

POPULAR Computing WEEKLY

23 September 1982 Vol 1 No 23

35p

SEE PAGE 24
Free Computer Buy/Sell Service

SWAP SHOP

**Spectrum software:
Is it worth buying?**

**New Series:
Machine Code
for beginners**

**Spectrum
Disassembler**

**Vic 20 & BBC
programs**

**Cover Story:
Kong's Revenge
on Spectrum**

Whizzkid '82
Win a Dragon 32 & £2000
of advertising



RAMSWOP^{ZX81}

- Make full use of your memory
- Run two programs at once
- Fully machine coded — compact and fast (access by direct keyboard command or from within Basic)
- Rapid program interchange in memory (swop two 16K programs in one second — or two 8K programs in less!)
- Also program chaining plus tape save verify
- 16K and 32K version both on one cassette
- Full documentation

£6.95 post paid

LOVE^{16K ZX81}

Bored with dragons and dungeons? Try LOVE — a truly interactive adventure game written by women for women (though men will enjoy(?) playing it too!)

If the machismo of other adventure games irritates you, then try LOVE.

Supplied on cassette for 16K ZX81, with full documentation.

£5.95 post paid

Other innovative adventure games coming soon.

REMSOFT, 18 George Street, Brighton
BN2 1RH (Tel (0273) 602354)

CAMPBELL SYSTEMS

The very best in machine code for
ZX81 and Spectrum

ZX81 16K GULP II Spectacular arcade game of the xxxMAN variety. "The best ZX81 game I have ever played" says John Fox of Osset W. Yorks — and so say many others. Entertains even just in demo mode. £4.75

ZX81 16K-64K THE FAST ONE business/domestic filing and reporting system, the best there is. Fully user-defined data and reports, sorting, totalling, printing, all menu-driven, a tool for the professional-minded. Absolutely crash-proof. With 11-page manual, £12.00

Spectrum SPDE Disassembler and Editor, fast self-relocating development tool. Shows all Z80 op codes and operands. £5.95. We used it to make...

Spectrum GULPMAN: this is GULP II plus colour and sound and is already a favourite for Spectrum. £5.95

Spectrum 48K MASTERFILE — the long asked-for equivalent to THE FAST ONE, with even more features which include separate files and full menu-driven report building. Almost total machine code. Yes, we will support the microdrive when they arrive. With full documentation and sample file, £15.00

All programs supplied double-recorded and sped 1st class return post. Prices include VAT and postage. SAE for full catalogue.

CAMPBELL SYSTEMS

(Dept WPC)

15 Rous Road, Buckhurst Hill,
Essex IG9 6BL, England.

SOUND with ZX~81!

MAKE AMAZING SOUND EFFECTS WITH
YOUR ZX-81



£25.95 THE ZON X-81
incl p&p & VAT

- * The ZON X-81 SOUND UNIT is completely self-contained and especially designed for use with the ZX-81. It just plugs in — no dismantling or soldering.
- * No power pack, batteries, leads or other extras.
- * Manual Volume Control on panel — ample volume from built-in loudspeaker.
- * Standard ZX-81 — 16K Rampack or printer can be plugged into ZON X-81 Sound Unit without affecting normal ZX-81 operation.
- * Huge range of possible sounds for games or: Music, Helicopters, Sci-Fi, Space Invaders, Explosions, Gun-shots, Drums, Planes, Lasers, Organs, Bells, Tunes, Chords etc., or whatever you devise!
- * Uses 3-channel sound chip giving programme control of pitch, volume of tones and noise, all with envelope control.
- * Easily added to existing games or programmes using a few simple "BASIC" lines.

FULL instructions with many examples of how to obtain effects and the programmes, supplied. Fully Guaranteed.

BI-PAK

Dept PC1, P.O.
Box 6,
63A High Street,
Ware, Herts.



Access & VISA accepted
Ring 0920 3182 for
immediate despatch.

Spectrum MONITOR

MACHINE CODE DEBUG/DISASSEMBLER

- Enter, Run, Debug machine code programs
- Compatible with Basic
- Breakpoints & Register Display
- Disassembly to Screen and/or ZX Printer
- Number converter — Hex/Dec/Hex
- 16K and 48K versions on one cassette + 30-page Manual

£7.50

EDITOR/ASSEMBLER available soon — please send SAE for details

ZX81

SCREEN KIT 1

MORE POWER TO YOUR SCREEN

in all your BASIC Programs

4K to 64K
£5.70
BORDERS any size, anywhere on screen. SCROLL in all 4 directions. CLEAR and REVERSE PART OF SCREEN. FLASHING CURSOR anywhere on screen — simulates INPUT. DATA FILES SAVE & LOAD Basic variables: Double Speed. 880 bytes machine code for INSTANT RESPONSE. Becomes part of Basic Program

ZX-MC

MACHINE CODE DEBUG/MONITOR

COMPLETE FREEDOM FROM BASIC for machine code programmers

4K to 64K
£7.50
ENTER, RUN, DEBUG machine code. SAVE, LOAD, VERIFY at double speed. BREAKPOINTS and REGISTERS DISPLAY. Self-contained — cannot be used with Basic. Cassette plus 36-page Manual.

RELOAD

MACHINE CODE ENTRY/DEBUG

16K to 64K
£6.95
Version of ZX-MC without the Save/Load/Verify facility. ENTER, RUN, DEBUG machine code. Instantly CREATE A REM LINE of any length. Compatible with Basic. Switch between Program & RELOAD Screen displays. Breakpoints and Registers displays.

6 CORKSCREW HILL
WEST WICKHAM, KENT

Mail order only
14 days delivery

SAE for more details
Cheques/POs to PICTURESQUE



POPULAR Computing WEEKLY

The Team

Editor

Brendon Gore

Reporter

David Kelly [01-930 3271]

Sub-editor

Ninette Sharp

Editorial Secretary

Fiona McCormick

Advertisement Manager

David Lake [01-839 2846]

Advertisement Executive

Alastair Macintosh [01-930 3840]

Managing Editor

Duncan Scot

Publishing Director

Jenny Ireland

Popular Computing Weekly,
Hobhouse Court, 19 Whitcomb Street,
London WC2
Telephone: 01-839 6835

Published by Sunshine Publications Ltd.

Typesetting, origination and printing by
Chesham Press, Chesham, Bucks

Distributed by S M Distribution
London SW9. 01-274 8611. Telex: 261643

© Sunshine Publications Ltd 1982

Subscriptions

You can have *Popular Computing Weekly* sent to your home: the subscription rate is £19.95 per year, for addresses in the UK, £37.40 overseas.

How to submit articles

Articles which are submitted for publication should not be more than 1000 words long.

All submissions should be typed and a double space should be left between each line.

Programs should, whenever possible, be computer printed.

At present we cannot guarantee to return every submitted article, so please keep a copy.

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.

This Week



Cover illustration by Teoman Irmak

News	5
New Rom for BBC micro.	
Letters	7
Double height characters for Vic20.	
Kong's revenge	8
A new game for Spectrum by Jonathan Flint.	
Street Life	10
David Kelly reports on the 4th London ZX Microfair	
Machine code	11
A new series for beginners by Ian Stewart and Robin Jones.	
Reviews	12
Spectrum software.	
Open Forum	16
Five and a half pages of your programs.	
Whizzkid 82	21
Win a Dragon 32.	
Spectrum	22
Disassembler by David Hawkins.	
Peek & poke	25
Your questions answered.	
Competition	26
Puzzle, Arthur.	

Editorial

Aladdin's Cave is not a new type of adventure game. It is an aptly named treasure house of 'free' software games, according to Prestel.

The idea behind the scheme is that, with the aid of a Prestel adaptor, you dial up Aladdin's Cave and see what programs are on offer. If any of the games take your fancy, you can download them directly into your micro.

On the surface, Aladdin's Cave is an excellent idea. But the services of the genie are not free. Apart from the cost of the adaptor, you must join Prestel's Micronet 800 scheme (*Popular Computing Weekly*, September 16) which costs about £50 a year.

In addition, the best programs are unlikely to be in Aladdin's Cave. They will be available elsewhere in the Micronet system, at commercial rates. Unlike Aladdin's Cave, you will be charged for downloading these programs.

Nevertheless, Aladdin's Cave and the Micronet 800 scheme could change the face of the software market in this country. It will certainly be easier to download a program than to go-out, buy a cassette and load it into your micro. Whether or not it will be cheaper remains to be seen.

Next Week

Journey to the centre of the earth and beyond, in Tunnel — a new game for ZX81.

COMPUTER SWAP 01-930 3266

Do you want to buy or sell a microcomputer? You can do it **FREE** in Computer Swap, a new regular service for *Popular Computing Weekly* readers.

All you have to do is phone Computer Swap on 01-930 3266 and give us details of your computer, the price you want for it, your name, address and telephone number.

Computer Swap entries are limited to a maximum of 30 words. They will be published in the first available issue.

POPULAR
Computing
WEEKLY

CLASSIFIED ADVERTISING

Computer Swap — Free/Private reader — 10p a word/Trade Advertisement — 20p a word/Semi-display — £5 a single column centimetre, minimum two-column centimetres.

Computer Swap — buy or sell your computer for free through Computer Swap. See box on left for details.

Private readers — other advertisements from private readers cost 10p a word.

Trade advertisements — cost 20p a word.

Semi-display — why not make your advertisement more substantial by choosing the semi-display rate. It is only £5 a single column centimetre.

Send your classified entries to Classified Department, *Popular Computing Weekly*, Hobhouse Court, 19 Whitcomb Street, London WC2. For semi-display enquiries call Alastair Macintosh on 01-930 3840.

Here's my classified ad.

Please continue on a separate sheet of paper

I make this words, at per word so I owe you £.....

Name.....

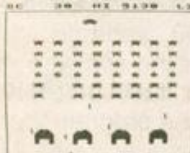
Address.....

Telephone.....

SEE FOR YOURSELF WHY WE HAVE SUCH
A GOOD REPUTATION FOR OUR

BBC MICRO GAMES

CASSETTE NINE
MODEL B INVADERS



Actual screen photo

Cassette nine contains Model B Invaders. A superb full feature adaptation of the arcade 'Space Invaders' game in machine code and high resolution colour graphics for the Model B BBC micro. Play normal game or choose from the many options including missile, bomb and invader speeds, invisible/visible invaders and shields/no shields. Quite simply the best — only **£6.95 inc.**

NOW SEE THE REST OF OUR FANTASTIC RANGE ...

FOR MODELS A AND B

Cassette 1 Star Trek and Candy Floss, the tremendous new game everyone is talking about — only **£5.95 inc.**

Cassette 2 Hangman, Kryptogram, Dice, Beetle, Grand National and Music — only **£3.95 inc.**

Cassette 3 Mutant Invaders — only **£5.95 inc.**

Cassette 4 Breakout — 6 skill levels, 1 or 2 players — only **£3.95 inc.**

FOR MODEL B ONLY

Cassette 5 Beebmunch, tremendous version with multi ghosts, screams, fruits etc — only **£5.95 inc.**

Cassette 6 Super Hangman, high resolution animated man, many categories — only **£3.95 inc.**

Cassette 7 3-D Maze. See your view in 3D as you battle to escape — only **£3.95 inc.**

Cassette 8 Model A Invaders. Superb machine, code teletext colour graphics version or the arcade game — only **£4.95 inc.**

Cassette 10 Word Pro — cassette based word processor for either Seikosha or Epsom Printers — only **£9.95 inc.**

YOUR ASSURANCE: ALL OUR SOFTWARE IS IN STOCK BEFORE WE ADVERTISE, AND WILL BE DESPATCHED WITHIN 48 HOURS OF RECEIPT OF ORDER.

I. J. K. SOFTWARE

(DEPT PCW)

55 FITZROY ROAD, BISPHAM,
BLACKPOOL, LANCs

HI RES PLANNERS

FOR THE

SPECTRUM

AND NOW THE

DRAGON/TRS-80

SPECIALLY DESIGNED PADS TO MAKE
GRAPHICS/HIGH RESOLUTION EASIER

SPECTRUM

256 x 192
WITH BOLD (CHARACTER)
24 x 32

DRAGON/TRS-80

256 x 192
WITH BOLD (CHARACTER)
16 x 32

BOTH PADS ARE A4 SIZE. 50 SHEETS
AND COST ONLY **£2.50 + 50p p & p**
PLEASE STATE WHICH COMPUTER
(CHEQUES PAYABLE TO XAVIERSINE)



XAVIERSINE
55 HIGH STREET
MIDSOMER NORTON
BATH AVON BA32DQ

ALSO AVAILABLE FROM

JADE COMPUTERS
COOMBEND
RADSTOCK
BATH, AVON

EVERYMAN COMPUTERS
14 EDWARD STREET
WESTBURY
WILTSHIRE

New Rom for BBC micro in November

ACORN is to charge owners of the BBC micro for 1.0 operating systems to replace the present 0.1. The new Series 1 Roms should be available by the middle of November.

In the case of orders for the Acorn disc interface (which costs £70) the new operating system will be supplied free. Owners not wishing the disc interface will pay £11.50, says Acorn's Technical Adviser, David Simpson.

Several aspects of the present 0.1 operating system are causing problems for users: the 0.1 will not support paged Roms — including disc operating system teletext adaptor or Econet system; there are problems with the Save and Load facilities and with some of the Fx calls.

These difficulties have been corrected in the new Roms. David Simpson explains: "The new system gives extra operating system calls, irons out a bug in the Rom in the Print # statement and allows the input of serial data using simple Fx commands."

"The 0.1 operating system is adequate but the subject of many discussions. We have asked Acorn for a definitive answer on pricing," said John Radcliffe, Executive Producer of the BBC's Computer Programme.

Acorn's John Horton said "We don't consider that people need the 1.0 system unless they have a disc operating system to support. Problems arise when dumping large amounts of software on to tape, and are caused by machine faults in the 0.1 operating system, but there is a well-publicised machine-code patch to solve most of the problems."

Cut-price Pets

COMMODORE has cut the prices of its Pet range of products for use in education.

The cost of Pets in schools has been cut by between 20 and 33 percent for a three-month period which began on September 1.

This move is a reaction to the company's exclusion from the government's Micros in Schools grants scheme (August 12).



A window into summer for enthralled youngsters.

Cheap holidays for micro kids

THIS Summer over 200 boys and girls will have benefited from Tandy Computer Camps, a scheme organised by the North London based community resource group, Inter-Action.

Ed Berman, Inter-Action's founder, said: "The non-residential sessions help those kids who cannot afford to take advantage of the more expen-

sive residential Summer camps outside London.

"We are a charity. The camps are run as a service for kids who are really keen to learn and not as a money-making exercise."

Inter-Action sessions cost £4 per day. Those attending are taught to use the Tandy and Commodore microcomputers by six undergraduate tutors.

Z80 disc pack from torch

TORCH Computers has launched a Z80 Disc Pack for the BBC micro. The unit includes a Z80 card which enables the machine to run CP/M[®] software.

The unit has a capacity of 800K, uses twin 5¼in double-sided 80-track discs and includes its own power supply.

The Z80 card fits inside the lid of the BBC machine and connects to the tube interface. The disc unit connects to the disc interface. A detailed instruction manual gives installation and operational advice.

Possible expansion options for the system include upgrading to a Winchester drive and addition of the Torch communications card which can be fitted inside the disc unit to provide Prestel, View-

data and auto-dial capabilities.

The disc unit is already available as part of the Torch microcomputer package — based around the BBC machine — and costing £3500.

The Torch Z80 Disc Pack costs £995. An Acorn disc interface is also necessary and costs £70. The Corresponding Acorn disc drive costs £235 for 200K. The Acorn Z80 card is not yet available but is expected to cost over £300.

Further information on the Torch Z80 Disc Pack is available from Torch Computers, Abberley House, Great Shelford, Cambridge.



Torch Z80 Disc Pack.

HP conference

PPC-UK, the British arm of the Hewlett Packard Programmable Calculator International Users Group, is holding its annual conference in London

on Saturday, October 9.

The cost of the PPC-UK meeting will be £15 (members) and £20 (non-members). More details from David Burch, PPC-UK, Astage, Rectory Lane, Windlesham.

