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50p

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An intriguing two player word guessing game packed full of educational potential.

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Gentle, pictorial word recognition for the very early reader.

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Based on a shooting gallery, this typing tutor will not only have you and your pupils touch-typing with ease – it's fun, too!

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"I'm thinking of a number" is a well known classroom standby. We've taken it much further in this computer version, giving the pupils far more flexibility in their strategy.

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Find the hidden word before it is too late. A novel way to reinforce vocabulary and spelling skills.

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Practice vital pre-reading skills with this letter recognition game.

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Given the four rules of number and three integers to work with, how close can you get to the target number?

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Takes the calculations out of matrix manipulation, leaving the student free to understand the underlying concepts.

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Explore the ideas of mapping with the use of simple number bonds.

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Drawing lines of best fit between points, this program will find applications from the infants' class to the sixth form.

# 4MATION Educational Resources

FORMERLY 4 MAT, ONLY THE NAME HAS CHANGED!

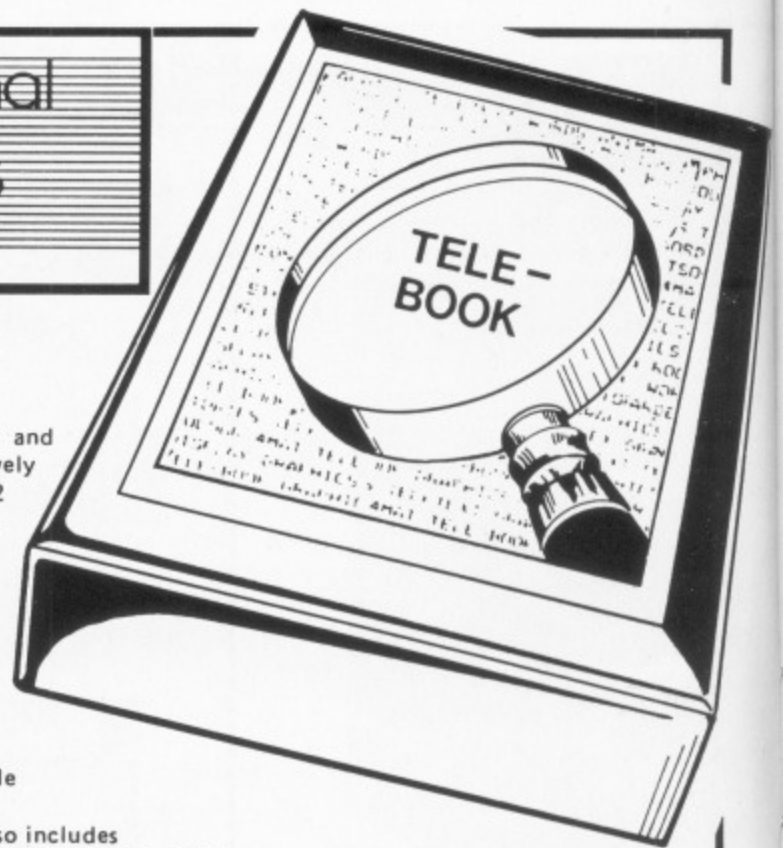
## TELE-BOOK

TELE-BOOK is not another teletext simulator but an extremely flexible menu-driven program which allows 'books' of up to 15 pages of text and graphics to be created on the BBC micro. Some of the many possibilities are: class magazines, simple animations, poetry anthologies, noticeboards, assignment/work cards, stories and records of all sorts.

TELE-BOOK has simple word-processing facilities so that text may be easily inserted or deleted and, at the end of each line, words are automatically 'wrapped round' onto the next line. All the teletext features are available so that children may enhance their writing in colours and other effects. Teletext graphics may be used on any page either to enhance text or create graphics-only displays. At any time pages may be copied or moved about within the book. TELE-BOOK is compatible with most printers. Any number of pages may be printed individually or as a single document.

TELE-BOOK is available both on tape and disc, the complete package being attractively boxed and containing a comprehensive 32 page manual, a set of 5 double-sided laminated 'help' cards, a coloured plastic key strip, a transparent plastic page-planning sheet (for use with O.H.P. pens), a set of paper page planning and 8 example 'books' (containing a total of 120 pages) which have been produced by both children and adults to illustrate how various effects are achieved and to demonstrate some possible uses in the classroom.

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**Active parental involvement is crucial, says STEFAN NOWAK,  
Computer Software Education Officer, BBC**

SINCE the launch of the BBC's Computer Literacy Project, and the BBC Micro itself, the intention of the Corporation has been to publish a range of software to complement radio and television programmes, as well as stand-alone packages.

In the coming months BBC Publications will be releasing a significant number of educational software packs. Although linked to particular radio or television broadcasts, the programs are designed to function just as effectively in isolation in order to appeal to the widest possible range of users.

In publishing educational software the commercial realities of the marketplace have to be considered. Despite a relatively high percentage of schools having BBC Micros, the sales potential is ultimately restricted by the size of the market. This can be expanded slightly by versioning the software, where technically feasible, to run on other machines.

However relative to the cost of developing software, which can not only be expensive but also time-consuming, the publishing overheads are quite significant, particularly in the educational field where supporting documentation of a high standard is mandatory. These constraints can limit the financial viability in the relatively low-volume schools market.

It may be that alternative distribution methods, such as telesoftware, could be more cost-effective, but that discussion would be an article in itself!

It would therefore seem desirable to make the "schools" software relevant to home users as well, but there are potential problems. For example, software in schools is often used in groups, not just because of limited access to hardware, but also for good educational reasons. The discussion between pupils may well be as important as their interaction with the program.

In the home this is less likely to happen unless parents are actively involved as well. The guiding hand of an adult, teacher or otherwise, is often desirable anyway. Parental involvement would therefore seem to be crucial.

Unfortunately I suspect that many parents take a fairly traditional view of education, relating most easily to drill and practice exercises, particularly in basic skills and examination or subject-based materials. It would appear that much of the commercially produced educational software caters for this viewpoint.

Although some teachers may share

this somewhat limited perspective, many academics working in computer aided learning prefer alternative strategies.

To make this traditional type of software commercially attractive it is usual to see great attention paid to the visual and aural impact of the product. Children obviously relate to arcade style games so we see attempts to give educational software an attractive veneer by using colourful or amusing graphics, sound effects and music.

Of course these elements are important – learning after all *should* be fun – but they should not outshine the educational content. It may nevertheless be true that some children prefer software that follows the familiar pattern of rote learning, where you do not need to think in order to do the task.

This may be more a reflection of the most prevalent teaching methods to which they have been exposed (conditioned?) rather than anything more fundamental.

A lot of educational software is produced by teachers, and naturally

computer-based instruction approach, for example, programmed instruction or "electronic page-turning". Besides being perceived as a threat to the teacher, the present day micro is not really capable of the required performance.

Assuming that you agree with the programmed learning philosophy, its effectiveness relies on having the capacity to store many "alternative prescriptions" or remedial paths through the material. The analogy here is with a hospital, where the pupil is a sick patient, and learning is receiving treatment, aided by the powerful drug, software!

In the past, mainframe and mini computers have followed this model with some success, but the capacity to deliver an individualised course of a reasonable size is beyond most micros. The balance may shift with wider use of hard discs and access to networks, but this approach is perhaps best suited to training rather than education.

Proponents of educational software often fall into two camps, favouring either a goal-orientated or an open-

## School software in the home

ended approach to learning. Programmed instruction is one extreme and the other is best illustrated by Seymour Papert's theories on the use of LOGO where the student is in control, the inventor in his workshop.

It is not as clear cut as that, of course, and there is a middle ground containing the various types of simulations. These can vary from the role-playing type of adventure game, based on real or imaginary scenarios, to flight simulators or scientific experiments, where the pupil can experiment and test hypotheses. This approach can encourage many types of learning activities, from creative writing to logical thinking.

Time, and possibly the marketplace, will determine the most effective direction for educational software. Ideally an increase in diversity to reflect the range of inventiveness in our best teachers would at least allow a more effective choice to be made.

Most people can tell the difference between a good and bad teacher so why should educational software be any different?

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Most people can tell the difference between a good and bad teacher so why should educational software be any different?

**JUST** over four years ago the Government announced two initiatives which they believed could foster the development of microelectronics education in our schools.

The first, from the Department of Industry, concerned the supply of a computer at half price to all secondary schools.

The second related to the establishment of the Microelectronics Education Programme (MEP) which had the objective of enriching the study of individual subjects in the school curriculum through the use of the micro and other equipment that use micro-processors.

The Department of Industry scheme offered secondary schools the choice of a half price BBC model A or Research Machines (RML) 380Z micro.

The scheme was subsequently extended to enable schools to increase the memory of their computer and to obtain a colour monitor and a printer.

Early in 1982 primary schools were encompassed within the scheme. They were offered the choice of a half price BBC model B, a RML 480Z or a Sinclair Spectrum.

The introduction of the DoI scheme to secondary schools almost overnight standardised the micro purchasing strategy of these schools and increasingly weaned them away from other machines which were assembled outside the UK and at that time were popular, such as Pets, Apples and Tandy equipment.

When the primary scheme was announced very few schools had already bought a micro and it was therefore not necessary for them to integrate their new acquisition into any existing purchasing strategy for micro-based equipment.

Although the DoI scheme enabled schools to buy only one micro at a reduced price, its effect has been to polarise the hardware purchasing strategy of both the primary and secondary education sectors towards Acorn and RML micros.

In turn this has tended to concentrate the efforts of those producing software for the education market towards these machines and has diverted the efforts of software writers away from needless versions of programs for a variety of different machines.

The DoI offer has also made itself felt at 18 plus since many colleges of further education, polytechnics and universities have found that software which was originally designed for sixth form work can also be used beyond school. This has encouraged these institutions to opt for Acorn and RML equipment. The

# MEP...helping come to grips

same is true for the adult training sector, which is also beginning to find that Acorn and RML software is attractive for their educational needs.

An unexpected bonus for these users is that since children have become familiar with these machines while they are at school, when they enter the post-school training environment teachers are not faced with the task of retraining their pupils to use new and unfamiliar equipment.

The principal aim of MEP, as defined in the programme's strategy document published by the Department of Education and Science in 1981, has been to help schools prepare children for life in a society in which devices and systems based on microelectronics are commonplace and pervasive.

Richard Fothergill, the Director of MEP, saw the programme's aims being implemented through three interconnected strands of activity: the provision of information to teachers, in-service training and the development of new materials for use in the classroom.

Early in the programme's lifetime MEP was asked to support the DoI initiative in the secondary sector by producing an in-service training pack which could be used by local education authorities to train teachers in the use of the BBC Micro and the RML 380Z.

More recently MEP has been involved in the production of over 25,000 copies of an Open University style training pack for primary school teachers to enable them to use the micro effectively in their classrooms.

As well as containing written material, the pack contains audio tapes outlining how teachers have integrated the micro into their classroom activities, a starter set of 31 programs and a very useful flip-chart which explains those all too obvious to the expert, but important points, such as how to connect up the equipment, load programs and trace

simple faults.

In devising the strategy for MEP, Richard Fothergill was very aware that the programme would be successful only if its message could make an impact with the teacher at the "chalkface".

To enable this to happen he proposed that 14 Regional Information Centres (RICs) be established, each of which would develop close links with its supporting local education authorities (LEAs) and their teachers.

The centre in Manchester, for example, serves the 10 LEAs in Greater Manchester, Lancashire and by special arrangement with the Board of Education, the Isle of Man.

The location of the other centres and their addresses are shown on the accompanying map.

The regional centres act as focal points for information about hardware, software and other materials in the field of microelectronics which are of interest to teachers.

They are one of the few places that stock a range of equipment from different manufacturers so that teachers can see for themselves, outside the plushy comfort of a computer showroom or the crush of a micro exhibition, the benefits and disadvantages of the different makes of equipment that are being offered for use in schools.

Centres also have an extensive software library since most bookshops do not have the facilities to demonstrate educational software and are unwilling to loan teachers inspection copies. Since software cannot be reviewed quickly teachers find the centres' facilities useful in order to review the packages that have been published in their own subject area.

As a result of discussions with teachers, publishers and manufacturers, a number of the centres have become a useful interface between the producer, who is putting up venture capital to develop his product and is anxious to get the product right for the classroom and the teacher who needs to know what is available in his area of interest. Many of

By **ROBERT CHANTRY-PRICE**,  
Director MEP Regional Centre,  
Manchester.

# g teachers

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# S with the micro

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the centres are therefore contributing towards establishing the British hardware and software industry as world leaders in the field of producing materials that are specifically geared to the needs of the education market.

The task of training teachers who are already in post is daunting, since resources for this activity are limited and most regions contain at least 30,000 teachers. The vast majority didn't have the opportunity of training in the use of computers while they were at college or university.

Regions and their constituent LEAs are therefore faced with the task of providing training for very large numbers of teachers in a subject area in which many are nervous or apprehensive.

MEP has therefore opted for a "cascade" procedure whereby the centres train a limited number of leading-edge teachers from each particular specialism and then rely on the LEAs to use these teachers on their own in-service training courses to quickly pass the information onto a wider circle of specialist teachers before it becomes obsolete.

This aspect of the programme has been particularly effective, since it has enabled comparatively large numbers of teachers to update their knowledge and skills as well as engendering considerable rethinking about the curriculum and how it should be taught in the light of new developments in the field of microelectronics.

The third strand of the programme, that of developing new materials, has also been very effective and over 500 MEP sponsored program packs, microelectronic devices or other materials related to microelectronics education have now been published. Many more are in the pipeline.

This area of the programme's work has also influenced standards in the production of new software and hardware and has enabled serving teachers to gain experience in developing their ideas with children in their own school and in publishing the results of

their work for other teachers to use.

This procedure has enabled new materials to be validated and published quickly and has avoided the need for reinventing the same wheel in every school!

The task of assessing whether the programme has been successful is not easy. However, it is clear that its impact on curriculum thinking and classroom practice had been very considerable bearing in mind that the programme has only been fully operational for just over three years.

Two additional unexpected benefits have also accrued from its work. One, which has been mentioned previously, relates to its impact on the use of the micro for computer assisted learning beyond school, the other concerns the considerable interest that the programme has created overseas where MEP efforts are often regarded as leading the world.

The programme's influence on the micro user at home is difficult to assess since many manufacturers of hardware and publishers of software have hedged their bets concerning development costs and marketed products that can be used both at home and at school.

As far as hardware is concerned this usually means that products for the schools market have to be made more robustly if they are to meet the additional wear and tear they will face in the classroom.

Publishers of software are starting to attempt to recoup their development costs by marketing two versions of programs, one for school use, the other for the domestic market. They are tending to trial software in a limited number of schools and then publish a school edition. Contemporaneously the program and its documentation are rewritten and published for the home user.

