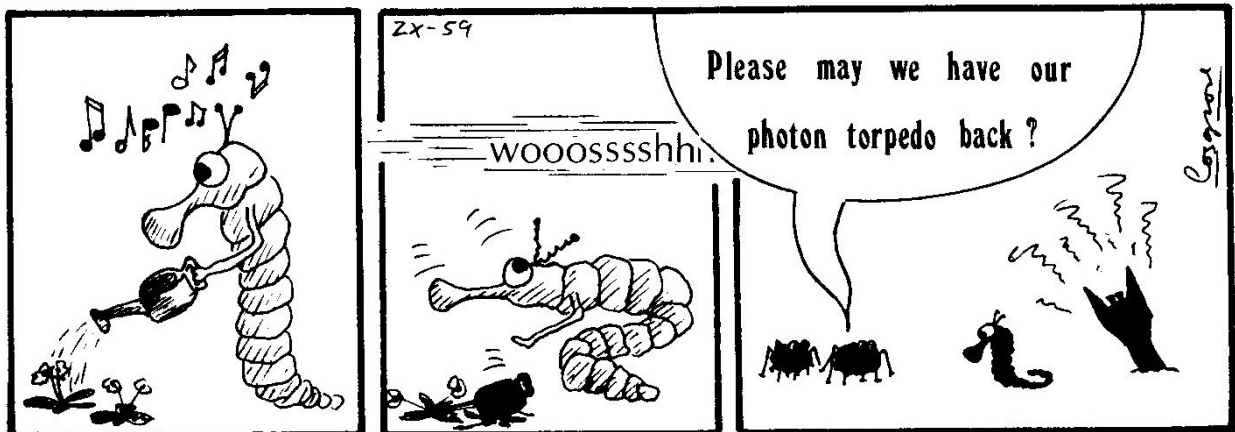
```
800    FOR a = 0 TO 2: PAUSE 25: BEEP .5, -5: NEXT a: INPUT "HIT
       ENTER TO TRY AGAIN! □"; a$: CLS: GO TO 90

900    DATA 35, 20, 35, 20, 35, 20

905    DATA "b", 0, 0, 0, 0, 0, 63, 63, 63

915    DATA "c", 32, 48, 48, 118, 118, 255, 255, 255

920    DATA "d", 0, 0, 0, 0, 0, 224, 0, 255

925    DATA "e", 63, 63, 31, 31, 15, 0, 0, 0

930    DATA "f", 255, 255, 255, 255, 255, 0, 0, 0

935    DATA "h", 254, 252, 248, 240, 224, 0, 0, 0

940    DATA "i", 0, 0, 0, 0, 0, 3, 15, 255

945    DATA "j", 0, 3, 15, 63, 255, 254, 255, 255

950    DATA "k", 64, 192, 0, 0, 0, 24, 248, 252

955    DATA "l", 255, 15, 3, 0, 0, 0, 0, 0

960    DATA "m", 255, 255, 254, 255, 63, 15, 3, 0

965    DATA "n", 252, 248, 24, 0, 0, 0, 192, 64

970    DATA "p", 0, 56, 16, 56, 56, 56, 56, 16

975    DATA "q", 0, 0, 0, 24, 24, 0, 0, 0

980    DATA "r", 0, 0, 16, 56, 28, 8, 0, 0

985    DATA "s", 0, 144, 86, 60, 60, 88, 16, 0
```