Micronet 800 — a new deal from Prestel

PRESTEL has released more details of its Micronet 800 scheme, announced last week.

The scheme, due to be launched in January, will enable subscribers to buy a range of software and download it into their micros. An educational exchange library will enable schools and colleges to share programs written by teachers and students. Subscribers will also be able to exchange messages with each other, and any other Prestel user.

The Amateur Computer Club and other local groups will be able to use the system to keep their members up-to-date on club activities.

Aladdin's Cave is a collection of software, indexed by both subject and micro, that can be accessed for free.

Micronet 800 is a joint venture between Prestel/British Telecom; EMAP Computer & Business Publications Ltd/Telemap Ltd; ECC Publications Ltd and Prism Microproducts. Subscription to Micronet 800 will cost approximately £50 a year.

Further information is available from Micronet 800, Telemap Ltd, Bushfield House, Orton Centre, Peterborough PE2 0UW (telephone 0733-236113).

Move over Jaws — ET is on your trail

ATARI has signed a deal with MCA to produce a series of computer games based on the theme of Stephen Spielberg's new billion dollar film, *ET: The Extra Terrestrial*.

Graham Daubney, Atari's software manager, told *Popular Computing Weekly* "The games will use the ET characters and we hope to see them shortly after the film's UK launch at Christmas — definitely in the first quarter of 1983."

The deal is one of many being set up by Merchandising Corporation of America to produce spin-offs from the movie.

ET has been on general release in the US since July, and will be released in the UK later this year.

Croydon Micros

**ALL BRITISH COLOUR HOME COMPUTER
DRAGON 32 ONLY £199.50 Inc. V.A.T.**

32K RAM EXPANDABLE TO 64K INSIDE CASE
EXTENDED MICROSOFT COLOUR BASIC
16 x 32 CHARACTERS + HI-RES GRAPHICS, PROFESSIONAL TYPEWRITER
KEYBOARD, CONNECTIONS FOR CASSETTE, PRINTER, GAMES
CARTRIDGE & JOYSTICKS.



ORDER NOW 01-689 4349/4341

Open Tuesday – Saturday 10 – 6 p.m. (3rd Floor)

**The
Micro-computer Professionals**

20-28 WHITEHORSE ROAD, CROYDON, CR9 ZNA

Prices include V.A.T. Delivery Extra FRONTREALM LTD (T/A) All Credit Cards accepted

POC 2

Letters

write to Letters, Popular Computing Weekly, Hobhouse Court, 19 Whitcomb Street, London WC2

Spelling out magic numbers

Glad to see that Sinclair have now reached the magic figure of 42 (*Popular Computing Weekly* July 29). I had thought, by the service and attention received from them, that they were at Millways spending the year dead for tax reasons.

J Roberts
10 Bulrush Close
Hatfield
Hertfordshire AL10 8PE

3-dimensional graphics

I would like to congratulate you on achieving a good mix of interesting items in your weekly magazine. Of particular interest to me at the moment is Nick Hampshire's page on Spectrum graphics as I, along with others, await delivery of said machine.

Could you ask Nick Hampshire if it is possible to have a moving/rotating disc or wheel, as this could really be developed into some interesting graphics. In the meantime, I am saving all the articles ready to develop in my new Spectrum when it arrives.

Don Williamson
44 Sutton Park Drive
St Helens
Merseyside WA9 3TR

In answer to your query, see PCW July 8 for Nick Hampshire's rotating fan program.

Conspiracy of talents

One of your rival magazines recently gave the following quote: "It is better to know where to go and not how to get there than to know how to get there but not know where".

Unfortunately, many of your readers, including myself, fall into the latter category. We are capable of writing complex programs, but cannot think of original programs to write. Thus we are forced to reproduce arcade games such as *Puckman* and *Space Invaders*.

However, not only does this

mean that there is only a small range of programs available, but also that many programmers risk prosecution (re Copyright, *Popular Computing Weekly*, August 5).

I feel it would be a good idea if people could pool ideas for new games ie those people with imagination, but little knowledge of programming, could publicise their ideas for others to computerise. A small percentage of any money made selling the program would be paid to the originator of the idea as an incentive.

Unfortunately, this pooling of ideas would need a large database for storage, and printing facilities. At present, I have neither and thus cannot operate such a scheme.

However, I would like to hear from any company with these facilities who would be interested in running this type of scheme. Ideally, the company would also market the finished product, handling the payments to both the programmer and the originator of the idea.

John Hardman
65 Sandringham Drive
Welling
Kent DA16 3QZ

A philosophers life

I recently realised that I spend as much time watching a 32 x 24 matrix visualised at the end of a cathode ray tube as I do eating.

Is this part of the natural order of life, the universe and everything?

Simon Cross
6 The Avenue
Ipswich IP1 3SY

Leapfrogging in Street Alley

Re Street Alley (*Popular Computing Weekly*, August 12). Excellent game, but the frog has only one foot. To get two feet, the eighth number of 750 should be 199.

If a man is preferred, then 750 should read:

750 Data 60,60,24,255,189,
189,36,231,63

Alternatively, the first eight numbers can be any from A Blackham's character maker (July 15).

G. Foreman
82 Hazelton Road
Colchester
Essex CO4 3DY

Soldering on whirrs away

I ordered my Spectrum on May 10 and it arrived on August 5.

When I switched it on, I was surprised to hear quite a loud buzz from inside the case — it sounds like an electric motor whirring away. Using it with a Sony Trinitron, the set recommended by Sinclair, produced disappointing results with rolling bands of random colour. Trying it with a Sharp set was more successful with clean, steady colours although there was a pronounced shimmer on graphics. Yellow ink on green paper was virtually unreadable.

A chat with a friendly TV engineer threw some light on the problem with the Sony. He suggested I try adjusting a trimmer capacitor inside the Spectrum. Getting inside was much easier than with the ZX81, as there are no screws hidden under the feet. A small adjustment to the trimmer was all that was needed to make the Sony lock on.

I also found that very small adjustments affected the shimmer. I have been able to reduce it a little, but it is still far from perfect. The pixels now tend to pulse rather than wobble. Surely this must be a design fault?

After several hours of use, the internal temperature becomes disturbingly high (the heat sink is almost too hot to touch). It was during a cooking session when a bug developed, the *Beep* command caused the computer to *New* itself. Worse still, *Load* would not work and *New* *Newed* without having to press *Enter*. Switching off for a while restored everything to normal. Another look inside for dry joints etc, revealed a crack in a fine section of track, cured with a blob of solder.

Since then the computer has behaved itself and despite these problems, I like the machine.

S R Aizlewood
19 Brushfield Road
Holme Park
Chesterfield
Derbyshire

Doubled up on Vic20

Enclosed is a very simple and short method of obtaining double height characters on the Vic20. This method can be used with the basic Vic or with any expanded Vic. But, with cartridges that program the function keys, these have to be re-defined, eg, 'Key 1, "Graphic" '.

This program reproduces all the standard letters and graphics which appear on the right hand side of each key. The memory required to program the characters is just under 1.5K, leaving 2K of memory still intact.

It is advisable, after the characters have been programmed, to *New* the program used, as to get into the double height mode you have to type in the following — *Poke* 36867, (*Peek* (36867)) or 23, and, *Poke* 36869, 254. The programmed characters cannot be written over by another program in memory, so a program of up to 2K can be entered safely without fear of deleting the characters.

The program: Line 1 — Sets various memory pointers to prevent 'writing over'. Lines 2 and 3 — Transfer characters from Rom into Ram. Line 4 — Changes screen colour/Puts Vic into double height mode. Line 5 — Changes character set to programmable one (254).

```
1 POKE 56,24:POKE 55,0:CS=6144
2 FOR I=CS TO 7678
3 STEP2:Z=PEEK(32768+(I-CS)/2)
4 POKE I,Z:POKE I+1,Z:NEXT
5 POKE 36879,25:POKE 36867,(PEEK(36867))OR 23
6 POKE 36869,254:POKE 36881,24
```

Chris Groenhout
25 Kerferd Street
Watson ACT 2062
Australia

Kong's Revenge

A new game for Spectrum
by Jonathan Flint

This is an arcade style game for the Spectrum. The idea is to climb a layout of girders safely while collecting as many points as possible (as shown by your score at the top of the screen). Points are gained by taking the white parasols which are found at various locations.

For reasons which may escape you, a large gorilla is throwing barrels at you as you climb. These barrels should be avoided at all costs. If there is sufficient head room, you may jump over them as they pass. Your character (a little blue man) is moved using the following keys:

z..... LEFT
c..... RIGHT
x..... DOWN
s..... UP

Caps Shift together with one of the above keys enables your man to jump in the appropriate direction, ie *Caps Shift z* jumps you to the left. Jumps are required over barrels and across gaps in girders. Beware the x key — it moves you down whether or not there is a ladder beneath to support you.

The game has four stages. You receive a large bonus when progressing to each new stage. To reach a new stage you must climb to the highest point on the screen and then simply jump into thin air.

The first three levels can always be scaled if you choose your route carefully, but the fourth (with no ladders) is sometimes impossible. You may have to go out of your way to pick up a parasol but this must be done before a barrel rolls over them. If this happens the parasols will lose their *Brightness* and become worthless.

The program starts with a series of data statements. Lines 11, 12, 13, 15 and 16,

define the user defined graphics used in the game. When entering the program from the keyboard, you should Run lines 1 to 90 as soon as they have been written in order to define the graphics.

These graphics and the lines in which they appear are:

Graphic:	Lines:	
"p"	255,550,560,570	(Parasols)
"d"	1100,1126,2005	(Man)
	2030,2120,5010	
	5030,5050,5060	
"h"	5280	(Ladder)
"f" and "g"	5180	(Gorilla)

Lines 5190, 5200, 5220 use standard mosaic graphics.

The remaining data statements define the girder layouts and the ladder locations used in stages two and three. Lines 100 to 570 use this data to draw levels. The main playing loop lies between lines 1100 and 1500 and contains a minimum number of lines to keep things fairly fast.

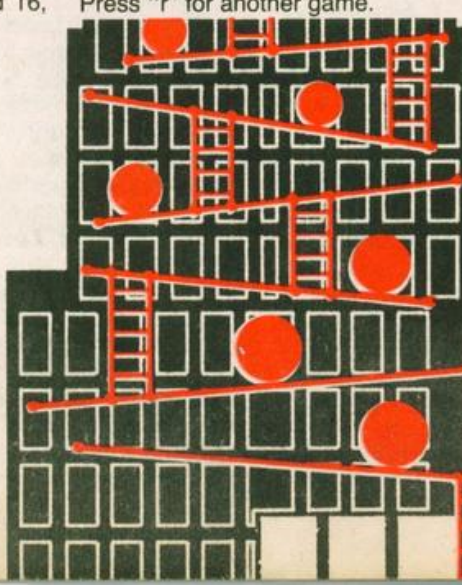
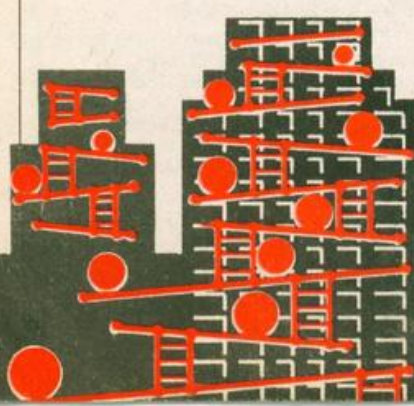
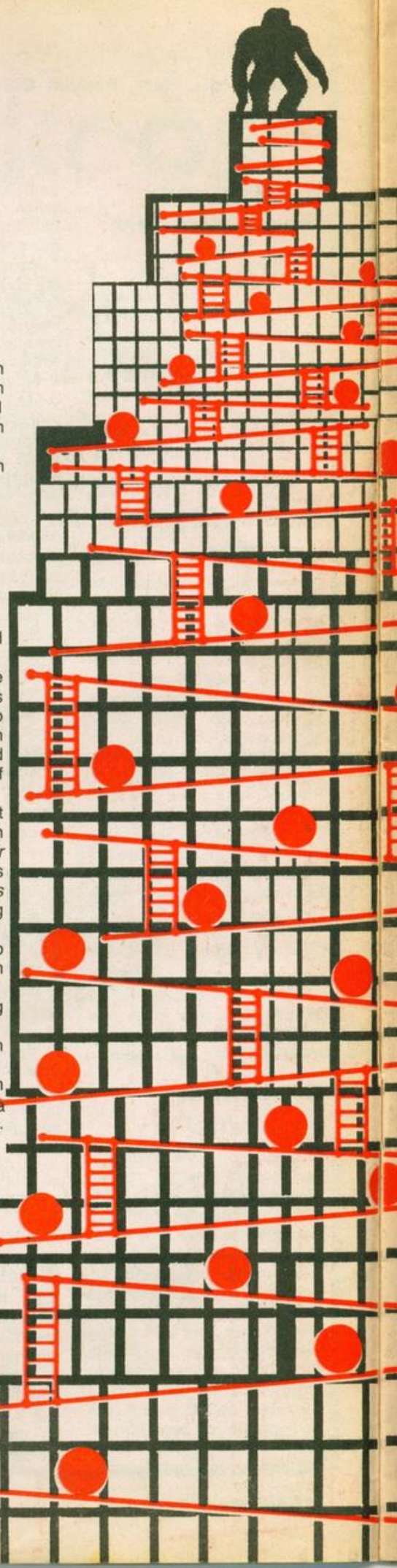
Since the *screen\$* function does not recognise user defined graphics or high resolution pictures, I have used the *Attr* function where necessary to identify items on screen by their colour and *Brightness* status. Thus if you wish to add anything further to the game bear in mind:

(a) The program as it stands will only stop and think about something it meets on screen if it is *Bright*.

(b) You cannot jump through anything which is red.

(c) You can stand on anything except an empty space.

When satisfactorily entered simply Run the game. You may be killed by hitting a barrel or by falling too great a distance. Press "r" for another game.




```

1 REM Kong's Revenge
2 REM BY J. Flint
3 REM
10 BORDER 6: INK 1: PAPER 6: C
-5
11 DATA "f",0,BIN 00001100,BIN
00001100,0,0,BIN 00001111,BIN 0
2001010,0
12 DATA "g",0,BIN 00110000,BIN
00110000,0,0,BIN 11110000,BIN 0
1010000,BIN 11110000
13 DATA "p",BIN 10001110,BIN 0
1110001,BIN 01100000,BIN 0101000
,BIN 10001000,BIN 10000100,BIN 1
3000010,BIN 01000100
15 DATA "d",BIN 00001000,BIN 0
1111110,BIN 10011000,BIN 0011110
0,BIN 00100100,BIN 00100100,BIN
20100100,BIN 00110110
16 DATA "h",BIN 01000100,BIN 0
1000100,BIN 01000100,BIN 0111110
0,BIN 01000100,BIN 01000100,BIN
21000100,BIN 01000100
18 DATA 18,17,6,28,14,2,25,16,
4,0,0,32,0,16,16,16,2,3,2,8,5,20
4,12,0,4,10,11,6,9,21,8,3,24,12
7,0,12,21
19 DATA 13,10,0,8,0,12,24,9,5,
2
20 DATA 0,16,20,21,16,10,0,12,
20,21,12,1,22,10,1,12,16,7,27,2,
4,24,1,2,29,0,0,2,8,3,0,0,32,2,4
26,16,8,14
21 DATA 25,5,0,9,0,13,5,0,25,9
30 FOR g=1 TO 5
40 READ a$
50 FOR x=0 TO 7
60 READ a
70 POKE USR a$+x,a
80 NEXT x
90 NEXT g
100 LET sc=0: LET l=0
101 BRIGHT 0: BORDER 6: INK 1:
PAPER 6: CLS
102 OVER 0: INK 2
105 FOR x=1 TO 140 STEP 32-16*(
l>2)
110 PLOT 0,x
130 FOR n=1 TO 31
140 DRAW 4,0: DRAW 0,4: DRAW 4,
2: DRAW 0,-4
150 NEXT n
155 DRAW 0,6
160 DRAW -248,0
170 NEXT x
175 GO SUB 5170
250 FOR Y=5 TO 19 STEP 4-2*(l>2)
255 PRINT AT y+1,RND*29; BRIGHT
1: INK 7;"X"
260 LET t=28*RND
261 LET s=26*RND
265 PRINT AT y,s;" "
290 IF l<2 THEN GO SUB 5270
300 NEXT y
310 PLOT 200,143
320 DRAW 7,0
330 PLOT 216,159
340 DRAW 7,0
350 GO TO 1000
390 INK 2
395 FOR t=1 TO 13
400 READ a,b,c
410 PLOT a*8,b*8+5
420 FOR x=1 TO c-1
430 DRAW 4,-2: DRAW 4,2
440 NEXT x
445 DRAW 4,-2: DRAW 3,3
450 DRAW -6*(c-.1),0
460 NEXT t
500 FOR c=1 TO 5
510 READ t,y: GO SUB 5270
520 NEXT c
530 GO SUB 5170
540 BRIGHT 1: INK 7
550 PRINT AT 6,1;"X"
560 PRINT AT 12,3;"X"
570 PRINT AT 18,30;"X"
580 IF l=2 THEN PRINT AT 2,13;
INK 1;"000000"
1000 LET y=0
1010 GO SUB 4000: GO SUB 4010
1020 BRIGHT 0: OVER 1: INK 8: FL
ASH 8
1030 LET y=20: LET x=0
1040 PRINT AT 1,14; OVER 0; INK
7: BRIGHT 1;sc
1100 PRINT BRIGHT 8;AT y,x;"Z"
1104 IF SCREEN$ (y+1,x)="" THEN
GO SUB 2000