This usually means scaling down the options in the software so that they relate to a small number of users rather than to the 20 or 30 pupils usually found in a classroom. The documentation is also amplified so that the subject matter

doesn't need the presence of a teacher to introduce the topic or the aid of a text book to discuss the theoretical aspects of the subject.

From the point of view of hardware manufacturers the dual strategy of making products that will satisfy both the domestic and the educational markets is likely to continue to be attractive and so will endure.

Developments in the software field are less easy to predict. However it seems likely that the demand for games for the micro has saturated and that the domestic user will look for alternative types of software to use on his machine.

One possibility here is that home micro users will opt for programs that are educational in their nature and so the concept of versions of programs for both markets will continue to be attractive to all concerned.

It is also apparent that both publishers and consumers are finding the present method of distributing software expensive and inefficient and that we need to find a better method of enabling the consumer to find out what is available in his area of interest and to enable him to make an informed choice as to which of the various products that are on the market are most allied to his needs.

The provision of information about software via Prestel or some other similar system could be attractive to both producer and consumer, since this would enable the latter to determine what is available and to have the program and its documentation squirted to him at the push of a key on the micro.

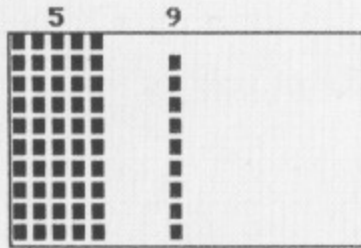
It is a chancy business trying to predict how the hardware and software markets are going to change, but the indications are that the links that have already been established between the educational and domestic markets in the UK are likely to continue to grow and that any symbiosis between these two markets should prove to be of benefit to both parties.

MEP is tackling the task of helping teachers to come to grips with the micro, to think about what it offers in their subject area and to evaluate software and use it effectively in the classroom.

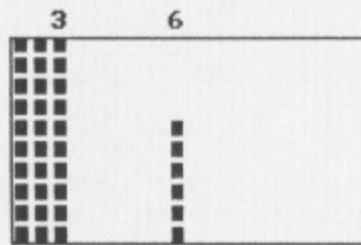
However, the parallel task of helping the home user to harness their interest in microtechnology in such a way as to ensure that their leisure time is used effectively seems to have been overlooked.

Perhaps this is an area where the adult education sector needs to respond by offering new courses, not just those on programming, and so capture a hitherto untapped clientele.

Add 59 and 36



$$\begin{array}{r} 59 \\ 36 \\ \hline \end{array} +$$



We start by  
adding up the  
ones from each  
number  
PRESS SPACE BAR  
TO GO ON

By  
**ANDREW  
DAVIS**

TUADD is a program that sets out to show and teach the addition of two digit numbers, in a fairly orthodox fashion.

It demonstrates by means of graphics what the class teacher would on other occasions show using standard apparatus.

The short first section puts into the micro a number of character definitions. These enable the sum to be displayed using large figures not standardly available in Mode 1.

I chose the latter mode, incidentally, because it has a reasonably adequate text display. The text provided by Modes 2 and 5 is squat and ugly, and I prefer to avoid it where possible when writing software for young children.

I regret the cramped nature of the listing and the less than helpful procedure names. This is a consequence of memory space limitation.

I originally developed the program on a BBC Mode B with a 0.1 operating

# Addition in the primary classroom

Add 59 and 36



$$\begin{array}{r} 59 \\ 36 \\ \hline \end{array} +$$



We have enough  
ones to make a  
new ten. I will  
put it with the  
other tens  
PRESS SPACE BAR

Add 59 and 36



$$\begin{array}{r} 59 \\ 36 \\ \hline \end{array} +$$



We count any  
ones that are  
left, and put the  
number of ones  
in the answer  
PRESS SPACE BAR

Add 59 and 36



$$\begin{array}{r} 59 \\ 36 \\ \hline 5 \end{array} +$$



I will put a 1  
for the new ten  
under the answer  
We must remember  
this new ten  
PRESS SPACE BAR

Add 59 and 36

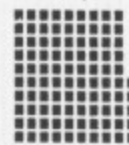


$$\begin{array}{r} 59 \\ 36 \\ \hline 5 \\ 1 \end{array} +$$



I will put all  
the tens we have  
got together at  
the top  
PRESS SPACE BAR

Add 59 and 36



$$\begin{array}{r} 59 \\ 36 \\ \hline 5 \\ 1 \end{array} +$$



Now we count all  
the tens. The  
new ten will be  
counted with the  
other tens.  
PRESS SPACE BAR

Add 59 and 36



$$\begin{array}{r} 59 \\ 36 \\ \hline 95 \\ 1 \end{array} +$$



PRESS SPACE BAR



system. When I finally had the thing brought up to date and fitted with the Acorn DFS I discovered what others had found out a long time ago – that the “improvements” were in certain respects rather a nuisance.

The array declared at line 20 groups together the pairs of user-defined characters forming the new large numerals with the numbers that they will replace. Here, data is read into the array in the usual way.

Line 50 calls the procedures which show the pupil how the program displays the numbers and how it illustrates their addition. The performance is repeated in case he didn't understand the first time!

Lines 60 and 70 call the procedures which require the pupil to tell the micro at various stages of the addition what to do next.

The numbers chosen for addition are selected at random and the “units” always add up to 10 or more.

## PROGRAM STRUCTURE

PROCn  
PROCd  
Line 270

Selects the numbers to be added.  
Displays the numbers in an appropriate form.  
Sets up the “sum” in the large numerals on the right hand side of the screen.

Lines 480-510

PROCc

Control the input of the pupil so that he is unable to corrupt the screen display. This approach is repeated elsewhere in the program.  
Clears text from the area in which it is displayed throughout the program. I was unable to use a text window.

PROCm

Handles the initial task of moving the “units” in the second number up to the units of the first number, and displaying them as a “new” ten with remaining units.

PROCt

Puts the “new” ten with the tens already displayed for the first number, altering its colour to match that of the other tens.

PROCmt

Moves the tens which remain in the second number up to the top and positions them appropriately with the tens of the first number.

```
1 VDU23,225,12,12,12,12,12,12,12,12,
12,23,226,12,12,12,12,12,12,0,23,2
27,60,102,195,3,3,3,6,6,23,228,12,12,
24,24,48,96,255,0
```

```
2 VDU23,229,60,102,195,3,3,3,6,28
,23,230,6,3,3,3,195,102,60,0,23,231,1
2,12,24,24,48,48,96,96,23,232,192,204
,255,255,12,0,0,0,23,233,255,128,128,
128,128,128,128,252,23,234,6,3,3,3,6,
12,248,0
```

```
3 VDU23,235,3,6,12,12,24,24,48,96
,23,236,124,66,129,129,129,129,126,0,
23,237,255,3,3,6,6,12,12,24,23,238,24
,48,48,96,96,192,128,0,23,239,60,102,
195,195,195,102,60,60,23,240,102,195,
195,195,102,60,0,0
```

```
4 VDU23,241,56,68,130,130,130,130
,130,66,23,242,62,6,6,12,24,48,96,0,2
3,243,0,24,60,102,195,195,129,129,23,
244,129,195,195,102,60,24,0,0,23,245,
0,0,0,24,24,24,24,255,23,246,255,24,2
4,24,24,0,0,0,23,224,0,0,62,62,62,62,
62,62
```

```
5 ON ERROR GOTO40
```

```
6 REM (c) Micro User 1984
```

```
10 MODE1:VDU19,3,6;0;
```

```
20 DIM TX(9,2):FORW=0TO9:FORr=0TO
2:READTX(WX,r):NEXT:NEXT
```

```
30 add$=CHR$245+CHR$10+CHR$8+CHR$2
46:VDU23,1,0;0;0;0;
```

```
40 c=0:*FX11,0
50 REPEAT:CLS:PROCn:PROCd:PROCadd:
PRINTTAB(24,21)"PRESS SPACE BAR":PROCm
sp:c=c+1:UNTILc=2
```

```
60 k=0:REPEAT:CLS:PROCn:PROCd:PROC
p1:PROCm:PROCp2:PROCp3
```

```
70 PROCc:PRINTTAB(24,21)"PRESS SPA
CE BAR":PROCsp:k=k+1:UNTIL k=3
```

```
80 CLS:PRINTTAB(0,3)"Type Y if you
want this programme again":REPEAT:A$
=GET$:UNTILA$="Y"OR A$="y":GOTO40
```

```
90 END
```

```
100 DEFPROCn
```

```
110 REPEAT
```

```
120 N=RND(80)+19:U1=N MOD 10:T1=N D
IV 10
```

```
130 M=RND(80)+19:U2=M MOD 10:T2=M D
IV 10
```

```
140 UNTILN+M<100AND U1+U2>9:ENDPROC
150 DEFPROCd
```

```
160 COLOUR2:PRINTTAB(0,3)"Add ";
170 COLOUR3:PRINT;T1;:COLOUR1:PRINT
```

```
;U1;
180 COLOUR2:PRINT;" and ";:COLOUR3:
PRINT;T2;:COLOUR1:PRINT;U2
190 COLOUR3:PRINTTAB(2,5);T1:COLOUR
1:PRINTTAB(8,5);U1
200 FORY%=6TO15:COLOUR3:PRINTTAB(0,
Y%)STRING$(T1,CHR$224):NEXT
210 FORY%=16-U1 TO15:VDU17,1,31,8,Y
%,224:NEXT
220 GCOL0,2:MOVE0,500:DRAW580,500:D
RAW580,824:DRAW0,824:DRAW0,500
230 COLOUR1:PRINTTAB(8,20);U2:COLOU
R3:PRINTTAB(2,20);T2
240 FORY%=21TO30:VDU17,3:PRINTTAB(0
,Y%)STRING$(T2,CHR$224):NEXT
250 FORY%=31-U2 TO30:VDU17,1,31,8,Y
%,224:NEXT
260 GCOL0,2:MOVE0,30:DRAW580,30:DRA
W580,340:DRAW0,340:DRAW0,30
270 VDU31,27,6:COLOUR2:VDU TX(T1,1)
,10,8,TX(T1,2),31,29,6,TX(U1,1),10,8,
TX(U1,2),31,27,8,TX(T2,1),10,8,TX(T2,
2),31,29,8,TX(U2,1),10,8,TX(U2,2)
280 VDU31,31,8:PRINT add$:MOVE768,5
```

From Page 9

```

60: DRAW960,560: MOVE768,688: DRAW960,68
B
290 ENDPROC
300 DEFPROCadd
310 PROCp("We start by","adding up
the","ones from each","number","PRESS
SPACE BAR","TO GO ON")
320 PROCsp:PROCm
330 PROCp("We have enough","ones to
make a","new ten. I will","put it wi
th the","other tens","PRESS SPACE BAR
")
340 PROCsp:PROCnt
350 PROCp("We count any","ones that
are","left, and put the","number of o
nes","in the answer","PRESS SPACE BAR
")
360 PROCa(29,13):PROCsp
370 COLOUR2:u=(N+M) MOD 10:VDU31,29
,12,TX(u,1),10,8,TX(u,2)
380 PROCp("I will put a 1","for the
new ten","under the answer","We must
remember","this new ten","PRESS SPAC
E BAR")
390 PROCsp
400 VDU17,2,31,27,15,49
410 PROCp("I will put all","the ten
s we have","got together at","the top
","PRESS SPACE BAR",""):PROCsp
420 PROCat
430 PROCp("Now we count all","the t
ens. The","new ten will be","counted
with the","other tens.,"PRESS SPACE
BAR"):PROCsp
440 VDU17,2,31,27,12,TX(T2+T1+1,1),
10,8,TX(T2+T1+1,2)
450 ENDPROC
460 DEFPROCp1
470 PROCp("Add up the ones","from b
oth","numbers. Tell me","your answer.
","","):REPEAT
480 REPEAT:VDU31,32,29:A=GET:VDU A:
IF NOT(A>47AND A<58)THEN VDU31,32,29,
32,8:FX15,0
490 UNTILA>47AND A<58
500 REPEAT:VDU31,33,29:B=GET:VDU B:
IF NOT(B>47AND B<58)THEN VDU31,33,29,
32,8:FX15,0
510 UNTIL(B>47AND B<58)OR B=127:IF
B=127THEN480
520 u=U1+U2:R=10*VAL(CHR$A)+VAL(CHR
$B):PROCT(40)
530 IFR<>u PROCc:PROCp("No. Please",
"add up the","ones again","",",",",",
)
540 UNTILu=R:PROCc
550 PROCp("Good. Let's","get all","t
he ones","to the top","",",",",")

