POPULAR Computing WEEKLY

35p 14-20 April 1983 Vol 2 No 15

This Week

Business software

Tony Bridge looks at a range of business programs designed for the Spectrum owner and decides whether or not they are value for money. See page 14.

Dragon 3-D graphics

Joseph Burr presents a program to draw a three-dimensional view of any mathematical formula on page 27.

Blind Alley

£10 prize to be won each month in our new competition. Can you beat the new high score? Find out the answer on page 37.

Vic programming

James Brennan explains how to obtain a printed copy of the Vic20's hi-res screen. See page 23.

★STAR
Defender on Spectrum.
See page 10.
GAME★

News Desk

Timex sit-in over cuts

OVER 100 workers at Timex's Dundee plant have begun a sit-in following the announcement of plans to make 200 compulsory redundancies.

The sit-in began after work finished at the company's Milton works last Friday — immediately before the plant's week long Easter holiday.

In January, Timex announced its intention to cut the workforce at Dundee by 1,900. So far, 1,700 employees have taken voluntary redundancy.

Milton is one of two Timex plants in Dundee and is the proposed site for manufacture of the Sinclair flat-screen tv. Sinclair computers are made at Camberdown, which has so far been unaffected by the industrial action.

Timex has already established a pilot production line at Milton for the £50 tv, due to be launched in the autumn.

"It is all a little unreal at the moment, because if they weren't sitting-in they would be on holiday," commented a Sinclair spokesman. "A lot de-

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BBC disc snags!

ACORN'S BBC disc drives look like running into trouble.

The main chip used in the disc interface unit — the Intel 8271 — is now in very short supply. This in turn is limiting production of the interface itself.

Many Acorn dealers now have no disc interfaces to sell and schools are experiencing lengthening delivery times for the disc drive units.

"World-wide demand for the 8271 chip has gone through the roof," said an Intel spokesman.

"We are out of stock ourselves and not even Intel in the States can supply any. And the situation is not likely to improve until at least the middle of the year."

A further complication is that it is not clear for how long Intel will continue to manufacture the chip. The 8271 disc controller device has now been on sale for over three years and has been superseded by other chips, such as the Intel 8272.

Colin Malone of BBC Enterprises commented: "I am certainly aware that there has

Continued on page 5

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Articles which are submitted for publication should not be more than 3,000 words long. The articles, and any accompanying programs, should be original. It is breaking the law of copyright to copy programs out of other magazines and submit them here — so please do not be tempted.

All submissions should be typed and a double space should be left between each line. Please leave wide margins.

Programs should, whenever possible, be computer printed.

We cannot guarantee to return every submitted article or program, so please keep a copy. If you want to have your program returned you must include a stamped, addressed envelope.

Accuracy
Popular Computing Weekly cannot accept any responsibility for any errors in programs we publish, although we will always try our best to make sure programs work.

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Editorial

The Software Centre's Buy 'n Try scheme (*Popular Computing Weekly*, 24-30 March) has been the subject of some controversy in recent weeks.

Proponents of the scheme — under which customers can return programs within one month of sale and receive a discount of 80 percent towards subsequent purchases — argue that it will benefit both the consumer and the software industry by increasing overall sales. Those opposed to the Software Centre plan fear that it will damage the industry, making it uneconomic to produce new games.

Legal action over the scheme by Quicksilva has been dropped in return for certain safeguards, including a reduction in the buy-back time from six months to one month. Other software houses opposed to the Buy 'n Try scheme appear to have accepted that they have no legal grounds for stopping it.

Most software companies seem to be adopting a 'Wait and see' approach, although some firms, such as Commodore, are actively looking for alternatives, including moving into Rom software. Other companies are reviewing their conditions of sale.

Early indications are that the Software Centre has been extremely busy since it first opened last month. Like it or not, it appears that we will have to learn to live with the Buy 'n Try scheme — it is not going to disappear.

Next Thursday

Can you fly your spacecraft through hordes of enemy aliens? Can you dodge the walls? Find out next week in Searcher, a new game for the 48K Spectrum by Andrew Filby.

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BBC discs

Continued from page 1

been some criticism of Acorn for using a chip that is coming to the end of its life-cycle."

If Intel were to stop manufacture of the device one solution would be for Acorn to persuade the company to produce a special run of the chip, specifically for use in the BBC machine. Such a move would put up the unit-cost of the chip quite considerably.

Although Acorn's joint Managing Director, Hermann Hauser commented: "We do not see delivery of the 8271 chip causing any production problems at this time," this is not entirely borne out by shortfalls at the dealers.

Acorn's David Bell, in charge of BBC liaison, said: "There are some concerns with regard to the supply of the 8271." However, he was confident that any price increase in the chip from Intel would not affect the fixed price to the consumer of £97.

"Obviously we are looking at alternative chips — we are doing that all the time," he said.

"But all of the other disc controller chips — including the Intel 8272 — have substantially different operating systems. Any change to an 8272 would require a substantial reconfiguration of the surrounding circuitry.

"I think that we would be reluctant to do that — it would pose problems of compatibility with the existing system."

Meanwhile it looks as if those wanting to buy the disc interface are in for a long wait — at least until June.

Timex sit-in

Continued from page 1

pends on how the action develops when the other workers return after the holiday.

"At this stage, it is most unlikely that computer production will be affected. But, if the action at the Milton plant continues, then it will progressively put back our plans for the tv which are now at a fairly crucial stage."

● IF you reckon you have a "dazzling" career record — including management success in the electronics business — then Clive Sinclair is offering an exciting new job opportunity.

He is looking for an "exceptional" person to become the managing director of a new company that will launch his £50 flat-screen tv in the autumn.

Cambridge Recruitment Consultants, who have been given the task of finding such a candidate, describe the new post as "the job of a decade". The successful applicant will probably be under 45 and will be looking for a salary of at least £40,000 pa.

Lack of response cancels show

THE Scottish Personal Computer World Show, planned for the end of April, has been cancelled.

Lack of exhibitor response was blamed for the decision to abandon the exhibition which was to have been held on April 16-18 at the MacRobert Pavilion, Ingleston, Edinburgh.

Happy hols!

WITH the warm weather almost here, now is the time to plan your computer holiday.

Two companies offer such an experience – Dolphin Activity Holidays and Beaumont Summer Camps. Both offer either residential or day camps between July and September. Prices vary from around £90 for a week at a day camp to between £120 and £160 for a week with full board. Dolphin use Sinclair, Acorn and Apple machines, and Beaumont use predominantly Commodore computers.

More details from Dolphin, 68 Churchway, London NW1 and Beaumont, 73 Upper Richmond Road, London SW15.

Digitised images

MICROEYE is a new low-cost vision analysis device that can be used with a range of microcomputers.

The package, developed by Digithurst, enables prerecorded images from a conventional video recorder to be digitised and transferred to a microcomputer.

At present the device is configured for use with the BBC Model B machine, but it can also be connected to Commodore, Apple, Research Machines, Hewlett Packard and IBM computers.

Pictures are digitised with a 256 × 256 resolution. Although, in the BBC implementation, only a 128 × 128 pixel format is used, the extra resolution could be extracted using a second processor.

Microeye is supplied complete with the necessary interfaces and cables from the video recorder to the computer. Software included allows the captured image to be dumped to a printer or disc. Images dumped on to disc can then be retrieved for further processing.

The complete package will sell for only £340 including VAT. Contact Digithurst, Leaden Hill, Orwell, Royston, Herts.

Texet changes hands again!

THE future of the Texet TX8000 £98 colour computer is still to be decided after a change of ownership.

The original Texet company, Texet Ltd, was put in the hands of the receiver three weeks ago and all the assets of the company have been acquired by a new company, Texet Sales Ltd, set up by Hira Ltd, a Manchester-based import/export company.

Peter Richardson, one of two partners who set up the original Texet company, has been retained by the new owners as managing director of Texet Sales.

The original Texet company negotiated an exclusive UK distribution agreement with the computer's Hong Kong manufacturers, Video Technology.

The 8K TX8000 is only one of a range of computers being produced by Video Technology — 4K and 16K machines are also being manufactured.

Atari agrees with Visicalc

IN a new series of licencing agreements, Atari has reached agreement with the Visicalc corporation to put a version of the Visicalc word processing package on to the Atari 800 and 1200XL machines.

In a separate agreement, Atari has licenced Logo for the two machines.

Recalled recorders

ACORN has had to recall 3,600 cassette recorders supplied with its machines under the Department of Industry's Micros in Primaries scheme.

Pressing the *Play* or *Rewind* button on the BBC Data Recorder while a program was being *loaded* produced a 'click' on the tape. This was often sufficient to cause the program to crash.

The machines, made in Hong Kong for Acorn, are now being replaced with modified units. Recorders with the design improvement can be identified because they have a white paint spot on the underneath of the casing.

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LETTERS

Bogus rumours

I wish to quell the recent incorrect rumours about the launch of the Sinclair Microdrives. When the Spectrum was launched in April last year, the Microdrives were said to be 'coming soon'. Then they were to be available 'at the end of the year' (1982), and now it is claimed 'in the early part of 1983'. These are all, of course, not true.

A contact working for Sinclair tells me that 'maybe' there will be a few ready for magazine reviews by 'about June' — there will obviously be none available to us Spectrum owners for at least another month from then, not including the statutory two-month waiting time for all new Sinclair products!

The Advertising Standards Authority should again be contacted about Sinclair's advertisements, not only for the 'coming soon' Microdrives but also because they still claim 256×192 pixels, when only 256×176 are addressable from Basic.

Andrew Pennell
14 Sweyn Road
Cliftonville
Kent CT9 2DH

Please help me!

I wonder if you or any of your readers could help me! I would like to know if there is a word processor on sale which will support right justification; and proportional, condensed, and elongated print.

I have a BBC Model 'B' Microcomputer, and a Centronics 739 printer. If possible, I would prefer to pay no more than £50 for the processor.

Andrew Bede
94 Westwood Road
Leek
Staffs ST13 8DL

Do's and don'ts

In addition to P Finn's comments on copyright (*Popular Computing Weekly*, April 7-13), which I am in full agreement with, I would like to offer this advice to all purchasers (potential or otherwise) of compilers.

1) *Potential purchasers*
If you are considering purchasing a compiler for your micro please ensure that the product for sale is:
— Not purely a naive converter
— can handle *all* Basic functions available on your micro
— not integer based
It is my opinion that no such compiler currently exists for the Spectrum and those that are for sale fall far short of the "basics" stated above.

2) *Purchasers*
If you have purchased a compiler, do not, I repeat, *do not* be fooled into thinking you must pay the company you purchased the compiler from any kind of royalty.
It is not enough that you have paid the company money in return for a product, that you are now told the you *must* pay further monies should you wish to market your own developed software? Sheer greed and stupidity on the company's part I would say.

No doubt my comments will upset a few companies — alternatively it might bring them to their senses. However, let me state now that should I develop software and subsequently market the same and if during 'my hard work' I used such tools as a compiler, then under no circumstances will I pay or recognise any form of royalty. If that upsets *you, "Mr Company"*, then I am more than willing to fight.

So come on all you companies out there, let's try to put some professionalism into the micro industry and take out any sharp practices.

G M Jackson
2 Sefton Gardens
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Twenty Ones debugged

My apologies to all who tried to run *Twenty Ones* (*Popular Computing Weekly*, March 31). I made some bad mistakes that were overlooked in proof reading. The following should put things right:

```
Lines 30 and 40 require commas after 135 and 172
Lines 450 460 470 require a colon before Return
Line 890 requires a semi-colon after GT
Line 940 requires a comma after 32
Line 950 requires an open quote
Lines 620 630 640 require an = after zz£
1180 PLAY"P1":CLS:PRINT @ 232, "YOU BUST":GG = GG – G
1190 GOTO 70
1200 PLAY"P1P1":CLS:PRINT @ 258"YOU WIN";G+2;"£":GG = GG + (G+2)
1210 GOTO 70
```

John Jackaman
61 Kathleen Ferrier Crescent
Laindon
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Essex SS15 5QX

Modified apology!

The program *Reconfiguration*, which you published on my behalf (*Popular Computing Weekly*, March 10-16), is a slightly modified version of one published by Mike Todd in the September 1982 issue of the newsletter of the Independent Commodore Products User Group. I would like to apologise for any embarrassment caused to Mike Todd, ICPUG and *Popular Computing Weekly*.

Peter Wilson
26 North Cape Walk
Corby
Northants NN18 9DQ

No reply from Acorn

Can you tell me if Acorn Computers is still in business? I am trying to get my BBC micro A upgraded to a B. Acorn's local agents say that they cannot get supplies and letters written directly to Acorn are not acknowledged. Why is this?

John Andrews
7 Priory Road
Dawlish
South Devon

Acorn is very much in business. Unfortunately, like many other micro manufacturers, Acorn does not always answer its correspondence promptly. If you cannot get any reply to your letters, I would suggest telephoning Acorn direct.

Gobbling up space!

Now that we have micros like the Dragon 32 offering us a good amount of user Ram for a fair price, it appears that people are very keen on gobbling up as much space as they can without a thought to how inefficient their programs might be. A good example is a program called *Board Game* published in *Popular Computing Weekly*, 27 January-2 February. Lines 550 to 740 read:

```
550 A$ = INKEY$
560 IF A$ = "X" THEN 10
570 IF A$ = "1" THEN C = 25:F1 = 1
580 IF A$ = "2" THEN C = 45:F1 = 1
590 IF A$ = "3" THEN C = 65:F1 = 1
600 IF A$ = "4" THEN C = 85:F1 = 1
610 IF A$ = "5" THEN C = 105:F1 = 1
620 IF A$ = "6" THEN C = 125:F1 = 1
630 IF A$ = "7" THEN C = 145:F1 = 1
640 IF A$ = "A" THEN D = 25:F2 = 1
650 IF A$ = "B" THEN D = 45:F2 = 1
660 IF A$ = "C" THEN D = 65:F2 = 1
670 IF A$ = "D" THEN D = 85:F2 = 1
680 IF A$ = "E" THEN D = 105:F2 = 1
690 IF A$ = "F" THEN D = 125:F2 = 1
700 IF A$ = "G" THEN D = 145:F2 = 1
710 IF A$ = "H" THEN D = 165:F2 = 1
720 IF A$ = "I" THEN D = 185:F2 = 1
730 IF A$ = "J" THEN D = 205:F2 = 1
740 IF A$ = "K" THEN D = 225:F2 = 1
```

By using a simple table, the 18 (!) conditional statements could be replaced with the following:

```
550 A$ = INKEY$:IF A$ = "" THEN 550
560 IF A$ = "X" THEN 10
570 IF ASC(A$) > 48 AND ASC(A$) < 56 THEN C = TABLE(ASC(A$)):F1 = 1
580 IF ASC(A$) > 64 AND ASC(A$) < 76 THEN D = TABLE(ASC(A$)):F2 = 1
```

The only extra code required is to initialise the table at the beginning of a run. This could appear as a subroutine:

```
1000 DIM TABLE(75)
1010 DATA 25,45,65,85,105,125, 145,165,185,205,225
1020 FOR A = 49 TO 55:READ TABLE(A):NEXT:RESTORE
1030 FOR A = 65 TO 75:READ TABLE(A):NEXT
1040 RETURN
```

This makes much more efficient use of both the interpreter and processor. Of course, this is not the only use for tables, but I hope it has given an insight into how the problem of testing for many conditions may be solved.

C Whitehead
63 All Saints Avenue
Westbrook
Margate
Kent CT9 5QJ

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Defender

A new game for the 48K Spectrum by Michael Levers

This program for the 48K Spectrum, is structured so as to make the game run as fast as possible. The main loop is located as near to the start of the program as possible so that *Gotos* and *Gosubs* are executed without delay. All 'trivial' routines, such as the instructions and skill level selection, are placed at the end of the program as these do not require fast moving graphics.

When readers are typing in the program, they may like to replace *Inks* and *Papers* with the corresponding *Control Characters*, as this will also speed up the program.

A detailed break-down of each subroutine follows:

Line(s)

110 Calls subroutine at 9500 which sets up characters etc.

120 Calls subroutine at 9000 which prints instructions.

130 Calls subroutine at 8000 which allows the player to enter his or her skill level.

140 Calls subroutine at 7000 which sets up initial score/position variables.

150 Calls subroutine at 6000 which prints the screen — score/lives/ships etc.

160 Calls subroutine at 5000 which plays an introductory tune.

170 Calls subroutine at 1000 — the main loop.

180 Calls subroutine at 4000 which tells the player that the game is over and updates high scores accordingly.

190 Tells the computer to repeat the whole process — (130-180).

500-590 Sets up variables to do with alien: LA = position across screen, LD = position down screen, AI = decrement for alien's horizontal position (this determines the speed at which it moves across the screen). AI is proportional to the skill level. DI = increment/decrement for alien's vertical position (this is chosen randomly from array D() which contains all possible increments/decrements).

1000-1900 The game itself:

1010 Calls alien variable subroutine and prints alien at its start position.

1100 ERASES DEFENDER from its previous position and prints it at its new one. C$() contains the 2 possible images of the ship — changing C from 0 to 1 alternately gives the "flickering engine" graphics. Scans keyboard — if fire button pressed and the alien is in front of you then a "laser bolt" is printed in front of your ship and then erased — if your position is the same as the alien's (down the screen) then a graphics subroutine is called.

1110 Creates a random number — if this is less than your skill level divided by ten and the alien is in front of you than a "laser bolt" is printed in front of the alien — essentially the lander is firing at you. The bolt is then erased and if the alien's vertical position is the same as yours then a graphics subroutine is called which simulates the explosion of your ship. The computer then branches to the appropriate line (contained in NEXT).

1120 Stores current position of ship and increments/decrements it according to key pressed. Also makes sure ship does not go off the screen.

1125 "Wraps around" landscape variables A$ and B$ giving the effect of Forward Motion. Prints these at the bottom of the display.

1130 Erases old position of alien and decrements its position across the screen: if this is less than zero then a human is taken and control branches to line 1200.

1140 Checks to see if new vertical position of alien is off the screen — if so changes sign of down increment.

1150 Prints alien at its new position, creates a random number — if this is less than 0.3 then the alien's down increment is changed.

1155 Checks to see if ship and alien occupy same position — if so then calls a graphics subroutine for the explosion of your ship.

1160 Repeats main loop from 1100 onwards.

1200 Decrements number of humans — if no more left calls a graphics subroutine for the explosion of your planet. Transfers control to line 1900.

1210 Repeats main loop from 1000 onwards.

1900 Returns control to the control loop at the start of the program.

2000-2490 Subroutine which produces flashing effects for when all the humans are taken.

2510-2520 Graphics for the explosion of an alien.

2530 Increments score — increment is proportional to the number of aliens you have shot so far. Prints score.

2540 Increments number of aliens shot. If this is a multiple of ten then the skill level is increased by one.

2900 Returns control to main loop.

3010-3060 Produces an explosion effect for when you are shot by an alien.

3070 Decrements number of ships and calls a routine to print the number remaining.

3080 If your lives have run out then sets NEXT equal to 1900 (a line number) and returns control to main loop.

3090-3900 Calls variables/screen/tune routines and returns control to main loop.

4010-4020 Informs player that game has finished.

4030 Clears screen and checks to see if a high score has been achieved — if not then transfers control to line 4200.

4035-4100 Informs player that he has achieved a high score.

4110 Sets the attributes of the bottom two lines of the screen to INK White, PAPER black and extra BRIGHT. Allows player to enter his or her name — checks to see that it is not too long or short.

4120 Updates high score table.

4200-4270 Prints the table of high scores.

4280-4290 Makes the word "DEFENDER" flash in different colours.

4300-4310 Waits for a second then prints a copyright message.

4320 Prints on the last line of the screen (using # 0). Asks player if he wants another game.

4330 Waits until either the "Y" key is pressed or the "N" key is pressed.

4340 Sends control to 4900 if "Y" key pressed.

4350 Pokes system variable ATTR P with attributes of screen, sets border colour and clears screen.

4360-4380 Thanks user for playing and informs that the program is about to NEW itself.

4390 Prints numbers from 99 to 0.

4400 Calls Rom routine equivalent to NEW.

4900 Returns to control loop.

5000-5040 Plays a little tune to inform user that game is about to begin.

5900 Returns to control loop.

6010 Pokes system variable ATTR P with attributes of screen, sets border colour, clear screen.

6020-6030 Draws a box at the top of the display — blue paper, white ink.

6040-6050 Prints score, number of ships left and number of humans left in box.

6060 Prints landscape at base of display.

6070 Calls subroutine to print graphically the number of ships left.

6080 Prints DEFENDER ship at its initial position.

6090 Returns to control loop.

6210 Prints graphically the number of ships left.

6900 Returns control to correct part of program.

7010-7020 Creates landscape variables A$ and B$.

7030 Creates array C$ which holds the two images of the DEFENDER ship including its attributes — CHR$ 16 etc.

7100-7200 Initialises main score/position variables: C = (number of ship to be printed) −1, SC = score, LIVES = number of ships left, HUMANS = number of humans remaining, NA = number of aliens destroyed, SD = present verticle position of DEFENDER ship, OSD = old vertical position of ship.

7900 Returns control to appropriate part of program.

8010 Pokes system variable ATTR P with attributes of screen, sets border, clears screen.

8020-8040 Asks player to choose a skill level.

8050 Calls variables subroutine.

8060 Checks to see if a key between 1 and 5 has been pressed — if not prints landscape and moves it to the left.

8070 Sets SK (skill level) to the value of the key pressed divided by ten. Sets SSK equal to SK times ten.

8900 Returns control to control loop.

9010-9110 Prints the name of the program in large letters and prints its author.

9120-9180 Prints the instructions at reading speed.

9190 Waits until ENTER is pressed.

9490 Returns to control loop.

9510-9530 Sets attributes of screen and asks user to wait while the user defined graphics/character set are created.