```

```

1105 PRINT BRIGHT 1;AT p,q;"0"
1110 PRINT BRIGHT 1;AT p1,q1;"0"
1120 BEEP (INKEY$("<"))/50,-y
1125 IF ATTR (y,x)>64 THEN GO TO
3000
1126 PRINT AT y,x;"Z"
1130 LET x=x+(INKEY$="c")-(INKEY
$="z")
1132 LET y=y-(INKEY$="s")+(INKEY
$="x")
1140 IF INKEY$("<a") AND INKEY$(">a")
" THEN GO SUB 5000
1150 PRINT :AT p,q;"0"
1160 PRINT :AT p1,q1;"0"
1170 GO SUB 3510
1180 IF SCREEN$ (p+1,q)="" THEN
LET p=p+2
1200 IF SCREEN$ (p1+1,q1)="" TH
EN LET p1=p1+2
1500 GO TO 1100
2000 REM DROP
2005 PRINT AT y,x;"Z"
2007 IF y<1 THEN GO TO 6000
2010 FOR b=1 TO 2
2020 LET y=y+1
2030 PRINT AT y,x;"Z"
2040 IF SCREEN$ (y+1,x)="" THEN
BEEP .1,-12: RETURN
2060 GO SUB 3510
2120 PRINT AT y,x;"Z"
2125 NEXT b
2130 IF SCREEN$ (y+1,x)="" THEN
GO TO 2500
2140 LET y=y+1: GO TO 2130
2500 PRINT AT y,x-2: OVER 0; FLA
SH 1: INK 2;"SPLAT"
2530 FOR x=0 TO -30 STEP -1: BEE
p,.05,x: NEXT x
2540 IF INKEY$="f" THEN CLS: RE
STORE 18: GO TO 100
2550 GO TO 2540
3000 REM BRIGHT
3005 IF ATTR (y,x)<>119 THEN GO
TO 2500
3010 BEEP .2,36
3020 LET sc=sc+100
3030 PRINT AT 1,14; OVER 0; INK
7: BRIGHT 1;sc
3040 PRINT AT y,x; OVER 0; INK 1
" "
3050 GO TO 1130
3500 REM BARREL
3510 LET q=q+d: LET q1=q1+d1
3520 IF q1>30 OR q1<1 THEN LET d
1=-d1: IF p1>y THEN GO SUB 4010
3540 IF q>30 OR q<1 THEN LET d=-
d: IF p>y THEN GO SUB 4000
3550 RETURN
4000 LET d=1: LET q=1: LET p=2*I
NT (y/3): RETURN
4010 LET d1=-1: LET q1=29: LET p
1=2*INT (y/3): RETURN
5000 LET g=(INKEY$="c")-(INKEY$=
"z")
5005 BRIGHT 8
5010 PRINT AT y-1,x;"Z": BEEP .0
5,0
5020 IF ATTR (y-1,x)=50 THEN GO
TO 2500
5030 PRINT AT y-2,x+9;"Z": BEEP
.05,12
5050 PRINT AT y-1,x;"Z"
5060 PRINT AT y-2,x+9;"Z": BEEP
.05,24
5080 LET x=x+2*9: LET y=y-2
5090 BRIGHT 0
5100 IF ATTR (y,x)>64 THEN GO TO
3000
5120 RETURN
5170 REM GORILLA
5175 PAPER 2: INK 0: FLASH 1
5180 PRINT AT 0,9;" "
5190 PRINT AT 1,8;" "
5200 PRINT AT 2,8;" "
5220 PRINT AT 3,8;" "
5230 FLASH 0: PAPER 6
5240 RETURN
5260 REM Ladder
5270 FOR x=0 TO 3
5280 PRINT AT x+y,t: INK 1;"H"
5290 NEXT x
5300 RETURN
5000 REM Again
5020 LET sc=sc+2+100
5030 BEEP .3,12: BEEP .3,24: BEE
p .3,12: BEEP .3,24: BEEP 1,0
5040 INK 1: CLS
5050 LET l=l+1
5060 IF l>2 THEN RESTORE 18: GO
TO 101
5070 GO TO 390

```


Street Life

Indoor garden party for ZX fans

David Kelly reports on the 4th London ZX Microfair and finds business is booming.

Over 6000 expectant ZX81 and Spectrum owners made their way to the 4th London ZX Microfair in Victoria on Saturday August 21. The New Horticultural Hall, built in 1928, proved to be far more popular than the previous venue, the Westminster Central Hall. By lunch-time all that could be seen of the hall was a seething mass of heads.

Mike Johnston, the show's organiser was clearly delighted. "My only worry" he said "was that the delay in production of the Spectrum would mean that none of the companies would have any Spectrum products to sell or display."

In the event, most of the companies at the fair managed to put some Spectrum wares on show. This was clearly necessary, since interest seemed to centre on products for the new machine.

Several of the 75 or so exhibitors commented that from the time of the Spectrum launch sales of their ZX81 stock were considerably reduced.

One software company even went so far as to say that its ZX81 stock 'died' with the announcement of the new machine.

It has been a lean time for companies this summer while they waited for their new Sinclair machines. Now, however, most of the companies have received their Spectrums and are frantically trying to stay in a market that has suddenly taken off at a tangent.

After several fairly dismal microfairs — including the last London and Manchester ZX Microfairs — the scene is once again alive.

There were at least eight Spectrums, and one Dragon 32, available on various stands. They proved to be a strong draw for those people still waiting for their own machines.

Kempston (Micro) Electronics demonstrated its new joystick for the Spectrum. The unit plugs into the Kempston I/O controller card which, in turn, plugs into the port at the rear of the machine. Up to four joysticks can be connected to the card at the same time and individually addressed from the Spectrum. The controller card is currently available for £16.50 and the joystick, together with demonstration tape and instructions, will be available by the



Avid micro enthusiasts, fingers poised at the keyboard.



Inside the New Agricultural Hall.

second week of September for around £9.50.

Stephen Adams displayed his £7 ZX81/Spectrum Ram converter. This device allows a ZX81 Ram pack to be fitted to the rear port of the Spectrum to convert a 16K machine into a 32K one.

Memotech showed a new Centronics printer interface for use either with the ZX81 or ZX Spectrum. A similar RS232 interface will be available by mid-September. Both interfaces cost £39.95.

East London Robotics had its 64K and

32K plug-in Ram expansion modules for the Spectrum for sale. The boards are available for £50 and £35, respectively. They are also available in kit form, although assembly by inexperienced constructors is not recommended.

Sir Computers had an 8-bit Spectrum I/O port on display, price £14.50, available in mid-September.

Nearly all of the main software companies at the fair had some Spectrum material to show.

Bug-Byte demonstrated its *Spectral Invaders* and Quicksilver had its *Space Intruders* and *Meteor Storm* on view — all for the 16K Spectrum.

Silversoft showed their new games for the 16K Spectrum — *Orbiter*, a version of *Defender*, and *Ground Attack*, a version of *Scramble* — each available for £5.95.

Macronics showed *Word-Pro* for the 48K Spectrum and a game called *Star Quest*. J P Gibbons had a 32K Spectrum *Personal Banking System* on display while Zedxta showed off its character programmer. C-Tech showed four new games including *Breakout* and *Fruit-Machine*.

Spectrum material was also in evidence from J W V Software and Silicon Software.

The impact of Atari's copyright actions against Commodore and Bug-Byte was being felt by many of the software companies. Concern centred, not so much on the Atari action itself, but on the general uncertainty of this area of the law. No one knows how different a program has to be from an original game before it ceases to be an infringement of copyright.

The next London ZX Microfair will be held on December 18. The venue has yet to be finalised.

Machine Code

Ian Stewart and Robin Jones present a new series for beginners

From the left by numbers

People normally think about numbers in terms of tens. If you write the number 3814 we all understand that to mean:

$$3 \times 1000 + 8 \times 100 + 1 \times 10 + 4 \times 1$$

and we can see that to get a "place value" from the one on its right we simply multiply by ten. We say the number is in *base ten*.

Because we've been doing this for as long as we can remember, it's difficult to realise that there are other, perfectly sensible, ways of doing the same job. Early computer designers certainly didn't; they used base ten representations in their machines and hit some nasty snags. Most of these problems were caused by the fact that electronic amplifiers don't behave the same way for all the signals you want to input to them. For instance, an amplifier that is supposed to output double its input signal may well do so for inputs of 1, 2, 3 and 4 units; but then it starts to "flatten off" so that an input of 5 produces an output of only 9.6, 6 produces 10.8, and you can hardly tell the difference between the outputs for inputs of 8 and 9.

Put a music tape in a cheap cassette recorder and wind up the volume. Hear the distortion in the loud bits? It's the same effect.

The simplest thing you can do with an electrical signal is to turn it on or off; so you can represent the digits 0 (off) and 1 (on) satisfactorily. Distortion no longer matters. It's clear whether a signal is present or not regardless of how mangled it is. But can we devise a number system which only uses 0s and 1s?

Yes. In a base ten number, the largest possible digit is 9. Add 1 to 9 and you get 10—a *carry* has taken place. We can write any number using any other base we choose, and the largest possible digit will always be one less than the base. If the base is 2, the largest digit is 1, so a base 2 (or *binary*) number only contains 0s and 1s.

What about the place values? In the base ten case we got those by starting at 1 (on the right) and multiplying by 10 every time we moved left one place. For a binary number we still start at 1, but we multiply by 2 every time we move left.

So for instance the binary number 1101 can be converted to base 10 like this:

$$\begin{array}{rcl} 1 & 1 & 0 & 1 \\ \downarrow & \downarrow & \downarrow & \downarrow \\ 1 & 2 & 4 & 8 \\ \times 1 & \times 2 & \times 4 & \times 8 \\ \hline & & & 8 \\ & & & 4 \\ & & & 0 \\ & & & 1 \\ \hline & & & 13 \end{array}$$

Converting the other way is easy as well. Take 25 for example. If you write down the binary place values:

32 16 8 4 2 1

and work from the left, it's clear that you need a 16. Subtract 16 from 25 and you will be left with 9, and that's made up of an 8 and a 1, so 25 is:

0 1 1 0 0 1

Hexadecimal code

This is fine for relatively small values, but a bit messy for large ones. There are a number of quick conversion techniques, and there are binary-to-decimal and decimal-to-binary conversion program listings in *PEEK, POKE, BYTE & RAM!*; but we want to examine a procedure which makes use of *hexadecimal* code, because it will stand you in good stead later.

A number in hex (nobody ever says "hexadecimal", except us, just now) is a number in base 16. So the place values are obtained by successive multiplications by 16. The first five are:

65536 4096 256 16 1

"Hang about!" everybody's saying. "Those are nasty numbers, and anyway, in base 16 the largest digit has the value 15. Things are getting complicated."

Bear with us. We handle the problem of digits greater than 9 by assigning the letters A-F to the values 10-15. So the number 2AD in hex converts to decimal like this:

$$\begin{array}{rcl} 2 & A & D \\ \downarrow & \downarrow & \downarrow \\ 2 & 10 & 13 \\ \times 256 & \times 16 & \times 1 \\ \hline & 160 & 13 \\ \hline & 512 & \\ \hline & 685 \end{array}$$

Now for the nice feature of hex. Because 16 is one of the binary place values (the fifth one) it turns out that each hex digit in a number can be replaced by the four binary digits which represent it. (By the way, "binary digit" takes almost as long to say as "hexadecimal" so it's normally abbreviated to "*bit*".) The following table shows the conversions:

Decimal	Hex	Binary
0	0	0000
1	1	0001
2	2	0010
3	3	0011
4	4	0100
5	5	0101
6	6	0110
7	7	0111
8	8	1000
9	9	1001
10	A	1010
11	B	1011
12	C	1100
13	D	1101
14	E	1110
15	F	1111

Now suppose we want to convert 9041

to hex. First we extract two 4096s, then some 256s and so on like this:

$$\begin{array}{rcl} 9041 & & \\ 2 \times 4096 & = & 8192 \\ & & 849 \\ 3 \times 256 & = & 768 \\ & & 81 \\ 5 \times 16 & = & 80 \\ & & 1 \\ 1 \times 1 & = & 1 \\ & & 0 \end{array}$$

So the hex representation is 2351. Now we just copy the digit codes from the table:

0010 0011 0101 0001

and that's the binary equivalent of 9041 — just run the four blocks together to get 0010001101010001.

The hex-to-binary conversion is so easy that, more often than not, we leave numbers in hex even when, ultimately, we need them in binary.

Conversion by Computer

Here's a program to convert from decimal to hex. It successively divides the number by 16, looking at the remainder each time, so it extracts digits in the opposite order to that shown previously.

```

1 DIM HEX$(4)
20 LET P=4
30 LET HEX$="0000"
40 PRINT "ENTER DECIMAL NO. (MAX:65535)"
50 INPUT DN
60 LET N=INT (DN/16)
70 LET HEX$(P)=CHR$(DN-16*N+28)
80 LET DN=N
90 LET P=P-1
100 IF DN>0 THEN GOTO 60
110 PRINT "HEX VALUE IS"; HEX$

```

The result is always presented as a 4-digit number, with leading zeroes if there are fewer than 4 significant digits. The program won't work if the result should contain more than 4 digits, but that's ideal for our purposes, as you shall see.

Here's the code to convert in the opposite direction (hex to decimal):

```

140 PRINT "ENTER 4 DIGIT HEX NO."
150 INPUT HEX$
160 LET DN=0
170 FOR P=1 TO 4
180 LET DN=DN*16+(CODE(HEX$(P))-28)
190 NEXT P
200 PRINT "DECIMAL VALUE IS"; DN

```

We could tie these routines together with a little menu:

```

2 PRINT "DEC/HEX CONVERTOR"
3 PRINT "1)DEC->HEX"
4 PRINT "2)HEX->DEC"
5 PRINT "3)END"
6 PRINT "ENTER 1, 2, OR 3"
7 INPUT SEL
8 IF SEL=1 THEN GOSUB 20
9 IF SEL=2 THEN GOSUB 140
10 IF SEL=3 THEN STOP

```

and, of course, we'll need *Returns* at lines 120 and 210.

Reproduced from *Machine Code and better Basic*, by Ian Stewart and Robin Jones (Price £7.50), by kind permission of Shiva Publishing Ltd, 4 Church Lane, Natwich, Cheshire CW5 5RQ.

Somewhere over the rainbow?

Boris Allan treads the yellow brick road, looking at the latest Spectrum software.

The ZX Spectrum is a far different machine to the old ZX81, but many software writers do not seem to have noticed.

I was rather disheartened to discover that at least two of the programs were being promoted by their length — a program may be long either because it is complex or because it is poorly written. In the case of two programs I suspect the main reason is the latter.

