

POPULAR

# Computing

WEEKLY

29 September 1992 Vol 1 No 23

35

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Is it worth buying?**

**New Series:  
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**Vic 20 & BBC  
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**Cover Story:  
Kong's Revenge  
on Spectrum**

**Whizzkid '82**  
with a program on it  
of adventures





# POPULAR Computing WEEKLY

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### How to submit articles

Articles which are submitted for publication should not be more than 1200 words long

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

Programs should wherever possible be computer printed

All programs 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



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## Editorial

Aladdin's Cave is not a new type of adventure game. It is an aptly named treasure house of 140 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 Microtel 800 scheme (Popular Computing Weekly September 88) 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 Microtel system, at commercial rates. Unlike Aladdin's Cave, you will be charged for downloading these programs.

Nevertheless, Aladdin's Cave and the Microtel 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 onto 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

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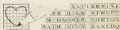
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## New Rom for BBC micro in November

ACORN is to change owners of the BBC micro for 1.9 operating systems to replace the present 0.1. The new Series 1 Rom should be available by the middle of November.

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

Several aspects of the present 0.1 operating system allowing problems for some 0.1 will not support page 0 Rom— including the operating system (which is native to Acorn systems), there are problems with the Slow and Load facilities and with some of the Fs calls.

These difficulties have been described in the new Acorn David Simpson explains: "The new series gives extra operating system calls which mean that a key in the Rom at the Front # is cleared and allows the input of several data using simple Fs 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 Ruckley, Executive Producer of the BBC's Computer Programmes.

Acorn's John Ruckley said: "We don't consider that people need the 1.9 system unless they have a disc operating system to support. Problems arise when dumping large amounts of software on to tape and are solved by machine built-in 0.1 operating system but there is a well-publicised machine-code patch to solve most of the problems."

## Cut-price Pets

LEARNINGWARE has cut the price of its Pet range of products for use in education.

The cost of Pets in schools has been cut by between 20 and 25 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 Maths in Schools grants scheme (August 15).



A school is also exempt for children's only days.

## Cheap holidays for micro kids

THIS Summer over 200 boys and girls will have benefited from Tandy Computer Camps, a scheme organised by the South London based community resources group, later Acorn.

Ed Brennan, later-Acorn's founder, said: "The non-residential nature helps these kids who cannot afford to take advantage of the more expensive residential Summer camps outside London."

new 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."

later-Acorn founder said 25 per day. These students are taught to use the Tandy and Commodore microcomputers by an undergraduate tutor.

## Z80 disc pack from torch

TRONIC Computers has introduced 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 80KB, uses two 5 1/4 double-sided 80-track discs and is driven by its own power supply.

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

Further 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 Facsimile, V-

data and serial capabilities.

The disc unit is already available as part of the Torch microcomputer package.

Further details of the BBC machine — and costing £250.

The Torch Z80 Disc Pack costs £90. An Acorn disc interface is also necessary and costs £70. The corresponding Acorn disc drive costs £15 for 20KB. The Acorn Z80 card is not yet available but is expected to cost over £50.

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



Torch Z80 Disc Pack.

## HP conference

HPC UK, the British arm of the Hewlett Packard Corp, is holding a Calculator International of Units Group is holding a annual conference in London

on Saturday, October 9.

The cost of the HPC-UK meeting will be £15 (non-member) and £20 (non-member). More details from David Walsh, HPC-UK, Avonley Rectory Lane, Wotton Bassett.

## Micronet 800—a new deal from Prestel

PRESTEL has introduced 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 screen. 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 say 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 Cove is a collection of software, indexed by both subject and screen that can be accessed for free.

Micronet 800 is a joint venture between Prestel/British Telecom, IBM/Computer & Business Publications Ltd/Telemap Ltd, BBC Publications Ltd and from Microcomputers Subscribers to Micronet 800 will cost approximately £20 a year.

Further information is available from Micronet 800, Telemap Ltd, Bushfield House, Devon Castle, Peterborough PE1 0RW (telephone 0753-230115).

## Move over Jews — 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 Dunbar, Atari's software manager, told Popm for Computing Weekly: "The games will use the ET characters and we hope to see them shortly after the film's UK launch at Christmas — or shortly in the first quarter of 1983."

The deal is one of many being set up by Mindaubing 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.

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# Letters

write to Letters, Popular Computing Weekly, Hobhouse Court, 18 Whitehall Street, London WC2

## Spelling out magic numbers

**G**lad to see that Sadler has 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 Dulwich Close  
Hatfield  
Hertfordshire AL10 9PE

## 3-dimensional graphics

**I**would like to congratulate you on achieving a good use of computer time, at least weekly, magazine DI MAGAZINE has offered to me at the moment to Nick Humphrey's page on Spectrum graphics as I struggle with other users' advice of what to do.

I said to ask Nick Humphrey if it is possible to have a non-transparent disc, or what is this could really be developed into some amazing graphics. In the meantime I am hoping all the articles ready to develop in my new Spectrum when it arrives.