```

```

560 ENDPROC
570 DEFPROCc
580 FORYZ=19TO29:PRINTTAB(24,YZ)STR
ING$(16,""):NEXT
590 ENDPROC
600 DATA0,243,244,1,225,226,2,227,2
28,3,229,230,4,231,232,5,233,234,6,23
5,236,7,237,238,8,239,240,9,241,242
610 DEFPROCp2
620 PROCT(500):PROCc
630 PROCp("Now tell me what","numbe
r of ones","I should put in","the ans
wer. ","",",")
640 PROCa(29,13)
650 U=(N+M)MOD 10:REPEAT:REPEAT:VDU
31,25,29:F=GET:VDU F:IF NOT(F>47AND F
<58)THEN VDU31,25,29,32,8:FX15,0
660 UNTILF>47AND F<58:q=VAL(CHR$F):
PROCT(60)
670 IFq<>U PROCc:PROCp("No. Look","a
gain and","tell me","",",",","):PROC
a(9,16)
680 UNTILq=U
690 PROCc:PROCp("Good. I","will put"
,"it in","",",",",")
700 u=(N+M)MOD 10:VDU17,2,31,29,12,
TX(u,1),10,8,TX(u,2):ENDPROC
710 DEFPROCm
720 VDU31,2,20,32,31,8,5,32,31,2,5,
32
730 GCOLO,0:MOVE0,500:DRAW580,500:D
RAW580,824:DRAW0,824:DRAW0,500:MOVE0,
30:DRAW580,30:DRAW580,340:DRAW0,340:D
RAW0,30
740 COLOUR1:YZ=15-U1:LX=-1:REPEAT:V
DU31,8,YZ+1,224,31,8,15-LX,32:LX=LX+1
:YZ=YZ-1:PROCT(20):UNTILYZ=4
750 YZ=30-U2:VDU30:REPEAT:VDU31,8,Y
Z+10-U1,32,31,8,YZ,224:YZ=YZ-1:PROCT(
20):UNTILYZ=15-10+U1
760 FORYZ=30TO22 STEP-1:VDU31,8,YZ,
32:NEXT
770 u=(N+M) MOD 10:IFu=0 ENDPROC
780 COLOUR1:FORYZ=41-U2-U1 TO30:VDU
31,9,YZ,224:NEXT:PROCT(10)
790 COLOUR1:YZ=30:REPEAT:VDU31,9,YZ
,32,31,9,YZ+10-U1-U2,224:PROCT(40):YZ
=YZ-1:VDU30:UNTIL YZ=15
800 ENDPROC
810 DEFPROCnt
820 COLOUR3:XX=8:REPEAT:FORCZ=6TO15
:VDU31,XX,CZ,32:NEXT:FORCZ=6TO15:VDU3
1,XX-1,CZ,224:NEXT:XX=XX-1:PROCT(40):
UNTILXX=T1
830 ENDPROC
840 DEFPROCp3
850 PROCT(500):PROCc
860 PROCp("Tell me what to","put un
der the","tens part of the","answer. "
,"",",")

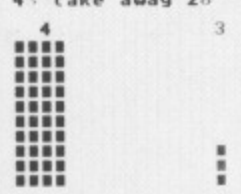
```

```

870 PROCa(27,16)
880 w=0:REPEAT:REPEAT:VDU31,24,29:E
=GET:VDU E:IF NOT(E>47AND E<58)THEN V
DU31,24,29,32,8:FX15,0
890 UNTILE>47AND E<58:E=VAL(CHR$E):
PROCT(60)
900 IFE<>1 PROCc:PRINTTAB(25,19)"No
.Try":PRINTTAB(25,21)"again.":w=w+1
910 UNTILw=30R E=1:FX15,0
920 PROCc:PROCp("You put a number",
"1 there. This is","the new ten.,"Pr
ess SPACE BAR","and I will write","it
in"):PROCsp
930 VDU31,27,15,49
940 PROCc:PROCp("I will put the","n
ew ten with the","other tens if","you
press","SPACE BAR",""):PROCsp
950 PROCnt:PROCc:PROCp("Press SPACE
BAR","and I will put","all the tens"
,"together at the","top.,""):PROCsp
:PROCat
960 PROCc:PROCp("Tell me the","numb
er to put","in the tens part","of the
answer. ","",",")
970 REPEAT:REPEAT:VDU31,33,29:g=GET
:VDU g:IF NOT(g>47AND g<58)THEN VDU31
,33,29,32,8:FX15,0
980 UNTILg>47AND g<58:PROCT(70)
990 g=VAL(CHR$g):IFg<>T1+T2+1 PROCc
:PRINTTAB(25,19)"Try again"
1000 UNTIL g=T1+T2+1:PROCc:PRINTTAB(
25,19)"Good. I":PRINTTAB(25,21)"will p
ut":PRINTTAB(25,23)"them in"
1010 FX15,0
1020 PROCT(500):VDU17,2,31,27,12,TX(
T1+T2+1,1),10,8,TX(T1+T2+1,2)
1030 ENDPROC
1040 DEFPROCat
1050 COLOUR3:XX=0:REPEAT:FORCZ=21TO3
0:VDU31,XX,CZ,32:NEXT:FORCZ=21TO30:VD
U31,XX+T2,CZ,224:NEXT:XX=XX+1:UNTILXX
=T1+1
1060 XX=T1+1:REPEAT:YZ=30:REPEAT:VDU
31,XX,YZ,32,31,XX,YZ-10,224:YZ=YZ-1:U
NTILYZ=15:XX=XX+1:PROCT(40):UNTILXX=T
2+T1+1
1070 ENDPROC
1080 DEFPROCT(Q):TIME=0:REPEATUNTILT
IME>Q:ENDPROC
1090 DEFPROCa(J,V):FORS=1TO8:VDU17,1
,31,J,V,94:PROCT(30):VDU31,J,V,32:PRO
CT(30):NEXT:COLOUR2:ENDPROC
1100 DEFPROCp(a$,b$,c$,d$,e$,f$):PRO
CT(200):COLOUR2:PRINTTAB(24,19)a$:PRI
NTTAB(24,21)b$:PRINTTAB(24,23)c$:PRIN
TTAB(24,25)d$:PRINTTAB(24,27)e$:PRINT
TAB(24,29)f$:ENDPROC
1110 DEFPROCsp:REPEAT:A=GET$:UNTIL
A$=" ":PROCc:FX15,0
1120 ENDPROC

```


43 take away 28



$$\begin{array}{r} 43 \\ -28 \\ \hline \end{array}$$

First of all we need to take away the 8 ones. But we cannot take 8 from 3. Press SPACE BAR

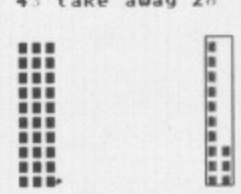
43 take away 28



$$\begin{array}{r} 43 \\ -28 \\ \hline \end{array}$$

There are too few ones in 43. So we move over a ten and put it in the place for ones. Press SPACE BAR

43 take away 28



$$\begin{array}{r} 43 \\ -28 \\ \hline \end{array}$$

We now have 13 ones. We change the ones in the sum like this. Press SPACE BAR

# STAGE BY STAGE SUBTRACTION - WITH TUSUB

HERE is another horse from the same stable as Tuadd (Page 8). It is a program designed to assist primary age children with their understanding of addition with carrying figures.

Now we tackle the problem of subtracting two-digit numbers in those cases where we can't take away the units - such as 61-35.

The structure of the program is very simple, though the listing may appear complicated. You are presented with a

By **ANDREW DAVIS**

menu containing two options.

The first gets the computer to show you the subtraction in all its stages. The graphics which accompany the explanation are designed to illustrate the reasons behind each stage.


The second option presents very similar material but you are invited to

supply answers on several occasions during the process.

Finally, pressing Escape returns you to the menu at any time.

This program and its related Tuadd were both designed with a particular audience in mind - children who are still having to tackle these sums at a rather later stage than many of their friends. I suggest the programs would be especially helpful if used with Dienes base 10 blocks or their equivalent.


43 take away 28



$$\begin{array}{r} 34^13 \\ -28 \\ \hline \end{array}$$

And we change the tens in the sum as well, like this. Press SPACE BAR

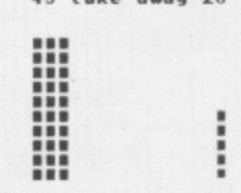
43 take away 28



$$\begin{array}{r} 34^13 \\ -28 \\ \hline \end{array}$$

Let's take away the 8 ones now and put them at the bottom. Press SPACE BAR

43 take away 28



$$\begin{array}{r} 34^13 \\ -28 \\ \hline \end{array}$$

We count the ones left behind and put them in the answer. Press SPACE BAR

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*"It has never been my policy to recommend software in any blanket form at all but merely to recommend particular programmes . . . However I do feel that the quality of the programmes you sent me may trigger me to give such a blanket recommendation". M. Savory, Educational Computing Advisor for Gloucestershire.*

*"Overall we were very impressed by these programmes . . . We felt a lot of excellent thought, care and educational reasoning had gone into their presentation. We were also very impressed by the firm . . . We would not hesitate in awarding the firm an 'A' grading as well as the program". The Ayrshire Primary Software Evaluation Project. (A.P.S.E.P.)*

### SHORT VOWEL SOUNDS: BBC Model B

Age range 5 to 8 years

A very comprehensive reading program to practice short vowel sounds using simple words and pictures. A diagnostic test tells you which sounds the child needs to practice and the program allows the adult to adjust the games according to the results. It is well presented with graphics and optional sound effects.

*"We found the words and drawings in this program to be particularly good - they were well presented and extremely suitable . . . We found the program an excellent impetus". A.P.S.E.P.*

Price: Cassette £7.00 + £1.05 VAT. Disc £8.50 + £1.28 VAT.

### MAGIC E: BBC Model B: 1.2 OS

Age range 6 to 9 years

This program illustrates and teaches the effect that a "magic e" has on short vowel sounds. It includes a teaching section - the short vowels actually lengthen when a "magic e" appears. Other options are diagnostic, practice and final assessment modes. *"The program is full of large, easy to read lettering . . . it is at its best when it uses the BBC's graphics to give a good strong visual illustration of the magic effect . . . It is among the best of the flood of programs of this type". Educational Computing, June 1984.*

Price: Cassette £7.00 + £1.05 VAT. Disc £8.50 + £1.28 VAT.

### MATHS SNAP: BBC Model B:

Age range 7 to 77 years!

A game for 1, 2, 3 or 4 players to practice addition, subtraction, multiplication and division all at five different levels of difficulty. The time allowed and the number of questions per game can both be altered making it suitable for all ability levels.

*"This computerised Maths Snap was certainly enjoyed by all those who played it. Teachers approved of how it encouraged quick responses that led to greater accuracy in number bonds and tables work . . . a real sharpener of wits and accuracy". Educational Computing, January 1984.*

Price: Cassette £6.00 + 90p VAT. Disc £7.50 + £1.13 VAT.

### WORD BUILDERS 1 AND 2: BBC Model B

Age range 5 to 9 years

Word Builders build up words exactly as children should and shows the sequence on the screen for children to sound out at their own speed. Options range from three letter short vowel sound words to consonant blends and vowel digraphs. Presented in large, colourful lower case lettering.

Price: Cassette £6.00 + 90p VAT. Disc £7.50 + £1.13 VAT.

*Available from October 1984:-*

### MR YOG AND THE NIPPET: BBC Model B

Age range 4 to 7 years

Mr Yog just loves to eat apples. Every day he walks along paths and climbs up ladders to get his apples. The wicked Nippet puts obstacles in his way to stop him. Help him get to his apples by selecting the right answer in 10 different reading and maths activities. Appealing graphics and optional sound effects.

Price: Cassette £7.00 + £1.05 VAT. Disc £8.50 + £1.28 VAT.

### INVISIBLE INK: BBC Model B

Age range 7 to 13 years

Discover the words that have been written in "invisible ink" by using your points to buy letters from the computer. Score points by correctly guessing the invisible words. An intriguing word game that offers practice in many aspects of reading, comprehension, spelling and grammar. It's good fun too!

Price: Cassette £7.00 + £1.05 VAT. Disc £8.50 + £1.28 VAT.

### INFANT MATHS SNAP: BBC Model B

Age range 4 to 7 years

A game for 1 or 2 players to help children understand and learn about numbers up to 20. Six different games ranging from very simple number recognition to simple addition and subtraction presented with colourful graphics and optional sound effects.

Price: Cassette £7.00 + £1.05 VAT. Disc £8.50 + £1.28 VAT.

### CONSONANT BLENDS: BBC Model B: 1.2 OS

Age range 6 to 9 years

Following on from "Short Vowel Sounds" and "Magic E" this reading program deals with the initial consonant blends, such as tr, bl, sm etc. Options include diagnostic, practice and games modes and can be tailored to the child's individual needs. Games are for 1 or 2 players. Presented with large colourful lettering, pictures and optional sound effects.

Price: Cassette £7.00 + £1.05 VAT. Disc £8.50 + £1.28 VAT.

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If you are not satisfied with our product simply return it within 14 days of the despatch date to get your money back.

43 take away 28



$$\begin{array}{r} 34'3 \\ 28 - \\ \hline 5 \end{array}$$

We are ready  
to take away the  
2 tens

Press SPACE BAR

43 take away 28

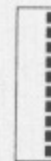


$$\begin{array}{r} 34'3 \\ 28 - \\ \hline 15 \end{array}$$

If there are  
any tens left  
behind at the  
top, we write  
them in our  
answer

Press SPACE BAR

43 take away 28



$$\begin{array}{r} 34'3 \\ 28 - \\ \hline 15 \end{array}$$

Now we have  
the answer  
to the sum.  
43 take away 28  
is 15

Press SPACE BAR

## PROGRAM STRUCTURE

- 10-40** Memory problems! This section allows the program to be run with or without the presence of a disc interface. If you do press Break having loaded it from disc you will have to reload it.
- 50-80** Redefines characters to form the big numbers used to illustrate the sum, etc.
- 90** Ties together the character definitions with their corresponding numbers.
- 110** The main program structure responds to the key pressed when the menu is presented.
- 130 PROCn** Chooses the numbers to be worked with. The units are always such that a 10 is required to sort matters out. *N%* is the first number, *M%* the number to be taken from it, *T1%* the first digit of the first number, *U1%* the second digit of the first number, *T2%* the first digit of the second number, and *U2%* the second digit of the second number.
- 140 PROCd** Displays the sum both in figures and in coloured blocks.
- 180 PROCsub** Major section in which the computer shows you the sum being carried out.
- 240 PROCp1** First half of the section in which the pupil assists the computer with the sum.
- 270 PROCc** Clears screen in the small text area. I was unable to use a text window. This procedure is used frequently throughout the program.
- 280 PROCX** Takes away the 1s from the top, once the new 10 has been brought over. This procedure is used in PROCd and in PROCp1.
- 300 PROCm** Moves across the 10 from the 10s to the 1s.
- 310 PROCp2** Second half of the section in which the pupil assists the computer with the sum.
- 370 PROCmt** Takes the appropriate number of 10s away from the top and puts them at the bottom.
- 400 PROCa** Produces flashing arrow used in several places in the program.
- 420 PROCp** Formats the text used throughout.
- 450, 460** Details of adding to the 1s and changing the 10s in the sum. CHR\$250 is the small 1 used to make, such as a 4 in the units look like 14. CHR\$251 is the crossing out of the number in the 10s column when it is replaced by a new number one less.
- 470 PROCi (Z)** Controls input from keyboard when only one figure is required. (As far as possible I have disabled all keys other than numbers and the space bar.)
- 500-540** Minor sections put into procedures to save space.
- 550** Draws or undraws frame round units when new 10 has been brought over.
- 560 PROCR (Z%)** Controls input when two digit entries are required.
- 600** Produces frame round blocks which constitute the answer at the end of each of the two possible options.

```

10 IFPAGE=&E00THENVDU6:GOTO50
20 VDU21:*KEYO*TAPE!M:FORAZ=0TO(TO
P-PAGE)STEP4:AZ!&E00=AZ!PAGE:NEXT!MPA
GE=&E00!MOLD!MRUN!M
30 *FX138,0,128
40 END
50 VDU23,225,12,12,12,12,12,12,12,
12,23,226,12,12,12,12,12,12,0,23,2
27,60,102,195,3,3,3,6,6,23,228,12,12,
24,24,48,96,255,0,23,229,60,102,195,3
,3,3,6,28,23,230,6,3,3,3,195,102,60,0
,23,254,24,60,90,153,24,24,24,24:*FX4
,2
60 VDU23,231,12,12,24,24,48,48,96,
96,23,232,192,204,255,255,12,0,0,0,23
,233,255,128,128,128,128,128,252,
23,234,6,3,3,3,6,12,248,0,23,235,3,6,
12,12,24,24,48,96,23,236,124,66,129,1
29,129,129,126,0:*FX11,0
70 VDU23,237,255,3,3,6,6,12,12,24,
23,238,24,48,48,96,96,192,128,0,23,23
9,60,102,195,195,195,102,60,60,23,240
,102,195,195,195,102,60,0,0,23,241,56
,68,130,130,130,130,130,66,23,250,0,1
6,16,16,16,16,16,0,23,251,0,1,3,6,12,
24,48,96
80 VDU23,242,62,6,6,12,24,48,96,0,
23,243,0,24,60,102,195,195,129,129,23
,244,129,195,195,102,60,24,0,0,23,245
,0,0,0,255,255,255,0,0,23,246,0,0,0,2
55,255,255,0,0,23,224,0,0,62,62,62,62
,62,62
90 DIM TX(9,2):FORAZ=0TO9:FORB%=0T
O2:READTX(AZ,B%):NEXT:NEXT:G$="Good.
I will":H$="Type how many ":T$=" take
away ":S$=" the sum":A$=" the answer
":P$=" put them":ONERRORGOTO100
100 MODE1:VDU23:8202:0:0:0:19,3,6:0
::REPEAT:PRINTTAB(0,10)"1. I do";S$''
"2. You help me do";S$''''Type 1 or
2''''''Press ESCAPE to choose again"
110 REPEAT:AZ=GET:UNTILAZ=49ORAZ=50
:CLS:PROCH:IFAZ=49 PROCn:PROCd:PROCSu
b:PROCSp ELSE PROCn:PROCd:PROCp1:PRO
Cp2:PROCSp