9540 Pokes system variable CHARS with 256 less than the address of the new character set data.

9550 Copies the data for the normal character set from Rom into Ram (above RAMTOP).

9560-9570 Pokes the data for the "space-age" character set into place, overwriting the similar character set in Ram.

9580 Pokes in the user defined graphics — aliens, DEFENDER etc.

9600-9880 Data for new character set and user defined graphics.

9970 Creates high score table.

9980 Pokes system variable FLAG2 this turns CAPS SHIFT on.

9990 Creates direction array — contains all directions for aliens.

9999 Returns control to control loop.

```
 0> DEFENDER
    COPYRIGHT 1983 M. LEVERS

 90 CLEAR 63999: REM FOR CHARS

100 REM CONTROL LOOP

110 GO SUB 9500: REM INITIALISE
120 GO SUB 9000: REM INSTRUCT
130 GO SUB 8000: REM SKILL
140 GO SUB 7000: REM VARIABLES
150 GO SUB 6000: REM SCREEN
160 GO SUB 5000: REM PAUSE
170 GO SUB 1000: REM MAIN LOOP
180 GO SUB 4000: REM GAME OVER
190 GO TO   130: REM REPEAT

500 REM SUBR FOR ALIEN VARS

510 LET LA=31: LET LD=INT (RND*
14)+5: LET AI=1+INT (RND*3)+(SK)
.3)+(SK).6)+(SK=.9): LET DI=D(IN
T (RND*6)+1)
590 RETURN

1000 REM MAIN LOOP

1010 GO SUB 510: PRINT AT LD,LA;
 INK 5;"☻"
1100 PRINT AT OSD,1;"   ";AT SD,
1;C$(C+1): LET C=NOT C: LET I$=I
NKEY$: IF I$="M" AND LA>3 THEN P
RINT AT SD,4;"                  
                ": BEEP .004,10: BEEP .
004,9: PRINT AT SD,4;"
                ": IF SD=LD THE
N GO SUB 2500: GO TO 1000
1110 IF RND<SK AND LA>5 THEN PRI
NT AT LD,4; INK 4;"                  
                "( TO LA-4): BEEP
.01,0: PRINT AT LD,4;"
                "( TO LA-4): IF
 LD=SD THEN GO SUB 3000: GO TO N
EXT
1120 LET OSD=SD: LET SD=SD+2*((I
$="Z" AND SD<19)-(I$="1" AND SD>
5))
1125 LET B$=B$(2 TO )+B$(1): LET
 A$=A$(2 TO )+A$(1): PRINT AT 20
,0; INK 4;A$;B$
1130 PRINT AT LD,LA;" ": LET LA=
LA-AI: IF LA<0 THEN GO TO 1200
1140 IF LD+DI>19 OR LD+DI<5 THEN
 LET DI=-DI
1150 LET LD=LD+DI: PRINT AT LD,L
A; INK 5;"☻": IF RND<.3 THEN LET
 DI=D(INT (RND*(6-(2 AND SK<.3))
)+1)
1155 IF (LA=2 OR LA=3) AND LD=OS
D THEN GO SUB 3000: GO TO NEXT
1160 GO TO 1100
1200 LET HUMANS=HUMANS-1: PRINT
AT 2,27;"0"( TO 2-LEN STR$ HUMAN
S);HUMANS: FOR X=20 TO 10 STEP -
2: BEEP .005,X: NEXT X: IF NOT H
UMANS THEN GO SUB 2000: GO TO 19
00
1210 GO TO 1000
1900 RETURN

2000 REM ALL HUMANS TAKEN

2010 PRINT AT OSD,1;" ": BEEP .1
,-27: BEEP .1,-27: BEEP .1,-27:
BEEP .4,-29
2020 BEEP .1,-27: BEEP .1,-27: B
EEP .1,-27: BEEP .4,-30
2030 PRINT OVER 1; INK 0; PAPER
2; FLASH 1;AT 4,0,,,,,,,,,,,,,,,
,,,,,,,,,,,,,,,,,,,,
2040 FOR X=30 TO 0 STEP -5: FOR
Y=1 TO 255 STEP 13: OUT 254,Y: B
EEP .01,X*2: OUT 254,X: NEXT Y:
NEXT X
2050 PRINT PAPER 0;AT 4,0,,,,,,,
,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
 OVER 1
; INK 4,,,,,
2060 LET Z=1: FOR X=1 TO 15: PRI
NT AT 20,0; INK 4;A$;B$;AT 20,0,
,,,: PAUSE Z: BEEP .01,X: BEEP .
01,10-X: LET Z=Z+1: NEXT X: FOR
X=60 TO 0 STEP -5: BEEP .01,60-X
: BEEP .01,X: NEXT X
2070 PRINT AT 20,0,,,,
2490 RETURN

2500 REM HIT A LANDER

2510 FOR Y=1 TO 3: FOR X=1 TO 4:
 PRINT AT LD,LA; INK X+3;"▪▫□▯"(
X): BEEP .005,X*10+5: NEXT X: NE
XT Y
2520 PRINT AT LD,LA;"☼": BEEP .1
,-40: PRINT AT LD,LA;" "
2530 LET SC=SC+10+(20 AND NA>=11
)+(30 AND NA>21)+(20 AND NA>=31)
+(20 AND NA>=41): PRINT AT 2,6-L
EN STR$ SC;SC
2540 LET NA=NA+1: IF NA/10=INT (
NA/10) THEN LET SK=SK+(.1 AND SK
<.9)
2900 RETURN

3000 REM HIT BY AN ALIEN

3010 PRINT AT SD,1;" ": FOR X=1
TO 9: PRINT AT SD,2; INK 2;"▙▟":
 BEEP .02,10: PRINT AT SD,2; INK
 6; BRIGHT 0;"▙▟": BEEP .01,13:
NEXT X
3020 PRINT AT SD,2; INK 5;" ▪ ":
BEEP .1,-38
3030 PRINT AT SD,2; INK 4;"▭":
BEEP .1,-40
3040 PRINT AT SD,2; INK 6;"◈":
BEEP .1,-42
3050 PRINT AT SD,2;"▒▒": BEEP .2
,-44
3060 PRINT AT SD,2;"  ": PRINT A
T LD,LA;" "
3070 LET LIVES=LIVES-1: GO SUB 6
200
3080 IF NOT LIVES THEN LET NEXT=
1900: RETURN
3090 GO SUB 7200: GO SUB 6080: G
O SUB 5000: LET NEXT=1000
3900 RETURN

4000 REM GAME OVER ROUTINE

4010 PRINT AT 8,0,," INK 5;"
    GAME  OVER",,
4020 FOR X=200 TO -50 STEP -1: B
EEP .005,X/3: NEXT X
4030 CLS : IF SC<=S(SSK) THEN GO
 TO 4200
4035 FOR x=0 TO 2: PRINT AT x,0;"
                ": INK 4;"
 INK 3;"              "; INK 5;"
              ": NE
XT x
4040 PRINT INK 8;AT 0,0;"
:LL DONE !!" WE
4050 FOR X=1 TO 5: FOR Y=20 TO 5
0 STEP 5: BEEP .01,Y: BEEP .01,Y
-5: NEXT Y: NEXT X
4070 PRINT '': RESTORE : FOR X=1
 TO 4: READ Y$: FOR Y=1 TO LEN Y
$: IF Y$(Y)=" " THEN PRINT " ";:
 GO TO 4090
4080 PRINT PAPER 1;Y$(Y);: PAUSE
 5
4090 NEXT Y: PRINT '': NEXT X
4100 DATA "    YOU HAVE QUALIFIED
 FOR THE","       DEFENDER HALL OF
 FAME.","  PLEASE ENTER YOUR NAM
E BELOW","  12 CHARACTERS MAXIMU
M PLEASE"
4110 POKE 23624,71: INPUT INK 6;
"YOUR NAME:"; LINE Y$: IF Y$="" 
OR LEN Y$>12 THEN BEEP .1,0: GO
TO 4110
4120 LET S$(SSK)=Y$: LET S(SSK)=
SC
4200 CLS : PRINT INK 2;Z$: LET Y
$=CHR$ 16+CHR$ 5+"
                "
4210 PRINT INK 6;"          HALL
 OF  FAME"
4220 PRINT Y$' INK 6'" LEVEL
   PLAYER        SCORE "
4230 PRINT Y$
4250 FOR X=1 TO 5: PRINT : PRINT
 "    ";X; INK X+2;"  ";S$(X)
;"      "; INK X+2;"0000"( TO 5-LE
N STR$ S(X));S(X): NEXT X
4260 PRINT Y$
4270 PAUSE 100
4280 FOR X=1 TO 10: FOR Y=1 TO 6
: PRINT AT 0,0; INK Y;Z$: NEXT Y
: NEXT X
4290 PRINT INK 2;AT 0,0;Z$
4300 PAUSE 50
4310 PRINT AT 21,0; INK 3;" DEF
ENDER"; INK 5;" ©"; INK 4;" 1983
"; INK 6;" M. J. LEVERS"
4320 PRINT #0;"WOULD YOU LIKE AN
OTHER GAME? Y/N"
4330 LET I$=INKEY$: IF I$<>"Y" A
ND I$<>"N" THEN GO TO 4330
4340 IF I$="Y" THEN GO TO 4900
4350 POKE 23693,15: BORDER 1: CL
S
4360 PRINT '" THANK YOU FOR PLAY
ING DEFENDER"
4370 PAUSE 100
4380 PRINT ' INK 6'"   THIS PROG
RAM WILL NOW SELF" INK 6'"
      DESTRUCT"
4390 PRINT AT 10,15; PAPER 0;"99
": PAPER 0: PAUSE 100: FOR X=98
TO 0 STEP -1: PRINT AT 10,15;"0"
( TO 2-LEN STR$ X);X: BEEP .005,
X/2: NEXT X
4400 PRINT USR 0
4900 RETURN

5000 REM TUNE

5010 BEEP .2,-30: BEEP .2,-26: B
EEP .4,-22
5020 BEEP .2,-26: BEEP .2,-22: B
EEP .4,-18
5030 BEEP .2,-22: BEEP .2,-18: B
EEP .8,-15
5040 PAUSE 50
5900 RETURN

6000 REM SET UP DISPLAY

6010 POKE 23693,71: BORDER 0: CL
S
6020 PLOT 0,144: DRAW 255,0: DRA
```

Continued on page 13

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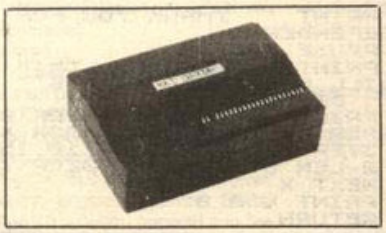

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Continued from page 11

```
W 0,31: DRAW -255,0: DRAW 0,-31
6030 PRINT OVER 1; PAPER 1;AT 0,
0;"
6040 PAPER 8: PRINT INK 6;AT 1,1
;"SCORE";AT 1,13;"SHIPS";AT 1,25
;"HUMANS"
6050 PRINT AT 2,1;"0000"( TO 5-L
EN STR$ SC);SC;AT 2,27;"0"( TO 2
-LEN STR$ HUMANS);HUMANS
6060 PRINT AT 20,0; INK 4;A$;B$
6070 GO SUB 6200
6080 PRINT AT SC,2;C$(C+1,4 TO )
6090 RETURN

6200 REM NO. OF SHIPS SUBR

6210 PRINT AT 2,12;"          ";A
T 2,12;: FOR X=1 TO LIVES: PRINT
 INK 3;"  ";: NEXT X
6900 RETURN

7000 REM SET UP VARIABLES

7010 LET A$="
7020 LET B$="
7030 DIM C$(2,11): LET C$(1)=CHR
$ 16+CHR$ 3+"<"+CHR$ 16+CHR$ 6+C
HR$ 19+CHR$ 0+"  "+CHR$ 16+CHR$
7: LET C$(2)=C$(1,1)+CHR$ 4+"<"+
C$(1,4 TO )
7100 LET C=1: LET SC=0: LET LIVE
S=3: LET HUMANS=15
7110 LET NA=0
7200 LET SD=15: LET OSD=SD
7900 RETURN

8000 REM SELECT SKILL LEVEL

8010 POKE 23693,40: BORDER 5: CL
S
8020 PRINT '"SELECT
YOUR
8030 PRINT '"
LEVE
L
8040 PRINT ' INK 1;"  [ 1 - EASI
EST, 5 - HARDEST ]"
8050 GO SUB 7000
8060 LET I$=INKEY$: IF I$<"1" OR
 I$)"5" THEN PRINT AT 20,0;A$;B$
: LET A$=A$(32)+A$( TO 31): LET
B$=B$(32)+B$( TO 31): BEEP .001,
20: GO TO 8060
8070 LET SK=VAL I$/10: LET SSK=V
AL I$
8900 RETURN

9000 REM INSTRUCTIONS

9010 POKE 23693,71: BORDER 0: CL
S
9020 PRINT AT 2,1;"M. J. LEVERS
PRESENTS..."
9030 LET Z$="
DEFEN
DER
9040 PAUSE 100
9050 FOR X=5 TO 20 STEP 3: PRINT
 AT 7,X-1; INK 6;Z$(X TO X+2);AT
 8,X-1;Z$(X+32 TO X+34);AT 9,X-1
;Z$(X+64 TO X+66): PAUSE 20: NEX
T X
9060 PAUSE 50
9080 FOR X=1 TO 10: FOR Y=1 TO 6
: PRINT AT 7,0; INK Y;Z$: NEXT Y
: NEXT X
9100 PRINT AT 13,4;"FOR THE 48K
ZX SPECTRUM"
9110 PAUSE 150
9120 LET Y$=" YOU ARE IN CONTROL
 OF THE LAST DEFENDER SHIP OF TH
E PLANET      SPECTA. IT IS YOUR
DUTY TO KILL EVIL LANDERS FROM A
 DISTANT      GALAXY WHO TRY TO K
IDNAP HUMANS TO SELL AS SLAVES.

                YOUR SHIP IS EQUIP
PED WITH      POWERFUL LASERS AND
 ION DRIVE TOTHRUST IT FORWARD O
VER THE       MOUNTAINOUS LANDSCA
PE OF SPECTA.YOU MUST DESTROY EA
CH LANDER YOUFIND; IF YOU FAIL T
O DO SO A     HUMAN WILL BE TAKEN
. IF ALL ARE KIDNAPPED YOUR PLAN
ET WILL BLOW UP AND YOU WILL BE
KILLED.       "
9130 LET Y$=Y$+"
                SHIPS CONTROLS
ARE:-
                1 - UP, Z - DOW
N, M - FIRE.
                                GOOD
LUCK!"
9140 POKE 23693,15: BORDER 1: CL
S
9150 FOR X=1 TO LEN Y$: IF Y$(X)
=" " THEN PRINT " ";: GO TO 9170
9160 PRINT Y$(X);: PAUSE 7
9170 NEXT X
9180 PAUSE 100: PRINT #0;" PLEAS
E PRESS ENTER TO CONTINUE"
9190 IF INKEY$<>CHR$ 13 THEN GO
TO 9190
9490 RETURN

9500 REM LOAD CHARACTERS ETC

9510 POKE 23693,71: BORDER 0: PO
KE 23624,71: CLS
9520 PRINT ' INK 2;"
PLEI
WAIT
PLEASE
9530 PRINT INK 6;"WHILE I CREATE
 THE USER GRAPHICS"
9540 POKE 23606,0: POKE 23607,24
9
9550 FOR X=15616 TO 16383: POKE
X+48384,PEEK X: NEXT X
9560 RESTORE 9600: FOR X=64128 T
O 64207: READ Y: POKE X,Y: NEXT
X
9570 FOR X=64264 TO 64471: READ
Y: POKE X,Y: NEXT X
9580 FOR X=USR "A" TO USR "U"+7:
 READ Y: POKE X,Y: NEXT X

9590 REM DATA FOR CHARACTERS

9600 DATA 0,126,98,114,106,102,1
26,0
9605 DATA 0,56,24,Y,Y,Y,126,0
9610 DATA 0,126,6,126,96,Y,126,0
9615 DATA 0,126,6,126,6,Y,126,0
9620 DATA 0,14,22,38,70,126,6,0
9625 DATA 0,126,96,Y,126,6,126,0
9630 DATA 0,126,96,126,98,Y,126,
0
9635 DATA 0,126,6,6,12,24,48,0
9640 DATA 0,126,98,60,98,Y,126,0
9645 DATA 0,126,70,126,6,70,126,
0
9650 DATA 0,126,98,126,98,Y,Y,0
9655 DATA 0,126,98,124,98,Y,126,
0
9660 DATA 0,126,96,Y,Y,Y,126,0
9665 DATA 0,126,98,Y,Y,Y,126,0
9670 DATA 0,126,96,126,96,Y,126,
0
9675 DATA 0,126,96,126,96,Y,Y,0
9680 DATA 0,126,96,Y,110,98,126,
0
9685 DATA 0,98,Y,126,98,Y,Y,0
9690 DATA 0,24,Y,Y,Y,Y,Y,0
9695 DATA 0,6,Y,Y,Y,70,126,0
9700 DATA 0,100,Y,126,98,Y,Y,0
9705 DATA 0,96,Y,Y,Y,98,126,0
9710 DATA 0,126,106,Y,Y,Y,Y,0
9715 DATA 0,122,106,Y,Y,Y,110,0
9720 DATA 0,126,70,Y,Y,Y,126,0
9725 DATA 0,126,98,126,96,Y,Y,0
9730 DATA 0,126,98,Y,106,Y,126,0
9735 DATA 0,126,98,124,98,Y,Y,0
9740 DATA 0,126,96,126,6,Y,126,0
9745 DATA 0,126,24,Y,Y,Y,Y,0
9750 DATA 0,98,Y,Y,Y,Y,126,0
9755 DATA 0,98,Y,Y,Y,82,8,0
9760 DATA 0,106,Y,Y,Y,Y,126,0
9765 DATA 0,66,102,24,Y,102,66,0
9770 DATA 0,98,Y,126,24,Y,Y,0
9775 DATA 0,126,6,12,24,48,126,0
9780 DATA 96,240,248,252,255,Y,Y
,63
9785 DATA 0,Y,Y,Y,248,254,255,22
4
9790 DATA 0,3,12,48,198,48,12,3
9795 DATA 0,Y,3,12,48,12,3,0
9800 DATA 0,Y,Y,Y,Y,Y,85,0
9805 DATA 60,126,219,Y,126,60,66
,129
9810 DATA 1,2,4,8,16,32,64,128
9815 DATA 128,64,32,16,8,4,2,1
9820 DATA 0,Y,Y,Y,Y,60,66,129
9825 DATA 0,Y,Y,24,Y,0,Y,Y
9830 DATA 0,Y,60,36,Y,60,0,Y
9835 DATA 0,126,66,Y,Y,Y,126,0
9840 DATA 255,129,Y,Y,Y,Y,Y,255
9845 DATA 32,132,16,1,72,2,16,12
9
9850 DATA 0,Y,Y,3,Y,0,Y,Y
9855 DATA 0,Y,Y,192,Y,0,Y,Y
9860 DATA 0,Y,63,64,Y,63,0,Y
9865 DATA 0,Y,252,2,Y,252,0,Y
9870 DATA 3,12,112,129,Y,112,12,
3
9875 DATA 192,48,14,129,Y,14,48,
192
9880 DATA 0,Y,Y,Y,Y,119,0,Y
9970 DIM S$(5,12): DIM S(5): FOR
 X=1 TO 5: LET S$(X)="ZX SPECTRU
M": NEXT X
9980 POKE 23658,8
9990 DIM D(6): LET D(1)=-2: LET
D(2)=2: LET D(3)=-1: LET D(4)=1:
 LET D(5)=-3: LET D(6)=3
9999 RETURN
```

NB: REPLACE LINE 1155 WITH:-

```
1155 IF (LA=2 OR LA=3) AND LD=OS
D THEN LET SD=OSD: GO SUB 3000:
GO TO NEXT
```

USER DEFINED GRAPHICS ARE:-

A=▙ B=▟ C=◀ D=◁ E=▁ F=▚ G=/ H=\

I=^ J=• K=▫ L=□ M=▣ N=▒ O=· P=▻

Q=⊂ R=⊃ S=◀ T=▷ U=–

Financial wizards . . .

***Tony Bridge** takes a look at the range of Spectrum programs available for small businesses*

By its very nature, the Spectrum is not a business machine. If your particular interest in using a micro is to help a company of 200 employees or more, you can safely move on and up a couple of thousand pounds.

The Microdrive, when it finally appears (soon, soon, say Sinclair) will enable the Spectrum to be used properly by businesses, but until then the machine is really only of use to the very small business. And for small business applications, there are myriad programs.

One of the most successful is *Visicalc*, which has become a generic title for financial "spreadsheet" programs. The term is a good indication of what these programs actually do.

Imagine you are the owner of a small restaurant. You know that if you spend a certain amount on food each week you can make so many meals, and thus earn so much money. What happens if you were to spend another £20 on your weekly spree? How many more meals would you be able to prepare, and thus how much more revenue would you create? What would be be the result of extending your premises to include another 10 tables?

You could, of course, just get a piece of paper and a pencil, and write all the figures down. Being a Spectrum owner, however, there is another course open to you, and that is to *Load* into your computer a spreadsheet program. This will, after some initial setting-up, produce a picture of all the effects on your original model of varying figures.

The Spectrum is well-served in this area — Sinclair, with the aid of Psion, have a spreadsheet package on the market, in competition with several others. How do they all compare?

Psion is well-known now as the producer of the Spectrum demonstration tape *Horizons* and *Hungry Horace*, *Flight Simulation*, etc. *Vu-Calc* is its contribution to the financial software scene, and comes with detailed documentation, albeit only on the cassette inlay.

Vu-Calc comes complete with an example which should definitely be looked at before *Loading* the main program. The layout is similar to the mainframe programs; that is, several rows and columns which may be filled with text and numerical data, thus building up a matrix of boxes.