9 KALEIDOSCOPE

This program is a fabulous demonstration of the graphics capabilities of the Spectrum. The patterns generated by KALEIDOSCOPE rely upon the fact that the Spectrum *cannot* draw straight lines! The OVER 1 command is used, so that when any dots are drawn over each other, they disappear. These two features enable you to DRAW OVER other lines that the Spectrum has already drawn, producing some amazing effects. I was going to call this program OVERDRAWN, but it might have reminded me about my bank account!
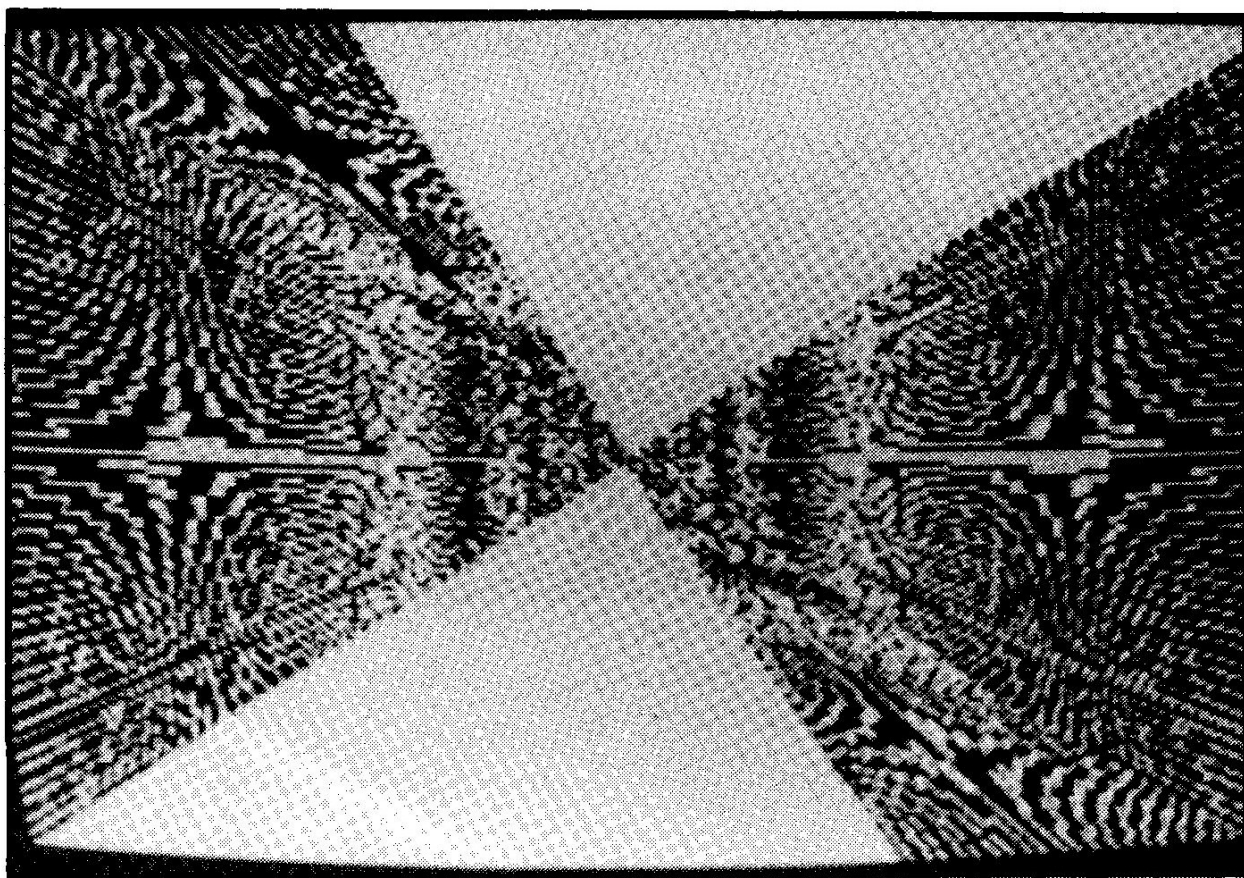
```
10      INK 1 + RND * 7: PAPER 0: BORDER 0: OVER 1: CLS

15      LET R = 1 + .5 * RND: FOR A = 1 TO 22: PRINT "g8c [32
        times]": NEXT A

20      FOR A = -87 TO 87 STEP R

30      BEEP .02, A/3: PLOT 128, 88: DRAW 127, -A: PLOT 128, 88: DRAW
        -128, A

40      NEXT A

50      FOR A = 127 TO -127 STEP -R

60      BEEP .02, A/3: PLOT 128, 88: DRAW A, -88: PLOT 128, 88: DRAW
        -A, 87

70      NEXT A
```
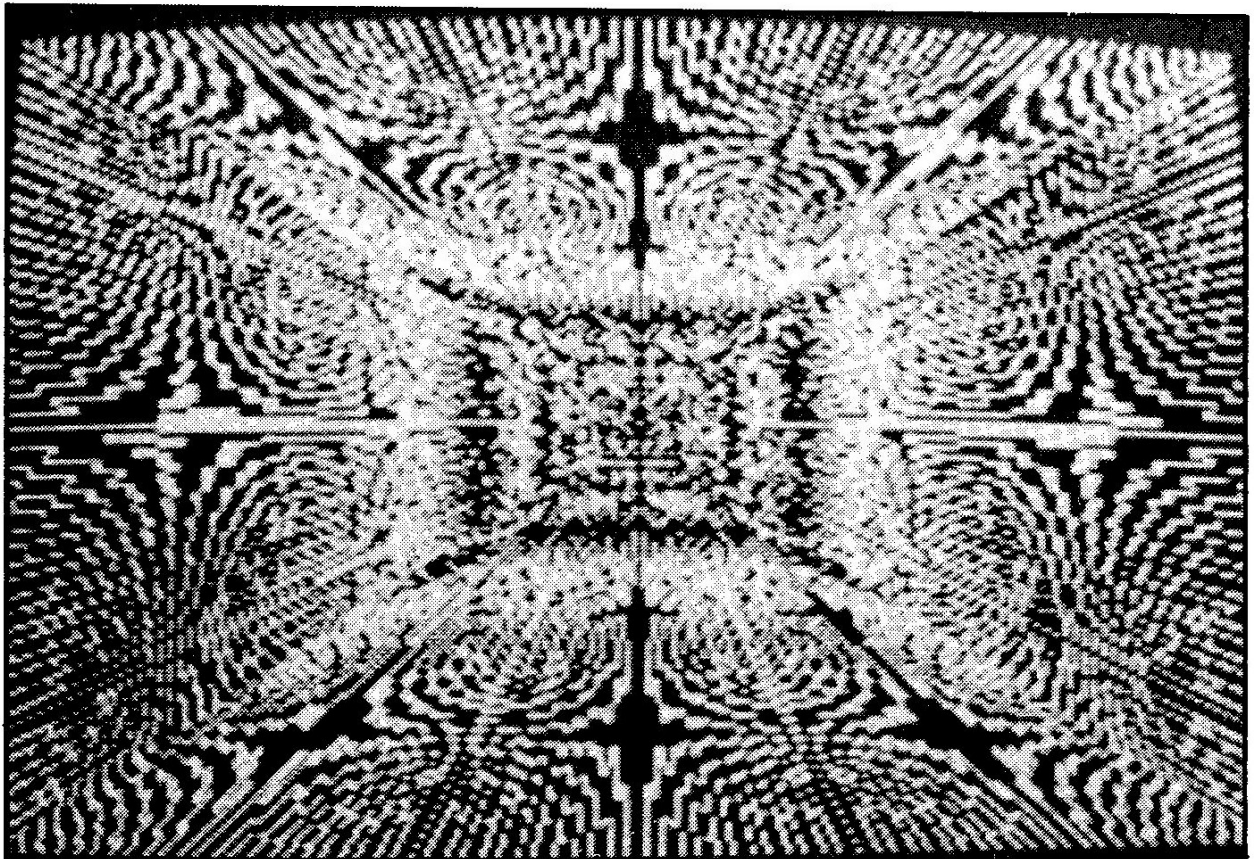
10 CUSTOMER

Strictly speaking, this is not a game, although it provides an interesting demonstration of how a computer can be used to handle "files". What, I can hear you say, is a file? A file as you or I know it is a box in which information is held. In a similar way, the Spectrum can store information on cassette, using data files. In this example (which can be easily modified for virtually any purpose), a 128 byte file is stored on cassette, with the following information: Name, address, telephone number, order number, notes, and date of order. Although designed for a small business, you may want to store friends and relatives 'phone numbers and addresses.

Note: F$ (128) is split up within the program to store 8 "fields". Each field is assigned to a particular part of the file, so, for example, field 2 is the first line of the address. Entry of the program is straightforward.