```

From Page 13

```
120 CLS:UNTILFALSE:END
130 DEFPROCn:REPEAT:NZ=RND(99):U1Z=
NZ MOD 10:T1Z=NZ DIV 10:MZ=RND(89)+10
:U2Z=MZ MOD 10:T2Z=MZ DIV 10:UNTILNZ>
MZ+10ANDU1Z-U2Z<0:ENDPROC
140 DEFPROCd:COLOUR3:PRINTTAB(0,3);
T1Z:COLOUR1:PRINT;U1Z:COLOUR2:PRINT
:TZ:COLOUR3:PRINT:T2Z:COLOUR1:PRINT
:U2Z:COLOUR3:PRINTTAB(2,5);T1Z:COLOUR
1:PRINTTAB(15,5);U1Z
150 FORYZ=6TO15:COLOUR3:PRINTTAB(0,
YZ)STRING$(T1Z,CHR$224):NEXT:IFU1Z>OF
DRYZ=16-U1ZTO15:VDU17,1,31,15,YZ,224:
NEXT
160 VDU31,27,6,17,2,TZ(T1Z,1),10,8,
TZ(T1Z,2),31,29,6,TZ(U1Z,1),10,8,TZ(U
1Z,2),31,27,8,TZ(T2Z,1),10,8,TZ(T2Z,2
),31,29,8,TZ(U2Z,1),10,8,TZ(U2Z,2)
170 VDU31,31,8,245,245:MOVE768,560:
DRAW960,560:MOVE768,688:DRAW960,688:E
NDPROC
180 DEFPROCsub:PROCp("First of all"
,"we need","to"+T$,"the "+STR$U2Z+" o
nes","But we cannot","take "+STR$U2Z+"
" from "+STR$U1Z):PROCsp
190 PROCp("There are too","few ones
in "+STR$NZ+","So we move over","a
ten and put it","in the place","for
ones"):PROCsp:PROCm:PROCL
200 PROCp("We now have",STR$(U1Z+10
)+ " ones. We","change the ones","in"+
S$,"like this",""):PROCK(3):PROCa(15,
17):PROCu:PROCK(0)
210 PROCp("And we change","the tens
","in"+S$,"as well, like","this",""):
:PROCC:PROCV:PROCSp:PROCX:PROCp("We c
ount the","ones left behind","and"+P$
,"in"+A$,"",""):PROCSp:AZ=U1Z+10-U2Z:
PROCE
220 PROCSp:PROCp("We are ready","to
"+T$+"the",STR$T2Z+" tens","",""):
PROCSp:PROCMt:PROCSp:PROCp("If there
are","any tens left","behind at the",
"top, we write","them in our","answer
"):IFT1Z-T2Z-1>OPROCO
230 PROCSp:PROCFr:PROCp("Now we hav
e",A$,"to"+S$+","STR$NZ+T$+STR$MZ,"i
s "+STR$(NZ-MZ),""):ENDPROC
240 DEFPROCp1:PROCp(H$,"ones we wan
t","to"+T$,"",""):PROCi(U2Z):PROCp
("Good. But we","can't take "+STR$(U2
Z),"from "+STR$(U1Z)+". We","must bri
ng over","a ten",""):PROCSp:PROCm:PRO
CL
```

```
250 PROCp("Look at the","blocks aga
in.",H$,"ones you see","in "+STR$NZ+"
now",""):PROCK(3):PROCa(15,17):PROCK
R(U1Z+10):PROCp("Good. We need","to c
hange the","ones in"+S$,"to show","th
is. I will","do it."):PROCu:PROCK(0)
260 PROCp("We have moved","a ten ov
er.",H$,"tens are left","in the tens"
,"place"):PROCa(2,17):PROCi(T1Z-1):PR
OCp("Good. Let's","change the tens","
in"+S$,"to show this","",""):PROCC:EN
DPROC
270 DEFPROCc:FORYZ=17TO29:PRINTTAB(
24,YZ)SPC(16):NEXT:ENDPROC
280 DEFPROCX:COLOUR1:IFU1Z>OYZ=16:R
EPEAT:VDU31,15,YZ,224,31,15,YZ-U1Z,32
:YZ=YZ+1:PROCT(20):UNTILYZ=30:YZ=30-U
1Z:REPEAT:VDU31,15,YZ,32:YZ=YZ+1:UNTI
LYZ=30:YZ=30-U1Z:REPEAT:VDU31,14,YZ,2
24:YZ=YZ+1:UNTILYZ=30
290 YZ=16:REPEAT:VDU31,14,YZ,224,31
,14,YZ-10,32:YZ=YZ+1:PROCT(20):UNTILY
Z=16+U2Z-U1Z:REPEAT:VDU31,14,YZ,224,3
1,14,YZ-(U2Z-U1Z),32:YZ=YZ+1:PROCT(20
):UNTILYZ=30-U1Z:PROCSp:ENDPROC
300 DEFPROCm:COLOUR1:XX=T1Z-1:REPEA
T:FORCX=6TO15:VDU31,XX,CX,32:NEXT:FOR
CZ=6TO15:VDU31,XX+1,CX,224:NEXT:XX=XX
+1:PROCT(40):UNTILXX=14:ENDPROC
310 DEFPROCp2:PROCV:PROCX:PROCp(H$,
"ones are","left at the top","Then I
can write","them in the","answer"):PR
OCa(14,17):PROCi(U1Z+10-U2Z):PROCp(6$
,P$,"in"+A$,"",""):PROCE:PROCSp
320 PROCp("We now need","to"+T$,"th
e tens.",H$,"we"+T$,""):PROCi(T2Z):PR
OCp(6$,T$+"the","tens to the","bottom
",""):PROCMt:PROCSp
330 PROCp(H$,"tens","are left at th
e","top. Then I","can"+P$,"in"+A$):PRO
Ci(T1Z-T2Z-1):IFAZ>OPROCa(6$,P$,"in"+
A$,"",""):PROCO
340 IFAZ=OPROCT(50):PROCC:PRINTTAB(
24,17)"Good"
350 PROCSp:PROCFr:PROCp("So we have
","done"+S$+","What","is"+A$+"?",W
hat is",STR$NZ+T$+STR$MZ+"?"):PROCR(N
Z-MZ):PRINTTAB(24,17)"GOOD !":*FX15,1
360 ENDPROC
370 DEFPROCmt:PROCT(50):XX=0:COLOUR
3:REPEAT:YZ=6:REPEAT:VDU31,XX,YZ,32,3
1,XX,YZ+10,224:YZ=YZ+1:UNTILYZ=20:XX=
XX+1:PROCT(40):UNTILXX=T2Z:ENDPROC
380 XX=0:COLOUR3:REPEAT:YZ=6:REPEAT
:VDU31,XX,YZ,32,31,XX,YZ+10,224:YZ=YZ
+1:UNTILYZ=20:XX=XX+1:PROCT(40):UNTIL
```

```
XX=T2Z:ENDPROC
390 DEFPROCt(Q):TIME=0:REPEATUNTILT
IME>Q:ENDPROC
400 DEFPROCa(JZ,VZ):FORS=1TO8:VDU17
,1,31,JZ,VZ,254:SOUND1,-8,200,6:VDU31
,JZ,VZ,32:SOUND1,0,0,6:NEXT:COLOUR2:*
FX15,1
410 ENDPROC
420 DEFPROCp(a$,b$,c$,d$,e$,f$):PRO
Cc:COLOUR2:PRINTTAB(24,17)a$:PRINTTAB
(24,19)b$:PRINTTAB(24,21)c$:PRINTTAB(
24,23)d$:PRINTTAB(24,25)e$:PRINTTAB(2
4,27)f$:ENDPROC
430 DEFPROCsp:PRINTTAB(24,29)"Press
SPACE BAR":REPEAT:AZ=GET:UNTILAZ=32:
PROCC:PROCH:*FX15,1
440 ENDPROC
450 DEFPROCu:PROCT(150):MOVE904,844
:6COLO,2:VDU5,250,4:PROCSp:ENDPROC
460 DEFPROCq:MOVE864,812:VDU5,251,4
:PRINTTAB(26,6);T1Z-1:PROCSp:ENDPROC
470 DEFPROCi(Z):REPEAT:REPEAT:VDU31
,32,29:AZ=GET:UNTILAZ>47ANDAZ<58:VDUA
Z:*FX15,0
480 AZ=VAL(CHR$AZ):PROCT(40):IFAZ<>
Z:PROCC:PRINTTAB(24,17)"Try again !"
490 UNTILAZ=Z:PROCT(50):ENDPROC
500 DEFPROCL:VDU31,2,5,32,31,15,5,3
2:ENDPROC
510 DEFPROCH:VDU23,1,0;0;0;0;:ENDPR
OC
520 DEFPROCV:PROCp("Let's"+T$,"the
"+STR$U2Z,"ones now","and"+P$,"at the
bottom",""):ENDPROC
530 DEFPROCE:VDU31,29,12,TZ(AZ,1),1
0,8,TZ(AZ,2):ENDPROC
540 DEFPROCO:VDU31,27,12,TZ(T1Z-T2Z
-1,1),10,8,TZ(T1Z-T2Z-1,2):ENDPROC
550 DEFPROCK(CZ):6COLO,CZ:MOVE448,5
12:DRAW448,832:DRAW512,832:DRAW512,51
2:DRAW448,512:6COLO,2:ENDPROC
560 DEFPROCR(Z):REPEAT
570 REPEAT:VDU31,24,29:AZ=GET:UNTIL
AZ>47ANDAZ<58:VDUAZ:REPEAT:BZ=GET:UNT
IL(BZ>47ANDBZ<58)ORBZ=127:VDUBZ:IFBZ=
127THEN570
580 AZ=10*VAL(CHR$AZ)+VAL(CHR$BZ):P
ROCT(30):PROCC:IFAZ<>Z:PRINTTAB(24,17
)"Try again"
590 UNTILAZ=Z:PROCT(50):ENDPROC
600 DEFPROCFr:MOVE0,500:DRAW512,500
:DRAW512,832:DRAW0,832:DRAW0,500:ENDP
ROC
610 DATA0,243,244,1,225,226,2,227,2
28,3,229,230,4,231,232,5,233,234,6,23
5,236,7,237,238,8,239,240,9,241,242
```

# Times without trouble

## An elementary multiplication program by ANDREW DAVIS

TUMULT seeks to help with elementary multiplication of two-digit numbers – in particular where there are tens to carry.

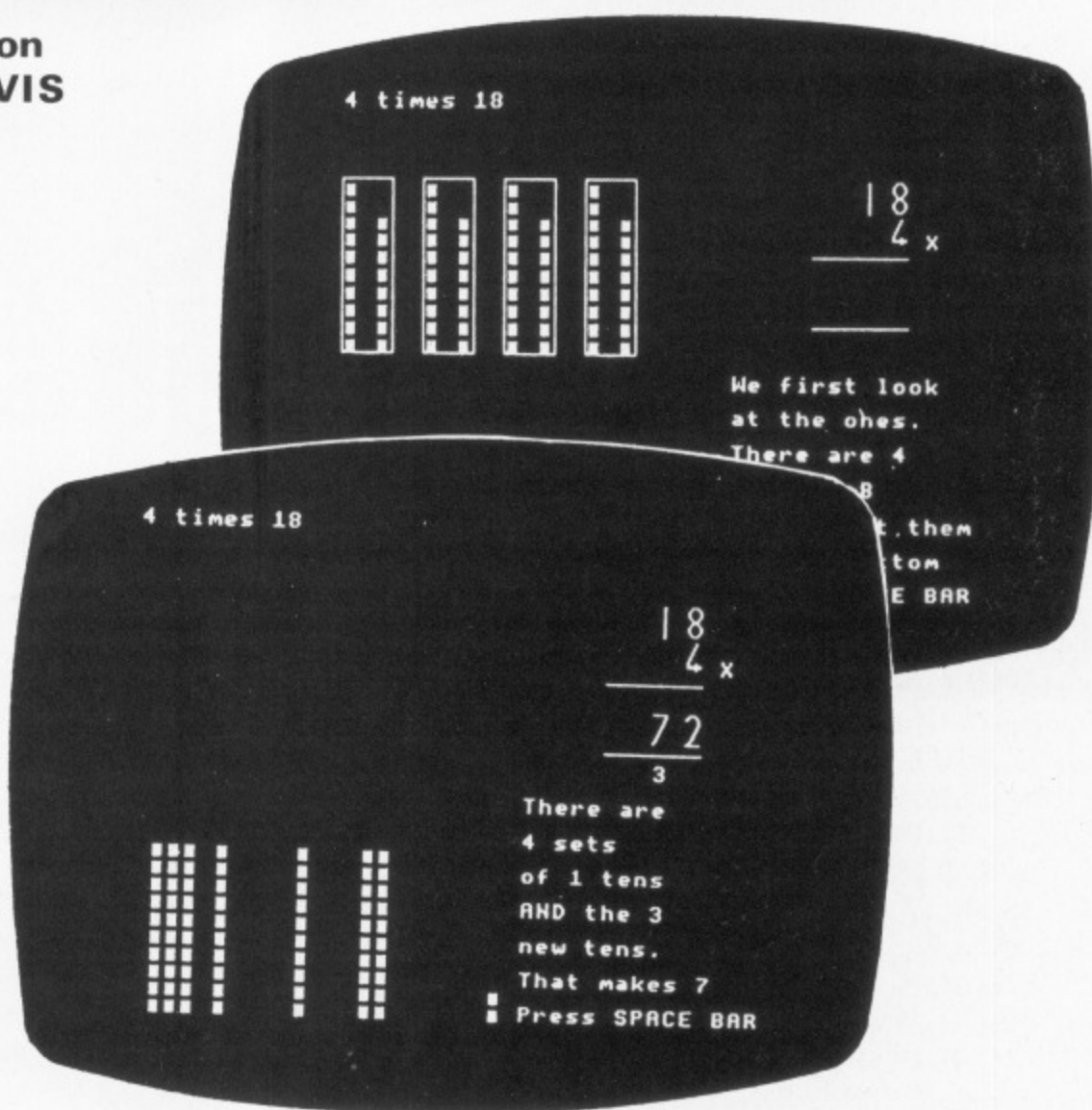
There is a menu presenting two options. In the first, the micro shows how the sum is carried out. In the second, the pupil is invited to help with the sum.