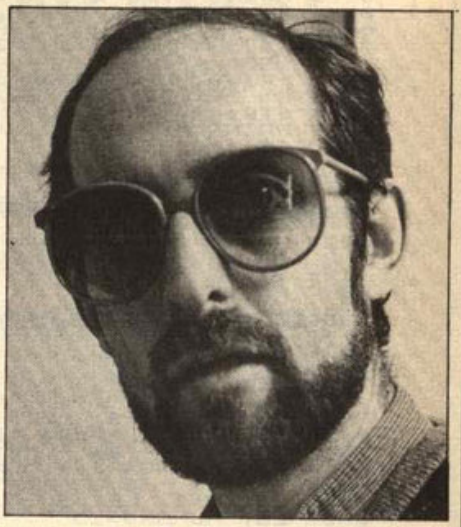
In *Vu-Calc*'s case, the rows run from A to Z, through AA to AZ and on to BH. The columns are numbered 1 to 60 — these figures are for the 48K machine, they will be less for the smaller machine. You may place text wherever you like within the matrix — a simple example will consist of headings such as Sales, Rent, and Profit along the top of the matrix, and maybe the months of the year making up the rows.

Numerical data may now be input. Only four columns of 18 rows each may be seen on-screen at any one time, but the red cursor which marks your present position may be moved to the edge of the screen, upon which the whole display moves in the desired direction. You can thus cover the whole matrix very quickly.

Once your data has been entered, the real power of a spreadsheet program can be explored. It's no good having all these figures just sitting there doing nothing — the benefit of a program like this is in the manipulation of such data.

The program uses formulae defined by the user to work on the figures. A simple example might be to invoke a formula to add box one to box two, and display the result on box three. In *Vu-Calc*, this formula can easily be repeated throughout the whole matrix, row by row and column by column.

By moving the cursor around the boxes, the formula relevant to each box is displayed, then one or more of your figures can be amended, and the result of such an alteration instantly calculated at your command.



I found the program easy to work, but I would have liked a *Help* page at certain moments. As it stands, a short summary of commands is displayed as required, but these are infuriatingly meagre. Also, it is very easy to lose your carefully-typed data, and although one has to select the option to clear the program, I feel that there should be one more chance to return to the data sheet. In the main, however, a useful program.

Running out of memory!

Matcalc comes from Workforce with the usual detailed, Epson'd documentation. This spreadsheet is a little more difficult to use than *Vu-Calc*, but comes complete with two excellent and informative sets of example data, so that you may see the effects of real figures on the program. Unfortunately, there is no display to start with as in *Vu-Calc*, and you have to work on entering the data with no visual feedback. It is essential, therefore, to work out your matrix requirements before starting to input data at the keyboard.

Matcalc will ask you for your matrix (row/column) requirements before you start, and there is a distinct advantage here over Psion's fixed grid. In this way, you will not find yourself running out of memory near the end of an exhausting session of entering data.

Once all your figures are in *Matcalc*'s memory, and the formulae set to your requirements, the matrix, complete with data and calculations, is displayed. A choice of 64 numerals per line, or the Spectrum's more usual 32 per line, is available.

Bear in mind that you will have to wait for the display to be printed each time you amend your data. This is where the conventional *Vu-Calc* scores over *Matcalc* — data can be seen instantly on-screen. However, Workforce's program is far more flexible overall than Psion's.

From Saxon Computing comes *Flexicalc*. Again, the program is accompanied by clear and detailed documentation,

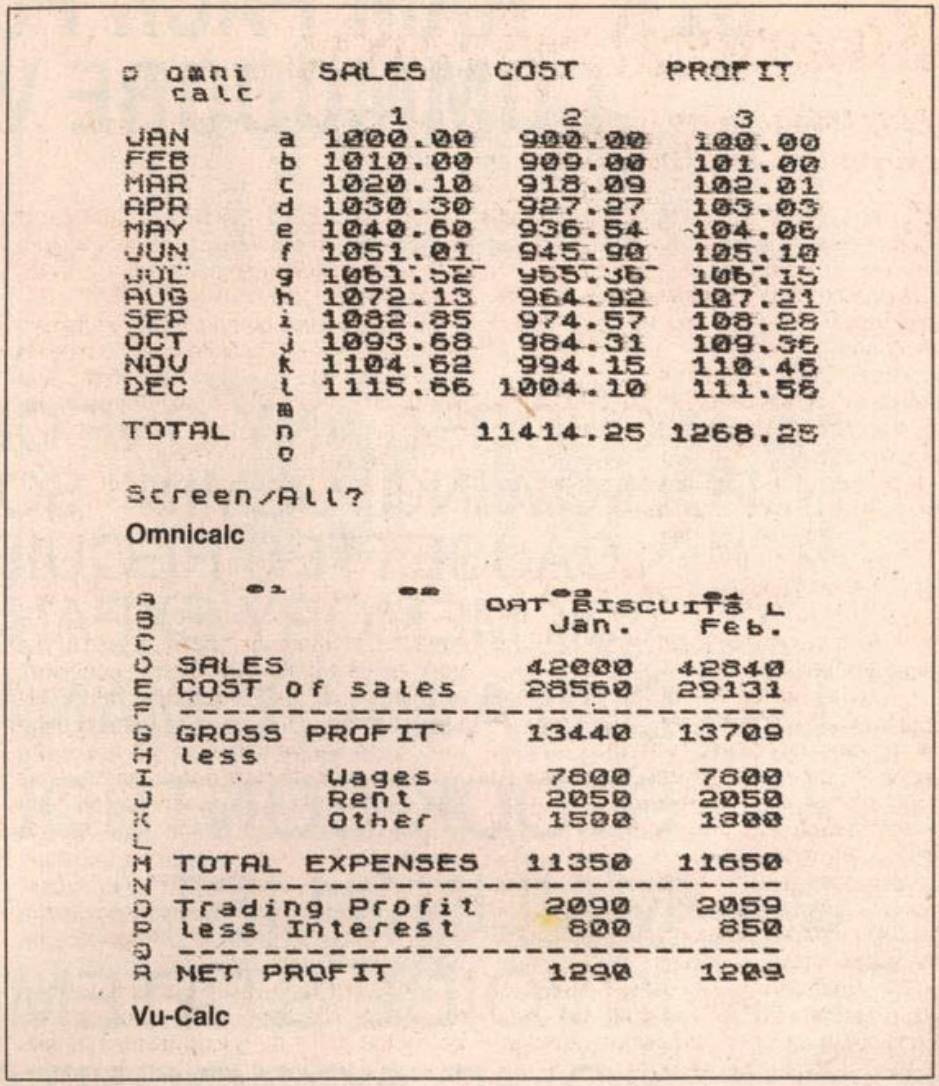
which is a necessity for these financial packages.

Saxon claims that *Flexicalc* is "the most versatile of spreadsheet programs available for the Spectrum". Well, like *Matcalc*, this program will allow you to dictate the size of matrix you wish to work in, and like *Vu-Calc*, formulae may be changed and edited at will.

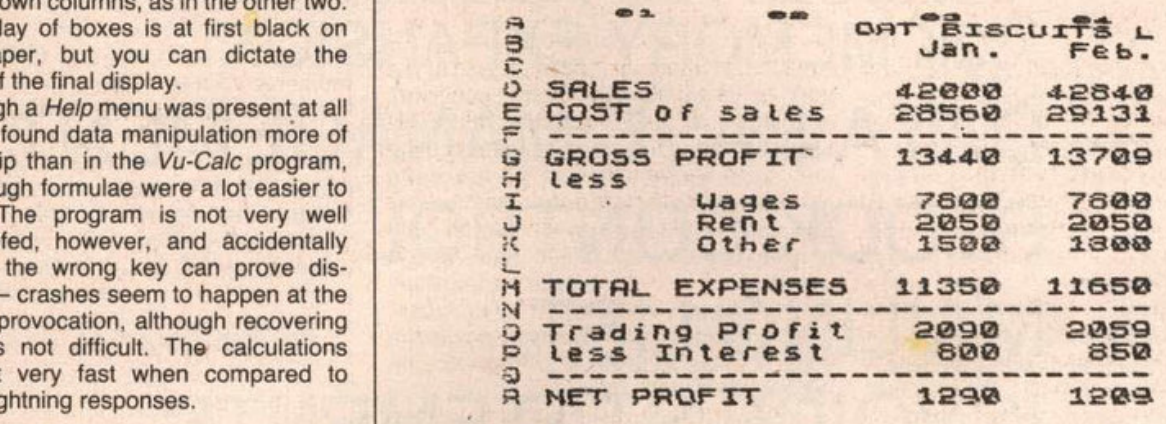
The section in the documentation referring to the construction of formulae is a lot easier to understand than either of the other two, and is actually a pleasure to read through. The formulae work relatively; the box currently being worked on is always box 000, regardless of its actual position in the matrix. This makes the business of devising formulae much easier than with *Vu-Calc* or *Matcalc*.

The *Copy Across* or *Copy Down* function allows you to repeat formulae across rows or down columns, as in the other two. The display of boxes is at first black on white paper, but you can dictate the colours of the final display.

Although a *Help* menu was present at all stages, I found data manipulation more of a hardship than in the *Vu-Calc* program, even though formulae were a lot easier to handle. The program is not very well idiot-proofed, however, and accidentally pressing the wrong key can prove disastrous — crashes seem to happen at the slightest provocation, although recovering control is not difficult. The calculations were not very fast when compared to Psion's lightning responses.



Omnicalc



Vu-Calc

However, Saxon provides an extremely good after-sales service with *Flexigen*, which formats the whole of your matrix to the printer in such a way that you can cut up the various strips and paste them all together to make up one large report. This comes together with a *Consolidation* program for £6.95. As a complete financial spreadsheet package, the three programs are excellent value.

Microsphere is a newly-formed company that has a number of interesting-looking programs available. They have graced the spreadsheet world with *Omnicalc*.

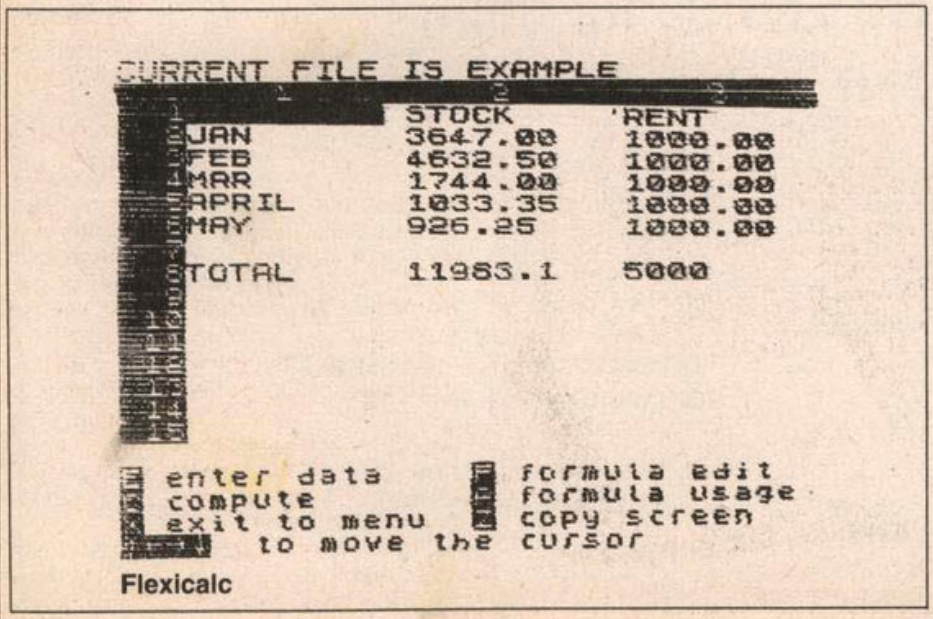
As with *Matcalc*, the user specifies his particular requirements for the matrix, dictating the number of rows and columns, before work begins. The manual is by far the best, being written for the completely computer-naive, and not assuming prior knowledge of this type of program. A five-page example comes first, and this will take you painlessly through the secrets of *Omnicalc*.

Text and data input is largely the same as the other programs, with the text or figures being displayed in the matrix. There are, however, one or two important differences. First, whenever a function is selected, a letter appears top-left to show you exactly what mode you are currently in. Next, room is allocated around the matrix for text only, such as headings, categories and so on.

Type in *Jan* (for January) at Row 1, then "*Y*" (for Year), and the computer will instantly respond by filling the labels of the next eleven rows with the remaining months of the year. Of course, you don't have to have months as a label, but that is a frequent requirement for this type of program.

In the borders surrounding the boxes, only text and/or numbers may be written, but move the cursor into a box, and the program will allow text values (ie, straight numeric values), blanks, or equations (or formulae). This is the easiest program of all to use, I feel — not only does the manual contain detailed information on all

Continued on page 17



Flexicalc

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Continued from page 15

the available functions, but formulae are extremely easy to implement. Any mistaken key presses can be recovered from by pressing *Edit*.

Which spreadsheet for you? All the programs under review do their job well, and all have detailed and helpful documentation. However, I found the *Omnicalc* from Microsphere the easiest to work on and become familiar with.

But maybe the spreadsheet idea as implemented in these Calc-type programs is not for you. There are several titles available of a more specific nature. One of these is *Modellerx*, from CCS, otherwise well-known for its management games. The program has two applications — to aid managers in making financial forecasts and thus decisions based on the projections, and secondly, as a training aid for management trainees.

The manual is very detailed and the manipulation of data is similar to the spreadsheets we have already looked at. That is, once the model is set up, the user can see the effect on the whole pattern, by changing just one piece of data.

The first stage is to input various market factors — such as effectiveness of advertising and salesmen, sales targets, market demands, etc, and then the variable data may be introduced.

Worthy of consideration

This data will take the form of advertising costs, showroom and office costs and all the other factors involved in running a financial business. Change one and all the others will be affected in some way. Four models may be set up at one time so that the differences between various sets of data can be compared on screen.

We've seen a spreadsheet from Saxon Computing, and now we come to their Numeric Database, *Figaro II*. A numeric database is a program to handle large quantities of numeric information. The program will arrange and manipulate the information into meaningful reports. To explain that, look at the example given in the excellent manual.

A chain of three shops acquires a new managing director, who, being very dynamic, asks for a forecast of sales in each shop for the next year, based on the last two years sales, together with a graph of each forecast and a table of the growth rate for each shop.

Once all the sales figures are entered, and this is very easy via an excellent display, graph plotting can begin. Several options are open to the user, such as barcharts, line graphs, or combinations of the two — and all in full colour hi-res colour graphics.

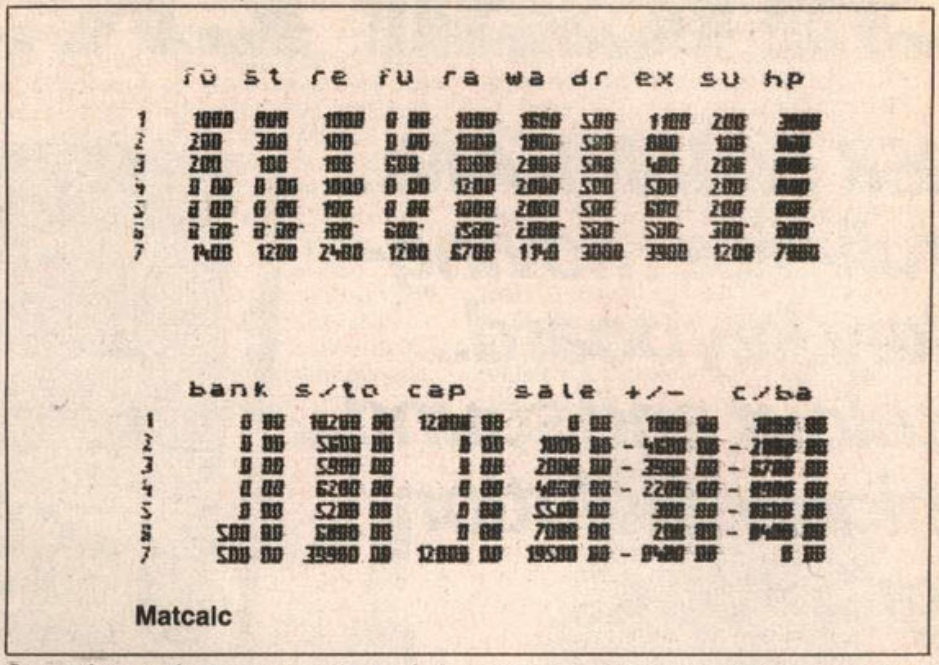
Unlike many financial programs, I feel, this program is worthy of consideration by the larger business. *Figaro* is completely error-trapped and the microdrive will make it even more useful.

But maybe you do not run a business and would just like to know the state of your own bank account. One of the newer Personal Systems to arrive is from Forest Software. The *Personal Finance System* is "a maintenance of your current account with reconciliation to your bank statement". Up to 250 credit or debit entries are allowed, along with 30 standing orders. The program is fairly straightforward, with prompts all the way to guide you. An interesting point is the facility to see your future bank balance, based on past data, The documentation is only average, but for £4.95, what can you expect.

Richard Shepherd, known mostly for his adventure programs, has produced a program called *Multi-Function Cash Controller*. With this program you can keep track of eight budgets (gas, rent, electricity, etc) and then see, from your actual outgoings, how you have kept within — or overspent! — your budget. The program is fully menu-driven, and will guide you through the whole process.

Another facility keeps track of your bank account, complete with standing orders. As a bonus, there is a routine to take you through the complexities of a loan or mortgage — input any three of the parameters: principle, interest rate, repayment time, units of repayment, and the *Cash Controller* will calculate the fourth parameter for you.

That completes our look at financial packages for the Spectrum. There are obviously many programs available, and there will be many more available in the future — after all, number manipulation is exactly what all computers, small or large, PDP/11 or Spectrum, are good at. ■



Matcalc

Firm	Program	Cost
Microsphere Computer Services 72 Rosebery Road London N10	*Omnicalc*	£7.95
Saxon Computing 3 St Catherine Drive Leconfield Beverley Humberside	*Flexicalc* *Flexigen* *Consolidation* *Figaro II*	£6.95
Workforce 140 Willesden Avenue Luton Beds	*Matcalc*	£7.00
Psion 2 Huntsworth Mews London NW1	*Vu-Calc*	£8.95
CCS 14 Langton Way London SE3	*Modellerx*	£9.00
Forest Software 45 Southwold Bracknell Berks RG12 4XY	*Personal Finance System*	£4.95
Richard Shepherd 22 Green Leys Maidenhead Berks SL6 7EL	*Multi-function Cash Controller*	£10.00

Sinclair ZX Spectru

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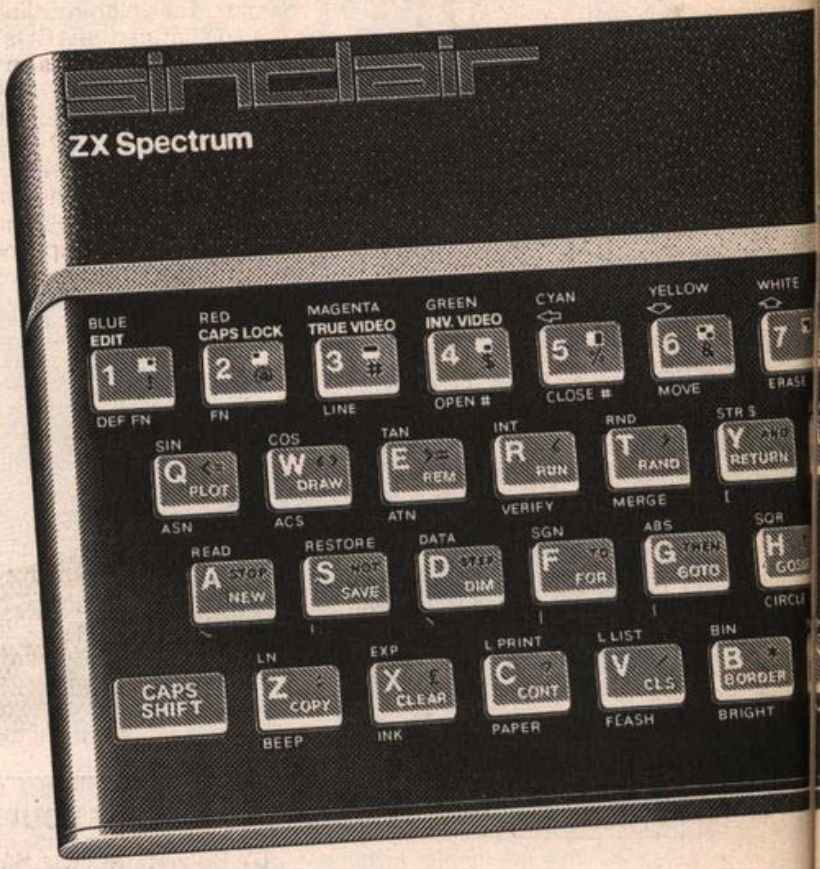

First, there was the world-beating Sinclair ZX80. The first personal computer for under £100.

Then, the ZX81. With up to 16K RAM available, and the ZX Printer. Giving more power and more flexibility. Together, they've sold over 500,000 so far, to make Sinclair world leaders in personal computing. And the ZX81 remains the ideal low-cost introduction to computing.

Now there's the ZX Spectrum! With up to 48K of RAM. A full-size moving-key keyboard. Vivid colour and sound. High-resolution graphics. And a low price that's unrivalled.

Professional power– personal computer price!

The ZX Spectrum incorporates all the proven features of the ZX81. But its new 16K BASIC ROM dramatically increases your computing power.

You have access to a range of 8 colours for foreground, background and border, together with a sound generator and high-resolution graphics.

You have the facility to support separate data files.