When using this program, the date is automatically SAVEd with the file, and when asked for "NEXT CUSTOMER NO.:", if you simply press "ENTER", you will get the number following the previous number.

```
10   LET D = 0: INK 7: PAPER 1: BORDER 1

15   CLS: DIM F$ (128)

20   PRINT TAB 4; BRIGHT 1; "g8c NAME AND ADDRESS FILER g8c"

30   IF D = 0 THEN PRINT "DATE: □";

40   IF D = 0 THEN INPUT "Enter date (DD/MM/YY): □"; D$

45   LET F$ (121 TO) = D$

50   PRINT F$ (121 TO) ' "NEXT CUSTOMER NO.: □";

60   INPUT "Number: □"; C$: IF C$ = " " THEN LET C$ = STR$ CN

65   LET CN = VAL C$

70   PRINT CN ' ' TAB 1; PAPER 6; INK 0; "1";

80   PRINT "□ SAVE A NEW CUSTOMER FILE"
```

```
 90   PRINT ' TAB 1; PAPER 6; INK 0; "2";

100   PRINT "□ SEARCH FOR A CUSTOMER (NO.)"

110   PRINT ' TAB 1; PAPER 6; INK 0; "3";

120   PRINT "□ DISPLAY ALL FILES"

130   PRINT ' TAB 1; PAPER 6; INK 0; "4";

140   PRINT "□ PICK OUT A SELECTED FILE"

150   PRINT INK 2; PAPER 6; AT 13, 8; "g4c g3 [14 times] g7"; AT
      14, 8; "g5c ENTER OPTION □ □ g5"; AT 15, 8; "g1c g3c [14
      times] g2c"

160   PRINT AT 14, 22; INK 4; PAPER 7; "?"

165   PAUSE 15

170   IF INKEY$ < > " " THEN GO TO 210

180   PRINT AT 14, 22; INK 4; PAPER 7; "□"

185   PAUSE 15

190   IF INKEY$ < > " " THEN GO TO 210

200   GO TO 160

210   LET I$ = INKEY$

220   IF I$ < "1" OR I$ > "4" THEN GO TO 160
```
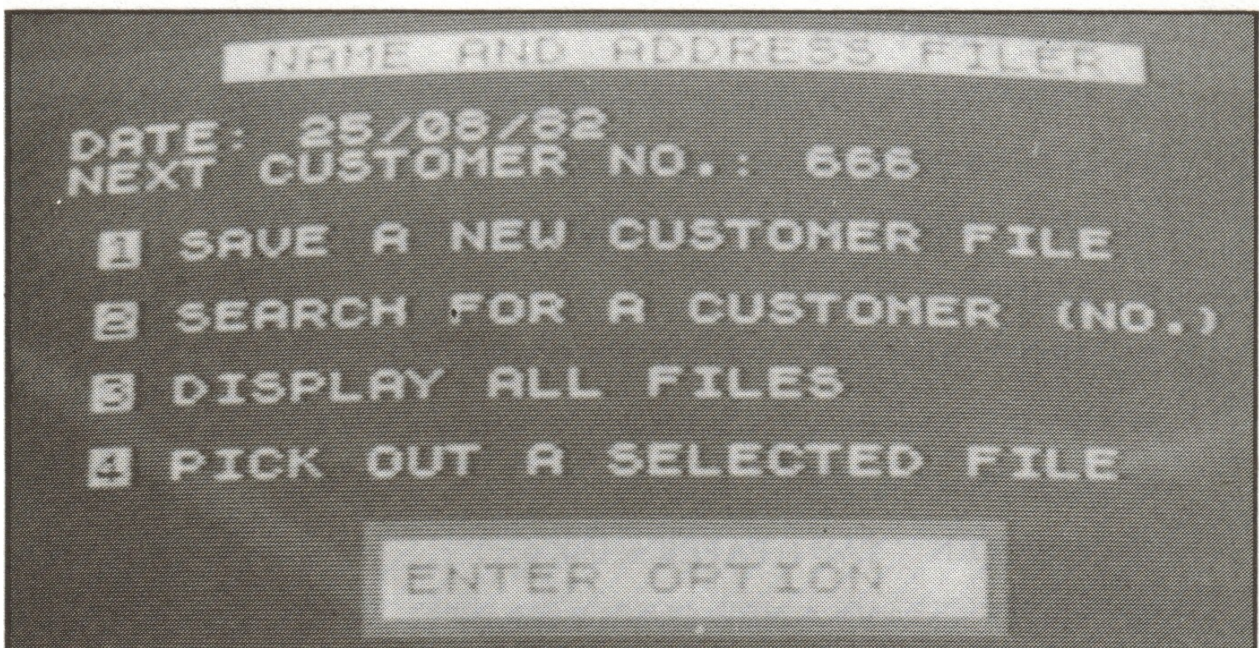
```
 225   LET D = 1

 230   CLS

 240   GO TO 1000 * VAL I$

1000   RESTORE 9000: PRINT "CREATE A NEW FILE" ' "g3 [17 times]"

1005   LET A$ = "No □" + STR$ CN

1010   LET A = USR "A"

1020   FOR B = 0 TO 7

1030   READ C: POKE A + B, C

1040   NEXT B

1050   LET A = USR "B"

1060   FOR B = 0 TO 7

1070   READ C: POKE A + B, C

1080   NEXT B
1085   PRINT "CUSTOMER NO.: □"; CN

1090   PRINT ' ' "NAME:" ' TAB 9; "gA [20 times] gB" ' "ADDRESS:" '
       TAB 9; "gA [20 times] gB" ' ' TAB 9; "gA [20 times] gB" ' '
       TAB 9; "gA [20 times] gB"

1100   PRINT "PHONE:" ' TAB 9; "gA [15 times] gB"

1110   PRINT "ORDER:" ' TAB 9; "gA gA gA gB" ' "NOTES:" ' TAB 9; "gA
       [22 times] gB"

1120   RESTORE 9020

1125   LET T = 0: LET L = 8

1130   FOR A = 0 TO 6

1135   LET T = T + L - 8

1140   READ L

1150   LET R = 5 + 2 * A: LET C = 9

1160   GO SUB 9500

1170   IF CODE I$ = 12 THEN PRINT AT R, C; "□": LET C = C - 1: GO TO
       1160
```

```
1180  IF CODE I$ = 13 THEN GO TO 1230

1190  LET F$ (T + C - 8) = I$

1200  IF C = L THEN GO TO 1230

1210  LET C = C + 1

1220  GO TO 1160

1230  NEXT A

1240  SAVE A$ DATA F$ ()

1250  LET CN = CN + 1

1260  GO TO 15

2000  INPUT "ENTER CUSTOMER NUMBER: □"; N

2010  PRINT ' "□ SEARCHING FOR CUSTOMER □"; FLASH 1; N

2020  LOAD "No □" + STR$ N DATA F$ ()

2040  GO SUB 9100

2050  IF INKEY$ = " " THEN GO TO 2050

2060  GO TO 15

3000  PRINT ' "□ SEARCHING"

3005  INK 1: PAPER 7

3010  LOAD " " DATA F$()

3020  CLS: PRINT ' "NAME: □"; F$ (TO 20) ' ' "ADDRESS: □"; F$ (21
      TO 40) ' TAB 9; F$ (41 TO 60) ' TAB 9; F$ (61 TO 80) ' '
      "PHONE: □"; F$ (81 TO 95) ' ' "ORDER: □"; F$ (96 TO 98) ' '
      "NOTES: □"; F$ (99 TO 120) ' ' "DATE OF ORDER: □"; F$ (121 TO
      128)

3030  GO TO 3010

4000  PRINT ' "□ WHICH FIELD? (1 TO 8)"

4005  INPUT "FIELD: □"; F

4010  RESTORE 9020

4015  LET T = 0

4020  FOR A = 1 TO F: READ L: LET T = T + L - 8: NEXT A
```

```
4030   DIM T$ (L - 8)

4040   PRINT ' "□ ENTER FIELD □"; F; "□ TEXT"

4050   INPUT T$ (TO L - 8)

4060   PRINT ' "□ SEARCHING FOR FIELD □"; FLASH 1; F; FLASH 0; ' '
       TAB 1; FLASH 1; T$

4070   LOAD " " DATA F$ ()

4080   IF F$ (T - L + 9 TO T) < > T$ THEN GO TO 4090

4085   CLS: PRINT ' "NAME: □"; F$ (TO 20) ' ' "ADDRESS: □"; F$ (21
       TO 40) ' TAB 9; F$ (41 TO 60) ' TAB 9; F$ (61 TO 80) ' '
       "PHONE: □"; F$ (81 TO 95) ' ' "ORDER: □"; F$ (96 TO 98) ' '
       "NOTES: □"; F$ (99 TO 120) ' ' "DATE OF ORDER: □"; F$ (121 TO
       128)

4090   GO TO 4070

8999   STOP

9000   DATA 128, 255, 0, 0, 0, 0, 0, 0

9010   DATA 128, 128, 0, 0, 0, 0, 0, 0

9020   DATA 28, 28, 28, 28, 23, 11, 35

9100   CLS: PRINT "CUSTOMER NUMBER □"; N ' ' "NAME: □"; F$ (TO 20) '
       ' "ADDRESS: □"; F$ (21 TO 40) ' TAB 9; F$ (41 TO 60) ' TAB 9;
       F$ (61 TO 80) ' ' "PHONE: □"; F$ (81 TO 95) ' ' "ORDER:
       □"; F$ (96 TO 98) ' ' "NOTES: □"; F$ (99 TO 120) ' ' "DATE OF
       ORDER: □"; F$ (121 TO 128)

9110   RETURN

9500   PRINT AT R, C; INK 6; "*"

9510   PAUSE 15

9520   LET I$ = INKEY$: IF I$ < > " " THEN GO TO 9560

9530   PRINT AT R, C; "□"

9540   PAUSE 15

9550   LET I$ = INKEY$: IF I$ < > " " THEN GO TO 9560

9555   GO TO 9500

9560   IF CODE I$ = 13 THEN PRINT AT R, C; "□"
```
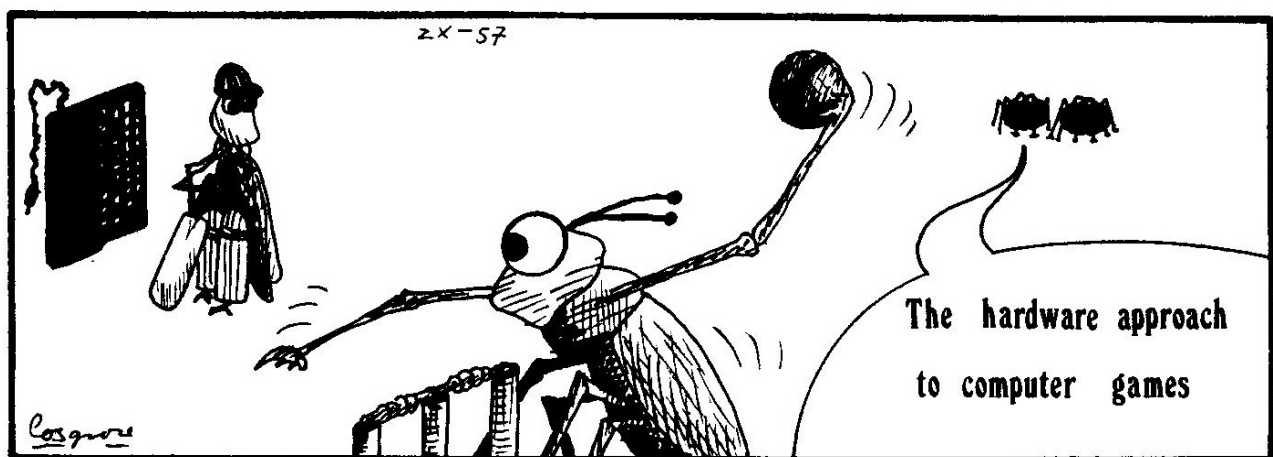
```
9565   PRINT AT R, C; I$

9570   RETURN
```