At any time the pupil may return to the menu by pressing Esc.

Children could profitably mirror the graphics displayed on the screen with apparatus such as Dienes base 10. No doubt teachers could think of many ways in which the program could be used in association with other classroom activities.

This particular program is rather longer than I would have liked. The routines for moving the units from the top to the bottom proved complicated.

I have a strong suspicion that the whole thing could be done far more elegantly and briefly, but as yet I don't see how. Meanwhile, it works as it stands.



### PROGRAM STRUCTURE

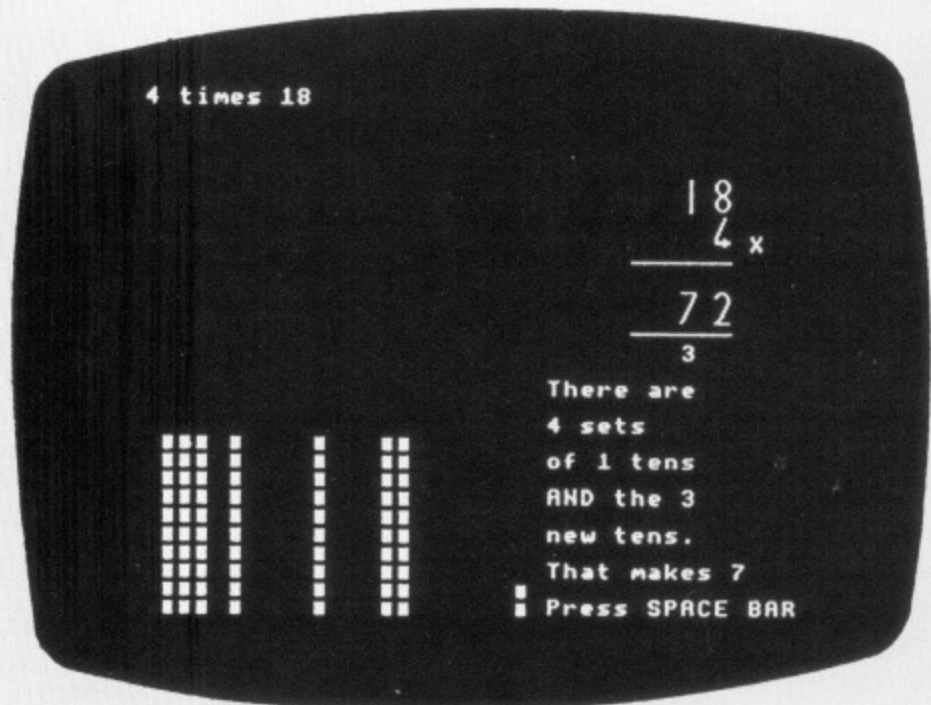
- |       |  |      |   |
|-------|--|------|---|
| 10-40 | Moves the program to PAGE=&E00.  | 530  | <i>PROCi (Z)</i> takes any single digit inputs from the pupil.  |
| 50-80 | Defines characters used to make the "big numbers" used in the sum.   | 570  | <i>PROCK(C%,X%)</i> draws frames round the numbers in the colour desired.   |
| 90    | The array links the big numbers with their corresponding standard numbers.   | 580  | <i>PROCR(Z%)</i> takes any two digit inputs by the pupil.   |
| 140   | <i>PROCn</i> , picks the numbers. The answer never exceeds 99. <i>M%</i> , the single digit number does not exceed 5, and <i>N%</i> , the two digit number does not exceed 29. If the numbers had been allowed to exceed these values, the display would have become too cluttered. <i>U1%</i> is the units of the top number. <i>U2%</i> (which is a holdover from previous programs and doesn't really need to be here), is the units of the bottom number, <i>U3%</i> the units of the answer, and <i>T3%</i> the tens of the answer. | 630  | <i>PROCY</i> takes ones to the bottom when there are three "new tens".  |
| 160   | <i>PROCd</i> displays the sum at the beginning.  | 720  | <i>PROCTwo</i> takes ones to the bottom when there are two "new tens".  |
| 220   | <i>PROCmult</i> is the main procedure taking the pupil through the sum.  | 810  | <i>PROCall</i> , nearly all the movements of the ones require this.   |
| 380   | <i>PROCX</i> , one of the procedures for getting the units to the bottom. This one deals with the situation where four "new tens" can be made with the units.  | 850  | <i>PROCone</i> takes ones to the bottom when there is one "new ten".  |
| 410   | <i>PROCmt</i> moves the tens from the top to the bottom, after the units have first been dealt with.   | 1030 | <i>PROCgen</i> , an important procedure used many times in the course of moving the units down.   |
| 480   | <i>PROCa</i> makes a flashing arrow which is used twice in the program.  | 1050 | <i>PROCmu</i> . Once the units are down at the bottom, and changed where possible into tens, if any are left, this procedure moves them over to the right to allow for the later descent of the tens. |
| 500   | <i>PROCP</i> ( <i>a\$,b\$,c\$,d\$,e\$,f\$</i> ) formats the text used throughout the program.  | 1060 | <i>PROCud</i> assigns the units moving procedures appropriately.  |
|       |  | 1110 | <i>PROCP1</i> , the main procedure in which the pupil helps the micro to do the sum.  |
|       |  | 1240 | <i>PROCb1</i> turns the new tens blue.  |