You have a choice of storage capacities (governed by the amount of RAM). 16K of RAM (which you can uprate later to 48K of RAM) or a massive 48K of RAM.

Yet the price of the Spectrum 16K is an amazing £125! Even the popular 48K version costs only £175!

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

Ready to use today, easy to expand tomorrow

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

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

There's no need to stop there. The ZX Printer – available now – is fully compatible with the ZX Spectrum. And later this year there will be Microdrives for massive amounts of extra on-line storage, plus an RS232 / network interface board.

Key features of the Sinclair ZX Spectrum

- Full colour – 8 colours each for foreground, background and border, plus flashing and brightness-intensity control.
- Sound – BEEP command with variable pitch and duration.
- Massive RAM – 16K or 48K.
- Full-size moving-key keyboard – all keys at normal typewriter pitch, with repeat facility on each key.
- High-resolution – 256 dots horizontally x 192 vertically, each individually addressable for true high-resolution graphics.
- ASCII character set – with upper- and lower-case characters.
- Teletext-compatible – user software can generate 40 characters per line or other settings.
- High speed LOAD & SAVE – 16K in 100 seconds via cassette, with VERIFY & MERGE for programs and separate data files.
- Sinclair 16K extended BASIC – incorporating unique 'one-touch' keyword entry, syntax check, and report codes.

rum

ZX Spectrum software on cassettes – available now

The Spectrum software library is growing every day. Subjects include games, education, and business/household management. Flight Simulation...Chess...Planetoids...History...Inventions...VU-CALC...VU-3D ...Club Record Controller...there is something for everyone. And they all make full use of the Spectrum's colour, sound, and graphics capabilities. You'll receive a detailed catalogue with your Spectrum.

ZX Expansion Module

This module incorporates the three functions of Microdrive controller, local area network, and RS232 interface. Connect it to your Spectrum and you can control up to eight Microdrives, communicate with other computers, and drive a wide range of printers.

The potential is enormous, and the module will be available in the early part of 1983 for around £30.

sinclair

Sinclair Research Ltd, Stanhope Road, Camberley, Surrey GU15 3PS.
Tel: Camberley (0276) 685311.

The ZX Printer – available now

Designed exclusively for use with the Sinclair ZX range of computers, the printer offers ZX Spectrum owners the full ASCII character set – including lower-case characters and high-resolution graphics.

A special feature is COPY which prints out exactly what is on the whole TV screen without the need for further instructions. Printing speed is 50 characters per second, with 32 characters per line and 9 lines per vertical inch.

The ZX Printer connects to the rear of your ZX Spectrum. A roll of paper (65ft long and 4in wide) is supplied, along with full instructions. Further supplies of paper are available in packs of five rolls.

The ZX Microdrive – coming soon

The new Microdrives, designed especially for the ZX Spectrum, are set to change the face of personal computing by providing mass on-line storage.

Each Microdrive can hold up to 100K bytes using a single interchangeable storage medium.

The transfer rate is 16K bytes per second, with an average access time of 3.5 seconds. And you'll be able to connect up to 8 Microdrives to your Spectrum via the ZX Expansion Module.

A remarkable breakthrough at a remarkable price. The Microdrives will be available in the early part of 1983 for around £50.

How to order your ZX Spectrum

BY PHONE – Access, Barclaycard or Trustcard holders can call 01-200 0200 for personal attention 24 hours a day, every day. BY FREEPOST – use the no-stamp needed coupon below. You can pay by cheque, postal order, Access, Barclaycard or Trustcard.

EITHER WAY – please allow up to 28 days for delivery. And there's a 14-day money-back option, of course. We want you to be satisfied beyond doubt – and we have no doubt that you will be.

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	Sinclair ZX Spectrum – 16K RAM version	100	125.00	
	Sinclair ZX Spectrum – 48K RAM version	101	175.00	
	Sinclair ZX Printer	27	59.95	
	Printer paper (pack of 5 rolls)	16	11.95	
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Chequed and banked . . .

***S Brown** presents a personal accounts program for the 16K Spectrum.*

I wrote this program for my own needs, as I found it annoying searching through my chequebook stubs to check my account with the bank's monthly statement. With this program the cheques are listed in order, making particular transactions easier to find.

When Run, the program asks for the user's account number (when typing in the program, the user should insert his own number in place of the *X*s in lines 60 and 1230 — in line 1240 the *O*s serve as the bank's area code). If a wrong account number is entered, the program *News* itself after flashing *Incorrect data*. A correct number displays a menu.

The menu allows the user to *Save* on tape, start afresh, debit/credit or display the account. The account is printed like a bank statement with 14 transactions listed. User prompts are at the bottom of the page — asking if the display is to be printed or continued. At the end of the file, a return to the menu is requested.

A particular transaction may be found quickly by giving either the date or details of the transaction. If the transaction is not found, the user is asked to try again or return to the menu. Once found, the transaction is printed at the top of the account display.

Crediting/debiting the account is simple. The user prompts ask for the date, details and amount, which is then printed and checked by the user. If correct, the information goes to up-date the account.

The program also keeps the date and balance part of the display in line; ie, the balance is printed with the decimal points in order.

The program should be easy to convert to other computers — those with a larger memory than 16K could possibly add other features, such as automatic debiting or standing orders.

Notes

1-5	DIM variables, a$ stores the date. t(n,1) stores the amount credited or debited; t(n,2) stores the balance; b2 calculates the new balance (starts as zero).
20-40	Sets INK colour and introduces program.
50-60	INPUT users own account number, if wrong NEWs the program.
60	The 'X's are for the user to insert his own account number.
80-130	Displays the menu.
135	Sets variable Z to zero, Z is used during the program sp the computer knows which part of the program is being performed (see line 830).
140-190	Awaits users INPUT.
200	Acts as a Mugtrap.
215	Variable P is to check if the screen is full.
220	FOR-NEXT loop using N as the counter.
230	Checks if t(n,1) is zero, if so then there are no more entries left in the file.
240	If line 230 was zero then GOSUB 1270 DRAWS borders around the display.
250	On return from line 240 a user prompt is displayed.
260	GOTO 400 sends the program to ask for user INPUT ie: Printout or menu.
270	Checks if variable P + 14 = N if so then the screen is full.
272-278	e is set to temporarily store the present balance. In a FOR-NEXT loop each letter in the string is tested to find '.', once found a space is added before the string. This ensures the decimal points are printed in line.
280	PRINTS the files contents ie; DATE DETAILS DEBIT BALANCE v$(n) a$(n) t(n,1) e$ or t(n,2)
300	Sends the computer to DRAW a border around the display.
310	PRINTS a user prompt.
400-440	Awaits user INPUT.
460-490	FOR-NEXT loop to clear the display ready for the next part of file display.
500	Sets P equal to N to ensure next time round the display has only 14 lines to it.
520	Makes printout of the display.
530	Sends the computer back to the user prompt.
550-570	Menu for displaying particular account.
580-610	Awaits user INPUT.
640-678	FOR-NEXT loop comparing users date INPUT with memory, once found sends computer to display the account with the particular transaction at the top of the screen.
681-688	Performs same task as above but compares Details INPUT.
690	If Date not found then user prompt displayed.
700-730	Awaits user INPUT.
750-770	FOR-NEXT loop checking for the last account entry, once found the value of N is where the next transaction can be placed.
780	User prompt for Date.
800-820	FOR-NEXT loop to insert a space if needed before the date to ensure dates are printed in line.
830	Z is checked to find what part of the program is being performed ie; if greater than zero then the program is working on the section that displays a particular account, from line 540 onwards. If Z = 0 then the account is being credited or debited.
840	Lets v store the new date.
880	Checks Z again for above reason.
885	Lets a store transaction details.
890	User prompt.
900-920	Awaits user INPUT.
930	S$ stores INPUT from INKEYS answer.
940	User prompt.
950-1010	Amount debited/credited INPUTted and stored in t(n,1).
1020	Mugtrap.
1030-1050	Calculates new balance, from value of old balance b2.
1060	Stores new balance in t(n,2).
1065-1070	Displays new information INPUTted.
1080	User prompt.
1090-1100	Awaits user INPUT.
1103-1110	If the information displayed was incorrect then the balance is adjusted to read as before and the computer sent to line 780 for the user to reINPUT the information.
1120-1190	User prompts.
1230	The 'X's are for the user to insert his own account number.
1240	The 'O's are to insert the bank's area code number.
1250-1260	Displays the accounts heading.
1270	Sets INK colour to green.
1280-1310	DRAWS boundaries around the display.
1500	User prompt for tape storage.
1510	INPUT for file name storing it in e$
1520	Check length of string.
1530	User instruction.
1540	SAVES program and the line number from which the program will RUN when reloaded.
1550	User prompt.
1560	VERIFYS program.
1600-1610	User prompts.
1620	Resets variables by RUNning the program.

```
    1 DIM a$(70,8)
    2 DIM t(70,2)
    3 DIM v$(70,7)
    5 LET b2=0
    8 REM © S.BROWN MARCH 1983
   10 REM Personal Accounts,Menu
   20 INK 1: CLS
   30 PRINT AT 10,6;"PERSONAL ACC
OUNTS"
   40 PAUSE 75: CLS
   50 PRINT AT 10,0;"ENTER ACCOUN
T CODE NUMBER"
   55 INPUT a1
   60 IF a1=XXXXX THEN GO TO 80
   70 PRINT AT 10,0; INK 2; FLASH
 1;"          INCORRECT DATA
    ": PAUSE 125: NEW
   80 CLS : PRINT AT 5,0;"ENTER:"
: PAUSE 30
   90 PRINT '"1-TO CREDIT OR DEBI
T ACCOUNT": PAUSE 25
  100 PRINT '"2-TO DISPLAY ACCOUN
T": PAUSE 25
  110 PRINT '"3-TO DISPLAY KNOWN
TRANSACTION": PAUSE 25
  120 PRINT '"4-TO SAVE ON TAPE":
 PAUSE 25
  130 PRINT '"5-TO START FRESH AC
COUNT"
  135 LET z=0
  140 INPUT a
  150 IF a=1 THEN GO TO 740
  160 IF a=2 THEN GO SUB 1210
  170 IF a=3 THEN GO TO 540
  180 IF a=4 THEN GO SUB 1500: GO
 TO 80
  190 IF a=5 THEN GO TO 1600
  200 IF a<1 OR a>5 THEN GO TO 14
0
  210 REM Display actual account
  215 LET p=1
  216 PRINT
  220 FOR n=p TO 70
  230 IF t(n,1)<>0 THEN GO TO 270
  240 GO SUB 1270
  250 PRINT AT 21,0;"END OF FILE.
 0-PRINTOUT, M-MENU"
  260 GO TO 400
  270 IF p+14=n THEN GO TO 300
  272 LET e$=STR$ t(n,2)
```

```
 274 FOR w=1 TO 3
 276 IF e$(w)="," THEN LET e$="
"+e$
 278 NEXT w
 280 PRINT v$(n);TAB 8;a$(n);TAB
 17;t(n,1);TAB 24;e$
 290 NEXT n
 300 GO SUB 1270
 310 PRINT AT 21,0;"PRESS C-CONT
INUE, Q-PRINTOUT"
 400 IF INKEY$="" THEN GO TO 400
 410 IF INKEY$="m" OR INKEY$="M"
 THEN GO TO 80
 420 IF INKEY$="c" OR INKEY$="C"
 THEN GO TO 460
 430 IF INKEY$="q" OR INKEY$="Q"
 THEN GO TO 520
 440 GO TO 400
 450 FOR l=21 TO 4 STEP -1
 470 PRINT AT l,0;"
 480 BEEP 0.05,0
 490 NEXT l
 500 LET p=n
 510 GO TO 220
 520 COPY
 530 GO TO 400
 540 REM Display particular acco
unt
 545 CLS
 550 PRINT AT 5,0;"ENTER:": PAUS
E 30
 560 PRINT '"1-IF TRANSACTION DA
TE IS KNOWN": PAUSE 25
 570 PRINT '"2-IF DETAILS ARE KN.
OWN"
 580 INPUT z
 590 IF z=1 THEN GO SUB 780
 600 IF z=2 THEN GO SUB 850
 610 IF z<1 OR z>2 THEN GO TO 58
0
 620 CLS
 630 IF z=2 THEN GO TO 681
 640 FOR n=1 TO 70
 650 LET p=n
 660 IF v$(n)=d$ THEN GO SUB 121
0
 670 IF v$(n)=d$ THEN GO TO 216
 678 NEXT n
 680 GO TO 690
 681 FOR n=1 TO 70
 682 LET p=n
 684 IF a$(n)=k$ THEN GO SUB 121
0
 686 IF a$(n)=k$ THEN GO TO 216
 688 NEXT n
 690 PRINT AT 5,0;"DATA INPUT NO
T FOUND. PRESS T TOTRY AGAIN OR
M TO RETURN TO MENU"
 700 IF INKEY$="" THEN GO TO 700
 710 IF INKEY$="t" OR INKEY$="T"
 THEN GO TO 540
 720 IF INKEY$="m" OR INKEY$="M"
 THEN GO TO 80
 730 GO TO 700
 740 REM Credit/Debit Account
 750 FOR n=1 TO 70
 760 IF t(n,1)=0 THEN GO TO 780
 770 NEXT n
 780 CLS : PRINT AT 10,0;"ENTER
DATE (AS 3JAN62)"
 785 INPUT d$
 800 FOR W=65 TO 122
 810 IF D$(2)=CHR$ W THEN LET D$
=" "+D$
 820 NEXT W
 830 IF z>0 THEN RETURN
 840 LET v$(N)=D$
 850 CLS : PRINT AT 5,0;"ENTER D
ETAILS OF TRANSACTION     (ie.CHE
00332 OR STAORDER)"
 860 INPUT k$
 880 IF z>0 THEN RETURN
 885 LET a$(n)=k$
 890 PRINT AT 10,0;"IS TRANSACTI
ON A DEBIT OR CREDITPRESS D FOR
DEBIT OR C FOR       CREDIT"
 900 IF INKEY$="" THEN GO TO 900
 910 IF INKEY$="c" OR INKEY$="C"
 OR INKEY$="d" OR INKEY$="D" THE
N GO TO 930
 920 GO TO 890
 930 LET s$=INKEY$
 940 CLS : PRINT AT 10,0;"ENTER
AMOUNT CREDITED OR DEBITEDIN POU
NDS TO TWO DECIMAL PLACES,NO HAL
F-PENNIES (ie.£125.50)"
 950 INPUT "£";b
1010 LET t(n,1)=b
1020 IF s$="d" OR s$="D" THEN GO
 TO 1050
1030 LET b2=b2+b
1040 GO TO 1060
1050 LET b2=b2-b
1060 LET t(n,2)=b2
1065 CLS : PRINT AT 8,0;" DATE
 DETAILS  AMOUNT BALANCE"
1070 PRINT AT 10,0;v$(n);TAB 8;a
$(n);TAB 17;t(n,1);TAB 24;t(n,2)
1080 PRINT AT 15,0;"IS THE ABOVE
 CORRECT? Y FOR YES"
1090 IF INKEY$="" THEN GO TO 109
0
1100 IF INKEY$="Y" OR INKEY$="y"
 THEN GO TO 1120
1103 IF s$="c" OR s$="C" THEN LE
T b2=b2-b
1105 IF s$="d" OR s$="D" THEN LE
T b2=b2+b
1110 GO TO 780
1120 CLS : PRINT AT 10,0;"IS THE
RE ANY MORE ENTRIES TO BE MADE?
Y FOR YES"
1130 IF INKEY$="" THEN GO TO 113
0
1140 IF INKEY$="y" OR INKEY$="Y"
 THEN GO TO 1147
1145 GO TO 80
1147 CLS
1150 PRINT AT 10,0;"IS THE DATE
THE SAME AS BEFORE? Y FOR YES"
1160 IF INKEY$="" THEN GO TO 116
0
1170 IF INKEY$="y" OR INKEY$="Y"
 THEN GO TO 1180
1175 GO TO 740
1180 LET n=n+1
1190 GO TO 840
1210 REM Display Account
1220 CLS
1230 PRINT "      ACCOUNT NUMBER
    XXXXX"
1240 PRINT AT 0,20; INK 2;"0000"
1250 PRINT '" DATE   DETAILS  DE
BIT/ BALANCE"
1260 PRINT AT 3,17;"CREDIT"
1265 RETURN
1270 INK 4
1280 PLOT 0,140: DRAW 255,0: PLO
T 0,141: DRAW 255,0: PAUSE 20
1290 PLOT 60,8: DRAW 0,159: PAUS
E 20
1300 PLOT 132,8: DRAW 0,159: PAU
SE 20
1310 PLOT 188,8: DRAW 0,159: INK
 1
1320 RETURN
1500 CLS : PRINT AT 7,0;"ENTER N
AME OF FILE NOT EXCEEDINGTEN LET
TERS (ie.FEB1983)"
1510 INPUT "FILE NAME";e$
1520 IF LEN e$>10 THEN GO TO 151
0
1530 CLS : PRINT AT 10,10;"PLEAS
E WAIT"
1540 SAVE e$ LINE 10
1550 PRINT AT 10,0;"REWIND TAPE
AND PLAY TO VERIFY"'"IF TAPE LO
ADING ERROR OCCURS    ENTER 'RET
URN'"
1560 VERIFY e$: RETURN
1600 CLS : PRINT AT 10,5;"CLEARI
NG DATA BANKS": PAUSE 50
1610 PRINT AT 15,0;"STANDBY FOR
ACCOUNT No REQUEST": PAUSE 80
1620 IF a=5 THEN RUN
1650 GO TO 10
```

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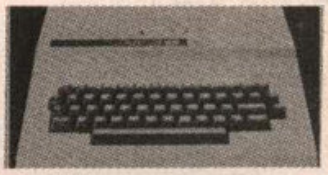

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Access BARCLAYCARD VISA

Screened for action!

***James Brennan** shows how to obtain a printed copy of the Vic20's Hi-res screen*

This program is a subroutine to produce a printed copy of the Hi-res graphics screen. The graphics should be completed before calling up the subroutine.

The super expander cartridge is used for the Hi-res graphics, and to help in the program with these two commands: *Rdot* — used to obtain the colour value of a dot on the screen, and is then compared with the background colour to see if it is part of a line. *Rcolr* — used to *Read* the colour contained in the colour register. *Rcolr*(0) — background colour.

The graphics screen is a matrix of 1024 by 1024 pixels. This program divides these pixels into blocks 28 by 28, which represent the printer head matrix of 7 by 7. Each block is then subdivided into columns 4 pixels wide.

Each column is looked at 4 pixels at a time, and if the colour value is not the same as the background, then its binary value is calculated. The final column value (+128) is then placed in a string array using *Chr*$, until the whole block has been read. It is then programmed into the printer.

The main program is suitable for graphs, etc, but because it prints out a square copy it distorts circles, etc. The three amendments to the program allow circles to be printed out correctly. They take into account the 70 per cent adjustment used when drawing circles.

Notes

10020	Open printer channel.
10060	Divide matrix into blocks 28 by 28.
10100	Divide blocks into rows 4 deep.
10120	Divide rows into columns 4 wide.
10130	Read colour value of each unit.
10150	Compare colour with screen colour.
10170	Calculating binary value.
10200	Program into printer head.
10220	Print out character **.
10240	Return at end of line.
10260	Close printer channel.

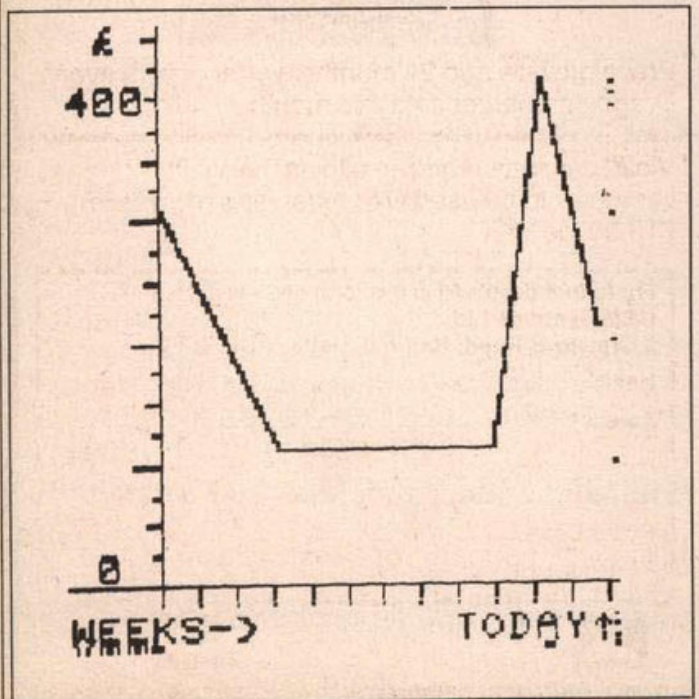
NB. The printer prints out in bursts because it only prints when the data buffer is full.