The hardware approach to computer games

Ever felt that you're going round in circles?

11 SPIRAL

This most interesting program draws all sorts of magnificent designs. Don't underestimate this program by its length. Enter it and RUN it. Enter your own values; try 3, 4, 6, 8, to see how it works — press v to clear the screen and start again or any other key to start without clearing the screen. Now, try 3.5, 6.66666666, 2.9, 4.95 and any value.

Q: What is the difference between 4.95 and 4.05?
      See if you can work out why this happens.

```
 10    BORDER 0: PAPER 0: INK 1 + RND * 7: CLS

 15    LET r = 80

 20    INPUT n

 25    LET x = 128: LET y = r + 85

 30    PLOT x, y

 40    FOR b = 0 TO 1000

 50    LET a = PI * 2 / n * b

 55    LET x1 = 128 + SIN a * r: LET y1 = 85 + COS a * r

 60    DRAW x1 - x, y1 - y: BEEP .05, (80 - R) / 3

 65    LET r = r - 1: IF r < 5 THEN GO TO 80

 70    LET x = x1: LET y = y1

 75    NEXT b

 80    LET a$ = INKEY$: IF a$ = " " THEN GO TO 80

 95    IF a$ = "v" THEN RUN

100    GO TO 15
```

12 STUNT BIKE

STUNT BIKE is a game of skill, where you race through fire-tunnels, jump buses and pull "wheelies" whilst accelerating hard. Use the keys 1 to brake and 0 to accelerate. There are two specific hazards — do not try to pull wheelies in the fire-tunnel, or you will crash, and you must take your hand off the throttle, well before hitting the take-off ramp or you will lose height!

As with the other games, get the graphics loaded first and enter graphics characters in lines 105, 110, 130, 150, 155, 160 and 240.