Don Williams  
41 Sutton Park Drive  
St Helens

Merseyside WAP 12R

is never in your zone, see PCW July 8 for Nick Humphrey's rotating the program.

## Conspiracy of talents

**O**ne of your recent magazines recently gave the following quote: "It is never to know where to go and not how to get there that is known 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 check or debug programs or write. Thus we are forced to reproduce arcade games such as Pacman and Space Invaders.

However, not only does this

mean that there is only a small range of programs available but also that many programmers seek compensation for Copyright, Popular Computing Weekly August 6).

I feel it would be a good idea if people could pool their for new games in those people with imagination, but little knowledge of programming, could produce their ideas for others to compensate. 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 this concept appears 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 Madson  
69 Sandborough Drive  
Widling  
Kent DA16 3QZ

## A philosopher's life

**I**recently realised that I spend as much time watching a 32 x 24 screen as watching a 16 x 24 screen watching at the end of a cathode ray tube as I do writing.

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

Simon Cross  
8 The Avenue  
Greenwich DT7 3JY

## Looping in Street Alley

**R**ick Street Alley (Popular Computing Weekly, August 13). Excellent game, but the loop has only one foot. To get into the, the right-hand bar of 750 should be 700.

If a man is preferred, then 750 should read

700  
700  
700

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

O Forster  
52 Winton Road  
Chichester  
Sussex CO4 3JY

## Soldering on whirring away

**I**ordered my Spectrum on 1 May 10 and it arrived on August 1.

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 a multi Sony Transistor, the set recommended by Sadler, produced disappointing results with rolling tracks of random colour. Typing it with a Sharp set was more successful with clear, steady colours although there was a pronounced shimmer on paper. Yellow ink on green paper was virtually unobtainable.

A chat with a friendly TV engineer threw some light on the problem with the Sony. He suggested I try adjusting a transformer tapping inside the Spectrum. Getting inside was much easier than with the Z801, so there was no screen holder under the feet. A small adjustment to the transformer was all that was needed to make the Sony look on.

I also found that very small adjustments affected the character. I have been able to reduce it a little, but it is still far from perfect. The prints are hard to police rather than mobile. 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 cooling session when a bug developed, the Sony command caused the computer to New itself. Worse still, Load would not work and New itself would not have to press Enter. Switching off for a while restored everything to normal. Another look inside for dry joints etc. revealed a crack in the surface of track, coated with a blob of solder.

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

J R Ashwood  
17 Brookfield Road  
Woburn Park  
Chesham  
Dorchester

## Doubled up on Vic20

**E**ntitled to a very simple sound effect method of changing double height characters on the Vic20. This method can be used with the basic Vic or with any expanded Vic Plus, with variations that program the screen keys. These have to be re-defined, eg. Key 1: "Alpha".

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 character is just under 1K, leaving 2K of memory still usable.

It is advisable after the character has been programmed — to New the program code, as to get into the double height mode you have to type in the following — F040 3680 (Print 3680) or 25, and F040 3680 25. The programmed character can be written away by another program in memory, as a program of up to 2K can be stored safely without fear of deleting the character.

The program Line 1 — Sets screen memory pointers to prevent 'writing over'. Lines 2 and 3 — Transfer character from Rom into Ram. Line 4 — Changes screen colour/Print Vic into double height mode. Line 5 — Changes character set to programmable one (256).

- 1 F040 3680 25 F040 3680 25
- 2 F040 3680 25
- 3 F040 3680 25
- 4 F040 3680 25
- 5 F040 3680 25

Chris Goodwin  
25 Redford Street  
Morden SE27 3JG  
London

# 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 grids 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 whole parcels which are found at various locations.

For reasons which may escape you a large gentle 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:

- ← LEFT
- RIGHT
- ↑ UP
- ↓ DOWN
- SPACE

Capit Link together with one of the above keys enables your man to jump in the appropriate direction, ie Capit-Shift a jumps you to the left. Jumps are required over barrels and across gaps in grids. Beware the a 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 parcel but this must be done before a barrel rolls over them. If this happens the parcels 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 80 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	Priority
0	255, 256, 259, 274	(None)
1	110, 112, 120, 122	(Med)
2	300, 310, 320	
	330, 335, 340	
3	130	(Ladder)
4 and 5	110	(Circle)

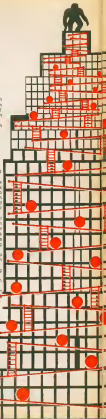
Lines 5190, 5200, 5200 use standard mosaic graphics.

The remaining data statements define the grid layouts and the ladder locations used in stages two and three. Lines 100 to 1070 use this data to draw levels. The main playing loop lies between lines 1150 and 1500 and contains a minimum number of lines to keep things fairly fast.

Since the command function does not recognise user defined graphics or high resolution pictures I have used the Alt function when it was necessary to identify points on screen by their colour and brightness status. Thus if you wish to add anything further to the game bear it 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't stand on anything except an empty space.