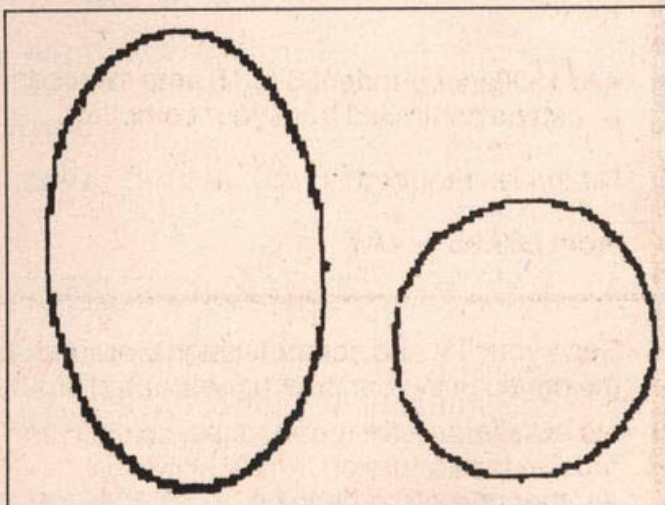
```
10000 REM********** HI-RES PRINT OUT *****
      *****
10010 REM***** OPEN PRINTER CHANNEL *****
10020 OPEN4,4
10030 REM***** SPLIT PIXELS INTO BLOCKS
      OF 28 BY 28 ******
10040 REM*** TO REPRESENT THE PRINTER HEAD
      MATRIX ***
10050 FORJ=0TO1023STEP28
10060 FORI=0TO1023STEP28
10070 A$=""
10080 REM***** SPLIT EACH BLOCK INTO
      UNITS 4BY 4 *****
10090 REM*** TO REPRESENT EACH PIN ON THE
       PRINTER HEAD ***
10100 FORX=0TO24STEP4
10110 Z=0
10120 FORY=0TO24STEP4
10130 R=RDOT(I+X,J+Y)
10140 REM***** IF UNIT VALUE IS 0 THEN GO TO
      NEXT UNIT ****
10150 IFR=RCOLR(0)THEN10180
10160 REM***** CALCULATE BINARY VALUE OF THE
      UNIT ****
10170 Z=Z+(2↑(Y/4))
10180 NEXTY
10190 REM***** PROGRAM PRINTER HEAD ****
10200 A$=A$+CHR$((Z+128))
10210 NEXTX
10220 PRINT#4,CHR$(8)A$;
10230 NEXTI
10240 PRINT#4
10250 NEXTJ
10260 PRINT#4:CLOSE4
10270 RETURN

READY.
```

PRINTING CIRCLES ETC.

AMEND THE PROGRAM AS FOLLOWS

```
10050 FORJ=0TO1023STEP49
10120 FORY=3TO45STEP7
10170 Z=Z+(2↑((Y-3)/7))
```





A circle printed using the normal program.

The same circle printed using the line changes

A random sample. . .

***Boris Allan** presents a program to assist in the sampling of distributions and the drawing of histograms*

In statistics, one of the most important items we have to learn is that of sampling distributions. In the presentation of statistics, one of the most important items is that of the drawing of histograms. *Stanorm* tries to assist in both these areas.

The Central Limit Theorem effectively states that (providing there are sufficient) the adding of random values will produce a normal distributed value. As the mean is little more than the summation of random values (which is why we have *random* sampling), this is why the mean is taken to have a normal distribution (ie, a sampling distribution which is 'Normal' or Gaussian).

The Law of Large Numbers tells us that the greater the number of summed values we examine, the closer the resulting distribution will be to the ideal (of a normal distribution). This program allows these views to be examined.

The accuracy of the Central Limit Theorem is checked via function *Fnnormal* (x): six random values (from 0 to 1) are added to the constant 6, and six random values (0 to 1) are subtracted (the result is *V*). I could have added twelve random values, and not bothered with the constant 6, but by inverting half of the random values, randomness is increased. If the Central Limit Theorem is correct, this should produce an almost perfectly normally distributed variable.

The normal variates produced by *Fnnormal* are used in *Procsample* (*Num, Cat*), where *Num* is a parameter which gives the number of quasinormal deviates to be examined, and *Cat* gives the number of categories into which the values are to be grouped (in array *V*). Line 510 gets a normal deviate; collects the sum in *Mean*, and the sum squares in *SD*; and adds 1 to the number in the correct category of array *V* (ie, *V*(*J*)).

After all the values have been allocated, the size of the largest category is held in V(0) (line 520), and finally the mean and standard deviation are calculated (the mean has the value 6 subtracted). For a perfect normal distribution, the mean should be 0.0 and the standard deviation should be 1.0.

The program splits the screen at line 26 on the screen after the initial information has been requested, partly so that the cursor does not interfere with the display, and mainly so that the mean and deviation can be output under the graphics. This division is accomplished by *Procinit*.

After setting the foreground colour to 2, and the background to 129 (yellow print, red background, in mode 1), the screen is cleared. The size of sample (ie, number of observations) and the total number of categories are then requested, and the text window is set from line 26 on the screen to line 30 (program line 630). If the mode is changed from 1 to 5 (the other four colour mode, and one which can be used for Model A), the *VDU* command becomes:

```
630 VDU 28, 0, 30, 19, 26
```

and the mode has to be altered in line 210. Though mode 5 does work, the resolution is inferior to that of mode 1, and the effect is not as convincing: in fact, it might be preferable to change *Procfreq* to a dummy procedure.

The actual histogram, and frequency polygon, are produced by *Prochist* (*Lower, Upper, Number*): where *Lower* gives the height of the histogram's base (as a Y co-ordinate), and *Higher* gives the maximum co-ordinate allowed for the histogram; and the third parameter gives the *Number* of categories (note that this makes *Prochist* quite general, and can be used in other programs).

The histogram is designed to fit between horizontal co-ordinates 39 and 1239, with a bar width (*Wl*) of 1200/*Number*. The base of the histogram is at *Lower* and the maximum is at *Upper*.

The bars in the histogram are drawn by *Procbar*, and the frequency polygon is drawn by *Procfreq* (line 700 can be omitted in mode 5). *Procbar* (*A,B,C,D*) draws bars by changing the graphics window, making the graphics colour 131 (ie, white), and then clearing the window with that colour: thus appearing to draw a bar of white. *Procfreq* plots from the middle of the top of each bar to the middle of the next, and is quite general in use.

★*FX 15, 0* clears the input buffer, so that idle doodling does not cause the results to disappear off the screen (in the text window at the bottom); and line 260 merely formats the output of the mean and standard deviation to three decimal places, then resetting the formatter. ■

```
LIST
  100REM----------------------------------------
  110REM
  120REM SAMPLING DISTRIBUTION FOR
  130REM STANDARD NORMAL CURVE
  140REM
  150REM
  160REM (C) BORIS ALLAN, 1983
  170REM
  180REM
  190REM----------------------------------------
  200REM----------------------------------------
  210MODE1
  220PROCINIT
  230PROCSAMPLE(SIZE,CATS)
  240PROCHIST(300,700,CATS)
  250*FX15,0
  260@%=&01020307:PRINT'"MEAN IS ";MEAN"    SD IS ";SQR(SD)':@%=10
  270END
  280REM----------------------------------------
  290REM----------------------------------------
  300DEF PROCBAR(A,B,C,D) : REM DRAWS A BAR FOR HISTOGRAM
```

```
  310LOCAL a,b,c,d
  320a=A:b=C:c=A+B:d=C+D
  330VDU 24,a;b;c;d;
  340GCOL0,131
  350CLG
  360ENDPROC : REM BAR
  370REM----------------------------------------
  380REM----------------------------------------
  390DEF PROCFREQ(X,INC,NUM,BASE,ROOF) : REM FREQUENCY POLYGON
  400LOCAL I,H:H=ROOF-BASE: VDU 24,0;0;1279;1023;:PLOT4,X,(BASE+H*(V(1)
/V(0)))
  410GCOL0,0
  420FORI=2TO NUM:PLOT5,X+INC*(I-1),H*V(I)/V(0)+BASE:NEXTI
  430ENDPROC : REM FREQ
  440REM----------------------------------------
  450REM----------------------------------------
  460DEF FNNORMAL(X):LOCALV,I: V=6:FORI=1TO 6:V=V+RND(1)-RND(1):NEXTI:
=V : REM NORMAL DEVIATE 0 MEAN, 1 SD
  470REM----------------------------------------
  480REM----------------------------------------
  490DEF PROCSAMPLE(NUM,CAT) : REM TAKES A 'SAMPLE' OF SIZE NUM, AND
COLLECTS THE RESULTS IN CAT CATEGORIES
  500LOCALI,J:MEAN=0:SD=0
  510FOR I=1TO NUM: J=FNNORMAL(I):MEAN=MEAN+J:SD=SD+J*J:J=INT(J*CAT/
12+1):V(J)=V(J)+1:NEXTI
  520FORJ=1TO CAT:V(J)=V(J)/NUM:IF V(0)<V(J) V(0)=V(J)
  530NEXTJ
  540MEAN=MEAN/NUM:SD=SD/NUM-MEAN*MEAN:MEAN=MEAN-6
  550ENDPROC : REM SAMPLE
  560REM----------------------------------------
  570REM----------------------------------------
  580DEF PROCINIT : REM FINDS SAMPLE SIZE AND NUMBER OF CATEGORIES
  590COLOUR2:COLOUR129:CLS
  600PRINT'''"SAMPLE DISTRIBUTIONS "
  610INPUT'"SIZE OF SAMPLE "SIZE
  620INPUT"CATEGORIES ARE "CATS:DIMV(CATS)
  630VDU28,0,30,32,26
  640ENDPROC : REM INIT
  650REM----------------------------------------
  660REM----------------------------------------
  670DEF PROCHIST(LOWER,UPPER,NUMBER) : REM PRODUCES HISTOGRAM AND
FREQUENCY POLYGON
  680LOCALI,ST,WI,HI:ST=39:WI=1200/NUMBER:HI=UPPER-LOWER
  690FORI=1TO NUMBER:PROCBAR(ST+(I-1)*WI,WI,LOWER,HI*(V(I)/V(0))):NEXTI
  700PROCFREQ(ST+WI/2,WI,NUMBER,LOWER,UPPER)
  710ENDPROC : REM HIST
  720REM----------------------------------------
```

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Another dimension . . .

***Joseph Burr** shows how a Spectrum program can be modified to draw 3-D graphics for the Dragon.*

Ian Reynolds presented a program to draw 3D graphics on the ZX Spectrum (*Popular Computing Weekly*, 10th September, 1982). The following is a modification of that program for the **Dragon 32**.

The program draws a three dimentional view of any formula the computer is given to process. The plot is as if the formula was started in the centre of the grid and rotated through the 360 degrees of a circle.

Program notes

Line(s)	
50 to 160	These lines set up the grid on which the design is plotted.
170 to 180	This portion of the program holds the picture on the screen until the space bar is pressed.
170	Prevents the screen clearing if the space bar was accidentally pressed.
200 to 380	This section 'moulds' the shape of the formula on to the grid.
220	This line holds the formula to be plotted.
260 and 280	These lines make sure the formula is plotted starting from position 150 down the screen.
290 and 300	These lines prevent the plot leaving the screen limits.

Making up your own formulae

If you wish to experiment the best functions to use are those involving sines (*Sin*) and cosines (*Cos*) of the 'active' variable Q, as these give interesting wave formations. Tans (*Tan*) and exponentials (*Exp*) are more difficult to use, but with careful working interesting shapes from formulae involving these functions and others (squares (r2), square roots (*Sqr*), logs (*Log*), and arctans (*Atn*)) can be written.

If the 'bumps' are too high, divide the original formula by a 'suitable' figure to bring the plot down. If the 'bumps' are too low, the values of Q can be multiplied by a 'suitable' value to increase the height of the plot. These values are best found by experiment. If you wish to invert the display on the screen add a minus sign to the front of the formula.

The program takes between 10 and 20 minutes to draw out the completed diagram depending on the formula in line 220.

Working formulae

```
COS(Q*2)/6
♦SIN(Q*3)+(Q)/4
COS(TAN(Q/15)-SIN(Q*2))

-SIN(Q*4)/6
SIN(Q*3)+COS(Q)/4
(-EXP(Q/3)-EXP(Q))/70
```

```
10 DIMN(250,2)
20 PMODE4,1:PCLS:SCREEN1,1:LETK=1
30 FORX=1TO250:LETN(X,2)=255
40 NEXTX
50 FORX=-50TO50STEP5
60 LETD=X:A=50-ABS(X)
70 FORY=-70TO70
80 E=70-ABS(Y)
90 GOSUB200:NEXTY
100 IFX=50THENGOTO170
110 FORD=X+1 TO X+4
120 LETA=50-ABS(D)
130 FORY=-70TO70STEP5
140 LETE=70-ABS(Y)
150 GOSUB200
160 NEXTY,D:NEXTX
170 FORA=1TO6:LETA$=INKEY$:NEXTA
180 IFINKEY$<>" "THENGOTO180
190 STOP
200 LETQ=A*E/800
210 LETH=D+Y+121
220 LETQ=(-EXP(Q/3)-EXP(Q))/150
230 LETQ=191-INT(80+D-Q*80)
240 IFX=-50THENLETN(H,2)=Q
250 IFQ<=N(H,1)THENGOTO330
260 IFK=1THENLETV=150-Q:K=0
270 LETN(H,1)=Q
280 LETQ=Q+V
290 IFQ>191THENLETQ=191
300 IFQ<0THENLETQ=0
310 PSET(H,Q,5)
320 RETURN
330 IFX=-50THENGOTO350
340 IFQ>=N(H,2)THENRETURN
350 LETN(H,2)=Q
360 GOTO280
```

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Partial screen clear

on Spectrum

This is a machine code program for the ZX Spectrum which allows you to clear part of the screen.

Unfortunately, because of the way the Display File is arranged, it is only possible to clear blocks of eight lines, so you can clear the top eight lines, the middle eight lines, the bottom eight lines or any combination of the three. By altering the second number in the data it is possible to fill the screen. This number is used like the numbers in user definable graphics so if you change the 0 to 255 it will fill the screen with a solid black square.

The Z80 Mnemonics are as follows:

Ld C,0	14,0
Ld HL,"start"	33,0,64
Ld DE,"limit"	17,0,88
Ld (HL),C	113 — Loop
INC HL	35
Ld A,D	122
SUB H	148
JRNZ Loop	32,250
Ld A,E	123
SUB L	149
JRNZ Loop	32,246
RETURN	201

As the program stands it will clear the complete screen so to clear part of the screen change the numbers underlined. To clear the top third only change the 88 to 72, to clear the bottom third change the 64 to 80 and to clear the middle third change the 64 to 72 and the 88 to 80.

When you have run the program it should give you the stop report, so to run the machine code enter *Continue* and the screen should fill with a solid black square and then clear.

```
  1 REM xxxxxxxxxxxxxxxxxxxx
 10 FOR n=23760 TO 23778
 20 READ a
 30 POKE n,a
 40 NEXT n
 50 DATA 14,0,33,0,64,17,0,88,1
13,35,122,148,32,250,123,149,32,
246,201
 60 STOP
 70 FOR n=0 TO 21: PRINT AT n,0
;"
■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■
```

```
 600 IF Q$=Z$ THEN LET S=S+1
 610 IF I=10 THEN GOTO 650
 620 PRINT AT 19,0;"PRESS ""NEWL
INE"" FOR THE NEXT SUM"
 630 INPUT A$
 650 NEXT I
 660 PRINT AT 19,4;"PRESS ""NEWL
INE"" TO SEE";AT 20,5;"HOW YOU D
ID, ";N$
 670 INPUT A$
 700 CLS
 710 PRINT AT 3,2;"YOUR SCORE WA
S ";S;" OUT OF 10",,,
 730 IF S<5 THEN PRINT "WHICH IS
 NOT VERY GOOD, ";N$
 740 IF S>=5 AND S<8 THEN PRINT
"  WHICH IS QUITE GOOD, ";N$
 750 IF S>=8 THEN PRINT "  WHICH
 IS VERY GOOD, ";N$
 760 FOR I=1 TO 50
 770 NEXT I
 780 PRINT AT 8,2;"DO YOU WANT T
O DO MORE SUMS?"
 785 PRINT AT 10,7;"ANSWER YES O
R NO"
 790 INPUT A$
 800 IF A$(1)="N" THEN GOTO 900
 810 IF A$(1)<>"Y" THEN GOTO 790
 820 PRINT AT 13,3;"OKAY, ";N$;"
, HERE WE GO"
 830 FOR I=1 TO 50
 840 NEXT I
 850 GOTO 30
 900 PRINT AT 13,4;"OKAY, ";N$;"
, GOODBYE,";AT 15,2;"BUT DON'T F
ORGET TO PRACTICE"
 999 STOP
1000 PRINT AT 2,1;"HELLO, I AM T
HE ZX81 COMPUTER";AT 4,3;"BUT YO
U CAN CALL ME ""ZX"""
1010 FOR I=1 TO 50
1020 NEXT I
1030 PRINT AT 7,6;"WHAT IS YOUR
NAME?"
1040 INPUT N$
1050 PRINT AT 10,3;"DO YOU LIKE
SUMS, ";N$;"?"
1060 INPUT A$
1070 PRINT AT 14,6;
1080 IF A$(1)="Y" THEN PRINT "I
LIKE SUMS AS WELL"
1090 IF A$(1)="N" THEN PRINT "OH
 WELL, I LIKE SUMS"
1100 PRINT AT 16,3;"LET'S DO SOM
E SUMS, ";N$
1110 FOR I=1 TO 50
1120 NEXT I
1130 RETURN
```

Maths
by Raymond Blake

Super tables

on Vic20

This program will run on the unexpanded Vic. It is an educational game for the younger child and will help them learn the full range of multiplication tables.

The program allows you to select which times table you require, gives 40 seconds to learn them, then sets 12 questions for you to answer. Other facilities are question number, number right and number wrong — all accompanied by suitable tunes and colour.

```
 10 REM****************
 20 REM* SUPER TABLES*
 30 REM*      BY      *
 40 REM* J.ROBERTS    *
 50 REM****************
 60 REM
 65 REM STARTING
 70 POKE36879,110
 80 PRINT"■"
 90 PRINT"■■■*** SUPER TABLES ***"
100 PRINT"■■■■■■■■■■■■■■■■■■■■■■HIT A KEY"
110 PRINT"■■■■■■■==  = ==="
120 GETA$:IFA$=""THEN120
130 TY=0:TN=0:TT=0:PRINT"■■■WHICH TABLE DO YOU
    ■■■■■■■■■■■■■WANT
140 INPUT"■■■■■■■■■■■■■■■■■■■■";A
145 PRINT"■■YOU HAVE 40 SECONDS"
146 REM PRINT TABLE
150 FORJ=1TO9
160 PRINT"■■■■■";J"*";A;"=";A*J
170 NEXTJ
175 PRINT"■■■■■";10"*";A;"=";A*10
185 PRINT"TO KNOW YOUR ■"A"■TIMES"
190 FORT=1TO40000:NEXTT
195 REM QUESTIONS
200 PRINT"■"
201 TT=TT+1
202 IFTT=13THEN3000
205 Q=INT(RND(1)*12)
210 PRINT"■■■■■■■"Q"*"A"="
215 PRINT"■■■■■■■■■■■■■■■■■■YOU ARE ON QUESTION"TT
220 INPUT"■■■■■■■■■■■■■■■■■■■■";B
230 IFB<>Q*ATHEN400
235 REM SUM RIGHT
240 PRINT"■■■■■■■■■■■■■■■■"
250 PRINT"■■■■■■■■//"
260 PRINT"■■■■■■■// "
270 PRINT"■■■■■■//  "
280 PRINT"■■ ■■■//   "
290 PRINT"■■\\//    "
300 PRINT"■■■\/     "
305 TY=TY+1
310 GOSUB1000
320 GOTO200
325 REM SUM WRONG
400 PRINT"■■■■■■■■     "
410 PRINT"■■■\\__//"
420 PRINT"■■■ \  / "
430 PRINT"■■■■/  \ "
440 PRINT"■■■//__\\"
450 PRINT"■■■■     ""
455 TN=TN+1
460 GOSUB2000
470 GOTO200
475 REM SOUND
1000 POKE36878,15
1001 FORL=1TO3
1002 FORM=180TO235STEP2
1003 POKE36876,M
1004 FORN=1TO10
1005 NEXTN:NEXTM
1006 POKE36876,0
1007 FORM=1TO100
1008 NEXTM:NEXTL
1009 POKE36878,0
1010 RETURN
2000 POKE36878,15
2001 FORL=1TO50
2003 POKE36876,INT(RND(1)*128)+128
2004 FORM=1TO10
2005 NEXTM:NEXTL
2006 POKE36876,0
2007 POKE36878,0
2008 RETURN
2009 REM YOU'VE DONE 12 SUMS
3000 IFTY=12THEN5000
3001 PRINT"■■■■■YOU GOT "TY"RIGHT"
3002 PRINT"■■■■■■■■■AND"TN"WRONG"
3003 PRINT"■■■■■■■■■■HIT Y OR N"
3004 GETA$:IFA$="Y"THEN130
3005 IFA$<>"N"THEN3004
3006 PRINT"■■■":POKE36879,29:END
3007 REM YOU GOT THEM ALL RIGHT!
5000 PRINT"■■■■YOU GOT THEM ALL                 ■RIGHT!"
5001 REM PLAY SONG
5010 S2=36875
5020 V=36878
5030 REM READ AND PLAYLOOP
5040 POKEV,15
5050 READP
5060 IFP=-1THEN6030
5070 READD
5080 POKES2,P
5090 FORN=1TOD:NEXTN
6000 POKES2,0
6010 FORN=1TO20:NEXTN
6020 GOTO5050
6030 REM IF NOTE=-1THENSTOP
6040 POKES1,0
6050 GOTO7040
6060 DATA225,360,225,360,225,240
6070 DATA228,120,231,360,231,240
6080 DATA228,120,231,240,232,120
6090 DATA235,720,240,360,235,360
7000 DATA231,360,225,360,235,240
7010 DATA232,120,231,240,228,120
7020 DATA225,480
7030 DATA-1
7040 PRINT"■■■■■■■■■■■■HIT Y OR N"
7050 GETA$:IFA$="Y"THEN130
7060 IFA$<>"N"THEN7050
7070 PRINT"■■■":POKE36879,29:END
7080 REM END OF PROG
```

Super tables
by D V Roberts

Compart

on Dragon

Compart is a graphics utility used for drawing on the *Pmode* 3 screen. Full instructions are printed at the beginning, but it is useful to keep a list of commands. The commands are as follows:

↑ ..... Move up
← ..... Move left
→ ..... Move right
↓ ..... Move down

R ..... Colour red
G ..... Colour green
B ..... Colour blue
Y ..... Colour yellow
P ..... Paint an enclosed area a chosen colour
Q ..... Clear screen
M ..... Cursor on
O ..... Cursor off
S ..... Stop moving
W ..... Move at 315 degrees
E ..... Move at 45 degrees
Z ..... Move at 225 degrees
X ..... Move at 135 degrees
@ ..... End

NB. LINE 330, WHICH WAS INCORRECTLY PRINTED, SHOULD READ: 330 IF G$="Q" THEN X=0:Y=0:PCLS

Program notes

60-240 Prints instructions
260 Switches to graphics screen
290 Reads keyboard
300-470 Carries out input function-graphics screen maintained at all times
480-530 Draws the line on the screen
550-590 Draws cursor on screen, resets old position of cursor
610-730 Subroutine for painting an area a chosen colour

```
10 '****************
20 '*  COMP ART    *
30 '*  BY          *
40 '*  M.J.PERRY   *
50 '****************
60 CLS
70 PRINT"TO CONTROL THE LINE, USE THE
   FOLLOWING COMMANDS:-"
80 PRINT" W MOVE AT 315 DEGREES E''
   45    '' Z   '' '' 225    ''
    X  ''   '' 135    ''"
90 PRINT:PRINT"USE THE ARROW KEYS TO
   MOVE LEFT AND RIGHT. USE 'S' TO
   STOP THE  LINE"
100 PRINT:PRINT"PRESS SPACE-BAR TO
   CONTINUE"
110 IF INKEY$<>" " THEN 110
120 CLS
130 PRINT"CHANGE COLOUR BY PRESSING
   R(ED),G(REEN),Y(ELLOW) AND B(LUE)
140 PRINT"Q CLEARS SCREEN :O STOPS
   CURSOR:M STARTS CURSOR""
150 PRINT:PRINT"YOU START AT THE TOP-
   LEFT OF THESCREEN":PRINT
160 PRINT"PRESS @ TO END WHILE DRAWING"
170 PRINT
180 PRINT"PRESS SPACE-BAR TO CONTINUE"
190 IF INKEY$<>" " THEN 190
200 CLS
210 PRINT:PRINT"PRESS P THEN A COLOUR
   CODE TO   PAINT AN ENCLOSED AREA
   COLOUR"
220 PRINT"THE COMPUTER WILL PAINT THE
   AREAENCLOSED BY THE current foregr
   ound colour THE COLOUR YOUCHOOSE.
    THE COLOUR CHOSEN WILL  THEN BECOME
    THE FOREGROUND COLOR"
230 PRINT:PRINT"PRESS SPACE BAR TO
   CONTINUE"
240 IF INKEY$<>" " THEN 240
250 CLS
260 PMODE 3,1:SCREEN 1,0:PCLS
270 X=0:Y=0:C=1
280 ' DRAWING ROUTINE
290 G$=INKEY$
300 IF G$="P" THEN GOSUB 610
310 IF G$="R" THEN C=4
320 IF G$="G" THEN C=1
330 IF G$="Q" THEN   X=0:Y=0:PCLS
340 IF G$="B" THEN C=3
350 IF G$="Y" THEN C=2
360 IF G$="O" OR G$="M" THEN CR$=G$
370 COLOR C
380 IF G$="^" THEN A=0:B=-3
390 IF G$="@" THEN SCREEN 1,0:CLS:
   PRINT"BYE-BYE!":SOUND 180,2:END
400 IF G$=CHR$(10) THEN A=0:B=3
410 IF G$=CHR$(8) THEN A=-3:B=0
420 IF G$=CHR$(9) THEN A=3:B=0
430 IF G$="S" THEN A=0:B=0
440 IF G$="W" THEN A=-2:B=-2
450 IF G$="E" THEN A=2:B=-2
460 IF G$="Z" THEN A=-2:B=2
470 IF G$="X" THEN A=2:B=2
480 XX=X+A:YY=Y+B
490 IF XX>255 THEN XX=255
500 IFXX<0 THENXX=0
510 IFYY<0 THENYY=0

520 IFYY>191 THENYY=191
530 LINE (X,Y)-(XX,YY),PSET
540
550 IF CR$="O" THEN 580
560 V=2:IF C=2 THEN V=3
570 PSET(LX,LY,C):PSET(X,Y,V):
   LX=X:LY=Y          'CURSOR
580 X=XX:Y=YY
590 GOTO 280
600 END
610 REM FILL
620 QW$=INKEY$
630 J=0
640 IF QW$="R" THEN J=4
650 IF QW$="G" THEN J=1
660 IF QW$="B" THEN J=3
670 IF QW$="Y" THEN J=2
680 IF J=0 THEN 620
690 IF C=2 THEN H=1 ELSE H=2
700 PSET(X,Y,H)
710 PAINT(X,Y),J,C
720 C=J
730 RETURN
```

Compart
by M J Perry

Bingo

on Spectrum

This program is in two parts. The latter will print bingo cards on the ZX printer, and is linked within the main loop.

The program is well documented with *Rem* statements, and will run on a 16K Spectrum.

Basically there are two routines: 5000 which operates the printer and 100-320 which is the main loop.

It is quite a simple program which should provide entertainment for all the family.

```
   5 REM Bingo By J.W.Walsh
  10 GO SUB 700
  50 GO SUB 500
  99 REM [illegible]
 100 DIM a(91): FOR n=1 TO 90: L
ET a(n)=n: NEXT n: LET gone=90
 104 REM [illegible]
 105 FOR k=1 TO 90: LET r=INT (R
ND*gone)+1: LET number=a(r): LET
 a(r)=0: LET gone=gone-1: LET fl
=0: PRINT PAPER 1;AT 11,30;" ";
 BEEP .5,-20: FOR n=1 TO gone: I
F a(n)=0 THEN LET fl=1
 110 IF fl=1 THEN LET a(n)=a(n+1
)
 115 NEXT n
 199 PRINT INK 7; BRIGHT 1; FLAS
H 1;AT 11,30;number: BEEP .25,nu
mber-40
 200 LET y1=INT p(number): LET x
1=p(number)-y1: LET x$=STR$ x1:
LET x1=VAL x$(3 TO )
 203 IF man=1 THEN GO TO 205
 204 LET z$=INKEY$: IF z$="" THE
N GO TO 204
 205 PRINT INK 1; PAPER 6; BRIGH
T 1;AT y1,x1;number
 207 IF man=1 THEN PAUSE k
 208 IF man=1 THEN LET z$=INKEY$
 210 IF z$="1" THEN GO TO 300
 215 NEXT k
 220 INPUT "All numbers now out
of bag."; LINE z$: GO SUB 600: G
O TO 100
 300 PAUSE 100: INPUT " New game
 (y)? "; LINE z$
 305 IF z$="y" OR z$="Y" THEN GO
 TO 320
 310 GO TO 215
 320 GO SUB 600: GO TO 100
 499 REM [illegible]
 500 PAPER 1: INK 6: BORDER 1: C
LS
 505 LET x=20: LET y=4
 510 FOR n=1 TO 11: PLOT x,y: DR
AW 216,0: LET y=y+16: NEXT n
 515 LET x=20: LET y=4
 520 FOR n=1 TO 10: PLOT x,y: DR
AW 0,160: LET x=x+24: NEXT n
 525 PRINT INK 5;"     1 10 20 30
 40 50 60 70 80"
 530 PRINT INK 5;" "'" 1"'" 2"'
" 3"'" 4"'" 5"'" 6"'" 7"'" 8"'" 9"'"10"
 540 REM ----------
 541 REM
 542 REM [illegible]
 545 DIM p(90): LET x=0: LET z=0
 550 FOR m=1 TO 9: LET z=z+3: LE
T y=0: FOR n=1 TO 10: LET y=y+2:
 LET x=x+1: LET z$=STR$ y+" "+ST
R$ z: LET p(x)=VAL z$: NEXT n: N
EXT m
 555 RETURN
 557 REM ----------
 558 REM
 599 REM [illegible]
 600 FOR n=1 TO 90: LET y1=INT p
(n): LET x1=p(n)-y1: LET x$=STR$
 x1: LET x1=VAL x$(3 TO ): PRINT
 AT y1,x1;" ": BEEP .1,INT (RND
*24)+1: NEXT n: PRINT AT 11,30;"
  ": RETURN
 603 REM ----------
 604 REM
 700 BORDER 6: PAPER 6: INK 1: C
LS
 705 PRINT AT 13,1;"
          ": LET z$="BINGO!": L
ET y$="By Jim Walsh. Oct.1982":
LET x$="Press '1' for new game!"
: LET w$="Press any key for new
number."
 710 PRINT AT 1,12;" ";: FOR n=1
 TO LEN z$: PRINT z$(n TO n);: P
AUSE 10: LET i$=INKEY$: IF i$<>"
" THEN GO TO 780
 715 NEXT n: PRINT " "
 720 PRINT AT 7,5;" ";: FOR n=1
TO LEN y$: PRINT y$(n TO n);: PA
USE 5: LET i$=INKEY$: IF i$<>""
THEN GO TO 780
 725 NEXT n: PRINT " ": PRINT AT
 1,13;"
 730 PRINT AT 10,0;" ";: FOR n=1
 TO LEN w$: PRINT w$(n TO n);: P
AUSE 5: LET i$=INKEY$: IF i$<>""
 THEN GO TO 780
 735 NEXT n: PRINT " ": PRINT AT
 7,6;"
 740 PRINT AT 13,0;" ";: FOR n=1
 TO LEN x$: PRINT x$(n TO n);: P
AUSE 5: LET i$=INKEY$: IF i$<>""
 THEN GO TO 780
 745 NEXT n: PRINT " ": PRINT AT
 10,1;"
 750 PRINT FLASH 1;AT 21,12;"Pre
ss any key!": FOR n=1 TO 100: NE
XT n: GO TO 705
 775 REM [illegible]
 780 CLS : PRINT AT 10,3;"DO YOU
 REQUIRE ANY BINGO"'''"
    CARDS?"
 785 INPUT "ENTER 'Y' or any. ";
 LINE z$
 790 IF z$="Y" OR z$="y" THEN GO
 SUB 800
 795 LET man=0: CLS : PRINT AT 5
,3;"Do you want an automatic"',"
    of a manual game?": INPUT "E
nter 'a' or any. "; LINE i$: IF
 i$="a" OR i$="A" THEN LET man=1
 797 RETURN
 800 CLS : PRINT AT 5,5;"Have yo
u plugged your"',"    printer in?
": PAUSE 300: GO SUB 5000: RETUR
N
4996 REM [illegible]
4997 REM ----------
4998 REM
4999 REM [illegible]
5000 LET number=0: BORDER 7: PAP
ER 7: BRIGHT 0: INK 0: CLS : INP
UT "Type in any 5 digit code. "'
'" ";a$: IF LEN a$<>5 THEN GO
 TO 5000
5005 INPUT "How many Bingo cards
 do you"'"want? 2 X "; LINE c$
: FOR n=1 TO LEN c$: IF c$(n TO
n)<"0" OR c$(n TO n)>"9" THEN GO
 TO 5005
5006 NEXT n
5010 LET card=VAL c$: PRINT AT 5
,0;"I am now going to print your
"'","    Bingo cards.": PAUSE 100:
 PRINT AT 15,0;"Be patient"','"
 PLEASE WAIT."
5014 REM ----------
5015 GO SUB 6000: LET number=num
ber+1
5020 CLS : LET j$="[illegible]
": FOR n=1 TO 9: PR
INT TAB 4;j$: NEXT n: PRINT : PR
INT : PRINT : PRINT : FOR n=1 TO
 9: PRINT TAB 4;j$: NEXT n
5025 LET p=1: LET o=6: FOR m=1 T
O 8: FOR n=1 TO 7 STEP 2: IF w(p
)<91 THEN PRINT AT n,o;w(p)
5030 LET p=p+1: NEXT n: LET o=o+
3: NEXT m
5032 REM ----------
5035 GO SUB 6000: LET p=1: LET o
=6: FOR m=1 TO 8: FOR n=14 TO 20
 STEP 2: IF w(p)<91 THEN PRINT A
T n,o;w(p)
5040 LET p=p+1: NEXT n: LET o=o+
3: NEXT m
5042 REM ----------
5043 PRINT AT 10,12;a$
5045 COPY : LPRINT : LPRINT TAB
12;a$: LPRINT : LPRINT
5050 IF number<>card THEN GO TO
5015
5060 RETURN
5999 REM [illegible]
6000 DIM z(15)
6003 FOR n=1 TO 15
6005 LET r=INT (RND*90)+1: GO SU
B 7000: IF y=1 THEN LET z(n)=r
6010 IF y=0 THEN GO TO 6005
6015 NEXT n
```

Continued on page 35

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```
6016 REM ____________________________
6017 REM
6020 REM [redacted]
6025 DIM x(17)
6030 FOR n=1 TO 17
6035 LET r=INT (RND*32)+1: GO SU
B 7010: IF y=1 THEN LET x(n)=r
6040 IF y=0 THEN GO TO 6035
6045 NEXT n
6047 REM ____________________________
6048 REM
6049 REM [redacted]
6050 DIM w(32): FOR n=1 TO 17: L
ET temp=x(n): LET w(temp)=100: N
EXT n
6053 REM ____________________________
6054 REM
6055 REM [redacted]
6060 FOR k=1 TO 15: FOR n=1 TO 1
4: IF z(n)>z(n+1) THEN GO SUB 70
30
6061 NEXT n: NEXT k
6063 REM ____________________________
6064 REM
6069 REM [redacted]
6070 LET c=1: FOR n=1 TO 32
6075 IF w(n)<>0 THEN GO TO 6090
6080 LET w(n)=z(c)
6082 LET c=c+1
6090 NEXT n
6092 REM ____________________________
6093 REM
6095 RETURN
6096 REM ____________________________
6097 REM
6999 REM [redacted]
7000 LET y=1: FOR k=1 TO 15: IF
z(k)=r THEN LET y=0
7005 NEXT k: RETURN
7006 REM ____________________________
7008 REM
7009 REM [redacted]
7010 LET y=1: FOR k=1 TO 17: IF
x(k)=r THEN LET y=0
7015 NEXT k: RETURN
7018 REM ____________________________
7028 REM
7029 REM [redacted]
7030 LET temp=z(n): LET z(n)=z(n
+1): LET z(n+1)=temp: RETURN
7032 REM ____________________________
7033 REM
```

Bingo
by J W Walsh

Sing

on Vic20

The program was written for the unexpanded Vic. It plays the well known song "I'd like to teach the world to sing" (in perfect harmony). The program uses two part harmony in soprano and alto clefs. The alto giving the bass walking pedal effect which I found to be quite realistic.

- line 100 sets the volume
- line 120 determines if the tune has been played three times as three-quarters of the song is the same tune
- line 130 determines if it is the end of the song or not
- the data lines give the values to be 'poked' in order to give sound generation

```
100 PRINT"[redacted]"
110 PRINT"I'D LIKE TO TEACH THE"
120 PRINT"[redacted]  WORLD TO SING"
130 PRINT"[redacted](IN PERFECT HARMONY)"
140 POKE36878,15
150 READA,B
160 IFA=6THENT=T+1:IFT<4THENRESTORE:
    GOTO150
170 IFA=7THEN210
180 POKE36876,A:POKE36874,B
190 FORD=1TO150:NEXTD
200 GOTO150
210 POKE36878,0:POKE36876,0:POKE36874,0
220 END
230 DATA 219,0,215,195,219,191,225,
    103,219,175,215,195,219,191,225,183,
    225,175
240 DATA 228,201,231,0,228,201,231,
    0,228,201,0,0,0,147,231,0,228,175,
    231,0,235
250 DATA 175,231,0,228,175,231,0,235,
    175,231,0,225,163,228,0,163,219,0,
    225,175
260 DATA 225,0,0,135,0,6,6
270 DATA 231,0,231,0,232,0,231,0,225,
    135,225,191,0,183,0,175,0,145,225,
    191,225
280 DATA 0,225,183,223,175,225,0,201,
    147,201,147,0,147,231,147,201,175,
    231,0
290 DATA 235,175,231,0,228,215,231,0,
    235,175,231,0,225,163,228,0,225,163,
    219
300 DATA 0,225,195,0,195,7,7
```

Sing
by D Charles

Hypnotic

on Vic20

The second program creates an impressive screen display. The program uses four of the Vic control registers to alter the position and size of the screen. They are:

Poke 36864,0-255 controls start of screen from the top

Poke 36865,0-255 controls start of screen from the left

Poke 36866,0-255 number of columns on screen

Poke 36867,0-255 number of rows on screen

- lines 1010-1070 make the screen smaller
- lines 2010-2070 make the screen larger
- lines 3000-3030 create random reverse fielded spaces which change within the two main subroutines.