A number of techniques are used in this program that you may not have seen before. The GO TO in line 155 jumps to 170 if you have not hit the roof of the fire-tunnel and 300 if you have. The LET command in 170 uses logical values of 0 and 1 to alter the bike's acceleration according to which keys you press. Finally, the most unusual lines are 272 and 300. The PRINT#1 prints on top of the bottom lines, as does PRINT#0, PRINT#2 prints normally and PRINT#3 sends output to the ZX Printer. This is the ZX Spectrum's stream mechanism, and the PRINT# command is really intended for use with the RS 232/net interface board.
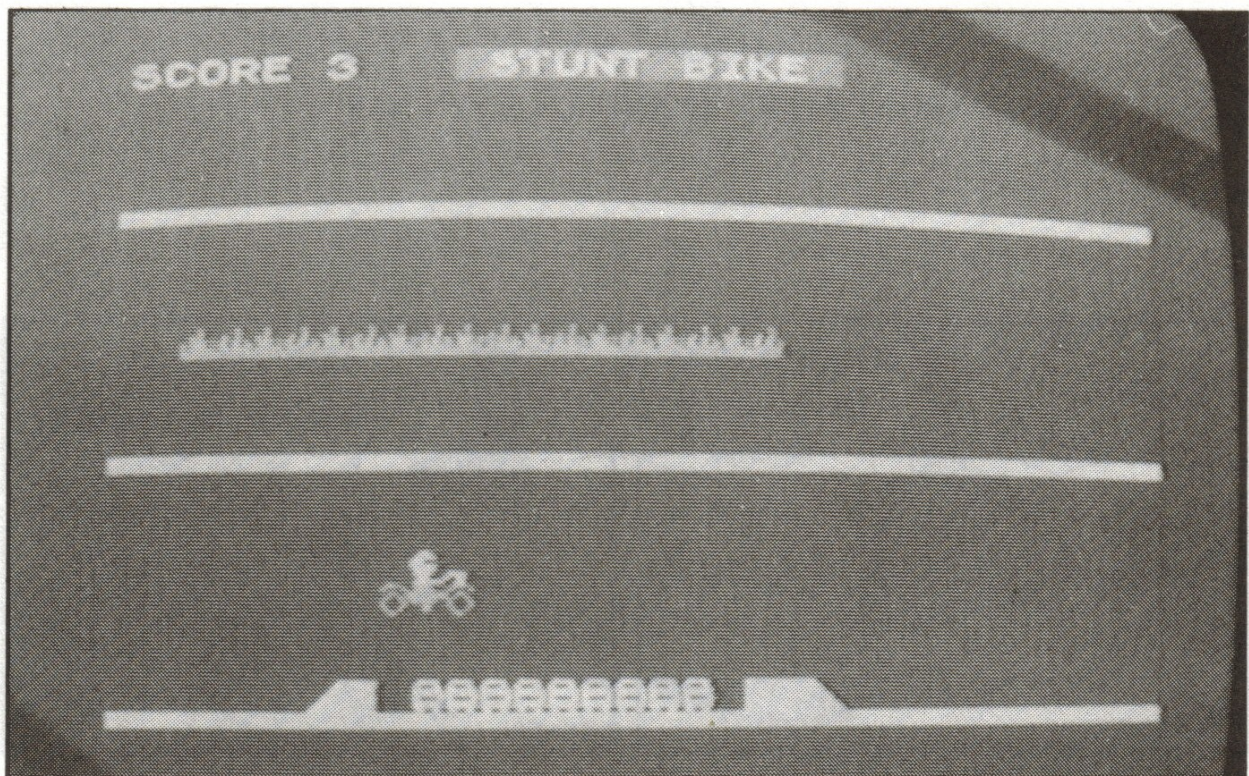
If you wish to change the function of any of these commands, you can, using OPEN#n, a$, where n is a number 0-15 and a$ is K, S or P according to whether the peripheral attached to stream n is a keyboard, screen or printer. If you are not quite sure how the stream facility works, I suggest you experiment for yourself.

```
 10   FOR A = 0 TO 95

 20   READ B: POKE USR "A" + A, B

 30   NEXT A

 40   FOR B = 1 TO 9

 50   LET V = 0: LET R = 0: LET X = 4: LET Y = 1

 60   BORDER 0: PAPER 0: INK 7: BRIGHT 1

 70   PRINT AT 0, 0; "SCORE □"; B - 1; TAB 10; PAPER 1; INK 6; "□
      STUNT BIKE □"

 80   FOR A = 0 TO 31

 90   PRINT AT 5, A; INK 4; "g3"; AT 13, A; "g3"; AT 21, A; "g3"

100   NEXT A

105   FOR A = 0 TO B + 4: PRINT AT 9, A * 2 + 2; INK 2; "gK gL":
      NEXT A

110   PRINT AT 20, 6; INK 4; "gG g8c □";

120   FOR A = 1 TO B + 5

130   PRINT INK 5; "gF";

140   NEXT A

150   PRINT INK 4; "□ g8c g8c gH"
```
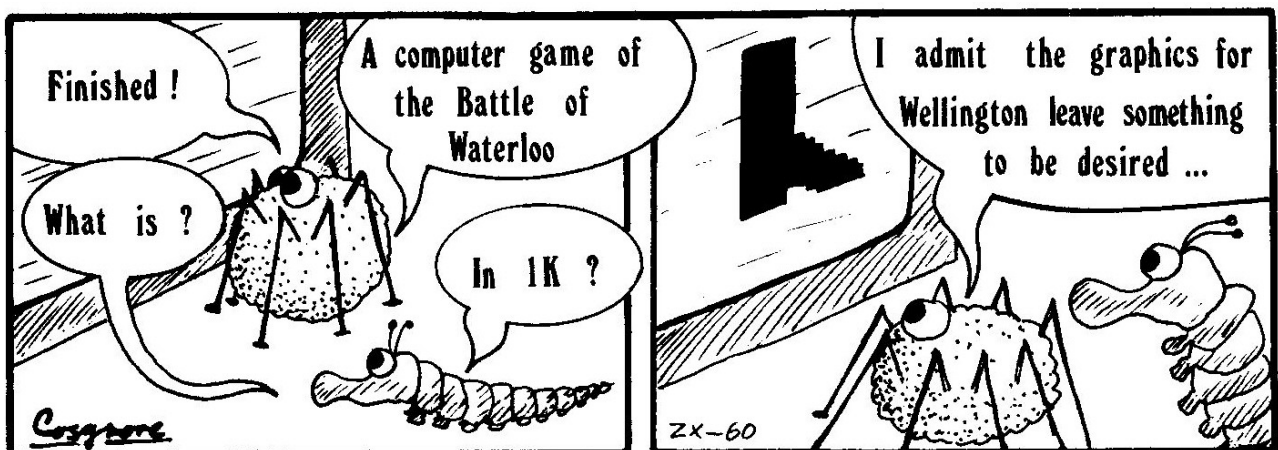
155 IF R > .7 THEN PRINT AT X - 2, Y; INK 6; "□ gC gE"; AT X - 1, Y - 1; "□ gJ gI gA"; AT X, Y - 1; "□ gB □ □": GO TO 170 + 130 * (X = 12 AND Y < B * 2 + 10.5)

160 PRINT AT X - 1, Y - 1; INK 6; "□ □ gC gE"; AT X, Y - 1; "□ gB gD gA"; AT X - 2, Y; "□ □ □"

170 LET R = R + .2 * (INKEY$ = "0") - .1 * (INKEY$ = "1" AND V > 0) - .12 * (V > 0): LET V = V + R: IF V > 10 THEN LET V = 10

175 IF V < 0 THEN LET V = 0

180 LET Y = Y + V / 10: IF INT Y = 28 THEN PRINT AT X - 2, Y; "□ □ □"; AT X - 1, Y - 1; "□ □ □ □"; AT X, Y - 1; "□ □ □ □": LET X = X + 8: LET Y = 1

190 BEEP .01, V * 3 - 20: IF INT (Y + .5) = 4 AND X = 20 THEN GO TO 220

200 IF X < 27 THEN GO TO 155

210 NEXT B: CLS: PRINT "CONGRATULATIONS! YOU HAVE JUST □ □ CLEARED ALL 15 BUSES ON YOUR □ □ □ □ STUNT BIKE, AND QUALIFIED FOR A PLACE IN THE GUINNESS BOOK OF □ □ □ RECORDS!": STOP

220 PRINT AT 18, 3; "□ □ □" ' "□ □ □ □ □ □ □" ' "□ □ □ □ □ □": IF R < .2 THEN LET R = .2

225 LET X = X - V / 7: IF X < 16 THEN LET X = 16

230 LET V = V - R / 2 - .42: LET Y = Y + 1: LET X = X + .3

235 IF X > = 20 THEN GO TO 270

240 PRINT AT X - 1, Y - 1; INK 6; "□ □ gC gE"; AT X, Y - 1; "□ gB gD gA"; AT X - 2, Y; "□ □ □"

245 BEEP .03, 10 - 3 * (X - 15)

250 PRINT AT X - 1, Y - 1; "□ □ □ □"; AT X, Y - 1; "□ □ □ □"; AT X - 2, Y; "□ □ □"

260 GO TO 225

270 IF Y > B + 17 THEN GO TO 210

272 PRINT#1; PAPER 2; FLASH 1; "You have crashed into the Buses Hit ENTER to play again □ □ □ □ □ □ □ □"

280 IF INKEY$ = CHR$ 13 THEN RUN

```
290   GO TO 305

300   PRINT#1; PAPER 2; FLASH 1; "You have crashed in the Fire □ □
      □ □ Tunnel. □ □ Hit ENTER to play again"

305   IF INKEY$ = CHR$ 13 THEN RUN

310   GO TO 305

1000   DATA 60, 66, 152, 164, 66, 66, 36, 24

1010   DATA 60, 66, 25, 37, 66, 66, 36, 24

1020   DATA 56, 124, 224, 252, 124, 120, 48, 127

1030   DATA 120, 124, 255, 255, 252, 24, 24, 0

1040   DATA 0, 0, 0, 0, 0, 120, 152, 24

1050   DATA 62, 66, 127, 127, 65, 127, 127, 34

1060   DATA 1, 3, 7, 15, 31, 63, 127, 255

1070   DATA 128, 192, 224, 240, 248, 252, 254, 255

1080   DATA 63, 127, 254, 252, 248, 252, 236, 192

1090   DATA 0, 0, 0, 1, 3, 7, 15, 31

1100   DATA 8, 8, 40, 61, 189, 191, 255, 255

1110   DATA 4, 4, 36, 109, 109, 127, 255, 255
```