Some programs loaded the user-defined characters of cassette by use of the `Load "" Code` command which meant that 16K programs would not work on 48K (and vice versa). All that was needed was the simple command `Load "" Code User "a"` and the same program worked on either system. Little things like this suggested that the program writers did not know the Spectrum well enough to use it to the full.

Other hangovers from the past were the way in which programs were written to use graphics which — apart from the colour — were in no way superior to ZX81 programs.

Of the programs I review here, only some are worth examining in detail. For a change, I will first look at the three which are far and away the worst specimens.

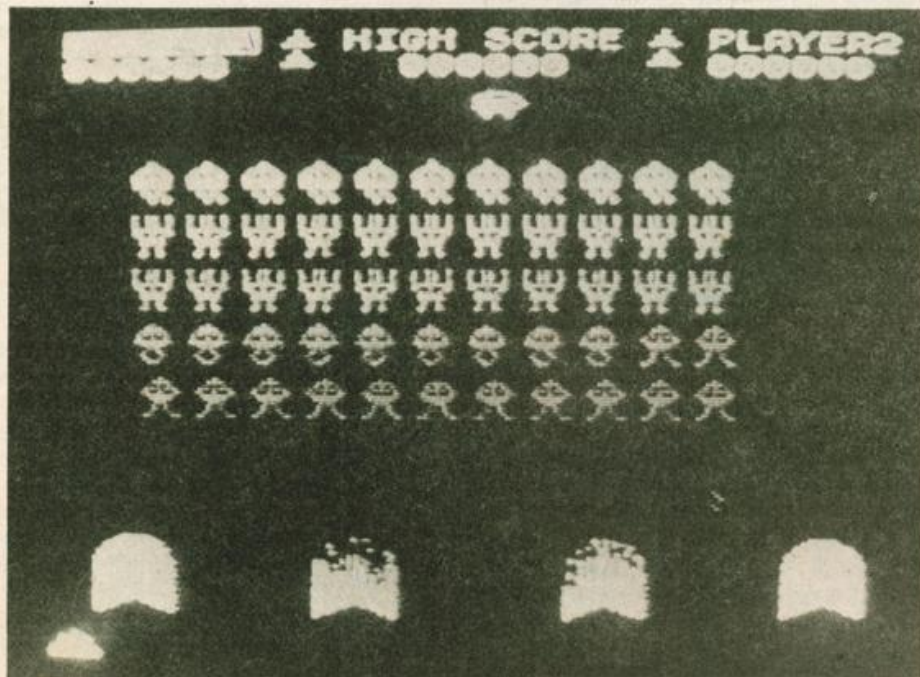


Boris Allan "the ZX Spectrum is a far different machine to the old ZX81".

Inheritance is easily the worst program. For a program with such a long listing there seem to be no error traps — an example of inefficient programming. The game is in two sections, building up an inheritance on the stock market (with a bit of gambling) and then using the inheritance to run a business.

To win at the first section, all you have to do is place half your money on a good bet (or what seemed to be a good bet) and an equal, but minus, amount on a bad bet. For example, in Black-jack if your first card was low, bet a minus amount, so that when you lose you lose a minus amount (ie gain a positive amount). Using such tricks it was easy to win. Surely, no decent program with an 11 foot print out should allow this.

In the second section, all that was needed was to have a negative number of



Reviews



advertising outlets (—1E14 was popular) to succeed. A waste of time. I had more fun trying to trip it up than actually playing it properly.

Venture was little better — a ZX81 program masquerading as a Spectrum program — and again one for which claims were made regarding length. This was the

“*Inheritance is easily the worst program. For a program with such a long listing there seem to be no error traps...*”

program with copious ZX81-type graphics, and many superfluous *lfs*. Only capital letters were allowed for input, it would not accept lower case.

The program was a series of games on the way to a final maze, where one collected gold. Included were a bomber style game which made little use of the Spectrum's facilities and a Mastermind type game which gave you 14 attempts to find the solution when the most you need is eight. In the final maze, you could accumulate items simply by going over the same spot.

Supersoft supplied three programs — an *Editor*, *Lgame*, and *Graphics*. At first I thought that the *Graphics* program (it helps to construct user-defined characters) was over-priced at £5 — especially as it is so simple to define characters in any case — but later, when I found that a superior program was part of the free *Horizon* cassette, I was certain.

Lgame (also £5) is based on the original version by lateral thinker Edward de Bono. The program was not complex, though an attempt was made to disguise the structure by the use of *Goto* labels (and not line numbers).

The final offering, *Editor* (at £15), was a text editor — not a word processor. The program was so rudimentary it did not even use the screen, input was into a string at the normal input position. The program's author claims “*Editor* is a program that turns the ZX Spectrum into a true word processor” — but this is just not so. True word processors allow you to

change the formatting of the file, within the file as part of text, and this is not possible with this system. *Editor* is not easy to use, is far too easily crashed, and is not recommended.

Spectral Invaders from Bug-Byte was a distinct improvement, though I prefer Quicksilver's *Space Intruders* and Campbell System's *Gulpman*. *Spectral Invaders* is a rather sedate game of the invaders type, with large slow-moving aliens. Bands of colour are set across the screen and each invader takes the colour of the band, rather than being individually pigmented.

At the end, the increase in speed of the invaders was not significant. The game was also spoilt by having to enter the game each time a base was destroyed — much better the instant appearance of your next base.

All the offerings from Abacus were standard, usually maze-type, games. *Android Pit-Rescue* had a bug in it such that if your laser blasted the bottom of the pit, you had an out-of-range error.

The three games from Lomax were middling. Two (*Defender* and *Thezeus*) loaded defined characters from cassette and the loading program had to be modified to load at *Usr* "a". *Defender* was



Looking for a pot of gold?

rather tame — almost an introductory attempt to produce a game using graphics, and was of the blow-up-all-the-Klingon-space-ships-with-your-lasers-type. The instructions are not complex — they do not need to be — and are incorrect at one point (it is 0 to fire and not f). *Thezeus* was of the collect-the-goodies-from-the-maze-but-do-not-trigger-the-hidden-bombs-type. *Squash* was poor, without being terrible.

I will discuss the two disassemblers at this point, because they are not games and every program has to be somewhere — to paraphrase Spike Milligan.

Both utility programs worked. *SPDE* had instructions within the program and offered

Supplier	Program	Comment	Price
Bug-Byte, 98-100 The Albany, Old Hall Street, Liverpool	<i>Spectral Invaders</i>	Standard	£5
Artic Computing, 396 James Reckitt Avenue, Hull	<i>Spectrum Bug</i>	Useful utility	£6.95
Simon W Hessel Software, 15 Lytham Court, Cardwell Crescent, Sunninghill, Berks	<i>Inheritance</i>	Poorly written	£5.95
Campbell Systems, 15 Rous Road, Buckhurst Hill, Essex	<i>SPDE</i>	Useful utility	£5.95
	<i>Gulpman</i>	An extraordinarily good program	£5.95
Lomax 25 Parkway Crowthorne, Berkshire ZX-Guaranteed, 29 Chadderton Drive, Unsworth, Bury, Lancs	<i>Defender</i>	Average	£4.50
	<i>Squash</i>		for the three
	<i>Thezeus</i>		
Psion, Sinclair Research	<i>Venture</i>	Thinks it's a ZX81 program	£6
	<i>Horizons</i>	Excellent value	Free with Spectrum
Abacus Programs, 186 St Hellens Ave, Swansea, West Glamorgan	<i>Destroyer</i>	Subchase	£4.95
	<i>Battle</i>	Tankchase	£4.95
	<i>Iceberg</i>	Grippingly tedious	£5.95
	<i>Android/</i>	And again	for the two
	<i>Pit-rescue</i>		
Supersoft, 6a Newlands Ave, Southampton	<i>Editor</i>	Must be joking at this price	£15
	<i>Lgame</i>	Poor	£5
	<i>Graphics</i>	Free in <i>Horizons</i>	£5

facilities to convert from hexadecimal to decimal and *vice versa* and other little treats. *Spectrum Bug* game with instructions on the insert and an instruction booklet is threatened.

There were little hiccups with both disassemblers. The Artic version (*Spectrum Bug*) was perhaps the more complete, but the Campbell Systems version (*SPDE*) was rather easier to use and modify. *Spectrum Bug* is in machine code, where-

“ There were little hiccups with both disassemblers. Artic was perhaps the more complete, but Campbell Systems-easier to use and modify. ”

as *SPDE* is written in Basic. There is little to choose between them, though my personal preference is for *SPDE*.

The *Horizons* cassette is now to be given away free with every *Spectrum*. Apart from one bug in the keyboard trainer (characters were selected at random and sometimes *Enter* was chosen, and appeared as a “?”) *Horizons* seems fine.

Side A is explanatory — What is a computer, What is a Spectrum, and What is a keyboard? While it generated no great enthusiasm, the keyboard trainer was more fun than some of the other cassettes reviewed here.

Side B contained games and demonstrations, including the best *Break-out* version yet seen for the Spectrum, a

competent (perhaps even good) character generator, a line draw program, and an intriguing sine-wave addition program (very pretty). Also on the tape were other more mundane programs such as *Life*, *Bubblesort*, *Evolution*, and *Monte Carlo*. Easily the best value for money of all cassettes — it's free — and not bad either.

Gulpman

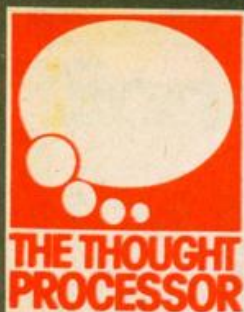
Gulpman is the one cassette that I would buy (given that *Horizons* is free). In *Gulpman* you go round picking up apples while being chased by nasties. You are protected only by lasers and your wits. You have nine lives.

It is possible to choose between nine speeds, nine “grades” (how fast the nasties are compared to you) and 15 different mazes (each requiring a different strategy). You can also choose which keys control your movements.

You can run a demonstration on any type of maze, and save that version of the game with your keys, plus reset high-score and other twiddly bits. An exceptional program. Given the work involved and the way the whole program is packaged it is well worth the £6 — and I do not often think that.

Summary

When are software writers going to realise that the Spectrum is a different machine from the ZX81? And when will people stop re-using all the same old ideas? Apart from the two disassemblers, only *Gulpman* and *Horizons* really stand out.



MiCROL[®] SPECTRUM

USE AND LEARN VOL.1: 25 BASIC PROGRAMS AVAILABLE NOW

USE 25 PRACTICAL BASIC programs you can put to work immediately—

Programs to demonstrate the wide-ranging potential of your 16 or 48K Spectrum:—
World Atlas — Cassette and Videocassette

Index — Music Composer — Computer Term
Glossary — Star Maps...

Personal Programming Aids to help you write your own programs more effectively:—

Memory Map Monitor — System Diagnostic —
Program debugging aids...

Time-saving routines to use in your own programs:—

Text Editor — Flexible graph drawing
routines — Sort and Search routines...

Plus much more.

And, of course, original games to entertain and challenge you.

LEARN New ways to get the most from your Spectrum. Over 100 pages packed with —

Powerful programming techniques:—
use Structured Programming to save time and
make your programs more reliable —

Ideas to make your games more exciting —
How and when to use trees, tables, sorts
and searches (do you know the Monkey
Puzzle sort?)...

Facts at your Fingertips:—
Memory and runtime Benchmarks for every

£9.95



command — Display File Memory Map

— Important PEEK and POKE locations
you won't find in your Spectrum manual.
Program Design Aids:—Screen Designers,
for fast graphics and print layouts —

Memory Manager, to keep track of every
variable and array. PLUS:— All 25 BASIC
programs explained line by line

— a goldmine of practical hints and tips.

Send today for USE AND LEARN

Volume 1— 25 BASIC Programs, and
we'll also keep you posted with details
of further important MiCROL products

for your Spectrum. And USE AND LEARN
comes with MiCROL's full 14-day
money-back Guarantee.

To order simply complete the
coupon, and FREEPOST with
your cheque, made payable to
MiCROL (UK Mail Order).

Despatch normally by return.

Telephone orders—credit card
holders can order by telephoning
(0223) 312866 from 9-5.30 Monday
to Saturday, stating name and address.
Card No. Access/Barclaycard/Visa.
and item(s) required.

THE DATA BASE

PRACTICAL. AND ONLY

POWERFUL. FOR 48K

RELIABLE. SPECTRUMS

AVAILABLE NOW **£9.95**

Whether you want to update mailing lists, re-organise the filing, or simply produce an index of your stamp collection, THE DATABASE makes it easy and enjoyable:

Easy-to-use one-touch commands and full onscreen prompts for fast, confident operation.

Down-to-earth 40-page manual — full operating instructions plus practical examples to show how THE DATABASE helps you in almost every work and leisure interest.

Massive storage capacity for real-work capabilities — over 900 screens of information (or over 7,000 names and addresses) on a single C90 cassette.

Advanced features you won't find on most £100 + databases — Machine-code automatic sorts and six kinds of searches (including Find Smith, Find Smith And Croydon, Find Smith or Croydon).

Performance you can depend on — professional design and testing ensures the reliability you need for storing important information.

And, with THE DATABASE, you get FREE MiCROL UserCare — informed, intelligent assistance and advice, whatever your question — by letter or telephone.



You can put THE DATABASE to work immediately. And as your Spectrum system grows, THE DATABASE will grow too, with low-cost MiCROL add-ons for Microdrives and full-size printers available soon.

AVAILABLE NOW!
ONLY £9.95

Find out for yourself how THE DATABASE puts real computing power at your fingertips.

Send for THE DATABASE today, and we'll also keep you posted with details of further important MiCROL products for your 48K Spectrum. And THE DATABASE comes with MiCROL's 14-day money-back Guarantee.

To order simply complete the coupon, and FREEPOST with your cheque, made payable to **MiCROL (UK Mail Order)**. Despatch normally by return.

Telephone orders—credit card holders can order by telephoning (0223) 312866 from 9-5.30 Monday to Saturday, stating name and address, Card No.

Access/Barclaycard/Visa and item(s) required.



MiCROL[®]

SPECTRUM

(0223) 312866

MAIL ORDER DISTRIBUTION EXCLUSIVELY
BY TEMPUS OF CAMBRIDGE
38 Burleigh Street,
Cambridge CB1 1BR.

Designed by Sesames(UK)Ltd

Post to:— **MiCROL (UK Mail Order) Freepost**
38 Burleigh Street, Cambridge CB1 1BR

Please send me copy/copies of **THE DATABASE**

Please send me copy/copies of **USE AND LEARN Vol.1**

I enclose cheque/P.O. for (£9.95 + 50p p + p
— £10.45 total each).

Or I wish to pay by Access/Barclaycard/Visa

Card Number

Please print name and address

Name

Address

PCWK/9

Credit card
holder's signature

Open Forum

Open Forum is for you to publish your programs and ideas.
It is important that your programs are bug free before you send them in. We cannot test all of them.
Contributions should be sent to: Popular Computing Weekly, Hobhouse Court,
19 Whitcomb Street, London WC2H 7HF.

How to contribute

Each week the editor goes through all the programs that you send to Open Forum in order to find the Program of the Week.

The author of that program will qualify for DOUBLE the usual fee we pay for published programs.
(The usual fee is £10.)

Presentation hints

Programs which are most likely to be considered for the Program of the Week will be computer printed and accompanied by a cassette.

The program will be well documented, the documentation being typed with a double spacing between each line.

The documentation should start with a general description of the program and then give some detail of how the program has been constructed and of its special features.

Listings taken from a ZX Printer should be cut into convenient lengths and carefully stuck down on to white paper, avoiding any creasing.

Please enclose a stamped, self-addressed envelope.

Bricks

on ZX81

In this game for a 16K ZX81 84 bricks are placed across the base of the screen and they have to be removed by bombing them from a craft which moves backwards and forwards across the top. The speed of this craft is set by the player from fairly slow to very fast indeed. The speed of the game is achieved by writing the majority of the game in machine code.

If a brick is missed — and it becomes harder and harder to hit a brick as the number diminishes — the rows of bricks advance towards the top of the screen. Your mission is to destroy all the bricks before they reach the top.

Program notes

Line 1 is the REM statement which contains all the machine code.