```
100 REM-HYPNOTIC
110 REM-BY DAVID CHARLES
120 GOSUB360
130 POKE36878,15
140 POKE36869,INT(RND(1)*128)+1
150 GOSUB180
160 GOSUB270
170 GOTO140
180 REM-CLOSE
190 FORI=0TO22
200 POKE36876,230+I
210 POKE36864,12+I
220 POKE36865,38+I
230 POKE36866,150-I
240 POKE36867,174-I*2
250 NEXT I
260 RETURN
270 REM-OPEN
280 FORI=22TO0 STEP-1
290 POKE36876,230+I
300 POKE36864,12+I
310 POKE36865,38+I
320 POKE36866,150-I
330 POKE36867,174-I*2
340 NEXT I
350 RETURN
360 FORI=0TO506
370 POKE7680+I,160
380 POKE38400+I,INT(RND(1)*2)
390 NEXTI
400 RETURN
```

Hypnotic
by D Charles

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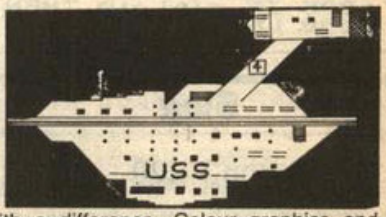

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Tony Bridge's Adventure Corner

World of fantasy

The Midnight Programmers, after the day's concentrated toil at designing their new machines, would finally relax and lose themselves in a world of fantasy. Adventure had swept through American computers since its beginnings several years before, and was now standard fare on large company mainframes. With computer time so expensive, management would eventually ban the use of their hardware for this pastime, but for now, it captivated the minds of the programmers.

Drawing heavily on *Dungeons and Dragons*, a role-playing game devised by Gary Gygax and Dave Arneson in the early 1970's, adventures (the plural was later dropped) was originally written in Fortran. As microcomputers became more and more common, so adventure was adapted for their use.

The original format of the game has remained the same to this day, although there are now also many variants. A couple of weeks ago I started a game on a mainframe, a PDP-11/24, which I have asked your help in solving — this will, I hope, give you an idea of some of the flavour of the original, which is as powerful now as it was then.

Throughout all the variations, however, be they graphic, text, or a mixture of both, the basic idea is still to solve a series of riddles or conundrums, while doing battle with various unsavoury monsters. In the original, all this took place in some unspecified network of catacombs, but authors now feel the need to site their adventures in ever more exotic locations, or, as in Melbourne House's *Hobbit*, to base their programs on existing works of fantasy.

Next week, I will discuss some of the well-tried methods and techniques for getting through the game — though many of you may not believe that there is any system to this frustrating pastime!

In the meantime, can anyone help Paul of the YMCA, Birmingham? He is stuck in *Mission Impossible* for the Vic20, written by good old Scott Adams, of whom more later. Entrance to the power room seems to be causing a problem for Paul, and he would appreciate any help — just drop me a line and I will pass on any tips you might have.

If you are a Vic20 adventure fan, you might also be able to pass along some hints for Ian Bingham, of Merseyside, who is playing *Moon Base Alpha*. He is trying to launch a missile at a comet that is on a collision course for the Base. How does he power up the computer, is what he would like to know.

Adventureland, again for the Vic20, has Tresco Richards completely stuck, trying to get past the bear to the treasure. Giving *Golden Honey* to the bear makes him fall asleep, but Tresco can't get the *Honey* back, which is a shame, as it is also *Treasure*! Help, please.

And don't forget — *adventuring is not just a load of Kobolds!*

● Many of you have asked in your letters if there are certain words or techniques to be used in adventuring on computers. Well, yes — there are several that have become fairly standard throughout all the versions available. This is an occasional corner to give the adventure dictionary an airing. The first word is one that everybody uses, some more than others: Help.

Type *Help* when you are really stuck, and the computer should (Ho! Ho!) come back with some clue or hint for you. If the author feels benevolent, it will help, but more than likely, the clue will be rather obscure and probably just another problem to be solved. Work this one out, however, and you are on your way to the next location. ■

This series of articles is designed for novice and experienced Adventurers alike. Each week Tony Bridge will be looking at different Adventures and advising you on some of the problems and pitfalls you can expect to encounter. So, if you have an Adventure you want reviewed, or if you are stuck in an Adventure and cannot progress any further, write to: Tony Bridge, Adventure Corner, *Popular Computing Weekly*, Hobhouse Court, 19 Whitcomb Street, London WC2 7HF.

Blind Alley

Blind Alley is a game of strategy. In order to win you must outwit the computer, using your craft to fence in and finally destroy the enemy pursuit vehicles. But, watch out for the solid trail left by your opponents — one touch is fatal!

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Entries for this month's competition close on May 31.

■ *Blind Alley* for the 16K and 48K ZX Spectrum is available through W. H. Smith and leading computer stores for £4.95. It is also available mail-order from Sunshine Books, Hobhouse Court, 19 Whitcomb Street, London WC2 7HF.

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Each month we will publish the name of the winner and the new *Cruising* high score. Are you good enough to accept the Cruising Challenge?

The highest score sent in so far this month is 8244 from *Neil Saloway* of 31 Avenue Road, Walkford, Dorset. If you have a higher score, you could still win this month's £10 — but hurry, entries close on April 30.

Notes

1) Each entry must consist of a ZX printout and your name and address.
2) Closing date for this month's *Cruising Challenge* entries is April 30.
3) The highest score each month will receive £10.
4) High scores cannot be transferred from one month to another.
5) The judges' decision is final.
6) No employees of Sunshine Publications Ltd, or their families, will be eligible to enter the *Cruising Challenge*.
7) *Cruising (on Broadway)* for the 16K and 48K ZX Spectrum is available through W H Smith and leading computer stores for just £4.95. It is also available mail-order from Sunshine Books Ltd, Hobhouse Court, 19 Whitcomb Street, London WC2 7HF.

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SPECIAL VIC20, 8K internal memory + 8K expansion. High res, Rom, Machine Code monitor, C2N tape, books, software including Backgammon, Adventureland, cost over £420 accept £250 ono. Tel: 061-431 3553.

CLUBS

ORIC-1 OWNERS. Tangerine created Oric-1 now TUG creates the rest. An independent users group with a solid reputation for progressive system support. Monthly newsletters, meetings, software, hardware, reviews, advice and lots more. We have a proven record of performance on our system. Join TUG. You'll like us, we do! Send £1.00 + S.A.E. (A4) for sample newsletter and details. Tangerine Users Group, 1 Marlborough Drive, Worle, Avon. BS22 0DQ.

HELP. Sharp MZ80K and MZ80A users. We have just formed a computer club in the Merseyside area and we are very short of software. We would be very glad of any software you could send us and we would return a cassette of our software. Some of us also have discs and printer and we would be glad to do list prints for you people without printers. Just send us your program on tape or disc and a large (S.A.E.) to: 60 Tholmondeley Road, Great Sutton, Ellesmere Port, L65 7BJ.

ATARI 400/800 software club, largest in the country. S.A.E. for details, Midland Games, 48 Read Way, Bishops Cleeve, Cheltenham 0242 674960, 6 pm-9 pm.

DEALERS

DRAGON SALES AND SERVICE

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Fast reliable service. Open some evenings. All repairs carried out in our own workshop.

WANTED

A word of advice to Basic/Machine Code Programmers: Are you wasting your carefully thought-out programs on companies who fail to realise their market potential? We at Dial Grove Ltd are seeking good quality, original, De-Bugged Games, Utility, Educational and Business Programmes for ZX81 (1K-16K) and Spectrum (16K–48K). We are offering an attractive remuneration package for the right programs.

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WANTED TRS 80 32K extended, or Mk III Basic Printer if price right. Kinghorn 0592 890423.

URGENTLY REQUIRED

Expanding company in need of new ideas in software for ZX Spectrum
Preferably arcade family games
Best royalties paid
Send sample tapes to:
TARGET SOFTWARE
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Follow signs from A1 (M) – A602 exit
Admission: Adults **30p**
Children, OAPs **15p**

Computer Swap 01-930 3266

Free readers entries to buy or sell a computer.
Ring 01-930 3266 and give us the details.

Spectrums for sale

ZX SPECTRUM, 48K and over £150-worth of software and books etc, £225. Tel: Hemel Hempstead 49395.

ZX SPECTRUM 48K, £70-worth of software, tape recorder, lots of magazines, mini amp, etc, bargain at £170 ono. Tel: 699 2447.

16K SPECTRUM, hardly used, all leads, original box, £15 of software, 2 additional books, £115. Tel: 0908 685389.

SPECTRUM 16K, £110 ono. 01-397 3066 (7 pm).

48K ZX SPECTRUM, 3 months old + compatible cassette recorder, £155; £110-worth of software + £20 of magazines, £75. Tel: 061 436 2621.

16K SPECTRUM, 1 month old, as new, substantial amount of good software, £130. Tel: Huddersfield 29355.

NEW 48K SPECTRUM + software, £170 ono. Tel: Bordon 2745 after 6 pm.

48K SPECTRUM, 2 months old + time gate VU 3D VU file + more, £175. Tel: Orpington 23466.

48K SPECTRUM assembler machine code book, 5 rolls of printer paper, Hobbit space invader, chess, flight simulation with extras, worth £285, selling for £200. Tel: Dorset, Terrant Hinton 240.

SPECTRUM 48K, as new, numerous software, including time gate, chess, flight simulation and others + books, £225. Tel: 01-367 4376.

48K SPECTRUM, with printer + 2 rolls paper, as new including all leads, manuals + cassettes, £200. Tel: 0734 786568.

48K SPECTRUM + £115 software + printer + £90 Spectrum books + magazines, value £450, sell for £250 ono, or swap for BBC. Tel: 01-738 0491 (4-9.30 pm), ask for Jenny.

SPECTRUM 48K, with custom console, case, Sharp cassette recorder + software + manual, £200. Tel: Hitchin 731249.

SPECTRUM 48K + printer from warehouse, unopened, 9 rolls paper, Dean keyboard, Sharp tape, lots of business/games, software, books, £350, will consider split. Tel: 01-692 1473 (6 pm).

SPECTRUM, 16K, mint condition plus over £100 software, may be sold separately, £115 ono. Tel: Oban 0631 62205 (David) after 5 pm.

48K SPECTRUM and complete Rom printout and printer, £200. Consider part-exchange ZX81 plus cash. Reading 0734 21264 after 6 pm.

ZX SPECTRUM, 48K, to swap for Lynx + tapes, boxed, as new, £250 of software, Pascal, Hobbit. Tel: Kegworth (05097) 2807.

SPECTRUM, 48K (owner emigrating, must sell), £140. 01-551 0362.

ZX81s for sale

ZX81 plus 16K, two months old, video inverter and PSU, all leads plus £10 of books and six other cassettes all original boxes, £80 ono. Tel: Waltham Cross 28173.

ZX81 16K + tape recorder + books, mags + cassettes, £50 ono. 49 Beech Avenue, Brentford.

ZX81 with unused 16K Ram + printer games, books and TV set, all for £90. (Fuller). Tel: Ware 2592 (evenings only).

ZX81 in DKtronics case plus keyboard, hardly used, £35; CAPS 16K rom pack, £10; Qsave, £8; Afmic, £20; Compucalc, £4; pocket book, £3; cassettes for £3; software, £1. Quick sale wanted. (0558) 822509 after 5 pm.

ZX81, File 60 keyboard, 16K, £50 of woftware, Black Crystal, Flight Simulation, £90 ono. 01-397 3066 (7 pm).

ZX81, 16K, Dectronics keyboard with numeric pad, software and mags, £80 ono. Tel: Hornchurch 53428 (6 pm).

ZX81 + 16K RAM PACK + software, £85 ono. Tel: 01-571 2870.

ZX 81 16K, £80 of software, 4 months guarantee still to run + manual + leads, £90 ono. Tel: Farnborough 58178 after 6 pm.

ZX81 16K boxed + £100 working software, + books, £100 ono. Tel: Norwich 663460 anytime.

ZX81, 16K, full size keyboard, 3D Defender, £70. Tel: 01-573 1566.

ZX81 16K + £105 of software + leads, manual + non-wobble gadget, good condition, £95 ono. Tel: 050-270 339, Matthew.

ZX81 16K RAM, £30 of software + magazines, £80, 9 months guarantee still left. Tel: Romford 21510.

16K ZX81 with Fuller keyboard, software manuals + mags, £75 ono. Tel: 603 4437.

ZX81 1K with some software + magazines, £35 ono. Tel: Chertsey 61516.

ZX81, 16K, + games, £75 ono. Tel: Stanton St John 805 (anytime).

ZX81 16K leads manual, 5 months old, still under guarantee, excellent condition, 3 tapes including Psion, chess and flight simulation, 12 Sinclair magazines, 1 book, worth over £100, £75 ono. Tel: Brentwood 0277 223817.

ZX81 16K + Kayde professional keyboard including repeat key + PS keys etc + £45 software including Mazogs, 3D Defender etc, £90. Tel: Crewkerne (0460) 74667.

ZX81, 16K, boxed, £45 ono plus £100-worth of software to be sold at half price. Tel: Norwich 663460.

16K ZX81, with Fuller keyboard + £50 software, including 3D Monster Maze + Black Crystal, £100. Tel: M. Sands, 771 0486

16K ZX81, + software, perfect condition, only 6 weeks old, £73 ono. Tel: 061-633 0654.

ZX81, 16K Ram + keyboard + software +manual, etc, £75. Tel: Crayford 524017.

ZX81, 16K, DK'tronics keyboard + case, tape recorder with power + computer leads, £60 software + magazines, worth £200+, sell for £100 ono. Tel: 674 0781 (after 5 pm). Ask for Andrew or Philip.

ZX81, 16K, Fuller SD42 keyboard, manual, leads + software, £70. Tel: 886 7222.

ZX81, 16K, proper keyboard DK 'Tronics graphics, Rom user definable graphics, £75-worth of games, £125. Tel: 460 2761.

Commodores for sale

VIC20 — Starbattle, £12 and Introduction to Basic, Part 1, £8. Tel: Penn 5192.

COMMODORE VIC20, Physics and Chemistry Revision, ????????, £7.50 each (mint condition). Johnstone (Renfrewshire) 21586.

VIC20 + 7 slot Arfon expansion unit + 16K + 8K + super expander + m/code + programs and cartridges, £200 worth of cassette and cartridge games, books, Vic Revealed + programmers guide and worth £650 plus. Accept £430 or swap for Basic P+I Commodore 64. Tel: 01-573 8935 (Middlesex).

VIC20, £117, cassette unit £30, 16K pack £42, 3K pack £15, joystick £6, Myriad Chess, Startrek, Vic Panic £24, dust cover £2, only 3 months old, mint condition, will sell for £225 complete. Tel: 01-460 7649 (Bromley).

VIC20 with cassette, joystick, Introduction to Basic Part 1, Jelly Monsters, and Star Battle, Shark Attack, £150 ono. High Wycombe 31826 evenings.

VIC20, Super expander, 8K mother board, cassette deck, £50 of software + books, selling for £250. Tel: 01-904 8148.

VIC20, recorder, super expander, £210 ono + television, £30 ono. Tel: Catterham 44546 (5-7 pm).

VIC20, £100 of software, 3K Ram/Eprom, information for Vic + books + 2 Vic joysticks, £70. Tel: 0274 677647.

VIC20, hardly used and fully boxed, £100 ono. Tel: 01-527 0377.

COMMODORE 64 tape unit, one month old, in perfect condition, two years guarantee, £340. Tel: Rajah 7225727.

COMMODORE 64, C2N cassette deck, PRG + software, two months old, excellent condition, £350 ono. Tel: (0202) 691887.

VIC20, cassette unit, joystick, Pacman cartridge, Invaders, Scramble, Centerpede, Asteroids, £150. Tel: Ascot 21160.

COMMODORE 64. Tel: 0664-60299.

VIC20 16K Ram pack, £35. Also 3K Ram pack, £20. Tel: 08956 38564 ask for Joel.

FOR SALE: VIC20, cassette deck, super expander, joystick, Intro to Basic, Jelly Monster, Omega Ray, £55 of software, cost over £300 new, will sell for £185. Tel: Linlithgow 842709.

VIC20 with cassette player, joystick, 16K expansion adventure Rom, over 30 programs, £190 ono. Tel: Cranleigh 272434.

COMMODORE VIC20 with C2M cassette unit and 16K memory expansion, 20 software tapes and 3 cartridges. Offers to 01-458 7277.

COMMODORE 8K Ram cartridge, £25, Rat Race cartridge £15, Omega Race £20. Tel: 0442 58200.

VIC20 Quiz Master plus Tomb of Druin, 16K. Also Tornado and Asteroids, will swap for any Autogenetic cartridge or Gorf. Tel: Odiham 3445 after 4 pm.

SWAP VIC20, cassette recorder, Asteroids, for BBC A Model. Tel: Hastings 714198 (Kourosh).

VIC20 cassette unit, 3K programs and 16K Ram, over £100-worth of software, £125 word processor. Best offer or will separate. Tel: Maidstone (0622) 813794.

VIC20, cassette unit, super expander cartridge, lots of software, 1 year's editions of Your Computer magazine, joystick, swap for BBC Model B that's still under guarantee. Tel: Nottingham 202632.

VIC20, 3K, tape deck, ADU cartridge, software, £160 ono. Tel: Hatfield 68496 (6 pm).

COMMODORE, 64 games, arcade + educational + Super Lander, price range from £2.95-7.95. Tel: 01-450 4858.

VIC20, tape deck, 3 tapes, super expander, 3 Rom games, joysticks, mags, 3 books, etc, £200 ono. Tel: 01-739 9061 (anytime).

VIC20, will swap Adventureland cartridge for The Count or Pirates Cove. Tel: 051-356 3874.

COMMODORE FOR SALE, Vic20, cassette unit, introduction to Basic part 1, books and some software, £120. Tel: 01-803 2851.

VIC20 plus C2N cassette with 3K, 8K and 16K Ram pack, six games cartridges including Gorf, programmer's aid, super expander, machine code monitor cartridges, £150-worth of software, Introduction to Basic 1 and 2, Vic revealed plus reference guide, joystick and paddle all worth £707, still under guarantee. Sell for £400. Tel: 01-892 8768.

VIC20, cassette unit, three-slot, motherboard, 8K expansion, machine code monitor cartridge, over £300-worth of software including Jelly Monsters, Sargon II Chess etc, joystick, books on home computing, Basic and machine code program manuals worth £600. Sell for £400 ono or swap for BBC Model B plus software. Wilson, 21 Chenton Field, Fulwood, Preston, Lancs PR2 3WTH.

Acorns for sale

ACORN ATOM, 12 Ram 15K Rom including floating point and toolbox tapes, books + listings, power supply + all leads, £180 ono. Oxted 4819.

ACORN ATOM, 12K Ram + 12K Rom + VTA, tape recorder + leads, manuals, etc, very good condition, £115 ono. Tel: Northwood 21485.

BBC MODEL B. Tel: Tiverton 258412.

ACORN ATOM, 12K Rom, + 15K Ram, utility gear, Rom manuals, + magic book games pack, + software, £140 ono. Tel: 01-863 8009.

BBC MODEL B, six months old, £380, including Acorn software, + books. Tel: Camberley 33780.

BBC B with disc interface, single disc drives micro-Vic deck monitor, Ferguson cassette recorder, Tandy full-colour printer and cable, 2 joysticks plus assorted software, £1,000 ono. Buyer collects. Tel: Littlewick Green 5207.

ACORN ATOM, 12+12 chess game and power supply, £90. Tel: Ripley (Derbyshire) 48870.

Ataris for sale

ATARI VCS, 8 cartridges, including: Space Invaders, Chess, Night Driver + Maze-Craze, £135. Tel: 0869 47593 (Steeple Aston) Oxford area.

ATARI VCS in excellent condition + 7 cartridges including Space Invaders, Missile Command, Star Raiders. Worth £280, will accept £170. Tel: Guildford 38560 evenings or weekends.

ATARI video computer system and cartridges + Combat Defender, Asteroids, Space Invaders and Breakout. Any offers. Tel: 501 2274.

ATARI VCS, 6 cartridges including Defender, Pacman and Missile Command, 6 months old, £130 or swap for Spectrum. Telephone Bracknel 23443

ATARI 400, 16K + basic + recorder + typewriter keyboard software, Miner, Shameless, Sub Commander, etc. Also books + magazines, £190. Tel: 01-204 2804.

ATARI 800 48K with tape recorder, joystick and lots of software, guaranteed, £550 ono. Tel: 74139.

ATARI 40 48K + disc drive + a lot of software, £1,000, sell for £600 ono. Tel: 859 3969.

ATARI 800 + cassette 3-game Pacman centipede, 1 star raiders, some books, £450. Tel: 936 3889, Mr Robinson.

ATARI VCS + 5 cartridges, to swap for any home computer. Tel: 01-648 0530 anytime.

ATARI VCS + 15 cartridges, including soccer, space invaders, basic program + chess. Total cost £460, accept £210 ono. Tel: 01-959 7394.

ATARI VCS, 4 cartridges including Space Invaders + Asteroids, £100 ono. Tel: Hatfield 63026.

ATARI VCS, 4 cartridges including Demon Attack, £75 ono. Tel: 430 4109.

ATARI VCS, + 5 cartridges, worth over £100, sell £70. Warrington 811879.

ATARI 400 WICO, joystick, games cartridge, basic programmer kit, 2 months old, registered, guaranteed, £230 ono. Tel: Luton 584238.

ATARI 400, 48K Basic cassette, joysticks + games worth £200, £265. Tel: 0702 201637.

ATARI VCS GAMES COMPUTER, 5 cartridges, excellent condition, £120 ono. Tel: 01-648 0530 anytime.

ATARI VCS, as new, with 2 games, £80. Tel: 0432 74362.

ATARI 400 SOFTWARE, swap Submarine Commander for Jumbo Jet Pilot. Tel: 01-858 2849 after 5 pm.

ATARI VCS Video Chess plus Pacman, mint condition, boxed as new, £90. Tel: 348 5668.

ATARI VCS plus five cartridges including Missile Command, Space Invader etc, £120 ono or swap for ZX Spectrum. Tel: Odiham 3445 after 4 pm.

ATARI VCS, as new, boxed with joysticks, paddles, Combat, Defender, Berserk, Empire Strikes. Unwanted gift, £95. Tel: 01-651 3863 after 4 pm.

ATARI VCS plus 17 cartridges, offers over £200. Tel: Lodge Hill 48949.

Tandys for sale

TANDY TRS 80 16K, model 1 level 2, in good condition + £70 monitor, £25 cassette recorder + over £100 of software + manuals, total value £500, sell for £200 ono. Tel: Abingdon 25865 after 4 pm.

TANDY TRS 80 MODEL 1, level 2, 16K, only 3 months old, over £270 of software, sound box amplifier, books, manuals, price £200. Tel: 021-7053469.

32K COLOUR TANDY, joystick, case, CCR, tape recorder, software + hardware + books etc, cost over £670, 3 months old, accept £450 ono. Tel: 061-570 2162.

FOR SALE: TANDY TSRS 80, level 2, 16K, brand new, £150 or swap for 16K Spectrum. Tel: 021-353 3998 after 6 pm.

TRS 80, 16K, level 2, including dust cover, monitor, cassette recorder, software, books and manuals, £220. Tel: Coventry (0203) 504485 after 5 pm.

For sale

SWAP OR SELL 30 Spectrum programmes. Tel: Whitham 518470.

ORIC 1, 48K, with full manual + cassette, leads, unwanted gift, £150. Tel: Rugeley 6677.

MISSION IMPOSSIBLE adventure for Vic20, £15; Panic Vic20, £3. Tel: 508 9558.

SHARP MZ 80K, 2 Basic tapes and assembler tape + software, £345 ono. Tel: 550 5272.

VIC CARTRIDGES mostly half price, also books. Tel: 574 4122.

DRAGON 32, Tensai cassette recorder, Tandy joysticks, several cassettes, London delivery possible, £195. Southend (STD 0202) 337336.

RECORD PLAYER, swap for BBC software. Tel: 0525 370438.

SHARP MZ 80K with dust cover, re-set button, large amount of software + languages inc assemble Forth machine code, Scramble, Defender, Chess, etc, £350 ono. Tel: Poynton 873389.

TEXAS TI99/4A with extended Basic plus speech synthesiser and cassette with leads, 3 months old, Parsec game and wide selection of programs, £260. Tel: Heywood (Manchester) 624 219.

VIC ROADRACE CARTRIDGE + Amoc + Cosmaids + Ferguson cassette recorder (not for Vic), £30. Tel: Worthing 202074.

SWAP GRAND STAND, Astro Wars games, with power adaptor, for Vic20 software or super expander. Tel: 885 1207.

LINKS 48K, 5 weeks old, £175. Tel: 0785 814736, Stafford.

COMMODORE GAMES, up to £5 depending on game. Tel: 501 2274.

SWAP OR SELL, Spectrum software programs, includes Invaders, Scramble, Centipede, etc. Tel: 01-864 2684 evenings. Ask for Omer.

ADVENTURE LAND for any other adventure in the series. Tel: 0341 280726.

SPECTRUM SOFTWARE for sale or swap Pimania, £7, Arcadia, £4, Winged Avenger, £3, Hobbit, £12, Time Gate, Spectres, Black Crystal etc all originals. Tel: (0825) 2514 evenings.

SWAP ADVENTURY LAND for any other adventure cartridge. Tel: 01-302 3562.

JUPITER ACE complete with leads, power supply + manual, £65. Tel: Toddington (Beds) 2470.

EXCHANGE your software with me. Send an sae to M. A. Valentine, 101A Underdale Road, Monk Moor, Shrewsbury, Shropshire 5YZ 5EF.

SWAP VIC20 Pirate Cove adventure cartridge for the Count. Tel: 0570 470362.

SHARP MZ80K 48K RAM RTT Y interface, various software + manuals, £320 ono. Tel: Atherton 0924 891140.

16K ZX81 ASSEMBLER, books + software, £50. Tel: 01-950 6651.

PANASONIC VC6000 video games system + six cartridges, £50 ono. Tel: Cirencester 860207.

VIDEO MASTER CHESS CHAMPION, 6 levels of play, £30. Tel: 01-267 6210.

SWAP PIRATE COVE for Gorf or Sargon 2 chess. Tel: 0606 77446.

ZX PRINTER, new, unwanted gift + QS time gate + Flight Simulation + Scramble + Centipede + Battle of Britain. £75. Tel: Hornchurch 71789.

VIC20 cartridges. Tel: 08956 38564 ask for Joel.

SHARP MZ8DA including manual and £100 of software. Good condition £375 ono. Tel: 0202 512681 evenings.

SOFTWARE for 16K or 8K Spectrum — TCM 1 solves cubic, quartic and quadratic equations with real coefficients; TSM 1, same written as subroutines, £5-£25. Tel: 01-286 2424.

ATOM, 12K + 12K, floating point, tape recorder, £70 of software, Defender, Pac-Man, Asteroids, G.C., £200 ono. Tel: Shoreham 5254 (anytime).

PHILIPS T7000 for sale, £50. Tel: 698 9604 — buyer to collect.

MX80 ST Type 3 printer, with cable, paper and dust cover, £310 ono. Foad Katan. Tel: 01-959 6707 (evenings).

SWAP VIC 20 GOLF for Vicmen. Tel: Worthing 202074.

VICMEN CASSETTE, best offer to T. Sanel, 6 Nevill Road, Uckfield, East Sussex TN2 1PG.

DRAGON 32, little used, mint condition in original box, £170. Also £100-worth of paddles, auxiliaries and software, sell for £70 or £220 the lot. Tel: Farmingham 864929.

PIRATE COVE adventure game for Vic swap for Sargon 2 Chess. Tel: 508 9558.

OMEGA RACE for Vic20, £15 to £20. Stains 53753.

FIDELITY VOICE SENSORY CHESS CHALLENGER + case, perfect condition, few months old, cost new £300, accept £100 for urgent. Tel: 01-600 1200 ext 274 (day), 01-898 2644 (evenings).

VIDEO GENIE 16K RAM, integral cassette recorder, monitor, manual, leads + some software, offers around £100. Tel: Crayford 528119.

ITT 20-20 + 48K + green VDU, disc unit, fully compatible with Apple II hardware and software, £475. Tel: Guildford 68595.

ALL POPULAR VIC20 GAMES, all originals. Tel: 885 1207.

ATARI VCS CARTRIDGES, as new with instructions: Missile Command £15, Night Driver £12, Space Invaders £12, Lazer Blast £9. Tel: 088 23254.

VIC music composer cartridge, £15; Alien cartridge, £15; Super expander, £25; 2 tapes, Vic writer strategic advance, to run them you need 16K memory, £15. Tel: 748 5276.

TI99 4a with 2 games cartridges + joysticks, £165. Tel: 866 9020.

FOR SALE. Golf £8, Colonel's House adventure £5. Tel: 0242 513450.

EXCHANGE your software with me: Send an SAE to M. Valentine, 101A Underdale Road, Monkmoor, Shrewsbury, Shropshire SY2 5EF.

GAMES for Vic20, Tracks, Andes Attack, Bonzo, Miriad, Night Crusader and others, will be willing to swap for others. Tel: 885 1207.

FIVE SPECTRUM machine games, £15. Tel: Leeds 0532 672122.

PC-100C printer, as new, £95. Structural engineering module for TI58 and TI59 Texas programmable calculators, unused, £20, all supplied in original boxes. Tel: St Albans 32069 or Fairbourne 596.

2001 PET, intergrown cassette deck, 32K, new Roms sound manual, books, dust cover, over £100 software, £250 ono. Tel: 0924 823525.

CHESS CHAMPION. Mark 1, £30 ono. Tel: 051-608 3887.

VIC20 adventure cartridges, Pirates Cove + Mission Impossible, £17 each or £30 together. Tel: 01-574 4122.

TI99 4A with new accessories, cassette lead + remote controllers + 3 games on cassettes + extra leaflets, £150. Tel: 800 1851.

SHARP PC1500 with 5-colour computer printer and cassette interface, with all leads + manual + case, as new, £200 ono. Tel: Winscombe 2622.

SWAP SPECTRUM original arcade games for other original cassettes. Tel: 06845 65657 (evenings, Richard).

SHARP PC1500 + 8K Ram + 4-colour printer, plotter hardly used, £279. Tel: 464 0845.

TANDY COLOUR. 5 games written in basic, learn programming techniques. All programmes require 16K or 32K extending basic, £5 including Lander and Ladder Chaser also Bedlam adventure to swap for other Tandy colour adventure not ??????? details on either. Tel: Mark Pel (0922) 691618.

VIC20 Sargon Chess swap for any adventure cartridge. Tel: Edenbridge 863572.

Wanted

TWO ALIEN 400s, 16K Ram and no basic. Tel: 0703 35642 (Southampton).

ZX SPECTRUM 16K, lowest price please and software. Tel: Merstham 2824.

WANTED Spectrum, exchange Olympus OM/MN + 80 — 2.10 zoom, mint condition, worth £230 or also ELO guitar as new, worth £100 + cash. Canterbury 69334 (Paul).

BBC Model A or B, must be under guarantee. Tel: Maidstone 53710.

ZX PRINTER + paper in exchange for Imperial portable typewriter + solar powered calculator + tape of assorted Spectrum programs. Call at 34 West Hill Road, Herne Bay, Kent anytime.

BBC A OR B part exchange for Apple II plus 48K (£500). Tel: 0273 508311.

WANTED: COLOUR MONITOR £125-£150. Tel: 01-788 6993 (6 pm).

BBC MODEL A OR B. Tel: Broadstone 694333.

DRAGON 32 or BBC computer. Tel: 0335 44148.

8K RAM for Vic20, will swap for 15 well known games. Tel: 01-579 2129.

WANTED BBC MODEL B. Manchester area. Phone 061-688 5023.

FELLOW for unexpanded Vic20. Tel: Banbury 720640 after 4.30 pm.

SPECTRUM WANTED. Good price offered for latest model preferably 48K. Tel: 01-574 4938.

4K ZX80, with or without memory expansion. Tel: 04862 70190.

DRAGON COMPUTER, 32K, all manuals + cables, includes T.V., £150. Ley Godwin, Flat 1. Tel: 01-373 8399.

C2N CASSETTE DECK, for Vic20. Tel: 021 5253332.

WANTED, BBC Model B. Tel: Croydon 01-654 3269.

WANTED, Atom or Vic for £95. Tel: 01-549 1164 (6 pm).

WANTED: 16K SPECTRUM, reasonable price paid. Tel: Coventry 469161.

AMATEUR SOFTWARE WRITERS needed for the BBC. Tel: 958 9442.

WANTED: ZX80, complete, in original box with manual, etc. Tel: Northwood 25240.

VIC20 plus cassette unit, £100-£200. Tel: Woking (0462) 70318.

LINKED UP NETWORK

Ruth Selby of York, writes:

Q I have a Vic20 and I am getting on quite well when it comes to learning how to program. I have seen a number of advertisements and articles mentioning Micronet, a system for linking up ordinary home computers to a Prestel network, that will carry programs for the home user. It seems that it can be used with the Sinclair computers and some others.

What others? Could you please give me some more details, especially about the Vic20?

A Micronet has a policy of steadily adding new computers to the Micronet system. It is a telephone accessed database, and each computer will need its own modem and decoding software. It is planned to bring the Vic20 on line in July this year. The Commodore 64 will also be bought on line later this year.

WHICH COMPUTER?

Gary Wilinson of Wilford Gardens, Chelsea SW3, writes:

Q I am thinking of buying a computer, but am not sure which one to buy. The two which interest me are the BBC model B and the Atari 800 (48K). I am not only interested in games, but learning to program in Basic and Machine code as well. Please could you give me some idea of the capabilities of these machines.

A You have chosen two machines that are very much in the same corner of the market and are now in a similar price range. The Atari will give you more user memory and its excellent graphics are well known. The BBC is generally considered to be able to mount at least a challenge to the Atari on the graphics front, though it does not have quite the same variations of colour. Neither will the BBC have as much Ram free for your own use.

On the other hand, the BBC is probably the best micro under £500 when it comes to additions to the system, including the potential of the 'tube' by which a second processor can be added. There will be more potential to build a complete system around the BBC.

The question of support is fraught with difficulties and cannot easily be dealt with here. Firstly, if you are at school, then the BBC is one of the most common computers chosen under the D.I. scheme. A lot of independent companies are making software for it, and the software tends to be cheaper than comparable Atari programs.

What it comes down to is looking not only at the computers, but at what is available for them, and the overall cost. Also, work out as far as possible how much you want to develop your system.

CHEAPER AND EASIER?

R Baker of Goole in Humberside, writes:

Q I have been working through Toni Baker's book *Mastering Machine Code on your ZX81* and find it excellent. I would like to know if there is a book available that will give the Z80 instruction set. I know of the Rodney Zak book, but I wonder if there is anything cheaper and more straight forward?

A Though Rodney Zak's tome is very much a standard work, I can understand people struggling in places. I can also appreciate your reluctance in paying £12 for a book that is difficult to comprehend.

However, cheaper alternatives do not readily spring to mind, with the exception of an excellent little book, that perversely seems to be very difficult to find. The *Z80 Instruction Handbook* is by Nat Wadsworth and is published by Scelbi. I have no ISBN number in my copy nor a library of congress catalogue number.

Georges do not have it listed in their catalogue and I do not think that Foyles have any more copies — as I said, the book is elusive. There is at least one in the library system, or you might try contacting Scelbi direct. The address is 20 Hurlbut Street, Elmwood, Illinois, CT06110, USA. Good luck.

ORIC QUESTIONS

C Dawson of Buttermere Drive, Allestree, Derby, writes:

Q I am thinking of buying an Oric 1. Having read some recent reviews, the following questions come to mind. It appears that the Oric will be able to accept Telesoft programs — does this mean that it will be able to download programs from Ceefax?

Since Telesoft is designed for the BBC micro, will the BBC programs be compatible with the Oric 1 (entered as listings or from tape)? Also, will *Popular Computing Weekly* be publishing programs for the Oric?

A The Oric was designed to download Prestel through its own modem — unfortunately this modem seems to have been 'delayed'.

To download Ceefax, a special adaptor will be needed and I do not know if one is yet available for the Oric.

At least Ceefax now has a standard, set by the CET (Council for Education Technology). This means that you will need a standard Ceefax adaptor, plus special software to decode the input into the Oric's own dialect of Basic. Again, I do not know if this is being done.

The Oric cannot *Load* BBC programs and a BBC program would have to be translated from the Oric's microsoft version of Basic to the BBC's lookalike version.

We are always on the look out for good programs, whatever the computer. Interest in the Oric is growing and I hope that good material will be available soon.

SPECTRUM PRINTERS

Cameron Smith of West Hill Road, Dartford, Kent, writes:

Q I wonder if you can help me. I would like to buy a colour printer for my ZX Spectrum (48K). Will the Tandy graphic colour printer CGP-115 be compatible? Will Tandy supply an interface for use with my Spectrum? Do you know how reliable it is and where I can contact the dealers?

I am not an electronic expert and I would appreciate any other advice you have about printers and prices for the Spectrum.

A The Tandy colour graphic printer is certainly an important addition to the range of printers available at the lower end of the market. The CGP-115 will not be directly compatible with the Spectrum, as the Spectrum does not have either a Centronics, or an RS 232 interface.

However, Soptest, 10 Richmond Lane, Romsey, Hants, has developed a package which enables the Spectrum to run the CGP-115. The package costs £35 and includes both connector and software to run the system. For further details see News Desk, March 31-April 6.

Is there anything about your computer you don't understand, and which everyone else seems to take for granted? Whatever your problem *Peek* it to Ian Beardsmore and every week he will *Poke* back as many answers as he can. The address is *Peek & Poke, PCW*, Hobhouse Court, 19 Whitcomb Street, London WC2 7HF.

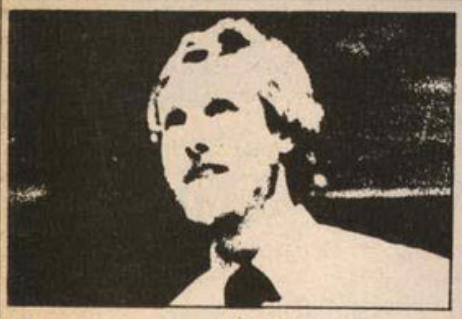
Top 10

Books

1	(2)	Assembly Language Programming for the BBC Micro, *Birnbaum*	(Macmillan)
2	(4)	Spectrum Machine Language for the Absolute Beginner, *Tang*	(Melbourne House)
3	(3)	Enter the Dragon *Carter*	(Melbourne House)
4	(1)	The BBC Micro — An Expert Guide, *James*	(Granada)
5	(6)	Introducing Spectrum Machine Code, *Sinclair*	(Granada)
6	(—)	Programming the 6502, *Zaks*	(Sybex)
7	(10)	Compute!'s First Book of Vic, *various authors*	(Compute!)
8	(—)	The Complete Forth, *Winfield*	(Sigma)
9	(9)	Vic Programmer's Reference Guide, *Finkel*	(Commodore)
10	(—)	Z80 Assembly Language Programming, *Leventhal*	(Osborne)

(Figures compiled by Watford Technical Books, Watford 0923 23324)
(Last week's positions in brackets)

Ziggurat



Sweet and Sour

Some American psychologists have developed a technique to quantify a human response called the method of "semantic differentials".

A semantic differential is a bipolar scale such as "hot . . . cold", "big . . . small" or "expensive . . . cheap" applied to a set of concepts. A concept can be an object such as "the Mini Metro", or an idea such as "justice", and the same scales are used for a whole series of concepts.

The psychologists found that people were quite willing to engage in this exercise, to the extent that they were willing to rate "boulders" (ie, big rocks) on scales such as "sweet . . . sour". That is, people were able to rate boulders as more sour than sweet, without being too sour. When I see some reviews of software, or hardware, I think of the boulder being sweet or sour, or scoring 5.7 on the sweet . . . sour scale (very sweet=1, very sour=7).

Take, for example, a list of different computers, by price. The list has a large number of categories, such as "memory", "languages", and such like — with some useful information within the categories. The final category is "ratings", where the sub-categories are "games", "business", "scientific", "program", and "overall". Each sub-category has a number from 1 to 10. One series of numbers is 3,5,4,4, with 4 being the score for the overall rating; another series is 4,6,4,4, still with an overall score of 4; yet one with 2,6,3,4, has an overall score of 5.

Numbers are used because they give a touch of (non-existent) objectiveness to the whole exercise.

In fact, they say no more (perhaps less) than good old-fashioned "excellent" or "terrible". The compilers of the list are trying to quantify the unquantifiable, because numbers seem to carry greater weight than words — they appear more professional.

In another example (from a different source), games could be rated on a percentage basis and given an overall stars-rating. The variation in the use of stars seemed to indicate that the most popular classification was four stars. Why not just say "very good"?

I am very interested in words, and I found the written commentary to be at variance with the percentages, which themselves seemed to have little relationship with the star appraisal.

The fascination with numbers has also extended to advertisers. I have seen one which proudly claims that this certain program had the greatest combined score (the review had several scales, all marks out of 5) for programs of that type.

This is a bit like saying: I have three marbles in my pocket, and two pound notes so I have more than you — because you only have one marble, and three pound notes. To score 6 by getting 4 for enjoyment and 2 for ease of loading, is not the same as scoring 6 by getting 1 for enjoyment and 5 marks for ease of loading.

The evaluation of software requires rather more sophistication than that.

So I have developed my own evaluation system (which is mine and belongs to me) — called the CO4 criteria. The criteria are Communication (how the user and program interact), Computation (how does the program do what it does, and should it?), Co-ordination (how do the various parts of the program relate?), and finally Constitution (does it make sense?). More of this next week. ■

Boris Allan

Puzzle

Back to front!

Puzzle No 51

102564

This is an interesting number. Moving the final digit — 4 — from the end of the number to the front the result is exactly four times as big:

$4 \times 102564 = 410256$.

This is the smallest number with this property.

Can you find the *lowest* number that ends in a '9' which becomes nine times as big if the figure is removed from the end and placed at the beginning.

Solution to Puzzle No 46

As we are told that zero is not used, we need to find a 3-digit number that has a 6-digit square in which all the nine digits involved are different.

The numbers, between 317 and 999, are tested sequentially for this property.