When satisfactorily entered safely into the game, you may be killed by hitting a barrel or by falling too great a distance. Press '7' for another game.







# 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 ZX601 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 lunchtime all that could be seen of the hall was a seething mass of heads.

Mike Johnson, 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 ZX601 stock were considerably reduced.

One software company even went so far as to say that its ZX601 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 realised their Spectrums are far more readily selling in a market that has suddenly taken off at a tangent.

After several fairly dismal months — 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 IQ 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



And more enthusiasts finger power at the keyboard.



Inside the New Agricultural Hall.

second week of September for around £9.90.

Stephen Adams displayed his £7.285/ Spectrum Ram converter. This device allows a ZX601 Ram pack to be fitted to the rear port of the Spectrum to convert a 16K machine into a 32K one.

Menaloch showed a new Centronics printer interface for use either with the ZX601 or ZX Spectrum. A similar Robotek interface will be available by mid-September. Both interfaces cost £35.95.

East London Robotics had its 64K and

ZX601 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.

St Computers had an 8-bit Spectrum IQ port on display, price £14.90, available in mid-September.

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

Bug-Bite demonstrated its Spectral II module and Quackiver had its Space Invaders and Inferno Store-on-vare — all for the 16K Spectrum.

Silveroff showed their new games for the 16K Spectrum — October a version of Defender and Ground Attack, a version of Scorcher — each available for £5.95.

Maccagne showed Word-Pro for the 48K Spectrum and a game called Star Quest. J P Dobson had a ZX Spectrum Personal Banking System on display while Zedex showed off its character programmer. C Tech showed four new games including Breakout and Fast-Machiner.

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

The impact of Atari's copyright actions against Commodore and Bug-Bite was being felt by many of the software companies. Atari's contract, not so much on the Atari scores itself, but on the general uncertainty of the 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 15. The venue has yet to be finalised.

# Machine Code

Ken 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 2014 we all understand that to mean:

$$2 \times 1000 + 0 \times 100 + 1 \times 10 + 4 \times 1$$

and we can see that to get a "place value" from the one on its right we simply multiply by ten. We try the number 4 in base ten.

Because we've been doing this for so long as we can remember it's difficult to realize 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 for some early stages. 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 volts, but then it starts to "fall off" so that an input of 5 produces an output of only 9.6, 6 produces 10.6 and you can hardly tell the difference between the outputs for inputs of 6 and 7.

Put a tuning tape in a cheap cassette recorder and wind up the volume. Hear the difference in the loud bit? 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 margined 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 get 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:



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

$$2^0 = 1, 2^1 = 2, 2^2 = 4, 2^3 = 8, 2^4 = 16$$

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:

$$1 \times 16 + 0 \times 8 + 1 \times 1 = 10011$$

### Hexadecimal code

This is fine for relatively small values, but a bit messy for large ones. There are a number of quite convenient techniques and there are binary-to-decimal and decimal-to-binary conversion programs (found in BASIC, FORTRAN, dBASE, dRAMP) 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 (probably ever says "hexadecimal", except as just now) is a number in base 16. So the place values are obtained by successive multiplications by 16. The first five are:

$$16^0 = 1, 16^1 = 16, 16^2 = 256, 16^3 = 4096, 16^4 = 65536$$

"Hang about! everybody's saying 'those are silly numbers' and anyway, in base 16 the largest digit has to be 15. These are getting complicated!"

Start 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:



How for the nice feature of base. Because 16 is one of the binary place values (the 8th 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 conversion:

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 2041

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

$$\begin{aligned} 2 \times 4096 &= 8192 \\ 2 \times 256 &= 512 \\ 2 \times 16 &= 32 \\ 1 \times 1 &= 1 \end{aligned}$$

So the hex representation is 2041. Now we just copy the digit coded from the table:

2041

2	0	4	1
hex	hex	hex	hex

and that's the binary equivalent of 2041—just run the four blocks together to get 00100001101010001.

The hex-to-binary conversion is so easy that most 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 N(100)
2 LET N(0)=0
3 LET N(1)=0
4 INPUT "NUMBER TO CONVERT: " N(0)
5 LET I=0
6 DO UNTIL N(0)=0
7   LET N(I+1)=N(0)/16
8   LET N(0)=N(0)-N(1)*16
9   LET I=I+1
10  IF N(I)=0 THEN GOTO 11
11 PRINT "HEX VALUE IS: "; N(I);
12 GOTO 6
```

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):

```
10 INPUT "HEX VALUE TO CONVERT: " N(0)
11 LET I=0
12 DO UNTIL N(0)=0
13   LET N(I+1)=N(0)/16
14   LET N(0)=N(0)-N(1)*16
15   LET I=I+1
16  IF N(I)=0 THEN GOTO 17
17 PRINT "DECIMAL VALUE IS: "; N(I);
18 GOTO 12
```

We could be these routines together with a little menu:

```
1 INPUT "DECODE OR ENCODE? "
2 IF INPUT="DECODE" THEN
3   INPUT "HEX VALUE: " N(0)
4   GOTO 10
5 IF INPUT="ENCODE" THEN
6   INPUT "DECIMAL VALUE: " N(0)
7   GOTO 11
8 GOTO 1
9 END
```

And, of course, we'll need RETURN at lines 120 and 210.

Reprinted from *Machine Code* and *later* edited by Ken Stewart and Robin Jones (Pitman 1985), the kind permission of Pitman Publishing Ltd, 4 Chichester Lane, Harlow, Essex CM9 9RS.

# Somewhere over the rainbow?

*Boris Allan reads 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 16K (and vice versa).

All that was needed was the simple command Load " Code User" or, 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.

**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 lot 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 reverse amount on a bad bet. For example in Black-pick 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



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



# Reviews



advertising costs (—1614 was popular) to succeed. A mistake in that I had more fun trying to trap it up than actually playing it properly.

**Intons** was little better — a ZX81 program masquerading as a Spectrum program — and again one for which at the time more was regarding length. This was the

---

**It 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 ifs. Only capital letters were allowed for input. I 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.

**Spellsoft** supplied three programs — an Editor (Lperts) and Graphics. All top I thought that the Graphics program (it helps to construct user defined characters) was over-priced at £3 — 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 Robinson cassette, I was certain.

**Lperts** (also £3) is based on the original version by Ivarer. Itinerer followed on from. The program was not complex, though an attempt was made to disguise the simplicity by the use of Goto labels (and not line numbers).

The final offering, **Editor-16** (£18), was a text editor — not a word processor. The program was so rudimentary it did not even use the screen input area into a strip 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. Better is not easy to use if it is too easily crashed, and it is not recommended.

Special Invaders from Bug Byte was a distinct improvement though I prefer Quake's Space Invaders and Campbell Systems's Gopher. Special Invaders is a rather simple game of the invaders type, with large slow-moving aliens. Bands of space are not across the screen and each invader takes the colour of the band, rather than being individually programmed.

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 initial appearance of your next base.

All the offerings from Abacus were standard, usually maze-type games. Andrew Fitzmaurice had a bug in it such that if you later visited the bottom of the pit you had an out-of-range error.

The three games from Lomas were modest. Two (Defender and Thaurus) loaded defined characters from cassette and the loading program had to be modified to load at 0x7 in Defender was



Looking for a job of gold?

rather than — almost an introductory attempt to produce a game using graphics, and most of the slow-up-of-the-Kingston-space-ships-with-your-beam-type. The animations are not complex — they do not need to be — and are incoherent at one point in it (it is for and not for). Thaurus was of the collect-the-gems-from-the-maze-but-do-not-tigger-the-Mitten-beasts type. Space was poor, without being terrible.

I will discuss the two decompilers at this point, because they are not games and every program has to be somewhere — is progress? Spica Milgram.

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

Supplier	Program	Comment	Price
Bug Byte, 55-108 The Albany, Old Hall Street, Liverpool	Special Invaders	Standard	15
Arts Computing, 389 James Road, Arden, Hill	Space Invaders	Usual utility	25.00
Brown & Hazel Software, 15 Lyfearn Court, Cardwell Crescent, Surrey Hill, Woking	Invaders	Plainly written	15.00
Campbell Systems, 16-Rose Road, Rushmore Hill, Essex	SPOC Gopher	Usual utility. An extraordinarily good program	15.00 15.00
Lomas, 25 Parkway, Cranford, Berkshire	Defender, Thaurus	Average	14.50 for the three
25-Glenview, 80-Cloddon Drive, Uxbridge, Bury Lane	Venture	There is a 2000 program	15
Pulse, British Research	Horizon	Excellent value	Free with Spectrum
Abacus Programs, 189 St Helens Ave, Swansea, West Glamorgan	Developer Beam, Isobug, Arkbug, Pit virus	Subgame, Termination, Category labels, Ant again	14.00 14.00 15.00 for the two
Supercell, 84 Newlands Ave, Southampton	Editor	Must be getting it this price	2.5
	Lgamma, Graphix	Free	10 15

facilities to convert from hexadecimal to decimal and vice versa and offer little hints. Spectrum Bug games with instructions of the most and an instruction booklet is freeless.

There were little hiccups with both decompilers. The Arts version (Spectrum Bug) was perhaps the more complete, but the Campbell Systems version (SPOC) was rather easier to use and modify. Spectrum Bug is in machine code, whereas

There were little hiccups with both decompilers. Arts was perhaps the more complete, but Campbell Systems version to use and modify.

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

The Horizon cassette is now to be given away free with every Spectrum Agent from one bug in the keyboard trainer (characters were selected at random, and sometimes later was chosen, and appeared as a "P"). Horizons seems fine.

Side A is explanatory — What is a computer? What is a Spectrum, and What is a keyboard? While a 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

complete (perhaps even good) character generator, a line draw program, and an intriguing site-visit addition program (very pretty). Also on the tape were other more mundane programs such as Life, Bobble, Evolution and Monte Carlo. Surely the best value for money of all cassettes — it is free — and not too often.

#### Gopher

Gopher is the one cassette that I would buy (given that Horizon is free). In Gopher, you go round picking up apples while being chased by insects. You are protected only by leaves and your wife. You have nine lives.

It is possible to choose between nine speeds (not a "piston" flow) but the results are compared to you and 10 different modes (each requiring a different strategy). You can also choose which keys control your movements.

You can run a demonstration on any type of mouse, and have that version of the game with your keys, plus read high score and other handy bits. An exceptional program. Given the work involved and the way the whole program is packaged it is well worth the 15 — and I do not often think that.

#### Summary

What are software writers going to realize that the Spectrum is a different machine from the C64? And when will people stop re-using all the same old stuff? Apart from the two decompilers, only Gopher and Horizon really stand out.



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**Goal**  
by Simon Goodson

## Allen Invaders

on 2200

Allen Invaders is a fast, addictive moving graphics game for the expanded ZX81 in which you are under siege from invading craft from outer space. As they move across the screen you have to try and shoot them down using your laser beams which you can move to the left and right using the 2 and 4 keys.

To fire press the 0 key. Try and hit them as quickly as possible as you'll score more

## Data/Read

on 2200

The idea is that data is stored in a string and the string read by the ZX81 string-scaning routines. The data-string is then reduced by the number of digits read.

In the example, the variable DS is initialised at the start of the program by a GOSUB 1000, the data-string is then read two digits at a time — (2000 LET R1) — (R1 TO 2) — and is then reduced in

length by those two digits — (2010 LET DS = DS - R1).

The resulting RS is then converted to a numeral by use of VAL. In using this routine it is essential that all data items are the same length in the case of numbers (they should be padded out with leading zeros), and non-numerics with trailing spaces. Therefore it simply a GOSUB 1000 which redefines DS to its original length.

- Lines 100-1000: Graphics
- Lines 1010-1030: Input routines
- Lines 1040-1060: Main program routine
- Lines 1070-1090: Data conversion routines
- Lines 1100-1120: String routines
- Lines 1130-1150: Data to be read
- Lines 1160-1180: Your data has been read
- Lines 1190-1200: End of game

- Declaration of variables
- D — Data points
- R1 — Number of lines
- R2 — Rows
- R3 — Position of ship
- R4 — Other points

length by those two digits — (2010 LET DS = DS - R1).

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to next page



# Open Forum

## 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 240-260).

(2) If your string is not of maximum length from the computer, word wrap will print out the remaining spaces of the array defined in which the string is stored (see lines 260 and 265).