Lines 130 to 155 set up the instructions on the screen and set the speed of the game from the player's instructions

TO ENTER THE MACHINE CODE PART OF THE PROGRAM USE A REM STATEMENT AT LINE ONE (MAKE SURE THE REM HAS SOME 260 CHARACTERS AFTER IT). THE FULL HEX LOAD PROGRAM SHOULD LOOK LIKE:

```
1 REM XXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXX
10 PRINT "TYPE IN THE NUMBER U
F BYTES TO BE INSERTED"
15 INPUT I
20 CLS
30 FOR X=16514 TO 16514+I
40 LET Y=INT (PEEK X/16)
50 SCROLL
60 PRINT X;TAB 10;CHR$ (Y+26)
CHR$ (PEEK X-16*Y+26);
70 INPUT A$
80 IF A$="" OR LEN A$<2 THEN G
OTO 110
90 IF CODE A$<26 OR CODE A$>2
(26 OR CODE A$>43 OR CODE A$>2)
43 THEN GOTO 110
100 POKE X,16*CODE A$+CODE A$(2
)-476
105 PRINT TAB 15;A$
110 NEXT X
```

RUN THIS PROGRAM TO ENTER THE MACHINE CODE SHOWN IN THE NEXT COLUMN. WHEN COMPLETE DELETE ALL OF THE HEX LOAD PROGRAM EXCEPT LINE ONE. THE FULL PROGRAM CAN NOW BE ENTERED AS BELOW:

```
130 CLS
132 PRINT TAB 13;"BRICKS";TAB 1
3
135 PRINT "DEMOLISH AS MA
NY BRICKS AS YOU CAN BY PRESSIN
G ANY KEY WHEN YOU WANT TO FIRE."
136 PRINT "EACH TIME YOU MISS
THE BRICKS MOVE UP ONE LINE
YOU HAVE TO STOP THEM REACHING
THE TOP."
137 PRINT "TYPE IN THE SPEE
D OF CRAFT FROM 1 TO 5";TAB 2
;"1 IS SLOW";TAB 2;"4 IS FAST";T
AB 2;"5 IS IMPOSSIBLE"
139 LET A$=INKEY$
140 IF A$="" THEN GOTO 139
145 IF CODE A$<29 OR CODE A$>33
THEN GOTO 139
150 LET S=VAL A$
155 POKE 16505,21-4*S
160 CLS
200 POKE 16515,0
210 FOR X=1 TO 14
220 FOR Y=1 TO 19 STEP 4
230 PRINT AT Y,X+2;"■";AT Y+1,
X+2;"■"
240 NEXT Y
250 NEXT X
260 PRINT AT 0,0;"■"
270 POKE 16514,0
280 LET L=USR 16515
290 IF L THEN GOTO 500
300 FOR Y=1 TO 10
310 NEXT Y
320 GOTO 260
330 IF L=100 THEN GOTO 600
340 FOR X=1 TO 5
350 LET G=USR 16725
360 FOR Y=1 TO 5
370 NEXT Y
380 NEXT X
390 PRINT AT 19,4;"FAILED...."
595 GOTO 700
600 LET G=USR 16753
605 PRINT AT 10,7;"CONGRATULAT
IONS"
610 PRINT AT 20,0;INT (84000/(8
4+PEEK 16515))/10;"PERCENT OF S
HOTS ON TARGET"
700 PRINT AT 21,0;"ANOTHER GAME
```

Lines 160 to 250 set up the game on the screen
Lines 260 to 300 is the game loop itself
Lines 510 to 595 are reached if the bricks reach the top of the screen
Lines 600 onwards are reached if the entire wall is

BRICKS

THE FOLLOWING HEX CODES NEED TO BE ENTERED USING THE HEX LOAD PROGRAM. THE LOCATION TO WHICH THE CODE IS ENTERED IS SHOWN EVERY TWENTY BYTES. (READ THE LINES OF CODE ACROSS THE PAGE.)

16514	00	3A	52	40	3C
FE	1E	30	15	ED	00
55	0D	40	21	ED	00
00	13	54	5D	ED	00
16534	01	1F	00	ED	58
32	02	40	15	ED	58
ED	00	19	54	ED	58
01	00				
16554	23	01	1F	00	ED
00	FE	3A	20	ED	02
3E	00	32	52	ED	40
CD	00	02	5C	ED	28
16574	1D	2A	0C	40	3A
62	40	FE	1E	30	04
04	06	02	15	04	06
4F	3E	3C	91		
16594	00	4F	09	22	58
40	0E	31	18	0E	0E
0E	05	06	FF	10	18
FE	0D	28	9E	18	
16614	F7	00	00	00	1E
14	09	7E	36	FE	17
06	FF	10	FE	FE	18
00	28	34	1D	20	
16634	F1	1E	14	2A	58
40	05	00	0E	21	21
09	36	00	1D	20	3C
FA	3A	E7	40		
16654	32	E7	40	2A	0C
40	54	5D	01	01	21
00	09	01	55	02	02
ED	50	2A	0C	40	
16674	23	05	00	0E	20
3E	50	ED	51	ED	00
3E	15	03	2A	ED	01
40	05	00	0E		
16694	09	36	00	3D	20
FA	2A	00	40	20	20
00	2A	0D	40	20	20
06	02	0E	D5	20	20
16714	80	ED	51	06	00
0E	00	C8	0E	64	06
09	2A	0C	40	06	06
16	C5	06	20	23	
16734	7E	FE	7F	38	04
DE	80	16	02	06	06
80	77	10	F1	2E	0E
C1	10	EA	C9	0E	
16754	03	06	52	18	02
06	FF	0E	97	D7	06
10	FD	0D	20	D7	06
C9	3D	3D	3D	3D	
710	INPUT A\$				
720	IF CODE A\$<>51 THEN RUN				
730	STOP				
1000	SAVE "BRICKS"				
1010	RUN				

THE CHARACTER IN LINE 260 IS AN INVERSE STAR

to next page

demolished and it then tells you how many shots were on target and invites you to play again (this invitation is also extended if you do not succeed)
GOTO 1000 can be used to save the program, and it will then run immediately upon subsequent loadings.

PROGRAM OF THE WEEK

ADDRESS	HEX	INSTRUCTION	16641	00		16715	ED	CPIR
16514	00	NOP-CRAFT MARKER	16642	0E	LD C,33	16716	B1	
16515	3A	LD A,(16514) MOVE	16643	21	ADD HL,BC	16717	06	LD B,0
16516	80	CRAFT	16644	00	LD (HL),0	16718	00	LD C,0
16517	40		16645	35		16719	0E	RET Z
16518	30	INC A	16646	00	DEC E	16720	00	LD C,100
16519	30	CP 30	16647	1D	JR NZ (-5)	16721	0E	RET
16520	1F	JR NC (+21)	16648	7A	LD A,(16615)	16722	00	LD HL,(16396)
16521	00		16649	40		16723	00	
16522	00	LD DE,(16396)	16650	3C	INC A	16724	0A	
16523	00		16651	32	LD (16615),A	16725	0C	
16524	00		16652	E7		16726	40	LD B,22
16525	00		16653	40	LD HL,(16396)	16727	16	PUSH BC
16526	00	LD HL,32	16654	00		16728	00	LD B,32
16527	00		16655	40	LD D,H	16729	00	INC HL
16528	00		16656	54	LD E,L	16730	7E	LD A,(HL)
16529	19	ADD HL,DE	16657	01	LD BC,33	16731	FE	CP 127
16530	31	LD D,H	16658	01		16732	3F	JR C,(+4)
16531	00	LD E,L	16659	00	ADD HL,BC	16733	04	SBC A,128
16532	00	DEC HL	16660	01	LD BC,695	16734	00	JR (+2)
16533	00	LD BC,31	16661	B5		16735	08	ADD A,128
16534	00		16662	02	LDIR	16736	77	LD (HL),A
16535	00	LDDR	16663	ED	LD HL,(16396)	16737	00	DJNZ (-15)
16536	00	LD (16514),A	16664	00		16738	00	INC HL
16537	00		16665	00	INC HL	16739	00	POP BC
16538	00		16666	00	LD B,0	16740	00	DJNZ (-22)
16539	00		16667	00	LD C,32	16741	00	RET
16540	00	JR (+25)	16668	00	LD A,128	16742	00	LD C,3
16541	00	LD DE,(16396)	16669	00	CPIR	16743	00	LD B,130
16542	00		16670	00	LDIR	16744	00	JR (+2)
16543	00		16671	00	LD HL,(16396)	16745	00	ADD A,128
16544	00		16672	00	INC HL	16746	00	LD (HL),A
16545	00		16673	00	LD B,0	16747	00	DJNZ (-15)
16546	00		16674	00	LD C,32	16748	00	INC HL
16547	00	LD HL,1	16675	00	LD A,128	16749	00	POP BC
16548	00		16676	00	CPIR	16750	00	DJNZ (-22)
16549	00	ADD HL,DE	16677	00	RET	16751	00	RET
16550	00	LD D,H	16678	00	LD A,21	16752	00	LD C,3
16551	00	LD E,L	16679	00	SUB E	16753	00	LD B,130
16552	00	INC HL	16680	00	LD HL,(16616)	16754	00	JR (+2)
16553	00	LD BC,31	16681	00		16755	00	ADD A,128
16554	00		16682	00	LD B,0	16756	00	LD (HL),A
16555	00		16683	00	LD C,33	16757	00	DJNZ (-15)
16556	00		16684	00	ADD HL,BC	16758	00	INC HL
16557	00		16685	00	LD (HL),0	16759	00	POP BC
16558	00		16686	00	DEC A	16760	00	DJNZ (-22)
16559	00		16687	00	JR NZ (-5)	16761	00	RET
16560	00		16688	00	LD HL,(16616)	16762	00	LD C,3
16561	00		16689	00		16763	00	LD B,130
16562	00	CP 55	16690	00	LD (HL),0	16764	00	JR (+2)
16563	00	JR NZ (+2)	16691	00	LD HL,(16396)	16765	00	LD B,255
16564	00	LD A,0	16692	00	INC HL	16766	00	LD A,0
16565	00	LD (16514),A	16693	00	LD B,2	16767	00	RST 10
16566	00		16694	00	LD C,213	16768	00	DJNZ (-3)
16567	00		16695	00	LD A,128	16769	00	DEC C
16568	00		16696	00				JR NZ (-10)
16569	00	CALL KSCAN	16697	00				RET
16570	00		16698	00				
16571	00	INC L	16699	00				
16572	00	JR Z (+29)	16700	00				
16573	00	LD HL,(16396)	16701	00				
16574	00		16702	00				
16575	00	LD A,(16514)	16703	00				
16576	00		16704	00				
16577	00		16705	00				
16578	00		16706	00				
16579	00		16707	00				
16580	00		16708	00				
16581	00	CP 30	16709	00				
16582	00	JR NC (+4)	16710	00				
16583	00	ADD A,2	16711	00				
16584	00	JR (+4)	16712	00				
16585	00	LD C,A	16713	00				
16586	00	LD A,60	16714	00				
16587	00	SUB C						
16588	00	LD E,0						
16589	00	LD C,A						
16590	00	ADD HL,BC						
16591	00	LD (16616),HL						
16592	00							
16593	00	LD C,33						
16594	00	JR (+14)						
16595	00	LD C,5						
16596	00							
16597	00	LD B,255						
16598	00	DJNZ (-2)						
16599	00	DEC C						
16600	00	JR Z (-96)						
16601	00	JR (-9)						
16602	00	NOP						
16603	00	NOP						
16604	00	NOP						
16605	00	LD E,20						
16606	00							
16607	00	ADD HL,BC						
16608	00	LD A,(HL)						
16609	00	LD (HL),*						
16610	00	LD B,255						
16611	00	DJNZ (-2)						
16612	00	CP 128						
16613	00	JR Z (+52)						
16614	00	DEC E						
16615	00	JR NZ (-15)						
16616	00	LD E,20						
16617	00	LD HL,(16616)						
16618	00	LD B,0						
16619	00							
16620	00							
16621	00							
16622	00							
16623	00							
16624	00							
16625	00							
16626	00							
16627	00							
16628	00							
16629	00							
16630	00							
16631	00							
16632	00							
16633	00							
16634	00							
16635	00							
16636	00							
16637	00							
16638	00							
16639	00							
16640	00							

Bricks
by Peter Vincent

Golf

on Spectrum

Golf, as the name implies, is a game which places you on a golf course generated by the computer. Your task is to get round the course in as few shots as possible by missing the bunkers, dodging the rivers and the trees, keeping out of the rough and putting accurately when you get close to the flag.

When the program is on the computer type *Run* to start and enter the number of holes that you wish to play. After a short pause you will be asked to enter your handicap (between 1 and 3). If you enter your handicap as 1 then you will be able to hit the ball further but you will also have longer holes and you will also have a smaller par.

If you choose a handicap of 3 you will have slightly shorter holes and you will have a larger par but you will not be able to hit the ball as far. When you have entered your handicap the hole will be displayed using the following symbols: the flashing T on the left is the Tee; the dark green (a

chess board character of black and green) is the rough and landing in this will decrease the strength of your shot considerably.

The light green in the centre (a chess board character of cyan and green) is the fairway; the light green square on the right is the green with the flag in the centre; the black objects dotted about are trees and hitting one of these costs a penalty shot.

The yellow and black characters are bunkers and landing in one of these causes the strength of your shot to be cut considerably.

The blue characters are lakes and landing in one of these costs a penalty shot. The distance across the screen is displayed in yards in the top left. The par for the hole is displayed in the centre at the top and the number of shots you have taken is at the top on the right (if you have had any).

You are then asked to enter the strength of your shot (in yards), the direction of your shot (this is like a clock, eg 12 is up, 3 is right, 6 is down, etc, decimals, eg 1.5, are allowed), the computer then works out where your shot landed. **turn to next page**

POPULAR COMPUTING WEEKLY

19

from previous page

on the screen, then the computer automatically puts in the four-space margin on the left-hand side of the screen, which is reserved for the number of the word (see lines 240-290).

(2) If your string is not of maximum length then the computer won't waste time printing out the remaining spaces of the array element in which the string is stored (see lines 250 and 530).

```
100 PRINT "STRING SORT. (C)DAVID
  M. WEBB"
110 PRINT "NUMBER OF WORDS="
120 INPUT N
130 PRINT N
140 PRINT "MAX LENGTH="
150 INPUT L
160 PRINT L
170 PRINT "TO EVALUATE EARLY
  INPUT KEYWORD"
180 DIM A$(N,L)
190 FOR A=1 TO N
200 IF PEEK 16442=2 THEN GOSUB
```

```
650
210 PRINT A;TAB 4;
220 INPUT A$(A)
230 IF A$(A,1)=" STOP " THEN GO
  TO 640
240 FOR F=1 TO L
250 IF A$(A,F) TO F+(F<L))=" "
  THEN GOTO 300
260 IF PEEK 16441=1 AND PEEK 16
  442=3 THEN GOSUB 710
270 IF PEEK 16441=1 THEN PRINT
  TAB 4;
280 PRINT A$(A,F);
290 NEXT F
300 PRINT
310 NEXT A
320 CLS
330 FAST
340 LET K=1
350 IF CODE A$(K,1)=0 THEN GOTO
  360
360 LET K=K+1
370 IF K=N THEN GOTO 350
380 DIM B$(K-1,L)
390 FOR A=1 TO K-1
400 LET M=A
410 LET B$(A)=A$(A)
420 FOR C=1 TO K-1
430 IF B$(A)>B$(C) THEN GOSUB 6
  10
440 NEXT C
450 LET A$(M)=" COPY "
460 NEXT A
470 CLS
480 SLOW
490 FOR A=1 TO K-1
```

```
500 IF PEEK 16442=2 THEN GOSUB
  650
510 PRINT A;TAB 4;
520 FOR F=1 TO L
530 IF B$(A,F) TO F+(F<L))=" "
  THEN GOTO 560
540 IF PEEK 16441=1 AND PEEK 16
  442=3 THEN GOSUB 710
550 IF PEEK 16441=1 THEN PRINT
  TAB 4;
560 PRINT B$(A,F);
570 NEXT F
580 PRINT
590 NEXT A
600 STOP
610 LET B$(A)=A$(C)
620 LET M=C
630 RETURN
640 LET A$(A)=" "
650 GOTO 330
660 PRINT AT 0,19;"PRESS ANY KE
  Y"
670 IF INKEY$="" THEN GOTO 670
680 IF INKEY$="" THEN GOTO 680
690 CLS
700 RETURN
710 PRINT AT 0,19;"PRESS ANY KE
  Y"
720 IF INKEY$="" THEN GOTO 720
730 IF INKEY$="" THEN GOTO 730
740 CLS
750 PRINT TAB 4;
760 RETURN
```

String sort
by David Webb

Canyon

on BBC Micro

"Canyon" was developed on a BBC model B microcomputer. It has been compressed to run on the model A. However, there is insufficient memory available in the model A unless the space reserved for the user supplied resident routines between &D00 and &E00 is made available to this program.