13 DRAUGHTS

Draughts, or checkers as it is called outside the UK, is a board game for two players. It was played in Southern Europe in medieval times and appears to have been derived from much older games played in the Middle East. The objective of the game is to take all of the Spectrum's pieces, or to get the Spectrum to concede by trapping its pieces. The rest of the instructions are in the game.

This program takes up nearly all the program space in a 16K machine, and as a result, has no "look ahead" or real "move evaluation" that an intelligent game like Draughts deserves. As a result, the standard of play of the Spectrum is abysmally low — although it makes an entertaining opponent. If you own a 48K Spectrum, try including some real move logic. As the author of ZX SPECTRUM CHESS, Published by Prism Computing, I would recommend you start by incorporating a routine to evaluate the present board situation, i.e. how strong your position is now, and how would each possible move put you in danger. In order to do this, you would need a separate piece-move routine and an evaluation routine.
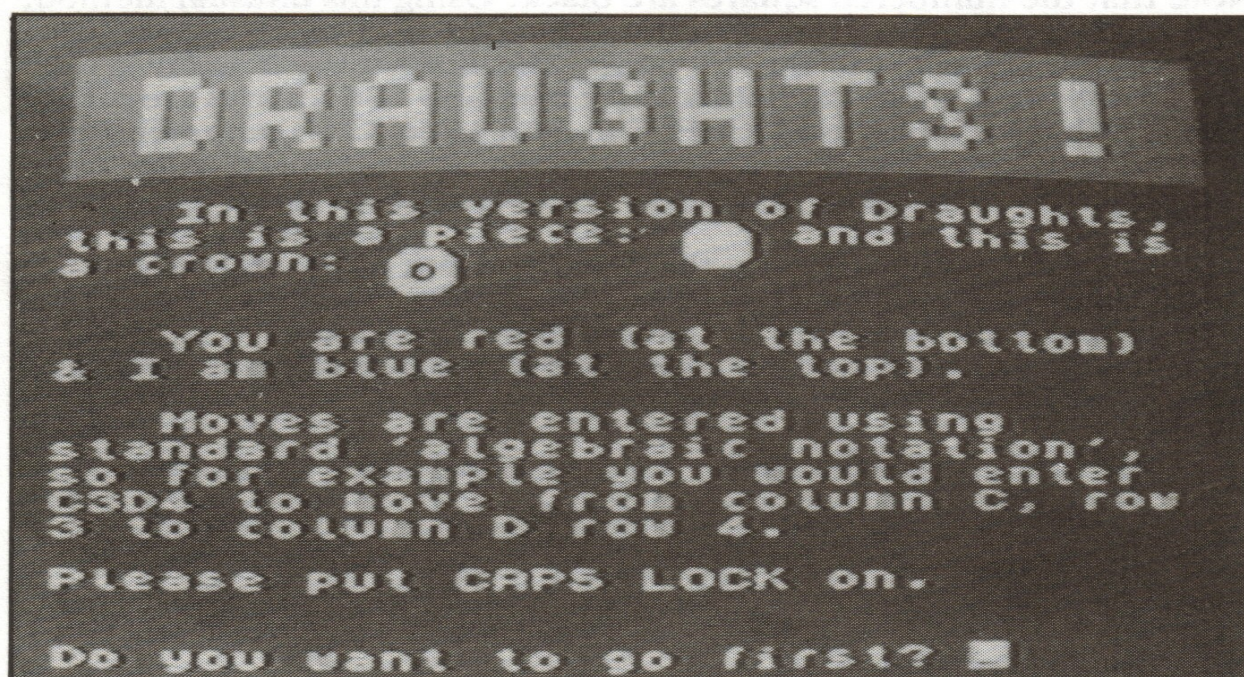
Back to the game — entry is straightforward, with graphics used to represent pieces. Note that a crown, or king, is generated automatically when you reach the opposite side. Although the rules of the game say that you must capture if you can, the Spectrum does not check for possible capture of its pieces, so it does not force you to move, but it always captures if it can.

The program is subdivided into a number of blocks and each one has a title REM telling you what it does. The only other thing you really need to know is how the board is numbered. It looks like this:

	72		71		70		69
66		65		64		63	
	59		58		57		56
53		52		51		50	
	46		45		44		43
40		39		38		37	
	33		32		31		30
27		26		25		24	

Note that the numbered squares are black. Using this unusual method, diagonally opposite pieces have the value of 6 or 7 more or less, than each other, according to the direction. This is what the X array is used for. The A array is used to hold a 10 by 10 board — 36 squares are off the edges. Other variables used are H = human piece, C = computer piece, W = human crown and
K = computer crown, B = off board. Also, LS = lose flag, CS = computer score, HS = human score and MO is a move flag.

It should be fairly easy from the above to work out exactly what each part of the program does. Q: Where is the multiple jump routine and the routine that guesses a move if it cannot find a good one?