## From Page 15

```

5 REM (c) The Micro User
10 IFPAGE=&E00THENVDU6:GOTO50
20 VDU21:*KEY0*TAPE!M:FORAZ=0TO(10
P-PAGE)STEP4:AZ!&E00=AZ!PAGE:NEXT:MPA
GE=&E00:MDLD:MRUN!M
30 *FX138,0,128
40 END
50 VDU23,225,12,12,12,12,12,12,12,
12,23,226,12,12,12,12,12,12,0,23,2
27,60,102,195,3,3,3,6,6,23,228,12,12,
24,24,48,96,255,0,23,229,60,102,195,3
,3,3,6,28,23,230,6,3,3,3,195,102,60,0
,23,254,24,60,90,153,24,24,24,24:*FX4
,2
60 VDU23,231,12,12,24,24,48,48,96,
96,23,232,192,204,255,255,12,0,0,0,23
,233,255,128,128,128,128,128,128,252,
23,234,6,3,3,3,6,12,248,0,23,235,3,6,
12,12,24,24,48,96,23,236,124,66,129,1
29,129,129,126,0:*FX11,0
70 VDU23,237,255,3,3,6,6,12,12,24,
23,238,24,48,48,96,96,192,128,0,23,23
9,60,102,195,195,195,102,60,60,23,240
,102,195,195,195,102,60,0,0,23,241,56
,68,130,130,130,130,130,66,23,250,0,1
6,16,16,16,16,16,0
80 VDU23,242,62,6,6,12,24,48,96,0,
23,243,0,24,60,102,195,195,129,129,23
,244,129,195,195,102,60,24,0,0,23,246
,0,0,0,255,255,255,0,0,23,224,0,0,62,
62,62,62,62,62
90 DIM TX(9,2):FORAZ=0TO9:FORBX=0T
O2:READTX(AZ,BX):NEXT:NEXT
100 ONERRORGOTO110
110 REPEAT:MODE1:VDU23,1,0;0;0;0;:V
DU19,3,6;0;:PRINTTAB(0,10)"1. I do th
e sum."""2. You help me do the sum.
""""Type 1 or 2""""Press ESCAPE t
o choose again"
120 REPEAT:AZ=GET:UNTILAZ=49ORAZ=50
:CLS:PROCH:IFAZ=49 PROCn:PROCD:PROCAu
lt:PROCsp ELSE PROCn:PROCD:PROCP1:PRO
Csp
130 UNTILFALSE:END
140 DEFPROCn:REPEAT:NZ=RND(29):U1Z=
NZ MOD 10:T1Z=NZ DIV 10:MX=RND(5):U2Z
=MX MOD 10:T3Z=(MX*NZ)DIV 10:U3Z=(MX*
NZ)MOD 10:UNTILNZ>10ANDMX>1ANDMX*NZ<1
00ANDU1Z*U2Z>9
150 ENDPROC
160 DEFPROCD:COLOUR1:PRINTTAB(0,1);
U2Z;:COLOUR2:PRINT:" times ";:COLOUR3
:PRINT:T1Z;:COLOUR1:PRINT:U1Z;
170 XZ=0:REPEAT:FORYZ=6TO15:COLOUR3
:PRINTTAB(XZ,YZ)STRING$(T1Z,CHR$224):
NEXT:IFU1Z>0FORYZ=16-U1ZTO15:VDU17,1,
31,XZ+2,YZ,224:NEXT
180 XZ=XZ+5:UNTILXZ/5=MX

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190 XZ=0:REPEAT:PROCK(2,XZ):XZ=XZ+1
60:UNTIL(XZ/160)=MX
200 VDU31,32,6,17,2,TX(T1Z,1),10,8,
TX(T1Z,2),31,34,6,TX(U1Z,1),10,8,TX(U
1Z,2),31,34,8,TX(U2Z,1),10,8,TX(U2Z,2
)
210 VDU31,36,9,98:MOVE928,560:DRAW1
120,560:MOVE928,688:DRAW1120,688:ENDP
ROC
220 DEFPROCmult:PROCP("We first loo
k","at the ones.", "There are "+STR$U2
Z,"sets of "+STR$U1Z,"I will put them
","at the bottom"):PROCsp
230 XZ=0:REPEAT:PROCK(0,XZ):XZ=XZ+1
60:UNTIL(XZ/160)=MX:PROCud
240 IF(U1Z*U2Z DIV 10)>1PROCP("We h
ave "+STR$(U1Z*U2Z DIV 10),"new tens.
I will","make them blue","","")
250 IF(U1Z*U2Z DIV 10)=1PROCP("We h
ave one","new ten. I will","make it b
lue","","")
260 PROCsp:PROCb1
270 PROCP("We write how","many new
tens","there are","under the","answer
like","this"):PROCa(32,15):PRINTTAB(
32,15);U1Z*U2Z DIV 10
280 PROCsp:IFU3Z>0PROCP("There are
some","ones that we","could not make"
,"tens with. We","write them","in the
answer")
290 IFU3Z=0PROCP("We used up","all
the ones","to make new tens","We writ
e zero","in the ones part","of the an
swer")
300 VDU17,2,31,34,12,TX(U3Z,1),10,8
,TX(U3Z,2)
310 PROCsp:IFT1Z>1PROCP("We have "+
STR$MX+" sets","of "+STR$T1Z+" tens..
"+STR$(MX*T1Z),"tens..still at","the
top. Down","they go to","the bottom")

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320 IFT1Z=1PROCP("We still have",ST
R$MX+" tens at","the top. Down","they
go to","the bottom","")
330 PROCsp:PROCMt
340 PROCP("Now we count","how many
tens","we have","altogether","and wri
te this","in the answer"):PROCsp
350 PROCP("There are",STR$MX+" sets
","of "+STR$T1Z+" tens","AND the "+ST
R$(U1Z*U2Z DIV 10),"new tens.", "That
makes "+STR$T3Z):VDU17,2,31,32,12,TX(
T3Z,1),10,8,TX(T3Z,2)
360 ENDPROC
370 DEFPROCC:FORYZ=17TO29:PRINTTAB(
24,YZ)SPC(16):NEXT:ENDPROC
380 DEFPROCX:PROCCall:PROCNxt:PROCG
en(0,17,4,3*U1Z MOD 20,21):PROCGen(30
-3*U1Z,17,5,0,31-(4*U1Z-30)):PROCGen(
0,22,5,4*U1Z-30,21)
390 IF5*U1Z-40(>0) YZ=12:REPEAT:VDU3
1,22,YZ,224,31,22,YZ-5,32:YZ=YZ+1:PRO
Ct(4):UNTILYZ=30
400 ENDPROC
410 DEFPROCmt:COLOUR3:tZ=4:REPEAT
420 IFMZ>tZ XZ=tZ*5:REPEAT:YZ=6:REP
EAT:VDU31,XZ,YZ,32,31,XZ,YZ+10,224:YZ
=YZ+1:UNTILYZ=20:XZ=XZ+1:PROCC(4):UN
TILXZ=tZ*5+T1Z
430 tZ=tZ-1:UNTILTZ=0
440 CZ=0:REPEAT:XZ=T1Z-1-CZ:REPEAT:
FORYZ=6TO15:VDU31,XZ,YZ,32:NEXT:FORYZ
=6TO15:VDU31,XZ+1,YZ,224:NEXT:XZ=XZ+1
:UNTILXZ=14-CZ:CZ=CZ+1:UNTILCZ=T1Z
450 XZ=14:REPEAT:YZ=6:REPEAT:VDU31,
XZ,YZ,32,31,XZ,YZ+10,224:YZ=YZ+1:UNTI
LYZ=20:XZ=XZ-1:PROCC(4):UNTILXZ=14-T
1Z
460 ENDPROC
470 DEFPROCC(Q):TIME=0:REPEATUNTILT
IME>Q:ENDPROC

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480 DEFPROCa(J%,V%):FORS=1T08:VDU17
,1,31,J%,V%,254:SOUND1,-8,200,6:VDU31
,J%,V%,32:SOUND1,0,0,6:NEXT:COLOUR2:*
FX15,1
490 ENDPROC
500 DEFPROCp(a$,b$,c$,d$,e$,f$):PRO
Cc:COLOUR2:PRINTTAB(24,17)a$:PRINTTAB
(24,19)b$:PRINTTAB(24,21)c$:PRINTTAB(
24,23)d$:PRINTTAB(24,25)e$:PRINTTAB(2
4,27)f$:ENDPROC
510 DEFPROCsp:PRINTTAB(24,29)"Press
SPACE BAR":REPEAT:AX=GET:UNTILAX=32:
PROCC:PROCH:*FX15,1
520 ENDPROC
530 DEFPROCi(Z):REPEAT:REPEAT:VDU31
,32,29:AX=GET:UNTILAX>47ANDAX<58:VDUA
Z:*FX15,0
540 AX=VAL(CHR$AX):PROCT(40):IFAX<>
Z PROCC:PRINTTAB(24,17)"Try again!"
550 UNTILAX=Z:PROCT(50):ENDPROC
560 DEFPROCH:VDU23,1,0;0;0;0;ENDPR
OC
570 DEFPROCK(CX,XX):GCDLO,CX:MOVEXX
,512:DRAWX+100,512:DRAWX+100,832:DR
AWX,832:DRAWX,512:GCDLO,2:ENDPROC
580 DEFPROCR(ZX):REPEAT
590 REPEAT:VDU31,24,29:AX=GET:UNTIL
AX>47ANDAX<58:VDUAZ:REPEAT:BX=GET:UNT
IL(BX)>47ANDBX<58)ORBX=127:VDUBX:IFBX=
127THEN590
600 AX=10*VAL(CHR$AX)+VAL(CHR$BX):P
ROCT(30):PROCC:IFAX<>ZXPRINTTAB(24,17
)"Try again"
610 UNTILAX=ZX:PROCT(50):ENDPROC
620 DATA0,243,244,1,225,226,2,227,2
28,3,229,230,4,231,232,5,233,234,6,23
5,236,7,237,238,8,239,240,9,241,242
630 DEFPROCY:PROCCall:IF3*U1X>19PROC
next
640 IF3*U1X<18 PROCz1
650 IF4*U1X>30PROCgen(0,17,4,3*U1X
MOD 20,21)
660 IF4*U1X>30ANDU1X=8PROCgen(6,17,
5,0,29)
670 IF4*U1X>30ANDU1X=9PROCgen(3,17,
5,0,25)
680 IFU1X=7PROCgen(0,17,4,1,23):PRO
Cgen(0,22,4,8,21):PROCgen(2,22,5,0,26
)
690 IFU1X=6PROCgen(0,12,3,2,23):PRO
Cgen(0,17,3,8,21):PROCgen(2,17,4,0,27
):PROCgen(0,22,4,4,21)
700 IFU3X>0PROCmu(1+(U1X*U2X DIV 10
),U3X)
710 ENDPROC
720 DEFPROCTwo:IF2*U1X>8AND NOT(U1X
=4ANDM%5)PROCCall
730 IFU1X=4ANDM%=5:PROCgen(0,2,2,0,
27):PROCgen(0,7,2,4,23):PROCgen(0,12,
2,8,21):PROCgen(2,12,3,0,29):PROCgen(

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0,17,3,2,25):PROCgen(0,22,3,6,21)
740 IFU1X>6AND(M%=3ORM%=4)PROCgen(0
,12,3,2*U1X-10,21):PROCgen(20-2*U1X,1
2,4,0,31-(3*U1X-20))
750 IFU1X=5PROCgen(0,12,3,0,26):PRO
Cgen(0,17,3,5,21)
760 IFU1X=5ANDM%=5PROCgen(0,22,4,0,
26)
770 IFU1X=6PROCgen(0,2,3,2,23):PRO
Cgen(0,17,3,8,21):PROCgen(2,17,4,0,27
)
780 IFU1X=7ANDM%=4PROCgen(0,17,4,1,
23)
790 IFU3X>0PROCmu(1+(U1X*U2X DIV 10
),U3X)
800 ENDPROC
810 DEFPROCCall:COLOUR1:PROCgen(0,2,
2,0,31-U1X):PROCgen(0,7,2,U1X,21)
820 IF2*U1X<11ENDPROC
830 PROCgen(10-U1X,7,3,0,31-(2*U1X-
10))
840 ENDPROC
850 DEFPROCCone
860 IFU1X>1ANDU1X<6CX=0:DZ=0:REPEAT
:PROCgen(0,2+DZ,2,CX*U1X,31-(CX+1)*U1
X):CX=CX+1:DZ=DZ+5:UNTILCX=10 DIV U1X
870 IFU1X=3PROCgen(0,17,2,9,21):PRO
Cgen(1,17,3,0,29)
880 IFU1X=3ANDM%=5PROCgen(0,22,3,2,
26)
890 IFU1X=4PROCgen(0,12,2,8,21):PRO
Cgen(2,12,3,0,29)
900 IFU1X=4ANDM%=4PROCgen(0,17,3,2,
25)
910 IFU1X=5ANDM%=3PROCgen(0,12,3,0,
26)
920 IFU1X>5PROCgen(0,2,2,0,31-U1X):
PROCgen(0,7,2,U1X,21)
930 IFU1X=6PROCgen(4,7,3,0,29)
940 IFU1X=6ANDM%=3PROCgen(0,12,3,2,
23)
950 IFU1X>6PROCgen(10-U1X,7,3,0,31-
(2*U1X-10))
960 IFU3X>0PROCmu(1+(U1X*U2X DIV 10
),U3X)
970 ENDPROC
980 DEFPROCNEXT:PROCgen(0,12,3,(2*U
1X)MOD 10,21)
990 PROCgen(20-2*U1X,12,4,0,31-(3*U
1X)MOD 20)
1000 ENDPROC
1010 DEFPROCCz1:PROCgen(0,12,9,2,23)
1020 ENDPROC
1030 DEFPROCgen(a%,b%,c%,d%,e%):COLO
UR1:EX=0:REPEAT:Y%=16-EX-a%:REPEAT:VD
U31,b%,Y%,224,31,b%,Y%-1,32:Y%=Y%+1:P
ROCT(3):UNTILY%=18
1040 FORX%=b%TOc%STEP-1:VDU31,X%-1,1
7,224,31,X%,17,32:PROCT(2):NEXT:REPEA
T:VDU31,c%-1,Y%,224,31,c%-1,Y%-1,32:Y

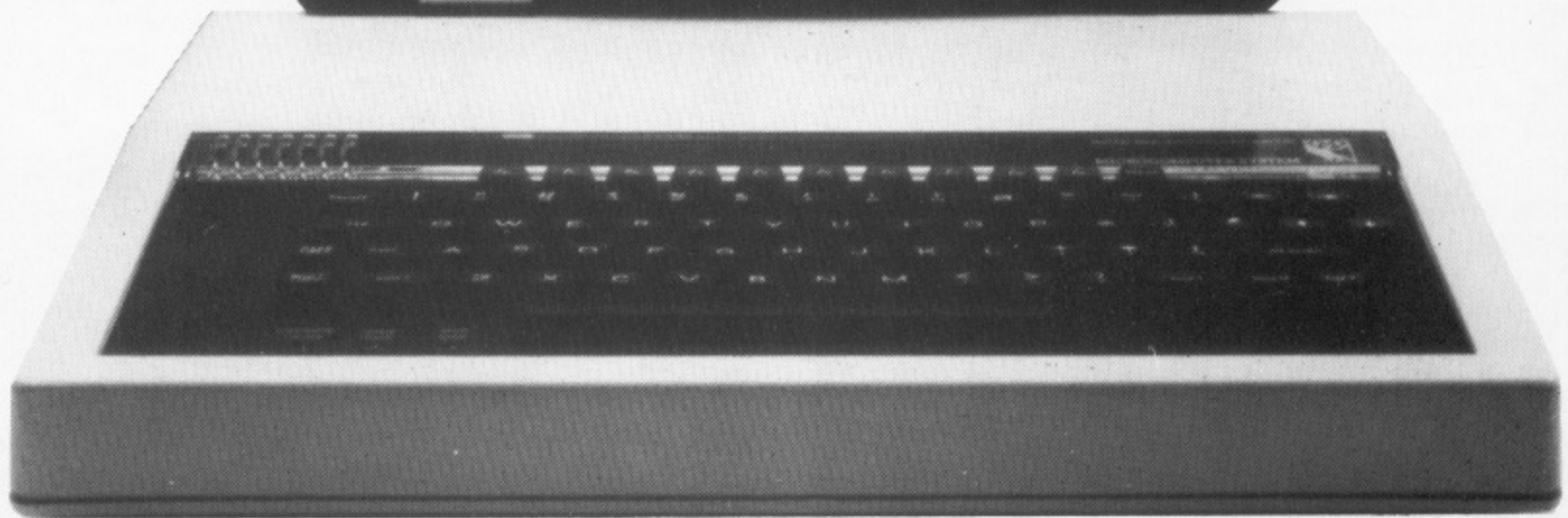
```

```

X%=Y%+1:PROCT(2):UNTILY%=30-EX-d%:EX=E
X%+1:UNTILY%=e%:ENDPROC
1050 DEFPROCmu(AZ,UZ):X%=AZ:REPEAT:F
ORCX=30-U%TO29:VDU31,X%+1,CX,224:NEXT
:FORCX=30-U%TO29:VDU31,X%,CX,32:NEXT:
PROCT(10):X%=X%+1:UNTILX%=22:ENDPROC
1060 DEFPROCud:IFU1X*U2X DIV 10=4PRO
CX
1070 IFU1X*U2X DIV 10=3PROCY
1080 IFU1X*U2X DIV 10=2PROCTwo
1090 IFU1X*U2X DIV 10=1PROCCone
1100 ENDPROC
1110 DEFPROCP1:PROCP("We first look
","at the ones. We","have "+STR$M%+" s
ets","of "+STR$U1X+"."Tell me how","ma
ny ones","that makes."):PROCR(M%*U1X)
1120 PROCP("Good. I will","put all t
he","ones at the","bottom","",""):PRO
Csp:X%=0:REPEAT:PROCK(0,X%):X%=X%+160
:UNTIL(X%/160)=M%:PROCCud
1130 PROCP("How many new","tens can
we","make from","these ones?","","")
:PROCI((M%*U1X)DIV 10)
1140 PROCP("Good. I will","turn them
blue.","Tell me the","number of ones
","we put in","our answer"):PROCB1:PR
OCI(U3%):PROCP("Good. I will","write
them in","","","")
1150 VDU17,2,31,34,12,T%(U3%,1),10,8
,T%(U3%,2):PROCCsp:PROCP("Now tell","m
e the number","for the new tens","we
put UNDER","the tens part","of the an
swer"):PROCCa(32,15)
1160 PROCI((M%*U1X)DIV 10):PROCP("Go
od. I will","put it there","","","")
:PRINTTAB(32,15):(M%*U1X)DIV 10
1170 PROCCsp:IFT1X>1PROCP("At the top
we","have "+STR$M%+" sets of","STR$T1
X%" tens. How","many tens are","there
at the top","altogether?")
1180 IFT1X=1PROCP("At the top we","h
ave "+STR$M%+" tens. Can","YOU see th
em?","YOU tell me how","many tens ar
e","still at the top")
1190 PROCI(M%*T1X)
1200 PROCP("Good. I will","put them
with","the other tens","at the bottom
","",""):PROCCat:PROCCsp
1210 PROCP("We have "+STR$M%+" sets
","of "+STR$T1X+" tens","AND "+STR$(M
%*U1X)DIV 10+" new tens.","How many
tens","altogether?",""):PROCI(T3X)
1220 PROCP("Good. I will","put them
in","","",""):VDU17,2,31,32,12,T%(
T3X,1),10,8,T%(T3X,2)
1230 ENDPROC
1240 DEFPROCCb1:COLOUR3:X%=1:REPEAT:F
ORYX=20TO29:VDU31,X%,Y%,224:NEXT:X%=X
%+1:UNTILX%=1+(U1X*U2X DIV 10):COLOUR
2:ENDPROC

```

# Use your computer to compute!



**ODDLY** enough, one of the things we rarely do on a computer is to use it to compute!

Simple though calculations are on a micro, children often get confused by the programming required to get an answer.

Calculator, written by **ANDREW HOUGHTON**, allows the child to cut through the programming clutter and concentrate on the calculations themselves.

Once the program has been loaded and run, a picture of a calculator will appear on the monitor with the instruction above it to "Enter first number".

After entering the first number of your calculation by pressing Return, the number will appear in the calculator display and the micro will ask what calculation you wish to perform by asking you to press a function key.

In this case a function key is one marked +, \* and so on. The calculator has several functions, summoned by pressing the keys shown on this page.

Key	Function
-	minus
+	plus
*	multiply by
/	divide by
^	raise to the power
A	'all clear'
C	cosine
R	square root
S	sine
T	tangent
=	equals

When using these, only press the key bearing the symbol of the function you want; do not press Return. These keys will work either shifted or unshifted.

If you select one of the functions -, +, /, \* or ^, the micro will ask you to enter a second number. This is the number by which the first is to be multiplied, divided, etc.

You don't have to press = except with the function ^. Remember that you do not have to press Return after pressing a function key.

If you select one of the functions S, C, or T the micro will ask if your angle is measured in degrees or radians. If measured in degrees, press key D. If in radians, press key R.

Again, you don't have to press Return.

Now the micro will ask you to press =. It will then display the answer in the calculator display.

If you select the function R, the micro will ask you to press =. The answer will then be displayed as before.

After the first calculation, the micro will ask you to press a function key. You can perform another calculation using the number already in the display, or you can clear the display by pressing A for a fresh start.

The micro will then start again by asking you to enter the first number of the calculation. To leave the program at any time, press Break.

Following this procedure you should encounter no problems as it is really just as simple to use as a normal pocket calculator.

Enter first number

?105

SIN COS TAN

7	8	9	+	#
4	5	6	-	√
1	2	3	=	1/x
^	0	.	ROOT	

### VARIABLES

- AS Used to select function.
- BS Prints command "Enter next number".
- CS Prints a long space over unwanted text.
- DS Used to select = and to choose between degrees and radians.
- ES Also used to select =.
- A First number in all calculations.
- B Next number in all additions.
- C Next number in all subtractions.
- D Next number in all multiplications.
- E Denominator in divisions.
- F Exponent in exponent calculations.
- T Answer to all calculations.