If the command PAGE = &D00 is entered BEFORE loading the program "Canyon" will then run on the model A.

This program was developed from Road Runner by Tim Hartnell as published in *Popular Computing Weekly* April 20, 1982 vol. 1 No. 1. Substantial modifications and enhancements have been made.

The fleet is surrounded. There is only one chance. Someone must make it through the canyon to find reinforcements. Only a madman would venture through the narrow and treacherous canyon. As you no doubt qualify I will explain the controls. Use the cursor control keys to move left and right and the space bar to energise your laser.

Line 1 If escape is pressed goto average routine

Lines 2-3 Instructions

Lines 4-8 Initialisation

Lines 9-22 Main program section

Lines 23-28 Crash routine

Lines 29-43 Top 10 scores update and display routine

Lines 44-46 Display average and reset routine

I have got rather bored waiting for the BBC wordprocessor chip and so as a stopgap measure I have written a three-line wordprocessor for my Epson MX80 F/T printer. I keep this under the bit of plastic guarded by the BBC owl.

Line 10 MODE0

Line 20 VDU8:INPUT LINE" "IS

Line 30 VDU11,2:PRINT\$VDU3:GOTO20

```
100 ERROR B0D 44
20000VDU8:GCOL0,2:PRINTTAB(5,5)"CANYON"***** THE SPACE MINES*** IN YOUR P
  ATH*** CAN BE DESTROYED*** WITH THE LASER***
30000VDU8:GCOL0,2:PRINTTAB(5,5)"FIRE YOUR LASER"***FIRE YOUR LASER***FIRE
  YOUR LASER***
40000VDU8:GCOL0,2:PRINTTAB(5,5)"REPEAT:UNTIL TIME>X+300:MODE4:I%:=0:SC=SC+M:REPEAT:I%:=I%+1:
  UNTIL SC>SC(I%) OR I%=10
50000VDU8:GCOL0,2:PRINTTAB(5,5)"YOUR SCORE IS IN THE TOP 10"***:
  *FX15,135INPUT"PLEASE TYPE YOUR NAME "N$:SCC=I%:REPEAT:H=SC(I%):H$
  =N$(I%):SC(I%)=SC:N$(I%)=N$:SC=H:N$=H$:I%=I%+1:UNTIL I%=11:SC=SC(SCC)
60000VDU8:GCOL0,2:PRINTTAB(5,5)"THE TOP TEN SCORES ARE"
70000VDU8:GCOL0,2:PRINTTAB(5,5)"YOUR SCORE WAS "SC:*FX15,1
80000VDU8:GCOL0,2:PRINTTAB(5,5)"YOUR AVERAGE DISTANCE WAS ";((T%*100/S%)
  DIV 10)/10;"IN ";S%;" RUNS"***DO YOU WANT TO RESET THESE VALUES "
  :IF GET$="Y" THEN T%=0:S%=0
90000VDU8:GCOL0,2:PRINTTAB(5,5)"RESTART ? ":IF GET$<>"N" RUN ELSE*FX4,0
```

```
10000VDU8:GCOL0,2:PRINTTAB(5,5)"CANYON"***** THE SPACE MINES*** IN YOUR P
  ATH*** CAN BE DESTROYED*** WITH THE LASER***
20000VDU8:GCOL0,2:PRINTTAB(5,5)"FIRE YOUR LASER"***FIRE YOUR LASER***FIRE
  YOUR LASER***
30000VDU8:GCOL0,2:PRINTTAB(5,5)"REPEAT:UNTIL TIME>X+300:MODE4:I%:=0:SC=SC+M:REPEAT:I%:=I%+1:
  UNTIL SC>SC(I%) OR I%=10
40000VDU8:GCOL0,2:PRINTTAB(5,5)"YOUR SCORE IS IN THE TOP 10"***:
  *FX15,135INPUT"PLEASE TYPE YOUR NAME "N$:SCC=I%:REPEAT:H=SC(I%):H$
  =N$(I%):SC(I%)=SC:N$(I%)=N$:SC=H:N$=H$:I%=I%+1:UNTIL I%=11:SC=SC(SCC)
50000VDU8:GCOL0,2:PRINTTAB(5,5)"THE TOP TEN SCORES ARE"
60000VDU8:GCOL0,2:PRINTTAB(5,5)"YOUR SCORE WAS "SC:*FX15,1
70000VDU8:GCOL0,2:PRINTTAB(5,5)"YOUR AVERAGE DISTANCE WAS ";((T%*100/S%)
  DIV 10)/10;"IN ";S%;" RUNS"***DO YOU WANT TO RESET THESE VALUES "
  :IF GET$="Y" THEN T%=0:S%=0
80000VDU8:GCOL0,2:PRINTTAB(5,5)"RESTART ? ":IF GET$<>"N" RUN ELSE*FX4,0
```

24UNTIL U=0

25M=(TIME DIV 10)/10-2.8

26 S%=S%+1:T%=T%+M:VDU5

27 MOVE0,1000:GCOL0,1:*FX15,1

28PRINT" CRASHED AT ";M;" KM"*** YOU ZAPPED ";SC;" MINES"

29X=TIME:REPEAT:UNTIL TIME>X+300:MODE4:I%:=0:SC=SC+M:REPEAT:I%:=I%+1:

UNTIL SC>SC(I%) OR I%=10

32IFSC<=SC(I%) GOTO39

33VDU19,1,3,0,0,0:PRINT TAB(3,10)"YOUR SCORE IS IN THE TOP 10"***:

*FX15,135INPUT"PLEASE TYPE YOUR NAME "N\$:SCC=I%:REPEAT:H=SC(I%):H\$

=N\$(I%):SC(I%)=SC:N\$(I%)=N\$:SC=H:N\$=H\$:I%=I%+1:UNTIL I%=11:SC=SC(SCC)

39CLS:PRINT"***TAB(10)"THE TOP TEN SCORES ARE"

40FORI%=1 TO10:PRINT TAB(4,I%*2+4);SC(I%);TAB(20,I%*2+4);N\$(I%):NEXT

I%:PRINT"*** YOUR SCORE WAS "SC:*FX15,1

43X=GET:UNTILFALSE

44MODE4:VDU 31,0,15:PRINT"YOUR AVERAGE DISTANCE WAS ";((T%*100/S%)

DIV 10)/10;"IN ";S%;" RUNS"***DO YOU WANT TO RESET THESE VALUES "

:IF GET\$="Y" THEN T%=0:S%=0

46PRINT"***RESTART ? ":IF GET\$<>"N" RUN ELSE*FX4,0

Canyon
by Peter Cassidy

21

Spectrum

Breaking up is always hard to do

David Hawkins explains how to disassemble Z80 instructions into mnemonics.

The ability of Sinclair Spectrum Basic to hold relatively complex data structures in a 'visible' form, ie, in the program listing, is well demonstrated by this Z80 disassembler. This is made possible by the new (to ZX Basic) commands: *Data* (with expressions as data), *Restore* (with a line-number pointer), *Read* and multi-statement lines for greater speed (less line-numbers for *Goto*, *Gosub*, *Return*, *Restore* etc to search through).

The program provides a disassembly of all Z80 instructions — indexed or otherwise — into mnemonics and, optionally into byte values (decimals and characters/keywords). Illegal instructions are *Beeped* and *Flashed*, whereupon the program goes into byte printing mode. *Jr* opcodes are printed with actual addresses. The program prints 2-3 lines a second.

The instruction relationships and mnemonics are held in *Data* statement tables as opcode (or pointer), arguments (or pointers) and brackets requirements. Some opcodes and arguments are contained in array tables, so certain *Data* lines hold pointers to the arrays — notice how an opcode can be built from two parts as in line 3271.

Each instruction byte is rearranged and split to form a pointer to a *Data* line. As certain instructions have a slightly different structure, the opcode is replaced where relevant by an indicator and pointer to a further line eg line 1001 points to line 4000 modified by variable *b*.

The lower-case letters *u* to *z* are used to indicate special editing requirements be-

Figure 1

45	RST	56
46	RST	56
47	RST	56
48	PUSH	BC
49	LD	HL, (23649)
50	PUSH	HL
51	JP	5790
52	PUSH	AF
53	PUSH	HL
54	LD	HL, (23672)
55	INC	HL
56	LD	(23672), HL
57	LD	A, H
58	OR	I
59	JR	NZ, 72
60	INC	(IY+64)
61	PUSH	BC
62	PUSH	DE
63	CALL	703
64	POP	DE
65	POP	BC

Address Bytes Bytes Continue

fore output ie insert Index registers, calculate displacements, double byte values, etc.

The program automatically determines the number of bytes in the instruction so printing the correct number of byte values is simple.

Variables used

<i>a</i> to <i>e</i>	— components of split byte.
<i>f</i>	— index register displacement.
<i>g</i>	— indicates which argument is bracketed (0 = none) also used for byte printing.
<i>i</i>	— used for index instruction validation.
<i>k</i>	— indicates instruction classification.
<i>l</i>	— instruction block pointer.
<i>m</i>	— modifies 1 pointer, also indicates which argument is being edited.
<i>p</i>	— address of byte being examined.
<i>p1</i>	— address of first byte of instruction.
<i>q</i>	— contents of byte being examined.
<i>s</i>	— indicates if byte values are to be printed, 0 = no, 1 = yes.
<i>z</i>	— Table initialisation <i>For</i> loop counter.
<i>a\$</i> to <i>c\$</i>	— opcode and two arguments.
<i>c\$</i>	— holds arguments for editing.
<i>i\$</i>	— holds "HL", "IX" or "IY" as required.
<i>n\$</i>	— contains flashing "?" for errors.
<i>c\$</i> to <i>y\$</i>	— Mnemonic tables.
<i>z\$</i>	— holds "+" or null for index register displacement.

230	If extended structure read next two items (line no and modifier), reset <i>Data</i> pointer and read item.
240	Check for invalid opcode.
250	Read two arguments and brackets indicator.
260-270	Check/edit both arguments.
280	If index instruction check if index editing was done.
300-310	Insert brackets if necessary.
700	Print disassembled instruction.
720	Print byte values if required.
740	Check for interrupt.

Argument editing

920	"u" — displaced address.
930	"v" — single byte value.
940	"w" — double byte value.
945	"↑" — invalid argument.
950	Set index edit flag.
955	"y" — index register.
960-990	"x" — index register and displacement.

Tables

1001-1371	Instruction byte not equal 203 or 237.
2071-2371	Instruction byte = 203.
3071-3371	Instruction byte = 237.
4001-4048	Extended instructions.

Miscellaneous

4500-4560	Handle interrupts.
4900-6000	Determine mode and set up mnemonic arrays.

When the program is *Run* it will ask if byte values are to be printed — press B (bytes to be printed) or N (not printed). Next, it will ask for a start address for disassembly. Printing will continue until a key is pressed. The options are: A — new address, B — byte values, N — no byte values or C — continue.

Figure 1 shows the output address and mnemonics only, Figure 2 shows address, mnemonics and byte values. Figure 3 contains the program listing.

Possible enhancements

Use a 16K array to map and disassemble the Rom, marking addresses of *Calls*, *Jps*, etc. Follow only these established instruction addresses in the disassembly. Place these symbolics into a large array and write with address array to Microdrive files for subsequent searching/editing. Symbolic names can be given to many addresses eg system variables and commonly used subroutines.

Next requirement — editor/assembler. Watch this space!

Figure 2

4505	INC	B	4	?
4506	JR	Z, 4533	40	?
4508	LD	(23732), HL	34	?
			180	TAN
			92	\
4511	LD	DE, 16047	17	?
			175	CODE
			62	>
4514	LD	BC, 168	1	?
			168	FN
			0	?
4517	EX	DE, HL	235	FOR

Address Bytes Bytes Continue


```

1 PRINT AT 5,5;"Spectrum Disa
ssembler": POKE 23658,8: GO SUB
4900
100 INPUT "Start address ?": p
110 LET p1=p: LET q=PEEK p: LET
p=p+1: LET k=1: LET i$="HL"
120 IF q=116 THEN LET a$="HALT"
: LET b$="": LET c$="": GO TO 70
130 IF q=203 OR q=237 THEN LET
k=2+(q=237): LET q=PEEK p: LET p
=p+1: GO TO 200
150 IF q=221 THEN LET i$="IX"
160 IF q=253 THEN LET i$="IY"
170 IF i$<>"HL" AND PEEK p=116
THEN GO TO 850
180 IF i$<>"HL" THEN LET q=PEEK
p: LET p=p+1: IF q=203 THEN LET
k=2: LET f=PEEK p: LET p=p+1: L
ET q=PEEK p: LET p=p+1
200 LET a=INT (q/64): LET b=INT
(q/8-a*8): LET c=q-b*8-a*64: LE
T d=INT (b/2)+1: LET e=b-2*d+3:
LET a=a+1: LET b=b+1: LET c=c+1:
RESTORE x=1000+a*100+c*10+e-111
: READ a$
230 IF a$<>">" THEN READ l,m: RE
STORE l+m: READ a$
240 IF a$(1)=">" OR a$(LEN a$)=
">" THEN GO TO 850
250 READ b$,c$,g
260 LET i=0: IF CODE b$>90 THEN
LET d$=b$(1): LET m=1: GO SUB 9
00: LET b$=d$
270 IF CODE c$>90 THEN LET d$=c
$(1): LET m=2: GO SUB 900: LET c
$=d$
280 IF i$<>"HL" AND NOT i THEN
GO TO 850
300 IF g=1 THEN LET b$="(" + b$ + "
"
310 IF g=2 THEN LET c$="(" + c$ + "
"
700 PRINT p1;TAB 6;a$;TAB 11;b$
: IF c$<>">" THEN PRINT ":",c$,"
"
720 IF s THEN FOR z=p1 TO p-1:
LET q=PEEK z: PRINT TAB 21;q;TAB
25;CHR$(PEEK z AND (9<16 OR 9>
23)): NEXT z
730 PRINT: POKE 23692,255
740 IF INKEY$<>">" THEN GO TO 45
00
800 GO TO 110
850 LET a$=n$: LET b$="": LET c
$="": BEEP .1,0: LET s=1: GO TO
700
900 REM edit arguments
920 IF d$="u" THEN LET q=PEEK p
: LET p=p+1: LET d$=STR$(p+q-25
6+(q<127)): RETURN
930 IF d$="v" THEN LET q=PEEK p
: LET p=p+1: LET d$=STR$(q: RETU
RN
940 IF d$="w" THEN LET q=PEEK p
: LET d$=STR$(q+256*PEEK (p+1))
: LET p=p+2: RETURN
945 IF d$="t" THEN LET d$=n$: B
EEP .1,10: LET s=1: RETURN
950 IF i$<>"HL" THEN LET i=1
955 IF d$="y" THEN LET d$=i$: R
ETURN
960 LET g=m: IF i$="HL" THEN LE
T d$="HL": RETURN
970 IF k=1 THEN LET f=PEEK p: L
ET p=p+1
990 LET f=f-256*(f>127): LET z$
=">" AND f>=0: LET d$=i$+z$+STR$
f: RETURN
1001 DATA ">",4000,b
1010 DATA "LD",s$(d),"w",0
1011 DATA "ADD",y,s$(d),0
1021 DATA ">",4010,b
1030 DATA "INC",s$(d),"",0
1031 DATA "DEC",s$(d),"",0
1041 DATA "INC",r$(b),"",0
1051 DATA "DEC",r$(b),"",0
1061 DATA "LD",r$(b),"v",0
1071 DATA "V",r$(b),"",0
1171 DATA "LD",r$(b),r$(c),0
1271 DATA "X",r$(b),r$(c),0
1301 DATA "RET",q$(b),"",0
1310 DATA "POP",t$(b),"",0
1311 DATA ">",4020,d
1321 DATA "JP",q$(b),"w",0
1331 DATA ">",4030,b
1341 DATA "CALL",q$(b),"w",0
1350 DATA "PUSH",t$(d),"",0
1351 DATA "CALL",w,"",0
1361 DATA "X",b,"v",0
1371 DATA "RST",STR$(b*8-b),"",
0
2071 DATA "w$(b),r$(c),"",0
2171 DATA "BIT",STR$(b-1),r$(c)
,0