If you add extra lines to make the game a bit of a challenge, I would be *most* interested to hear from you!

```
10    BORDER 0: POKE 23624, 70: OVER 0: BRIGHT 1: INVERSE 0: PAPER
      0: INK 6: CLS

20    LET BD = 0

30    GO SUB 6000

40    GO SUB 4000

50    GO SUB 9000

60    LET MO = 0

70    GO SUB 5000

1000  REM ACCEPT PLAYERS MOVE

1010  LET MO = 0

1020  INPUT "ENTER MOVE: □"; LINE B$

1030  PRINT AT 21, 0; "Your move —"; B$ (TO 2); "□ to □"; B$ (3
      TO); "□ □ □"

1040  LET Z (1) = CODE B$ (1) * 10 + CODE B$ (2)

1050  LET Z (2) = CODE B$ (3) * 10 + CODE B$ (4)

1060  FOR F = 1 TO 2

1070  RESTORE 9160: BEEP .02, 35

1080  READ X, Y

1090  IF X = 0 THEN PRINT AT 21, 0; INK 2; PAPER 7; "ILLEGAL
      MOVE!"; PAPER 0; "[15 spaces]": BEEP .5, -10: GO TO 1020

1100  IF Z (F) = X THEN LET B (F) = Y: GO TO 1120

1110  GO TO 1080

1120  NEXT F

1160  LET MO = 0

1170  LET A (B (2)) = A (B (1))

1180  LET A (B (1)) = B

1190  IF ABS (B (1) - B (2)) > 7 THEN LET MO = 1: LET A ((B (1) + B
      (2)) / 2) = B

1200  GO SUB 5000
```

```
2000   REM THE 'INTELLIGENT' BIT

2020   FOR F = 24 TO 72: BEEP .015, F/2: BEEP .008, F/2 + 1

2050   IF A (F) < > C AND A (F) < > K THEN GO TO 2100

2060   FOR D = 1 TO 4

2070   IF A (F) < > K AND D > 2 THEN GO TO 2100

2080   IF(A (F + X (D)) = H OR A (F + X (D)) = W) AND A (F + 2 * X
       (D)) = B THEN LET Q = X (D): GO TO 2120

2090   NEXT D

2100   NEXT F

2110   GO TO 2240

2120   LET A (F + 2 * Q) = A (F)

2130   LET CS = CS + 1

2140   LET A (F + Q) = B

2150   LET P = F + 2 * Q: LET A (F) = B

2160   LET M = 0: FOR D = 1 TO 4

2170   IF (A (P + X (D)) = H OR A (P + X (D)) = W) AND A (P + 2 * X
       (D)) = B THEN LET M = X (D)

2180   IF A (P) < > K AND D > 2 THEN GO TO 2200

2190   IF M = 0 THEN NEXT D

2200   IF M = 0 THEN GO TO 60

2210   GO SUB 5000: LET A (P + M) = B: LET A (P + 2 * M) = A (P):
       LET A (P) = B: LET S = S + 1

2230   GO TO 60

2240   LET Y = 0

2250   BEEP .07, -2: LET F = 24 + INT (RND * 49): LET Y = Y + 1: IF
       Y > 400 THEN LET LS = 1: GO TO 5000

2260   IF A (F) < > C AND A (F) < > K THEN GO TO 2250

2270   FOR D = 1 TO 4

2280   IF A (F) = C AND D > 2 THEN GO TO 2250
```

```
2290   IF A (F + X (D)) = B THEN LET A (F + X (D)) = A (F): LET A
       (F) = B: GO TO 60

2300   NEXT D

2310   GO TO 2250

3000   REM CONVERT TO CROWNS

3010   FOR F = 24 TO 72

3020   IF A (F) = H AND F > 68 THEN LET A (F) = W

3030   IF A (F) = C AND F < 28 THEN LET A (F) = K

3040   NEXT F

3050   RETURN

4010   PRINT PAPER 1; INK 4; "[34 spaces] g3c g7c □ g3c g7c □ g4 g7c
       □ g7c g4 □ g4 g7c □ g7c g4 □ g3c g3c g7c □ g3c □ □ g3c □ □
       □ □ □ g5c g5 □ g5c g5 □ g5c g5 □ g5c g5 □ g5c g1 □ g5c g5 □
       □ g5c □ g1 g7c g2 □ □ g8c □ □ □ □ □ g5c g5 □ g4c g5c □ g4c
       g7 □ g5c g5 □ g5c g7 □ g4c g7 □ □ g5c □ g4 g1 g7c □ □ g3 □ □
       □ □ □ g3 g2 □ g2 g1 □ g2 g1 □ g1 g2 □ g1 g2 □ g2 g1 □ □ g2 □
       □ g3 □ □ □ g3 [36spaces]"
```
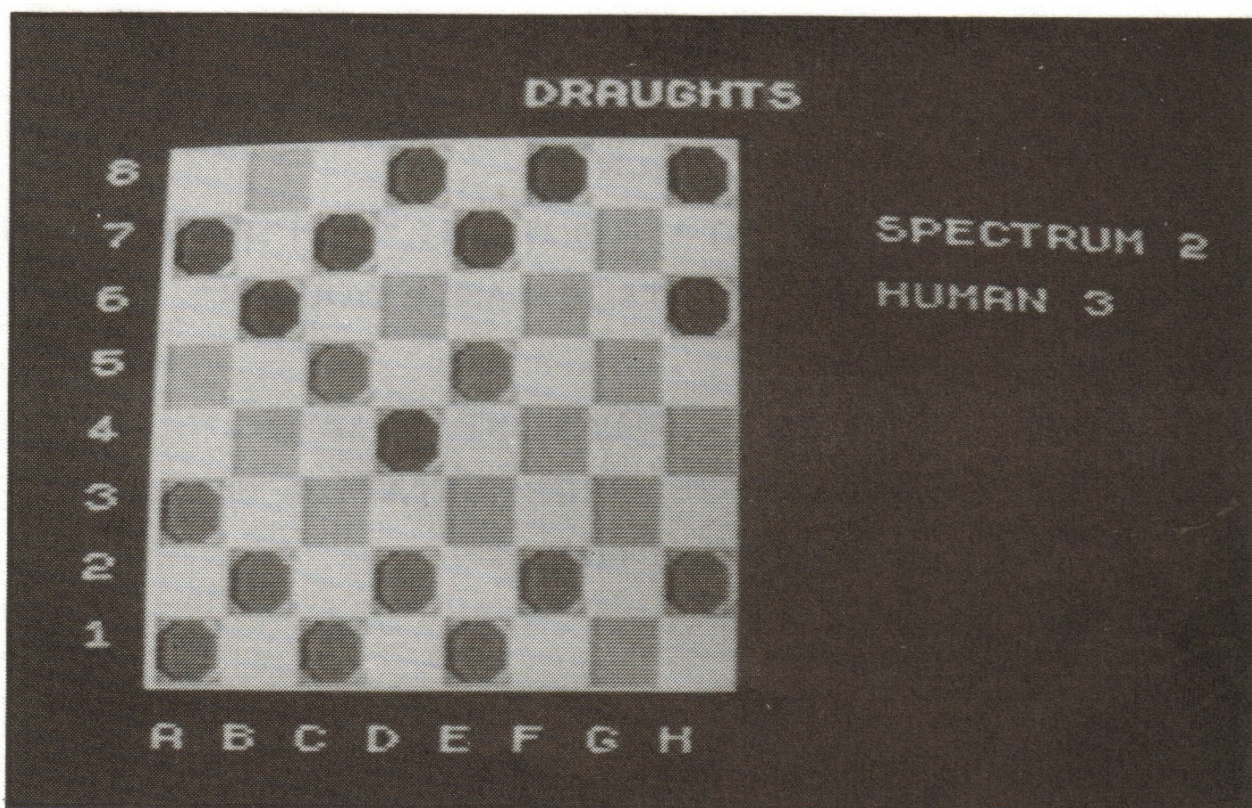
```
4020  PRINT ' "□ □ □ In this version of Draughts, this is a piece:
      gA gB and this is a crown: gE gF □ □ □ □ □ □ gC gD [22
      spaces] gG gH □" ' ' "□ □ □ You are red (at the bottom) □ □ &
      I am blue (at the top)." ' ' "□ □ □ Moves are entered using □
      □ □ □ □ □ standard 'algebraic notation', □ □ so for example
      you would enter □ □ C3D4 to move from column C, row 3 to
      column D row 4."

4030  PRINT ' "Please put CAPS LOCK on."

4040  RETURN

5000  REM DISPLAY BOARD

5010  GO SUB 3000: BEEP .09, 20: BEEP .05, 15: IF MO = 1 THEN LET
      HS = HS + 1

5020  PRINT AT 0, 12; INK 6; PAPER 1; "DRAUGHTS"; PAPER 0; INK 6;
      AT 4, 22; "SPECTRUM □"; INK 7; CS; AT 6, 22; INK 6; "HUMAN
      □"; INK 7; HS: IF BD = 1 THEN GO TO 5080

5030  FOR F = 3 TO 15 STEP 4