```

100  DIM A$(100)
110  A$=""
120  PRINT "ENTER A STRING"
130  INPUT A$
140  IF LEN(A$) > 100 THEN
150    PRINT "STRING TOO LONG"
160    GOTO 120
170  END IF
180  PRINT "STRING LENGTH IS"; LEN(A$)
190  PRINT "NUMBER OF SPACES TO EVALUATE IS";
200  100-LEN(A$)
210  FOR I=1 TO 100-LEN(A$)
220    A$(I)=A$(I+LEN(A$))
230  NEXT I
240  FOR I=1 TO 100
250    PRINT A$(I);
260    IF I/10=10 THEN PRINT
270  NEXT I
280  PRINT
290  END

```

```

300  DIM A$(100)
310  A$=""
320  PRINT "ENTER A STRING"
330  INPUT A$
340  IF LEN(A$) > 100 THEN
350    PRINT "STRING TOO LONG"
360    GOTO 320
370  END IF
380  PRINT "STRING LENGTH IS"; LEN(A$)
390  PRINT "NUMBER OF SPACES TO EVALUATE IS";
400  100-LEN(A$)
410  FOR I=1 TO 100-LEN(A$)
420    A$(I)=A$(I+LEN(A$))
430  NEXT I
440  FOR I=1 TO 100
450    PRINT A$(I);
460    IF I/10=10 THEN PRINT
470  NEXT I
480  PRINT
490  END

```

```

500  DIM A$(100)
510  A$=""
520  PRINT "ENTER A STRING"
530  INPUT A$
540  IF LEN(A$) > 100 THEN
550    PRINT "STRING TOO LONG"
560    GOTO 520
570  END IF
580  PRINT "STRING LENGTH IS"; LEN(A$)
590  PRINT "NUMBER OF SPACES TO EVALUATE IS";
600  100-LEN(A$)
610  FOR I=1 TO 100-LEN(A$)
620    A$(I)=A$(I+LEN(A$))
630  NEXT I
640  FOR I=1 TO 100
650    PRINT A$(I);
660    IF I/10=10 THEN PRINT
670  NEXT I
680  PRINT
690  END

```

String sort  
by David Webb

## Canyon

on BBC Model A

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 8000 and 8200 is made available to this program.

If the command PAGE = 8000 is entered BEFORE loading the program Canyon will then run on the model A.

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

The feel is simulated. There is only one chance. Sometimes you can make it through the canyon to find reinforcements. Only a machine would venture through the narrow and treacherous canyon. As you no doubt quality I will explain the controls. Use the cursor control keys to move left and right and the space bar to emerge your bear.

Line 1-2 makes a printed path through maze  
Line 3-5 instructions  
Line 6-8 to calculate  
Line 9-10 My program vector  
Line 11-15 Game screen  
Line 16-18 Use 10 cores space and 10 core maze  
Line 19-21 Display change 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 MX50 PT printer. I keep this under the bit of plastic guarded by the BBC case!

Line 10-20000  
Line 20-20000 edit? (see 8)  
Line 20-20000 ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?