```
10 FOR N = 317 TO 999
20 LET M = N * N
30 LET N$ = STR$ N + STR$ M
40 FOR A= 1 TO 8
50 FOR B = A + 1 TO 9
60 IF N$(A) = N$(B) OR N$(A) = "0" OR N$(B) =
   "0" THEN GOTO 100
70 NEXT B
80 NEXT A
90 PRINT N, N * N
100 NEXT N
```

This gives the results 567 or 854.

Winner of Puzzle No 46

The winner is: Martin McKeown, Carnvue Gardens, Carnmoney, Newtownabbey, Co. Antrim, Northern Ireland.

Top 10

Dragon

1	(1)	Donkey King	(Microdeal)
2	(7)	Katerpiller Attack	(Microdeal)
3	(2)	Dragon Trek	(Salamander)
4	(3)	Planet Invasion	(Microdeal)
5	(8)	Champions	(Peaksoft)
6	(6)	Space Race	(Compusense)
7	(5)	Attack	(PSS)
8	(4)	Alcatraz II	(Microdeal)
9	(9)	Pimania	(Automata)
10	(—)	Wizard War	(Salamander)

(Figures compiled by Dragon Dungeon, Ashbourne 0335 44626)

Vic20

1	(1)	Grid Runner	(Llamasoft)
2	(2)	Lazer Zone	(Llamasoft)†
3	(8)	Scramble	(Rabbit)
4	(5)	Colonel's House	(Rabbit)‡
5	(4)	Sargon II Chess	(Commodore)*
6	(3)	Avenger	(Commodore)*
7	(6)	Andes Attack	(Llamasoft)†
8	(7)	Hopper	(Rabbit)
9	(10)	Alien Attack	(Interceptor Micros)
10	(—)	Road Race	(Commodore)*

*Cartridge. †Requires 8K or 16K. ‡16K only.
(Figures compiled by Vic Centre, London 01-992 9904)

Spectrum

1	(10)	Black Crystal	(Carnel)*
2	(—)	Galaxians	(Artic)
3	(6)	Compiler	(Softek)*
4	(2)	The Hobbit	(Melbourne House)*
5	(—)	Do Not Pass Go	(Workforce)*
6	(5)	Flight Simulation	(Psion)*
7	(—)	Football Manager	(Addictive Games)*
8	(9)	Knight's Quest	(Phipps Associates)*
9	(4)	Frogger	(A+F)*
10	(—)	Centipede	(DK'Tronics)

*Requires 48K.
(Figures compiled by Buffer Micro Shop, London 01-769 2887)

Atari

1	(1)	Zaxxon	(Datasoft)
2	(4)	Floyd of the Jungle	(Microprose)§
3	(—)	Preppie	(Adventure International)
4	(2)	Defender	(Atari)*
5	(9)	Astro Chase	(First Star)†
6	(—)	Pac-Man	(Atari)*
7	(3)	Eliminator	(Adventure International)
8	(8)	Sea Dragon	(Adventure International)
9	(—)	Shamus	(Synapse)
10	(—)	Ali Baba and the 40 Thieves	(Quality Software)§

*Cartridge. †32K cassette. §32K disc.
(Figures compiled by Calisto Computers, Birmingham 021-632 6458)

ZX81*

1	(2)	Galaxians	(Artic)
2	(—)	Black Crystal	(Carnel)
3	(10	Kong/Dracula	(Tony Roberts)
4	(6)	Froggy	(DJL)
5	(8)	Trader	(Pixel)
6	(5)	Do Not Pass Go	(Workforce)
7	(7)	Gauntlet	(Colourmatic)
8	(—)	Invasion Force	(Artic)
9	(9)	Gulp 2	(Campbell Systems)
10	(3)	Chess II	(Artic)

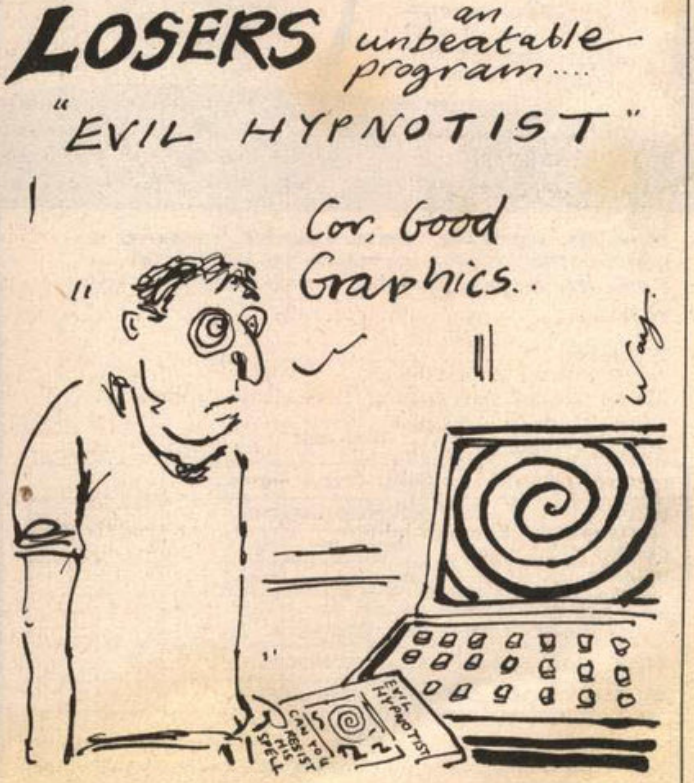
*All 16K.
(Figures compiled by Buffer Micro Shop, London 01-769 2887)

BBC*

1	(1)	Rocket Raid	(Acornsoft)
2	(4)	Snapper	(Acornsoft)
3	(6)	Meteors	(Acornsoft)
4	(—)	Arcade Action	(Acornsoft)
5	(—)	Sphinx Adventure	(Acornsoft)
6	(2)	Creative Graphics	(Acornsoft)
7	(—)	Arcadians	(Acornsoft)
8	(—)	Chess	(Computer Concepts)
9	(—)	Castle of Riddles	(Acornsoft)
10	(—)	Lisp	(Acornsoft)

*All Model B.
(Figures compiled by Micro Management, Ipswich 0473 59181)

(Last week's positions in brackets)



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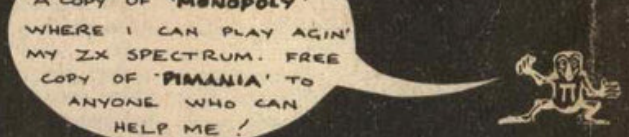

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