### PROCEDURES

- PROCinit Sets up screen display.
- PROCplus Carries out addition.
- PROCminus Carries out subtraction.
- PROCmultiply Carries out multiplication.
- PROCdivide Carries out division.
- PROCroot Square roots entered number.
- PROCsine Calculates the sine of any angle (in degrees/radians).
- PROCcosine Calculates the cosine of any angle.
- PROQtangent Calculates the tangent of any angle.
- PROCpowers Calculates the value of the entered number raised to any specified power.
- PROCrepeat Starts a second calculation with the previous answer as the first number.

```

10 REM (C) Micro User
20 REM
30 REM CALCULATOR
40 REM by A.R.Houghton
50 ON ERROR GOTO 1540
60 MODE 1
70 COLOUR 2
80 CLS
90 PROCinit
100 INPUT TAB(13,9),A
110 SOUND 1,-15,53,2
120 PRINT TAB(10,5);"Press function
key":PRINT TAB(19,3);C$
130 A$=GET$
140 SOUND 1,-15,53,2
150 PRINT TAB(13,9);"          "
160 PRINT TAB(10,3);"FUNCTION:";SPC
170 IF A$="A" OR A$="a" THEN GOTO B
180 IF A$=";" OR A$="+" THEN PROCpl
190 IF A$=":" OR A$="*" THEN PROCmu
200 IF A$="-" OR A$="=" THEN PROCmi
210 IF A$="/" OR A$="?" THEN PROCd
220 IF A$="R" OR A$="r" THEN PROCro
230 IF A$="S" OR A$="s" THEN PROCsi
240 IF A$="C" OR A$="c" THEN PROCco
250 IF A$="T" OR A$="t" THEN PROCta
260 IF A$="1" OR A$="=" THEN PROCpo
270 END
280 REM PROCinit - sets up the scre
en
290 DEF PROCinit
300 VDU 23;8202;0;0;0;
310 PRINT TAB(10,5);"Enter first nu
mber"
320 B$="Enter next number "
330 C$="
"
340 PRINT TAB(12,12);" SIN COS TAN
"
350 PRINT TAB(12,15);" 7 8 9 + +
"

```

# Electronequip

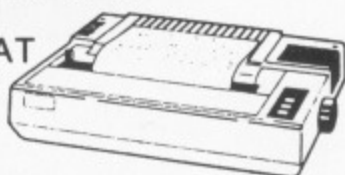
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**\* EPSON**

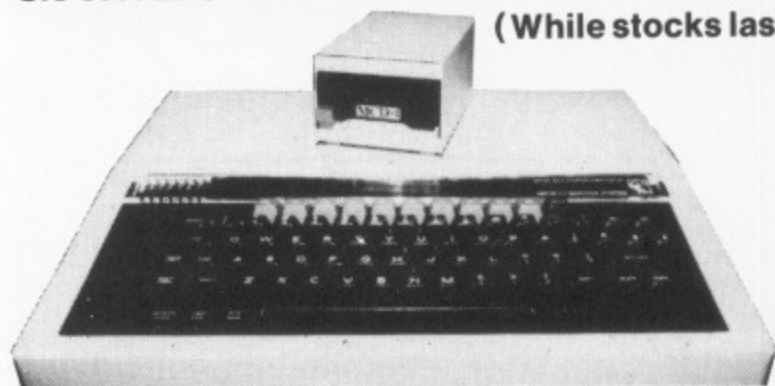
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**NORDMENDE**

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MNKVIS2	Kaga/Taxan Vision II RGB Mon. (Medium)	239.40	275.31
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3" Micro Disc £89.00  
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**Micro Disc Drive for the BBC Micro**

The Micro disc drive offers a method of low cost quick access to programs. The drive is essentially a small version of a 5 1/4" disc drive and offers similar features to the larger drive. The data is stored on a 3" disc, this is enclosed in a protective hard plastic cassette which features a write protect switch. The micro drive requires the standard Acorn disc interface, but a new disc filing system rom. Acorn DFS may be exchanged for the micro DFS for £12.00. The new micro disc filing system can read and write to Acorn DFS discs. Thus if a 5 1/4 inch and a micro floppy were connected on the same cable files could be transferred between them.  
**Capacity: 80.64 K bytes Transfer Rate: 125k bit/s.**



Ref	Disc Drives	Ex VAT	Inc VAT
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DDCD200	Cumana 200K dual disc drive 40T	256.20	294.63
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# BBC



**From Page 19**

```

360 PRINT TAB(12,18);"4 5 6 - /
"
370 PRINT TAB(12,21);"1 2 3 = %"
"
380 PRINT TAB(12,24);" + 0 . ROOT
"
390 MOVE 350,200
400 PLOT 1,0,600
410 PLOT 1,490,0
420 PLOT 1,0,-600
430 PLOT 1,-490,0
440 PLOT 1,5,0
450 MOVE 390,690
460 PLOT 1,0,70
470 PLOT 1,410,0
480 PLOT 1,0,-70
490 PLOT 1,-410,0
500 ENDPROC
510 REM PROCplus - performs addition
"
520 DEF PROCplus
530 PRINT TAB(19,3)"ADDITION":PRINT
TAB(10,5);B$
540 INPUT TAB(13,9),B
550 SOUND 1,-15,53,2
560 T=A+B
570 PRINT TAB(13,9);"          ":
PRINT TAB(13,9);T
580 PROCRepeat
590 ENDPROC
600 REM PROCminus - performs subtraction
"
610 DEF PROCminus
620 PRINT TAB(19,3)"SUBTRACTION":PR
INT TAB(10,5);B$
630 INPUT TAB(13,9),C
640 SOUND 1,-15,53,2
650 T=A-C
660 PRINT TAB(13,9);"          ":
PRINT TAB(13,9);T
670 PROCRepeat
680 ENDPROC
690 REM PROCroot - finds square roots
"
700 DEF PROCroot
710 IF A<0 THEN PRINT TAB(13,9);"
-VE ROOT "
720 PRINT TAB(19,3)"SQUARE ROOT":PR
INT TAB(0,5);C$;PRINT TAB(14,5);"Pres
s '='
730 T=SQR(A)
740 D$=GET$
750 SOUND 1,-15,53,2
760 IF D$="-" OR D$="=" THEN PRINT
TAB(13,9);T ELSE GOTO 720
770 PROCRepeat
780 ENDPROC
790 REM PROCsine - calculates sines
800 DEF PROCsine
810 PRINT TAB(19,3);"SINE"
820 PRINT TAB(3,4);" Is the angle i
n degrees or radians?":PRINT TAB(0,5)
;C$
830 D$=GET$
840 SOUND 1,-15,53,2
850 IF D$="R" OR D$="r" THEN PRINT
TAB(0,4);C$;PRINT TAB(0,5);C$;PRINT T
AB(23,3);"(RADIANS)":PRINT TAB(14,5);
"Press '=':T=SIN(A):GOTO 880
860 IF D$="D" OR D$="d" THEN PRINT
TAB(0,4);C$;PRINT TAB(0,5);C$;PRINT T
AB(23,3);"(DEGREES)":PRINT TAB(14,5);
"Press '=':T=SIN(RAD(A)):GOTO 880
870 GOTO 820
880 E$=GET$
890 SOUND 1,-15,53,2
900 PRINT TAB(14,5);"          ":PRI
NT TAB(13,9);T
910 PROCRepeat
920 ENDPROC
930 REM PROCmultiply - performs mul
tiplication
940 DEF PROCmultiply
950 PRINT TAB(19,3);"MULTIPLICATION
":PRINT TAB(10,5);B$
960 INPUT TAB(13,9),D
970 SOUND 1,-15,53,2
980 T=A*D
990 PRINT TAB(13,9);"          ":
PRINT TAB(13,9);T
1000 PROCRepeat
1010 ENDPROC
1020 REM PROCdivide - performs divis
ion
1030 DEF PROCdivide
1040 PRINT TAB(19,3);"DIVISION":PRIN
T TAB(10,5);B$
1050 INPUT TAB(13,9),E
1060 SOUND 1,-15,53,2
1070 T=A/E
1080 PRINT TAB(13,9);"          ":
PRINT TAB(13,9);T
1090 PROCRepeat
1100 ENDPROC
1110 REM PROCcosine - calculates cos
ines
1120 DEF PROCcosine
1130 PRINT TAB(0,5);C$
1140 PRINT TAB(19,3);"COSINE"
1150 PRINT TAB(3,4);" Is the angle in
radians or degrees?"
1160 D$=GET$
1170 SOUND 1,-15,53,2
1180 IF D$="R" OR D$="r" THEN PRINT
TAB(25,3);"(RADIANS)":PRINT TAB(0,4);
C$;T=COS(A):GOTO 1210
1190 IF D$="D" OR D$="d" THEN PRINT
TAB(25,3);"(DEGREES)":PRINT TAB(0,4);
C$;T=COS(RAD(A)):GOTO 1210
1200 GOTO 1160
1210 PRINT TAB(14,5);"Press '='
"
1220 E$=GET$
1230 SOUND 1,-15,53,2
1240 PRINT TAB(13,9);T
1250 PROCRepeat
1260 ENDPROC
1270 REM PROCtangent - calculates ta
ngents
1280 DEF PROCtangent
1290 PRINT TAB(19,3);"TANGENT"
1300 PRINT TAB(3,4);" Is the angle in
degrees or radians?":PRINT TAB(0,5);
C$
1310 D$=GET$
1320 SOUND 1,-15,53,2
1330 IF D$="R" OR D$="r" THEN PRINT
TAB(0,4);C$;PRINT TAB(26,3);"(RADIAN
S)":PRINT TAB(14,5);"Press '=':T=TAN
(A):GOTO 1360
1340 IF D$="D" OR D$="d" THEN PRINT
TAB(0,4);C$;PRINT TAB(26,3);"(DEGREE
S)":PRINT TAB(14,5);"Press '=':T=TAN
(RAD(A)):GOTO 1360
1350 GOTO 1310
1360 E$=GET$:SOUND 1,-15,53,2:PRINT
TAB(13,9);"          ":PRINT TAB(13
,9);T
1370 PROCRepeat
1380 ENDPROC
1390 REM PROCpowers - calculates pow
ers
1400 DEF PROCpowers
1410 PRINT TAB(19,3);"POWERS"
1420 PRINT TAB(0,5);C$;PRINT TAB(8,5
);"Enter power to raise x to":PRINT T
AB(13,9);"          ":INPUT TAB(13,
9),F:SOUND 1,-15,53,2:PRINT TAB(0,5);
C$
1430 T=A^F
1440 PRINT TAB(14,5);"Press '='
"
1450 E$=GET$
1460 SOUND 1,-15,53,2
1470 PRINT TAB(13,9);"          ":
PRINT TAB(13,9);T:PRINT TAB(0,5);C$
1480 PROCRepeat
1490 ENDPROC
1500 REM PROCRepeat - provides anothe
r calculation
1510 DEF PROCRepeat
1520 A=T
1530 GOTO 120
1540 VDU31,0,0:REPORT:PRINT " at lin
e "ERL

```

Gone are the days of reciting monotonous times tables in the classroom. DAVID EARLE has brought a lively new dimension to learning by rote...

*It's your times*

# TABLE MOUNTAIN

TABLE Mountain is intended to give children an entertaining way to practise their multiplication tables.

The child is asked to select a multiplication table and then offered straightforward rote practice.

If the pupil selects this, the chosen table is run through in sequence with correct answers being offered as

necessary. The child then continues with the main program, the aim of which is to guide a mountaineer to the top of Table Mountain. Every correct answer means the mountaineer climbs higher – if the answer is wrong, though, he slips back.

At the end, the time taken, together with average time per question, is displayed to give the teacher some

feedback. Tested extensively in primary schools, children have found Table Mountain thoroughly absorbing.

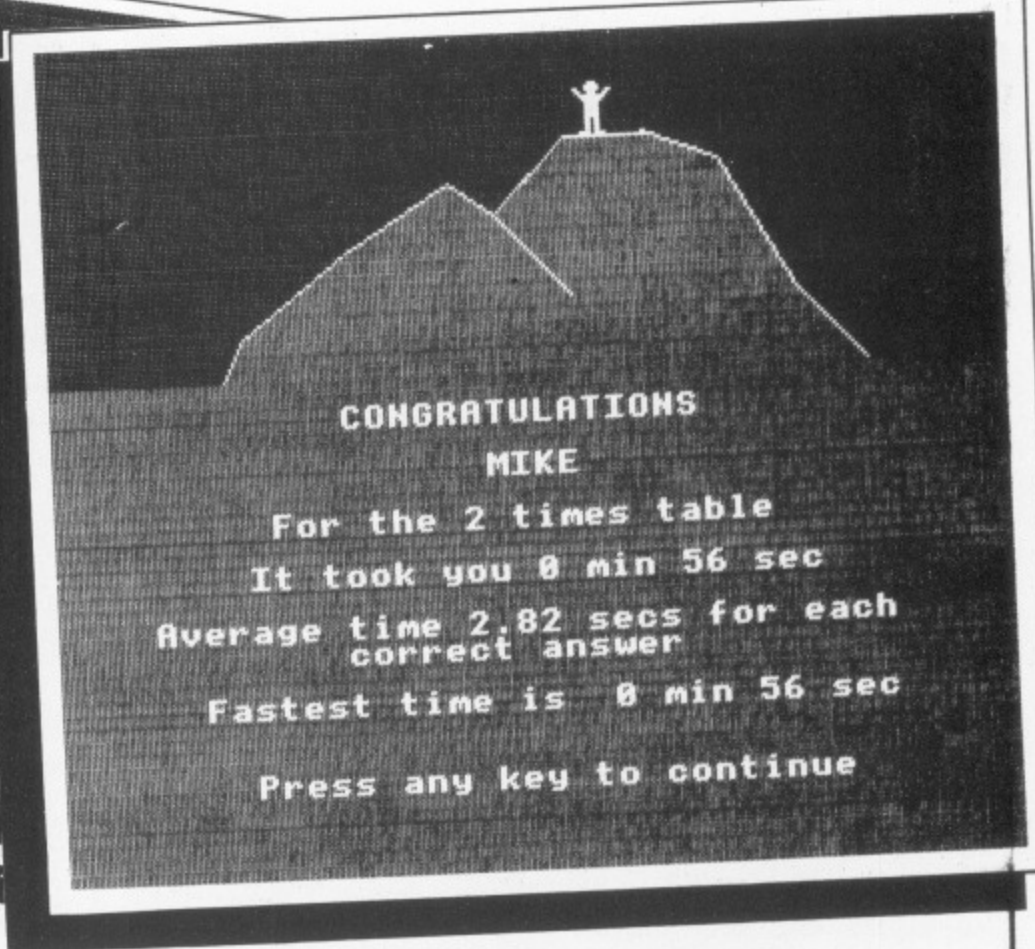
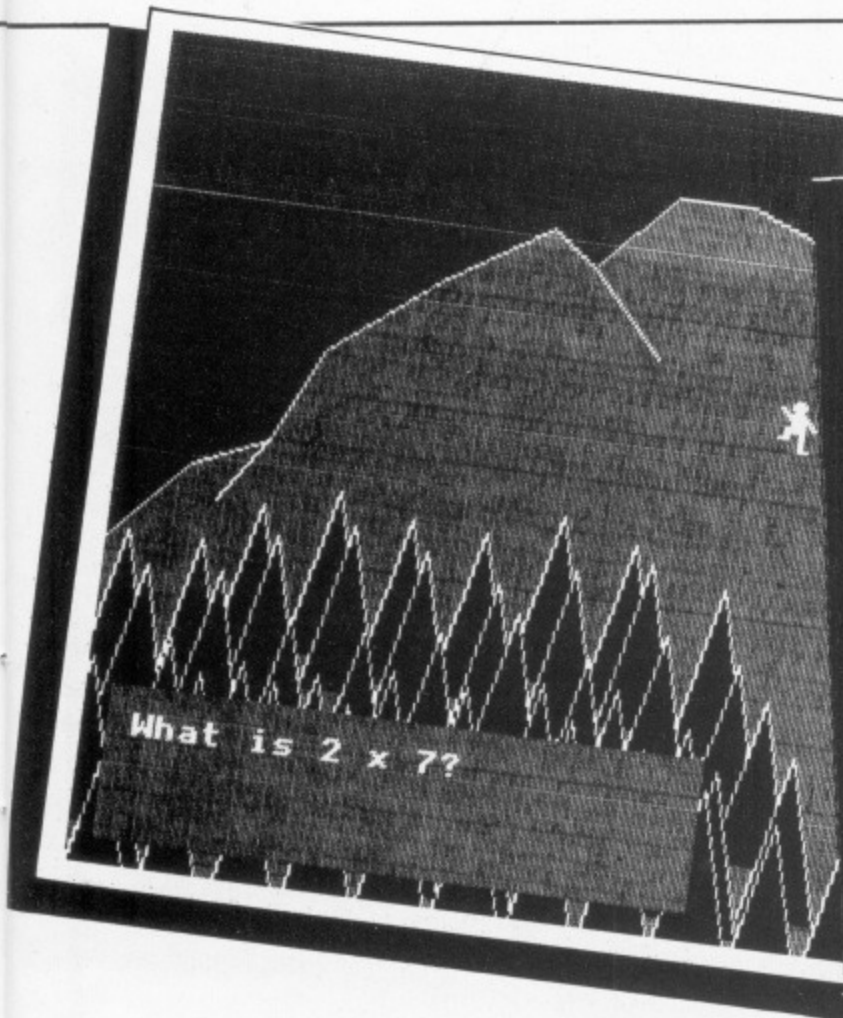
Parents and teachers might like to know that the value of U% in line 650 sets the highest table allowed – at the moment it is set to 12. Also the value 0% in the same line determines the number of attempts allowed for each question.