```

100  DIM A$(100)
110  A$=""
120  PRINT "ENTER A STRING"
130  INPUT A$
140  IF LEN(A$) > 100 THEN
150    PRINT "STRING TOO LONG"
160    GOTO 120
170  END IF
180  PRINT "STRING LENGTH IS"; LEN(A$)
190  PRINT "NUMBER OF SPACES TO EVALUATE IS";
200  100-LEN(A$)
210  FOR I=1 TO 100-LEN(A$)
220    A$(I)=A$(I+LEN(A$))
230  NEXT I
240  FOR I=1 TO 100
250    PRINT A$(I);
260    IF I/10=10 THEN PRINT
270  NEXT I
280  PRINT
290  END

```

Canyon  
by Peter Cassidy

# Open Forum

## Black Hole

by W. B. 80

This is a space invader game with a difference. At any one time three invaders pass in front of you from the top of the

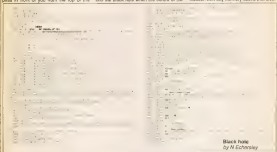
screen each having a different score value which you simply have to shoot. You cut ahead the alien when it appears anywhere in the sight.

But beware, there are six invisible black holes in front of you. You will be sucked into the black hole when the centre of the

right passes over one of these holes.

A good average for the game is 100. All keyboard directions are shown in the instructions.

The program runs in a minimum of 25K and can also be used without any modification with any memory above that level.



Black Hole  
by W. B. 80

A GREAT NEW COMPETITION WORTH £THOUSANDS TO THE WINNER

# Whizz-Kid '82

### For your chance?

Are you looking for a bright young thing who can out-write all the commercial software houses and come up with a sparkling new program that can be marketed as successfully?

We want you to prove you can write a selling program and if you win the competition you'll be well on the way to making big money. The winner will receive:

1. A Dragon 32 computer
2. Advice from *Popular Computing Weekly* on how to market and sell the winning software and how to form and finance the company to do so.
3. £2,000 worth of free advertising in *Popular Computing Weekly*

The winner will be the author who submits the most commercially viable program together with a written outline of the author's own proposals on how he would run his software business and why he would like to do it. The judge will be *Popular Computing Weekly*'s editor, Brandon Cox.

If a number of equally good and commercially viable programs are submitted the decision of the overall winner will be based on the best accompanying written outline of the author's proposals for running a software house.



Entries to the event will close on 15th October 1982. Entries should be sent to the editor of *Popular Computing Weekly* throughout September. The closing date for the competition is October 15. The winning entry will be announced in the issue published on November 15.

- Notes**
1. There is no limit on the number of entries you can submit. But each entry must be accompanied by four differently numbered programs.
  2. Closing date for entries is October 15, 1982.
  3. The names of the winners will be announced in the November 15 issue of *Popular Computing Weekly*.
  4. The Judge: Brandon Cox.
  5. An employee of *Sanctuary Publications Ltd* or their agencies, and he might consider the competition.

## Popular Computing Weekly Whizz-Kid '82 Scheme

Fill in this coupon. When you have collected four differently numbered programs, send them with your program to: *Popular Computing Weekly*, Whizz-Kid '82, Robinson Court, 67 Whitechapel Street, London EC2.

NAME: \_\_\_\_\_  
ADDRESS: \_\_\_\_\_  
\_\_\_\_\_



# Spectrum

## Breaking up is always hard to do

David Hawkins explains how to disassemble Z80 instructions and mnemonics.

The ability of *Disasm Spectrum Basic* to add relatively complex data structures in a readable form, ie, in the program listing, is well demonstrated by this Z80 disassembler. This is made possible by the new (so ZX Basic) comments. Data (with expressions as data), Address (with a line-number pointer), Read and write statements (for greater speed) (use line numbers for Get/Go to 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 (hexadecimal and character/keyword). Special instructions are flagged and flagged whenever the program goes into byte printing mode. It operates as printed with actual addresses. The program prints 2 lines a second.

The instruction mnemonics and mnemonics are held in Data statements (table as opcode (or pointer) arguments (or pointers) and bracketed requirements. Some opcodes and arguments are contained in array tables, so certain Data lines hold pointers to the array — rather than an opcode can be built from two parts as in line 3071.

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 1004 points to line 4000 needed by variable J.

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



fore output or 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

- A — components of half byte
- F — data register displacement
- J — indicates which operand is bracketed (if some are used for byte printing)
- K — used for value-instruction operation
- L — indicates collective displacement
- M — instruction mask pointer
- N — modifies J pointer also indicates which arguments is being edited
- P — address of byte being examined
- P' — address of first byte of instruction
- Q — address of byte being examined
- Q' — address of first byte of instruction
- R — indicates if byte values are to be printed (0 or 1) in pm
- T — byte-instruction (for long operands)
- U to Z — opcodes and low arguments
- AA to AB — byte arguments to editing
- B — byte '0', '1' or '2' is required
- BB — memory loading 'T' to array
- CC to CD — Memory table
- EE — byte '1' or not to index register etc placement

### Detailed Description

- 1 Prints the Get/Go List and returns

### File program

- 101 Input/output address
- 110 Get first byte and data and into data table
- 120 Get opcode
- 130 Determine class of instruction
- 140-150 Data instructions
- 160-170 Split byte and arguments and data pointer to line and Read table line
- 180

- 190 Flag extended structure and read next line from line no and modify read Data pointer and read line
- 200 Check for instructions
- 210 Read low arguments and bracket index
- 220-230 Check with arguments if index instruction (print if more editing is done)
- 240-250 Insert brackets if necessary
- 260 Print disassembled instruction
- 270 Print byte values if required
- 280 Check for strings

### Argument editing

- 300 0' — hex value address
- 310 1' — single byte value
- 320 2' — double byte value
- 330 3' — double argument