5040  PRINT INK 4; PAPER 7; AT F - 1, 2; "□ □ g8c g8c □ □ g8c g8c □
      □ g8c g8c □ □ g8c g8c"; AT F, 2; "□ □ g8c g8c □ □ g8c g8c □
      □ g8c g8c □ □ g8c g8c"; AT F + 1, 2; "g8c g8c □ □ g8c g8c □ □
      g8c g8c □ □ g8c g8c □ □"; AT F + 2, 2; "g8c g8c □ □ g8c g8c □
      □ g8c g8c □ □ g8c g8c □ □"

5050  PRINT AT F - 1, 0; CHR$ (57 - F/2); AT F + 1, 0; CHR$ (56 -
      F/2)

5060  NEXT F: LET BD = 1

5070  PRINT AT 19, 2; "A □ B □ C □ D □ E □ F □ G □ H": INK 6: PLOT
      15, 160: DRAW 129, 0: DRAW 0, -129: DRAW -129, 0: DRAW 0,
      129: INK 6

5080  LET F = 0: FOR E = 0 TO 7: LET S = (E/2 = INT (E/2)): LET F =
      F + 7 * S + 6 * NOT S: LET D = 2 * S

5090  FOR J = 0 TO 3: LET V = A (79 - F - J)

5100  PRINT INK 1 + (V < C); PAPER 4; AT E * 2 + 2, 4 * J + 2 + D;
      ("□ □)" AND V = B); ("gA gB" AND (H = V OR C = V)); ("gE gF"
      AND (K = V OR W = V)); AT E * 2 + 3, 4 * J + 2 + D; ("□ □"
      AND B = V); ("gC gD" AND (H = V OR C = V)); ("gG gH" AND (K =
      V OR W = V))

5150  NEXT J: NEXT E

5160  PRINT AT 21, 0; "[32 spaces]"
```

```
5170   GO SUB 7000: RETURN

6000   REM g8c INITIALISE U.D.G.s g8c

6010   RESTORE 9190

6020   FOR F = 1 TO 8: READ A$

6030   FOR G = 0 TO 7

6040   READ H: POKE USR A$ + G, H

6050   NEXT G

6060   NEXT F

6070   RETURN

7000   REM g8c VARIOUS CHECKS g8c

7010   IF LS = 1 THEN PRINT AT 8, 22; "I give up!": INPUT "Hit ENTER
       to play again □"; LINE A$: RUN

7020   IF CS = 12 THEN PRINT AT 6, 24; FLASH 1; " I WIN": PAUSE 0:
       RUN

7030   IF HS = 12 THEN PRINT AT 6, 24; FLASH 1; "YOU WIN": PAUSE 0:
       RUN

7040   LET Q$ = "□": IF MO = 1 THEN PRINT AT 6, 22; "again?": INPUT
       "Can you jump? □"; LINE Q$: PRINT AT 8, 22; "□ □ □ □ □ □":
       IF Q$ (1) = "Y" THEN GO TO 1000

7050   LET MO = 0

7060   RETURN

9000   REM

9010   RESTORE 9150: DIM A (100): LET Y = 0

9020   DIM X (5)

9030   FOR F = 1 TO 5: READ G: LET X (F) = G: NEXT F

9040   LET H = 0: LET C = 128: LET W = 1: LET K = 129: LET B = 255:
       LET Q = 0

9050   FOR F = 1 TO 100

9060   LET A (F) = 9: IF F < 73 AND F > 55 AND F< > 68 AND F < > 67
       AND F < > 62 AND F < > 61 AND F < > 60 THEN LET A (F) = C: GO
       TO 9090
```

```
9070   IF F < 54 AND F > 42 AND F < > 49 AND F < > 48 AND F < > 47
       THEN LET A (F) = B: GO TO 9090

9080   IF F < 41 AND F > 23 AND F < > 36 AND F < > 35 AND F < > 34
       AND F < > 29 AND F < > 28 THEN LET A (F) = H

9090   NEXT F

9100   LET LS = 0: LET CS = 0: LET HS = 0

9110   DIM B$ (4): DIM B (2): DIM Z (2)

9120   LET MO = 0: LET B$ (3) = "K"

9130   INPUT "Do you want to go first? □"; LINE A$: CLS: IF A$ (1) =
       "Y" THEN RETURN

9140   GO SUB 5000: LET Z = 57 + INT (RND * 3): LET Q = INT (RND *
       2) - 7: LET A (Z + Q) = C: LET A (Z) = B: RETURN

9150   DATA -6, -7, 6, 7, 9

9160   DATA 699, 27, 701, 40, 703, 53, 705, 66, 710, 33, 712, 46,
       714, 59, 716, 72, 719, 26, 721, 39, 723, 52, 725, 65

9170   DATA 730, 32, 732, 45, 734, 58, 736, 71, 739, 25, 741, 38,
       743, 51, 745, 64, 750, 31, 752, 44, 754, 57, 756, 70

9180   DATA 759, 24, 761, 37, 763, 50, 765, 63, 770, 30, 772, 43,
       774, 56, 776, 69, 0, 0

9190   DATA "A", 0, 15, 31, 63, 127, 127, 127, 127

9200   DATA "B", 0, 240, 248, 252, 254, 254, 254, 254

9210   DATA "C", 127, 127, 127, 127, 63, 31, 15, 0

9220   DATA "D", 254, 254, 254, 254, 252, 248, 240, 0

9230   DATA "E", 0, 15, 31, 63, 127, 124, 120, 121

9240   DATA "F", 0, 240, 248, 252, 254, 62, 30, 158

9250   DATA "G", 121, 120, 124, 127, 63, 31, 15, 0

9260   DATA "H", 158, 30, 62, 254, 252, 248, 240, 0
```

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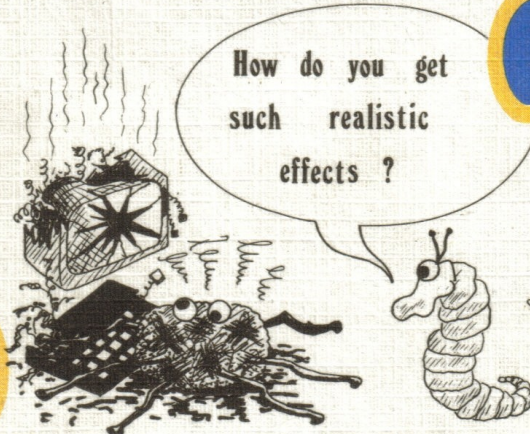A selection of 10 educational games and puzzles.

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