```

```

2271 DATA "RES",STR$(b-1),r$(c)
,0
2371 DATA "SET",STR$(b-1),r$(c)
,0
3071 DATA ">"
3101 DATA "IN",r$(b),"C",2
3111 DATA "OUT",C,r$(b),1
3120 DATA "SBC",HL,s$(d),0
3121 DATA "ADC",HL,s$(d),0
3130 DATA "LD",w,s$(d),1
3131 DATA "LD",s$(d),w,2
3140 DATA "NEG",o$(d),"",0
3141 DATA ">"
3150 DATA "RETN",o$(d),"",0
3151 DATA "RETI",o$(d),"",0
3161 DATA "IM",p$(b),"",0
3171 DATA ">",4040,b
3231 DATA "u$(c)+y$(b),"",0
3371 DATA ">"
4001 DATA "NOP","",0
4002 DATA "EX",AF,"AF",0
4003 DATA "DJNZ",u,"",0
4004 DATA "JR",u,"",0
4008 DATA "JR",q$(b-4),"u",0
4011 DATA "LD",BC,"A",1
4012 DATA "LD",A,"BC",2
4013 DATA "LD",DE,"A",1
4014 DATA "LD",A,"DE",2
4015 DATA "LD",w,"y",1
4016 DATA "LD",w,"w",2
4017 DATA "LD",w,"A",1
4018 DATA "LD",A,"w",2
4021 DATA "RET","",0
4022 DATA "EXX","",0
4023 DATA "JP",y,"",1
4024 DATA "LD",SP,"y",0
4028 DATA ">"
4031 DATA "JP",w,"",0
4032 DATA ">"
4033 DATA "OUT",v,"A",1
4034 DATA "IN",A,"v",2
4035 DATA "EX",SP,"y",1
4036 DATA "EX",DE,"HL",0
4037 DATA "DI","",0
4038 DATA "EI","",0
4041 DATA "LD",f,"A",0
4042 DATA "LD",A,"f",0
4043 DATA "LD",s,"A",0
4044 DATA "LD",A,"s",0
4045 DATA "RRD","",0
4046 DATA "RLD","",0
4048 DATA ">"
4500 PRINT "Address Bytes nbyte
s Continue"
4510 IF INKEY$<>">" THEN GO TO 45
10
4520 IF INKEY$="A" THEN PAUSE 0:
GO TO 100
4530 IF INKEY$="B" THEN LET s=1:
GO TO 110
4540 IF INKEY$="N" THEN LET s=0:
GO TO 110
4550 IF INKEY$="C" THEN GO TO 11
0
4560 GO TO 4520
4900 PRINT AT 21,5;"Bytes or nbo
ytes ?"
4910 IF INKEY$="B" THEN LET s=1:
GO TO 4940
4920 IF INKEY$="N" THEN LET s=0:
GO TO 4940
4930 GO TO 4910
4940 CLS
4990 LET n$=CHR$ 18+CHR$ 1+"?"
4995 LET o$=">?"
5000 LET r$="BCDEHLXA"
5002 LET p$="0+12++"
5005 DIM s$(4,2): DIM t$(4,2)
5010 FOR z=1 TO 4
5015 LET s$(z)="BCDEy SP"(2*z-1
TO 2*z)
5020 LET t$(z)="BCDEy AF"(2*z-1
TO 2*z)
5040 NEXT z
5050 DIM q$(8,2): DIM x$(8,3): D
IM v$(8,4): DIM w$(8,3): DIM y$(
8,2): DIM u$(8,2)
5055 FOR z=1 TO 8
5060 LET q$(z)="NZZ NCC POPEP M
"(2*z-1 TO 2*z)
5065 LET x$(z)="ADDAADCSUBSBCANDX
OROR CP"(3*z-2 TO 3*z)
5070 LET w$(z)="RLCRRCL RR SLAS
RA++SRL"(3*z-2 TO 3*z)
5075 LET v$(z)="RLCRRCLRAA RAA
DAA CPL SCF CCF"(4*z-3 TO 4*z)
5076 LET y$(z)="+++++I D IRDR
"(2*z-1 TO 2*z)
5077 LET u$(z)="LDLCPINOT+++++
"(2*z-1 TO 2*z)
5080 NEXT z
6000 RETURN
9999 REM © Aug 82 David Hawkins

```


Classified

ZX81 VIDEO INVERTER PCB

Displays sharp white characters on solid black background screen. Kit £4, built £5, will fit inverter £7.50 (includes VAT + P&P, instructions). Send cheque/PO to D. Fritsch, 6 Stanton Road, Thelwall, Warrington, Cheshire, WA4 2HS.

YOUR ZX SPECTRUM PROGRAMS LISTED. Send cassette, S.A.E. and 25p per program to David Bayliss, 26 Elgin Road, Cheshunt, Herts, EN8 8QN.

MZ 80K with £200 worth of software, £320. Philips TV game, five cartridges, £100. Tel: 0302 840768.

VIC20 with 3K, Joy stick, cassette unit, £25 of software, manuals etc. one month old, £240. Tel: Leeds 589465.

ZX81. Sinclair built, all leads, manual etc, plus software, £50. 16 Bryntirion Avenue, Rhyl. Tel: 2168.

SPECTRUM OZ CONNECTOR. No more plug pulling, load save, inbuilt mic/speaker, jackplug to amplify beep, £18, see for details. J. Incledon, Long Beach, Warren Road, Brean, Somerset. Tel: 027-875477.

SPECTRUM GAMES! Blitz (bomber), Cavern (adventure), Galaxy, Depth-charge. All for £3, cassette. A. Wright, 67 Evendene Road, Evesham, Worcester.

SPECTRUM GOLF. The bestselling golf game for 16K or 48K Spectrum. Can you beat course par? Tee off today for £3.95. Cassette with instructions or see for details. B. S. McAlley, 78 Hedgerley, Chinnor, Oxfordshire.

FROG. An Arcade game for the 32K BBC. Manoeuvre your frog across a motorway and a river. Features include animated snakes, beavers, crocodiles and diving turtles. Available from James Hager, 7 Basset Street, Cambridge, Cornwall. Price £6.50.

ATTENTION ALL MICRO USERS
Official Opening Saturday,
4th September, 1982
of the North-west's First Home
Computer Users Shop

MICRO—LINK

Covers S/ware for all popular Micros —
BBC, Atom, Spectrum, ZX81 and Dragon
32 plus Hardware Ad-Ons

10% off your first software purchase
with this advertisement, valid until
31st September

**OFFICIAL DRAGON
DEALERS IN MANCHESTER**

830 Hyde Road, Manchester M18 7JD.
Tel: 061-223 6206 (near Reddish
Bridge, opposite Debdale Park)

VIDEO GENIE 48K with sound. Includes manuals, leads, printer cable, m/c, programming book and cassette recorder. Priced at over £575 in shops, will sell for £450. Telephone Stevenage 60056.

SPECTRUM CASSETTE, one. Includes Multiwars, Chase, Patterns and Scene. Only £2.95. S. Pope, 36 Hartington Road, Dentons Green, St Helens, Merseyside, WA10 6AQ.

ZX81 16K ADVENTURE. Tomb of Terror, rescue the princess from the terrible tomb, and Zybtor, escape from the walled city. Intriguing and exciting. Both on one cassette for only £3.99. Send cheque/PO to Paul Harold, 16 The Oval, Ordsall, Retford, Notts, or send see for full list.

TOTAL SCREEN for your 16K ZX81. Define 16 windows, fill, invert and scroll in any direction. For details SAE to 445 Barlowmoor Road, Chorlton, Manchester.

PET 3032, 3022 printer, Computhink 400 disk-drive, data-base, assembler, games, toolkit, invoicing, adventure and plotting programmes. All for £675. Telephone 01-940 2077, ask for David.

ZX81 PROGRAM SERVICE. See for details. GRD, 4 Kilmiston Close, Buckland, Portsmouth, PO1 4JL.

BBC SOFTWARE
Educational and Leisure programs
Space Academy 32K, Driving Test 32K,
Goldmine 32K, England 32K, Battle Ships
32K, Film Buffs 32K, and more. Programs £4
inc. 2 for £6 inc S.A.E. for details.

Sent by return of post after cheques/POs
cleared. Mail order only.

SWIFT LINK SOFTWARE
118-120 WARDOUR STREET, W1V
4BT

VIC20 SOFTWARE: Send S.A.E. for a list, D. Spencer, 230 Low-Grange Avenue, Billingham.

BBC SOFTWARE. Mastermind, five pegs, nine colours, 32K. Gunboat 16K. Disassembler 16K. Three for £5. M. Shammas, 209 Court Lodge Road, Horley, Surrey.

SPECTRUM RENUMBER, instantly rennumbers all or part of program. All Gotos, Gosubs, etc. included. The first and probably the best in M/C for only £3.95. David Webb, Southolme, 9 Park Road, Woking, Surrey.

ZX81 16K, plus £40 software, 30 mm, 3D defender etc, £60 ono. Tel: 0622 61917.

BUZZMAN on 16K Spectrum. Addictive Pacman Arcade game on cassette. Send £3.50 to Buzzsoft, 56 Qualitas, 56 Roman Hill, Bracknell, Berkshire, RG12 4QG.

BBC INVADERS for models A and B, fast m/c program, full colour and sound, Hi-score, Spaceship etc, £4.95. R. Marshall, 235A Mapperley Plains, Nottingham.

ACETRONIC COMPUTER GAMES CENTRE with 16 preprogrammed cartridges. Perfect condition. Everything from Invaders to music. Cost over £400, only £225. Phone 01-440 8633 evenings.

VIC20 plus 16K Ram, cassette unit, Sargon II chess and Invader cartridge. All as new, £270. Miss Lorna Findlay, The Manse, St Monans, Fife, KY10 2DD.

SPECTRUM 48K. Tape One — Star-trek and Towers. Tape Two — Dungeon and Astrospy, £5.95 each. As seen at ZX Microfair. Cheques etc to Star Dreams, 9 Bainbridge Close, Seaford, Sussex.

TRS-80 4K L1 CTR-80A Cassette plus five games including Chess. All leads and manuals £200 ono. Tel: Erith 32102 and ask for Peter.

VIC20 C2N, super expander, machine code, monitor, super lander cartridge, joystick plus £50 software, £290 ono. Tel: 01-471 2563.

ZX81 (16K) machine code games. Odyssey, realtime adventure. Ulysses, must fight his way home, plus Snack-man Maze. Two games plus full instructions, only £3.95. J. Scarlett, Westfields, S. Kelsey, Lincoln, LN7 6PS.

SHARP PC1211 POCKET COMPUTER with CE122 printer cassette interface, £65 ono. Phone 041-884 3404.

ACORN ATOM 12K+12K, F.P. ROM via and 64 way socket, Acorn soft games and books. Printer interface. £250 ono. Tel: Bungay (0986) 2299, evenings.

VIC 8K RAM CARTRIDGE (audio com), expandable, £25 ono. Tel: 021-440 2124 (evenings).

SPORTING FORECASTS

Professor Frank George's well-known Football Pools Forecasting program is now available on the

SINCLAIR ZX81 16K
and 8 other micros

A Horse-Race Forecast Program in preparation.

Write to: Professor F.H. George
Bureau of Information Science
Commerce House, High Street,
Chalfont St. Giles, Bucks.

Computer Swap

01-930 3266

Are you one of the thousands of owners of an old computer? Do you want to sell it?

Why not sell it through Computer Swap? In each issue between now and the end of October we will publish a FREE entry in Computer Swap for anyone who has a computer to sell. All you have to do is phone Computer Swap on 01-930 3266 and tell us your name, address, telephone number, the type and specification of the computer you have to sell, and the price you want for it.

Computer Swap is limited to private individuals who have one computer to sell. No more than 20 words may be booked and the information you supply must be limited to the computer. You may not include information about accompanying software or hardware.

If you would prefer to write in with your copy for Computer Swap please mark your letter clearly as Computer Swap, Popular Computing Weekly, Hobhouse Court, 19 Whitcomb Street, London WC2 7HF.

Computer Swap is run solely as a service to Popular Computing Weekly readers. We can therefore accept no responsibility for any errors or omissions in any copy used.

CASIO FX702 plus cassette interface, plus printer. Offers? Tel: 0202 875 321 (work), 0202 888 634 (home).

BBC MODEL B, one month old, price £375. Tel: 0473 53161 (after 6 pm).

ZX81 with 16K ram and tape recorder, both still under guarantee, price £70. Tel: Rochdale 58890.

ATARI 800 plus cassette, 32K ram. Three months old plus £200 of software, Joystick, colour tv, £640. Tel: West Forest (Berks) 5174 (evenings and week-ends).

ACORN ATOM 12K/12K with power supply, £150. Call Pete at Norwich 504696 (evenings only).

ACORN ATOM 12K + 12K power supply unit and manual, £150. Telephone 0533 826370.

SUPERBOARD 3, cased with Cegmon tool kit, basic 5, new basic 1, 3 and 4 and RS232 output, £100. Tel: Harlow 39406 or Ware 67101.

16K ZX81, Sinclair built, 7 months old, £65 ono. Tel: 989 8138.

16K ZX81 with £200 software plus extras. Total cost £340, will accept £100 ono. Nottingham (0602) 264851.

VIC20 complete with Vic cassette unit in original box, as new condition, £180. 061-223 0493 after 6 pm.

NASCOM 2 48K, cased, £75 ono. 0294 54301.

COMMODORE PET 3016 with extras, bargain £630 ono, or swop for BBC "B" with cash adjustment. Details from GED (0253) 68630.

16K ZX81. Complete with leads, manual etc. £55 ono. Tel: (0947) 604125.

For details of advertising rates
see coupon on page 4.

Here's my classified ad.

(Please write your copy in capital letters on the lines below.)

Please continue on a separate sheet of paper

I make this words, at per word so I owe you £.....

Name

Address

Telephone

Please cut out and send this form to Classified Department, Popular Computing Weekly,
Hobhouse Court, 19 Whitcomb Street, London WC2

Peek & poke

Peek your problems to our address. Ian Beardsmore will poke back an answer.

INFORMATION, HELP ME

D McIlpatrick of Salloon, Co Fermanagh, Northern Ireland, writes:

Q I was about to order a 48K Spectrum when I came across a company offering an 80K Spectrum, for the price of a 48K model. This was done by supplying a 64K add on, in place of the 32K offered by Sinclair, at the same price.

However, I have also read that the Z80a processor in the ZX81 can only address 64K, and 8K of that is used by the Sinclair Rom, so in fact the maximum available memory could only be 56K. Is this true of the Spectrum? I do not want to void my guarantee by having the 64K extra put in for no real gain, but if the claim is true it would be better for me to order a 16K Spectrum, and the 64K Ram extension.

A The Z80a processor in the Spectrum can only address 64K. In the Spectrum 16K of that memory is used by the Rom, so it does not take a mathematical genius to work out that you will be left with a maximum possible 48K of user Ram at any one time. This does not mean that you cannot have a memory capacity larger than 48K, as long as the balance is not being used.

What the advertisement does not say is that the spare Ram can only be switched in after a corresponding, or greater amount has been switched out to make room for it.

This is just one of the first of many such add-on memories of various sizes that will soon be available for the Spectrum. Extra Rams produced by independents are likely to be cheaper than the £50 or £60 that Sinclair will charge.

LOADING ONLY

M Haghsenas of Dunsmuir Grove, Tyne & Wear, writes:

Q I have written a few programs and would like to send them to your magazine, but I have no printer for my

Vic20. However, I have access to a Pet with a printer. I would be grateful if you could tell me how to Load my Vic programs onto a Pet, so I can get a proper printout.