- 340 4' — double edit flag
- 350 5' — index register
- 360-370 6' — index register and displacement

### Tables

- 1001-1011 Instruction byte table (hex 00 to 0F)
- 1011-1011 Instruction byte = 200
- 1011-1011 Instruction byte = 201
- 4001-4001 Extended instructions

### Mnemonics

- 4001-4001 mnemonics instruction
- 4001-4001 Extended mnemonics and data and arguments array

When the program is Run it will ask if byte values are to be printed — press P (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 — raw address, B — byte value, M — no byte value 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 1000 array to map and disassemble the ROM, marking addresses of Code, Jsr etc. Follow only those established instruction addresses in the disassembly. Place these symbols into a large array and write with address array to introduce files for subsequent re-arranging/printing. Symbolic names can be given to many addresses eg system variables and commonly used subroutines.

Next requirement — assembler. Watch this space!

Figure 2









# Peek & poke

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

## INFORMATION, HELP ME

Q *McIntosh of Galilee, 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 80K processor in the ZX81 can only address 64K, and 64K of that is used by the Sinclair Rom, so in fact the maximum available memory could only be 64K. Is this true of the Spectrum? If so, what can I do to get my guarantee for 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 14K Spectrum, and the 48K Rom extension.

A The ZX81 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 guess to work out that you will be left with a maximum possible 48K of user Rom as you see here. 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 Rom can only be installed as an extra component; in greater amounts has been worked out to make room for it.

As it is just one of the lines of many such add-on memories of various sizes that will come be available for the Spectrum Extra Roms produced by independent firms are likely to be cheaper than the 120 or 240 that Sinclair will offer.

## LOADING ONLY

Q *Highland of Downside, Clonsilla, Truro & Near 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 paper printout.

A For the unexpanded Vic20 type the first line is on the Pet, followed by Poku 4050.0 Poku 41.15 then ClrChr. No changes need to be made for a Vic that has the 3K expansion. If you have more than 3K then use the following Poku 41.15 Poku 4040.0 then ClrChr.

## POSTING THE PRICE

James Young of Leicester Avenue, Rickmansworth, Leicestershire writes:

Q In the editorial of Popular Computing Weekly, July 21, you said that the Amstrad 488 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 488 model could not have more than 16K user Rom, but I have seen an advertisement for 48K Rom. Which is right?

A The cheapest Amstrad I can find is £180 from Deems of Kensington 191 Kensington High Street, London W8 7NS. Deems do not say what postage and packing costs are.

As for your second question, the Amstrad 488 chip is capable of addressing 64K, of which a block of 16K is allocated to memory. However, the 488 is designed in such a way that only 16K of this can be normally loaded.

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

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

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

## ... FROM SANTA

Andrew Magpie of Mount Street, Altrincham, Cheshire, 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 readers 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 Magazine 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, Moleclok makes a machine that is designed particularly for Loading and Saving on the ZX81 Data-Assette with a Perspex model that is also meant to remove the credits normally associated with the ZX machines.

The Spectrum's Load/Save facilities have been improved by the introduction of a 5-bit trigger. As yet, I have come across an *Event/Load* problem on the Spectrum. All you have to do is that your recorder has just written of the right size (1.5mm).

Data-Assette is based at 44 Stratton Street, London NW1 6JG. Hamilton's address is 3-7 Church Street, Crawley, Sussex.

## CAUGHT NAPPING

R S O'Brien of Aber Clonduff, Fermanagh, Middlesex writes:

Q On Page 3 of Popular Computing Weekly,

June 17, you say that the Spectrum has a design fault, and in the review article you say that it is unreliable and bug ridden. Only yesterday I ordered a Spectrum, but I felt uneasy and worried of my choice now. Are there any simple programs which I can use to test/verify my Spectrum and check all its functions ready?

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 see this time to test the Spectrum in an if it malfunctions. The next edition is Print 2-2 to see if it answers here. But there must be other programs to test it thoroughly.

A This is what happens when a company supplies a pre-production model to review. All the faulty Spectrums were caught before going out to the public (as far as we know). Only the companies put up the test machines, and that has not done Uncle Dave'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 32K chip wired in. Our machine has had the modifications read, apart from the fact that a little more, we have to be found no further bugs. It is thought that the later 48K machines will have the fault rectified on the job.

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. For more people ordered the 48K version, and Sinclair Research were not just geared up to meet the demand.

● Stop agonising over this problem. Write to Ian Beardsmore, Park and Poku, Popular Computing Weekly, Middlesex Court, 19 Mountcorn Street, London WC2 7PF.

An Amstrad user reports that he could never get his game to run properly, in games do not number a 54K.

# Competitions

## Past your prima?

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. So is itself a composite being  $2 \times 3$ . However, 13, 2 and 3 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 five then it is divisible by 5. After that, however, there is no way of telling — each number must be individually checked to see if it is prime.

The following program divides a chosen number by all the primes between 2 and the square root of the number. (It is fast, for simplicity it divides by all odd numbers, but there exist variants of primes greater than 2.)