A For the unexpanded Vic20, type the first line in on the Pet, followed by `Poke 4096,0 : Poke 41,16 :` then `Clr/Ret`. No changes need to be made for a Vic that has the 3K expansion. If you have more than 3K then use the following: `Poke 41,18 : Poke 4680,0 :` then `Clr/Ret`.

POSTING THE PRICE

Simon Young of Hermon Avenue, Blackpool, Lancashire, writes:

Q In the editorial of *Popular Computing Weekly*, July 22, you said that the Atari 400 could now be bought for under £200. I would be grateful if you could give me an accurate price, and an address where I could get one from.

Could you also clear up another question about the same machine. It was said that the 400 model could not have more than 16K user Ram, but I have seen an advertisement for 48K Ram. Which is right?

A The cheapest Atari that I can find is £199 from Deans of Kensington, 191 Kensington High Street, London W8. But, Deans do not say what postage and packing costs are.

As for your second question, the Atari 6502 chip is capable of addressing 64K, of which a block of 16K is allocated to memory. However, the 400 is designed in such a way that only 16K of this can be normally accessed.

The 48K extension is not recognised by Atari, whose technical department said that such an expansion will Void the warranty, as physical changes to the pcb are needed. However, Maplin assured me that they offer their own one year guarantee.

If you read our August 26 issue, you will see that Maplin chose to work with the Atari because it had so much poten-

tial. No one can doubt that the machine offers superb graphics. But it does strike me as odd that a company should develop a machine with so much potential, and then make it difficult for that potential to be fully realised by the average user.

... FROM SANTA

Andrew Morgan of Buscot Drive, Abingdon, Oxford, asks:

Q Could you please tell me if there is a machine code book available for the ZX Spectrum. Also do you know which tape recorders are compatible with ZX computers.

A As yet there are no Spectrum machine code books available that I know of. However, I know that at least one book is in preparation, and I would not be surprised if there were more.

There is going to be another ZX Microfair in November and I would suggest that you keep a look out around then. The run up to Christmas seems a logical time to release such a book.

As for tape recorders, Monolith makes a machine that is designed particularly for *Loading* and *Saving* on the ZX81. Data-Assette sells a Ferguson model that is also meant to remove the trouble normally associated with the ZX machines.

The Spectrum's *Load/Save* facilities have been improved by the introduction of a Schmitt trigger. As yet, I have come across no *Save/Load* problems on the Spectrum. All you have to ensure is that your recorder has jack sockets of the right size (3.5mm).

Data-Assette is based at 44 Shroton Street, London NW1 6UG. Monolith's address is: 5-7 Church Street, Crewkerne, Somerset.

CAUGHT NAPPING

R S Guhra, of Alicia Gardens, Harrow, Middlesex, writes:

Q On Page 5 of *Popular Computing Weekly*,

June 17, you say that the Spectrum has a design fault, and in the review section you say that it is crude and bug ridden. Only yesterday I ordered a Spectrum, but I feel uneasy and unsure of my choice now. Are there any simple programs which I can use to Benchtest my Spectrum and check all its functions easily?

On receipt of my Spectrum, I am allowed two weeks to make up my mind as to whether I want to purchase it. It would be useful to use this time to test the Spectrum to see if it malfunctions. The most obvious is *Print 2+2* to see if it answers four. But there must be other programs to test it exhaustively.

A This is what happens when a company supplies a pre-production model for review. All the faulty Spectrums were caught before going out to the public (as far as we know). Only the computer press got the bad machines, and that has not done Uncle Clive's reputation much good.

You do not say whether you ordered a 16K machine or a 48K machine. Only the 16K machines were faulty, and these now have an extra Nand gate wired in. Our machine has had this modification and, apart from the fact that it looks messy, we have so far found no further bugs. It is thought that the later 16K machines will have the fault rectified on the pcb.

The 48K machines are late for the simple reason that Sinclair made the same mistake as Acorn in underestimating the demand for the larger machine. Far more people ordered the 48K version, and Sinclair Research were just not geared up to meet this demand.

● Stop agonising over that problem. Write to Ian Beardsmore. Peek and Poke, *Popular Computing Weekly*, Hobhouse Court, 19 Whitcomb Street, London WC2 7 HF.

Ian Beardsmore regrets that he cannot answer each question personally, so please do not enclose a SAE.

Competitions

Past your prime?

by Gordon Lee

It is useful to categorise numbers in convenient groups. For example, a number can be odd or even, positive or negative, high or low, rational or irrational or prime or composite.

The last two terms are particularly interesting. A composite number is one that is divisible by numbers, or factors, other than itself and 1 — 78 is a composite as it has the factors 13 and 6. Six is itself a composite, being 2×3 . However, 13, 3 and 2 cannot be subdivided any further, so these are said to be prime. We can therefore say that the prime factors of 78 are 2, 3 and 13. Any composite number has a unique set of prime factors.

Unfortunately, there is no easy way of telling if a number is prime or composite. Two is the only even prime number. If the last digit is a five then it is divisible by 5. After that, however, there is no way of telling — each number must be laboriously checked to see if it is prime.

The following program divides a chosen number by all the primes between 3 and the square root of the number. (In fact, for simplicity it divides by all odd numbers, but these must include all primes greater than 3.)

```
10 PRINT "ENTER AN ODD NUMBER"
20 INPUT T
30 IF T/2 = INT(T/2) = 0 THEN GOTO 20
40 FOR N = 3 TO (SQR T) + 0.5
50 IF T/N = INT(T/N) = 0 THEN GOTO 100
60 NEXT N
70 PRINT T; " IS PRIME"
80 STOP
100 PRINT T; " IS NOT PRIME"
110 PRINT "IT HAS FACTORS "; N; "AND "; T/N
```

The Greek mathematician Eratosthenes, in the third century BC, was the first to develop a technique for determining primes. First write out a list of all odd numbers from 3 up to as far as

we wish to go. Take the first number, 3, circle it, and then divide each number in the list by three. Cross out all the multiples of three.

At the end of the list, go back to the next number after 3 that is *not crossed out*. This is 5, the next prime. Circle it and repeat the process, crossing out all multiples of 5 in the list. Continue until all the numbers are either circled or crossed out. The circled numbers are the primes.

3	5	7	9	11	13	15	17	19	21
23	25	27	29	31	33	35	37	39	41
43	45	47	49	51	53	55	57	59	61
63	65	67	69	71	73	75	77	79	81
83	85	87	89	91	93	95	97	99	101

This may be cumbersome, but it is one of the few methods by which primes and composites can be separated.

Since the turn of the century a large table of primes has been compiled and is housed in the Vienna Academy of Sciences. Unfortunately, the six-volume work containing all the primes between 1 and 100,000,000 has one volume missing. As a result there is a task awaiting anyone who is prepared to check the numbers between 13 million and 23 million.

Here is a problem that will be answered in two weeks time. Can you give a proof that it is impossible to construct a right-angled triangle with all the sides having a prime number of units?

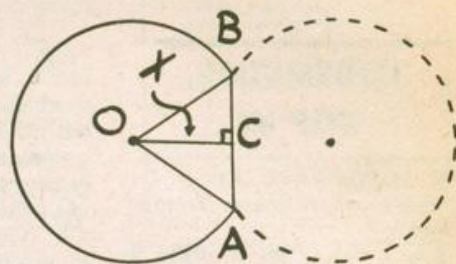
Puzzle No 23

Several early attempts were made to find a formula that would generate prime numbers only. One such attempt was: $p = z^2 + z + 41$, where z is a positive integer. When $z = 1$ the formula gives the prime, 43, and gives further primes for higher values of z .

Unfortunately, the formula is not infallible.

What is the lowest positive integer for which this formula fails to give a prime number?

Solution to Puzzle No 19



The areas of the two pools are the same. So, the area of half the Smith's pool is $\pi \times 12.5 \times 12.5/2$ which is the area of the larger sector AOB plus the area of the triangle AOB.

In the diagram, the area of the sector AOB = $(\pi \times 81 \times (360 - (\text{ACS}(X/9) \times 360\pi))/360)$ and the area of the triangle AOB = $(X \times \text{SQR}(81 - X \times X))$.

The program assigns a value to X which is used to find the area of the Smith's pond, A. This is compared with the area of the Jones' pond, J, and X is corrected accordingly.

```
10 LET X = 8
20 LET J = PI * 12.5 * 12.5/2
30 LET A = (PI * 81 * (360 - (ACS(X/9) *
360/PI))/360) + (X * SQR(81 - X * X))
40 IF ABS(A - J) < 0.000001 THEN GOTO 100
50 LET X = X * J/A
60 GOTO 30
100 PRINT "X = "; X
```

The distance apart of the centres of the two circles, $2X$, is found, using the program, to be 15.224 ft.

Winner of Puzzle No 19

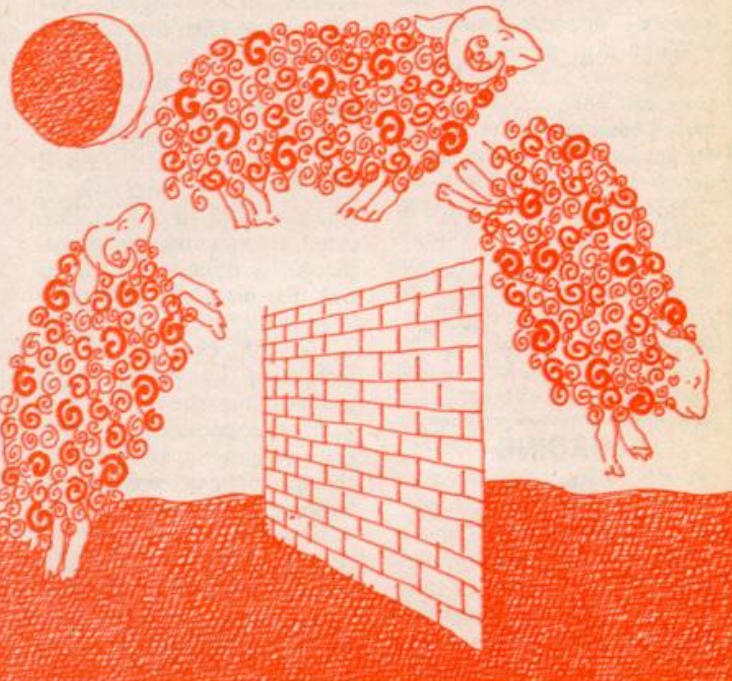
The winner is: Mark Chidlow, Mountbatten Avenue, Sandal, Wakefield, W Yorks, who receives £10.

ARTHUR HAS INSOMNIA

A.R.T.H.U.R.

Lawrence Lerner & James Macdonald
PUBLISHED BY THE HARTLEPOOL PRESS, 16, SHIP ST.,
HARTLEPOOL. TEL. 0205 723031/2/3.

ONE	WHITE	SHEEP	TWO	WHITE	SHEEP
ONE	BLACK	SHEEP	TWO	BLACK	SHEEP
ONE	BLACK	SHEEP	ONE	WHITE	NIGHT
TOO	BLACK	DEEP	FRIGHT	BACK	TRACK
WHITE	SHEEP	MIGHT	KEEP	NIGHT	LIGHT
DEEP	BLACK	NIGHT	SIGHT	SHEEP	WEEP
BLACK	BACK	KEEP	SHEEP	MIGHT	LACK
SHEEP	FLIGHT	DEEP	NIGHT	BLACK	FRIGHT
BLACK	WHITE	BLACK	WHITE	BLACK	WHITE
SLEEP	SLEEP	SLEEP	SLEEP	SLEEP	TIGHT



READ-OUT

READ-OUT FOR
SOFTWARE
& BOOKS

THE FIRST IN A NEW SERIES FOR FIRST TIME USERS

JUST
AVAILABLE

Learning to Use the PET Computer by Garry Marshall is the first title in a new series of books which introduces newcomers to the most widely used micros in the marketplace.

The book assumes absolutely no knowledge about computers and the reader is shown even the most fundamental operations such as "switching on" and "loading a program". The book leads the reader through simple programming and then on to graphics, with several programs which show how to achieve pictures and even animation!

The user friendly approach is consistent throughout the text – not only are program listings clearly shown, but, in many cases, a photograph is included to show what the program looks like when actually loaded and run! £5.95 (incl. postage) **Gower – A Read-Out Publication**

Other titles in the series due August/September 1982

Learning to Use the ZX Spectrum by Robin Bradbeer £5.95 (incl. postage)

Learning to Use the BBC Microcomputer by P. M. Dane £5.95 (incl. postage)

Learning to Use the VIC-20 by Ron Greere 5.95 (incl. postage)

Learning to Use the ZX81 by Robin Bradbeer £5.95 (incl. postage)

Reserve your copies today! Complete the order form below and your order will be reserved and sent you on publication.



READ-OUT PUBLISHING COMPANY LTD

8 Camp Road, Farnborough, Hampshire, GU24 6EW Telephone: 0252 510331/2 Telex 858001 GOWER G

READ-OUT PUBLISHING COMPANY LTD

8 CAMP ROAD, FARNBOROUGH, HAMPSHIRE GU24 6EW.
24 hour answering service. Telephone: 0252 510331/2

Name _____

Address _____

Make cheques payable to Read-Out Publishing Company Ltd.

I enclose my cheque for £.....

Please debit my Access ☐

Number

Signed _____

Date _____

Please send me : _____ copy/ies of :
All prices include postage.

☐ Learning to Use the PET Computer
@ £5.95

☐ Learning to Use the ZX Spectrum
@ £5.95

☐ Learning to Use the BBC
Microcomputer @ £5.95

☐ Learning to Use the VIC-20 @ £5.95

☐ Learning to Use the ZX81 @ £5.95



New From Fuller
FD System for the

ZX SPECTRUM

£39.95

+ £2.50 p & p.

Professional Keyboard & Case —

This unit has the same high standard as our ZX81 unit.
Tough A.B.S. Plastic case encloses our Keyboard, the Spectrum Printed Circuit Board and the Power Supply.

Our own Power supply is available:- 9 volts DC at 2 amps.

Mains either 110v or 240v AC at £5.95 + 80p. p & p.

The Keyboard has 42 keys with all the spectrum functions printed onto them, the full travel key switches have gold plated contacts and a guaranteed life of 10⁶ operations.

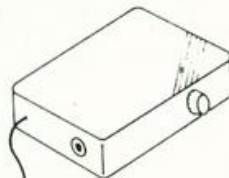
INSTALLATION - Simply unscrew the ZX printed circuit board from its case and screw it into the FD case, plug in the keyboard and that's it. No technical know how or soldering required, the built unit is tested and comes with a money back guarantee.

Spectrum Keyboard and Case Kit £33.95

Our Mother Board for the spectrum has 2 slots at £15.95 or 3 slots at £19.95, this unit also fixes inside the case. p & p 80p.

SPECTRUM SOUND AMPLIFIER £5.95 + 80p p & p.

Complete with leads, volume control and loud speaker in tough ABS Plastic case measuring 5" x 3" x 1" just plugs into your spectrum MIC input.



First Anniversary Offer

The FD System is now one year old and Fuller are celebrating with this amazing offer on the FD42 Professional Keyboard and Case.

Makes an ideal Christmas present to expand the new low priced Sinclair ZX81. Or why not buy a new ZX81 based system directly from us, consisting of ZX81, FD42 keyboard and case with power supply and reset switch, leads and manual £69.95 + £2.50 p & p

FD42 Keyboard and Case Kit £24.95 + £2.50 p & p

FD42 Keyboard kit £14.95.80p p & p

STAR TREK FOR ZX 16K SPECTRUM

Play this popular adventure game on your Spectrum with ship display and sound
£5.00 + 50p p & p

GUARANTEED 14 DAYS DELIVERY FROM RECEIPT OF ORDER, OR CALL TO THE ZX CENTRE.

Mail to **FULLER MICRO SYSTEMS,**

The ZX Centre, Sweeting Street, Liverpool 2. England, U.K.

Please Supply:-

Name

Address

SAE for more details — Enquiries: Tel. 051-236 6109

FULLER FD SYSTEM