```

10 PRINT "ENTER AN ODD NUMBER"
20 INPUT N
30 IF N = 1 THEN GOTO 130
40 FOR M = 3 TO SQR(N) : STEP 2
50 IF N/M = INT(N/M) THEN GOTO 100
60 NEXT M
70 PRINT "IT IS PRIME"
80 STOP
90 PRINT "NOT PRIME"
110 PRINT "FACTORS: ", N AND 130

```

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

we wish to go. Take the first number, 3, and list 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. Do the same process. Cross it out, repeat the process crossing out all multiples of 5 in the list. Continue until all the numbers are either crossed or crossed out. The unlisted numbers are the primes.

3	5	7	11	13	A	17	19	23	29
31	37	41	47	53	59	67	71	79	83
89	97	103	109	113	127	131	137	143	149
157	163	167	173	179	181	187	193	199	211

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

Some of the lists of the century a large table of primes has been compiled and is housed in the Vienna Academy of Sciences. Unfortunately, the volumes were containing all the primes between 1 and 100,000,000 had one volume missing. As a result there is a task awaiting anyone who is prepared to check the numbers between 73,000,000 and 73,000,001.

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  $p = n^2 + n + 41$

where  $n$  is a positive integer. When  $n = 1$  the formula gives the prime 53 and gives further primes for higher values of  $n$ .

Unfortunately, the formula is not infallible.

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

## Solution to Puzzle No. 18



The areas of the two parts are the same. So the area of half the circle with pool is  $\pi \times R^2 \times 12.5 \div 2$  which is the area of the larger sector ACB plus the area of the triangle ACB.

In the diagram, the area of the sector ACB —  $(\pi \times R^2 \times 12.5) \div 2$  —  $(R^2 \times X) \div 2$  —  $(R^2 \times 12.5) \div 2$  and the area of the triangle ACB —  $(X \times R \times \sin 90) \div 2 = X \times R$ .

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

```

10 LET X = 0
20 LET R = PI * (2.5) / (2 * 3.14)
30 LET A = (PI * 12.5 * R^2) / (2 * 3.14) + (R * X * SIN(90)) / 2
40 FOR I = 1 TO 100000 : STEP 1 : X = X + 1
50 LET B = X * R
60 PRINT B = A

```

The solution apart of the centres of the two circles 23 is found using the program to be 12.2845.

## Winner of Puzzle No. 19

The winner is Mark Christie, Mountbatten Avenue, Sandus, Woodford, W. Yorks. who received 120.

## ACTIVITIES PROGRAM

ONE	WHITE	SHEEP	TOP	WHITE	SHIRT
TWO	BLACK	SHEEP	FLAT	BLACK	SHIRT
THREE	BLACK	SHEEP	ONE	WHITE	SHIRT
FOUR	BLACK	SHEEP	FRIGHT	BLACK	TRUCK
FIVE	SHEEP	MIGHT	DEEP	MIGHT	SHIRT
SIX	BLACK	MIGHT	ONE	DEEP	SHIRT
SEVEN	BLACK	DEEP	SHEEP	MIGHT	TRUCK
EIGHT	FLIGHT	DEEP	MIGHT	BLACK	FRIGHT
NINE	BLACK	WHITE	BLACK	WHITE	SHIRT
TEN	DEEP	SHEEP	SHEEP	DEEP	SHIRT

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