## PROCEDURES

<b>PROCclear</b>	Loop used to clear question area.	<b>PROCmountain</b>	Draws mountain.
<b>PROCdefine</b>	Define user-defined characters.	<b>PROCpractice</b>	Practice table procedure if selected by player.
<b>PROCdelay</b>	Delay loop used to retain text on screen.	<b>PROCsound</b>	Sounds note during ascent in accordance with pitch from PROCexercise.
<b>PROCending</b>	Display of results and times.	<b>PROCTree</b>	Production of trees in accordance with data.
<b>PROCexercise</b>	Main exercise procedure.	<b>PROCTriumph</b>	Triumphant display and sound on reaching summit of mountain.
<b>PROCheading</b>	Prints heading and instructions. Accepts player's name and choice of table.		
<b>PROCinitialise</b>	Initialise certain variables before each exercise.		
<b>PROCman</b>	Displays the man in accordance with		

## VARIABLES

<b>AS</b>	General answer string used throughout the program.	<b>No%</b>	Number read from data for trees to be produced by PROCTree.
<b>A%</b>	Number of attempts at each question in PROCpractice and PROCexercise.	<b>P%</b>	Pitch of sound determined in PROCexercise and used in PROCsound.
<b>Alt%</b>	Altitude of trees read from data in PROCTree.	<b>Q%</b>	Number of attempts allowed at each question, set in PROCinitialise and used in PROCpractice and PROCexercise.
<b>Av</b>	Average time for each correct answer calculated and displayed in PROCending.	<b>R%</b>	Horizontal TAB position calculated according to the length of N\$ and used to centre N\$ in PROCending.
<b>C%</b>	Correct answer to question used in PROCpractice and PROCexercise.	<b>S%</b>	Solution to question entered from the keyboard in PROCpractice and PROCexercise.
<b>D%</b>	Delay in seconds (approx) used in call to PROCdelay.	<b>Sec%</b>	Seconds element of exercise time calculated and displayed in PROCending.
<b>Delay%</b>	Loop variable used in PROCdelay.	<b>St%</b>	Horizontal start coordinate read from data and used in PROCTree.
<b>F%</b>	Number of forest loops through PROCTree.	<b>T%</b>	Multiplication table chosen by the player in PROCheading and used in PROCpractice and PROCexercise.
<b>FM%</b>	Minutes element of fastest time calculated and displayed in PROCending.	<b>Tree%</b>	Loop variable for number of trees produced and used in PROCTree.
<b>FS%</b>	Seconds element of fastest time calculated and displayed in PROCending.	<b>Time%</b>	Total time taken for exercise determined in PROCexercise and used for calculations in PROCending.
<b>FT%</b>	Array containing the fastest times for the tables attempted in PROCexercise.	<b>U%</b>	Upper limit of tables allowed, set in PROCinitialise and used in PROCheading.
<b>ft%</b>	Loop variable used to initialise array FT%.	<b>Var%</b>	Random variation in altitude determined and used in PROCTree.
<b>G%</b>	Running total of all attempts made at questions during PROCexercise used to determine the position of the hands in PROCman.	<b>W%</b>	Loop variable used to control pitch of whoop in PROCTriumph.
<b>H%</b>	Flag set to 0 or 4 in PROCman according to the value of G% to determine characters used to produce man.	<b>X</b>	Horizontal coordinate of the man determined in PROCexercise and used in PROCman.
<b>L%</b>	Loop variable to clear question area in PROCclear.	<b>Y</b>	Vertical coordinate of the man determined in PROCexercise and used in PROCman.
<b>M%</b>	Loop variable for multiplication factor in PROCpractice and multiplication factor read from data in PROCexercise.	<b>Z%</b>	Number of correct answers given in PROCexercise and used in PROCending to calculate average time.
<b>Min%</b>	Minutes element of exercise time calculated in PROCending.		
<b>N\$</b>	String containing name of player accepted in PROCheading.		
<b>N%</b>	Number of attempts at exercise and used in PROCheading to check if repeated attempts are made.		



```

10 REM Table Mountain
20 REM by David Earle
25 REM (C) The Micro User
30 *FX11
40 *FX220
50 ONERRORGOTO90
60 DIMFTX(12):FOR ftZ=1 TO 12:FTX(
ftZ)=0:NEXT:NZ=0
70 MODE1:VDU23;B202;0;0;0;
80 PROCdefine
90 PROCinitialise
100 VDU19,2,6,0,0,0,17,130,12
110 PROCmountain
120 PROCheading
130 PROCpractice
140 VDU28,4,31,36,18,12:PRINTTAB(5,
6)"PREPARE FOR THE CLIMB!":PROCdelay(
5):CLS
150 RESTORE1830:FOR FZ=0 TO 9:READN
oZ,StZ,AltZ:PROCtree(NoZ,StZ,AltZ):NE
XT
160 PROCdelay(1):VDU26,18,129,18,0,
31,X,Y,224,225,10,8,8,226,227
170 SOUND1,-15,PZ,5:PROCdelay(1)
180 PROCexercise
190 PROCtriumph
200 PROCending
210 VDU26:PRINTTAB(8,28)"Press any
key to continue"
220 *FX15,1
230 REPEAT UNTIL INKEY(0)<>-1
240 GOTO90
250 END
260 DEF PROCending
270 *FX15,1
280 VDU28,0,31,39,13,17,129,12
290 PRINTTAB(12,1)"CONGRATULATIONS"
300 RZ=(40-LEN(N$))/2
310 PRINTTAB(RZ,3);N$
320 MinZ=TimeZ DIV 6000
330 SecZ=INT((TimeZ MOD 6000)/100)
340 Av=TimeZ/100/ZZ
350 IF FTZ(TZ)=0 OR FTZ(TZ)>TimeZ F
TZ(TZ)=TimeZ ELSE FTZ(TZ)=FTZ(TZ)
360 FMZ=FTZ(TZ)DIV6000;FSZ=INT((FTZ
(TZ)MOD6000)/100)
370 PRINTTAB(9,5)"For the ";TZ;" ti
mes table"
380 PRINTTAB(8,7)"It took you ";Min
Z;" min ";SecZ;" sec"
390 @Z=&2020A:PRINTTAB(4,9)"Average
time ";Av;" secs for each":@Z=10
400 PRINTTAB(12,10)"correct answer"
410 PRINTTAB(6,12)"Fastest time is
";FMZ;" min ";FSZ;" sec"
420 ENDPROC
430 DEF PROCtriumph
440 TimeZ=TIME:COLOUR131:PROCclear
450 COLOUR1:PRINTTAB(6,27)"S U C C
E S S !":VDU17,129,31,X+2,Y+2,32,32,3
1,X+2,Y+3,32,32
460 VDU17,130,17,0,31,21,2,32,232,2
29,32,31,21,3,32,236,237,32
470 GCOL0,0:MDVE700,895:DRAW805,895
480 FOR WZ=200 TO 1000 STEP25:SOUND
1,-15,WZ/4,1:SOUND2,-15,WZ/5,1:NEXT
490 PROCdelay(3)
500 ENDPROC
510 DEF PROCman(X,Y,BZ)
520 IF INT(BZ/2)=BZ/2 THEN HZ=0 ELS
E HZ=4
530 VDU31,X,Y,32,32,32,31,X,Y+1,32,
228+HZ,229+HZ,32,31,X,Y+2,32,230+HZ,2
31+HZ,32,31,X+1,Y+3,32,32,32
540 ENDPROC
550 DEF PROCsound(PZ)
560 SOUND1,-15,PZ,5
570 ENDPROC
580 DEF PROCexercise
590 TIME=0:GZ=0:RESTORE1840
600 AZ=0
610 READ MZ:CZ=MZ+TZ:IF MZ=5 THEN R
ESTORE 1840
620 PROCclear
630 PRINTTAB(2,26)"What is ";MZ;" x
";TZ;"?"
640 *FX15
650 INPUTTAB(2,28)SZ:IFSZ>144 THEN
VDU7:PRINTTAB(2,28);SPC(24):GOTO650 E
LSE GZ=GZ+1:AZ=AZ+1
660 IFSZ=CZ THEN 670 ELSE 700
670 ZZ=ZZ+1:PZ=PZ+4:PROCsound(PZ):P
RINTTAB(2,30);SZ;" is correct"
680 X=X-0.6:Y=Y-1:IFY<=3 THEN ENDPR
OC ELSE 690
690 PROCman(X,Y,GZ):PROCdelay(1):G0
T0600
700 X=X+0.6:Y=Y+1:IFY>=22 THEN Y=22

```

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From Page 23

```

:IF X>=33 THEN X=33
710 PROCman(X,Y,BZ)
720 PZ=PZ-4:IF PZ<10 THEN PZ=10
730 PROCsound(PZ)
740 PRINTTAB(2,30);SZ;" is wrong. Try
again"
750 IFAX<QZ THEN 760 ELSE 790
760 PROCdelay(3):PRINTTAB(2,28);SPC
(24):PRINTTAB(2,30);SPC(24)
770 GOTO630
780 ENDPROC
790 PRINTTAB(2,30)"Try another ques
tion "
800 PROCdelay(3)
810 PRINTTAB(2,30);SPC(24)
820 GOTO 600
830 ENDPROC
840 DEF PROCclear
850 FORLX=25 TO 30:PRINTTAB(1,LX);S
PC(25):NEXT
860 ENDPROC
870 DEF PROCtree(NoZ,StZ,AltZ)
880 VDU19,3,2,0,0,0,18,0,3
890 FOR TreeZ=0 TO NoZ
900 SOUND1,-10,200,1
910 VDU18,0,3:VarZ=RND(50)
920 MOVEStZ,AltZ+VarZ:MOVEStZ+50,Al
tZ+200+VarZ:PLOT85,StZ+100,AltZ+VarZ
930 VDU18,0,0:MOVEStZ,AltZ+VarZ:DRA
WStZ+50,AltZ+200+VarZ:DRAWStZ+100,Alt
Z+VarZ
940 StZ=StZ+100
950 NEXT
960 ENDPROC
970 DEF PROCpractice
980 PRINT""Do you want a Practice
Table?"
990 *FX202,32
1000 PRINT""Press <Y> for YES or <N
> for NO"
1010 A$=GET$
1020 IF A$="Y" THEN 1050
1030 IF A$="N" THEN ENDPROC
1040 IF A$<>"Y" AND A$<>"N" THEN 101
0
1050 VDU12,28,13,25,31,20
1060 PRINT"PRACTICE TABLE",TAB(1,2)
"Press any key",TAB(3,3)"to start"
1070 *FX15
1080 REPEAT UNTIL INKEY(0)<>-1
1090 FORMZ=0 TO UX:CZ=MZ+TZ:AX=0
1100 CLS:PRINT;MZ;" x ";TZ;" = ?"
1110 *FX15
1120 INPUT'SZ:AX=AX+1:CLS:PRINT;MZ;"
x ";TZ;" = ";SZ
1130 IF SZ=CX THEN 1140 ELSE 1160
1140 PRINT""That is correct":PROCdel
ay(4):NEXT
1150 ENDPROC
1160 PRINT""That is wrong!":PROCdela
y(5)
1170 IF AX<QZ THEN 1180 ELSE 1190
1180 PRINT""Try again please":PROCde
lay(4):GOTO 1100
1190 CLS:PRINT"The correct answer",T
AB(0,2)"is ";MZ;" x ";TZ;" = ";CZ:P
ROCdelay(5):NEXT
1200 ENDPROC
1210 DEF PROCdelay(DZ)
1220 FOR DelayZ=0 TO (DZ*1000):NEXT
1230 ENDPROC
1240 DEF PROCheading
1250 NZ=NZ+1
1260 VDU28,4,31,36,18,17,0,17,129,12
1270 IFNZ>1 THEN 1280 ELSE 1340
1280 PRINTTAB(5,5)"Are you trying ag
ain?"
1290 *FX202,32
1300 PRINT""Press <Y> for YES or <N>
for NO"
1310 A$=GET$:IFA$="Y" THEN 1500
1320 IFA$="N" THEN 1340
1330 IFA$<>"Y" AND A$<>"N" THEN 1310
1340 CLS:PRINTTAB(11,0)"Welcome to",
TAB(3,3)"T A B L E M O U N T A I N",
TAB(2,7)"Would you like instructions?"
1350 *FX15
1360 PRINTTAB(1,9)"Press <Y> for YES
or <N> for NO"
1370 *FX202,32
1380 A$=GET$:IFA$="Y" THEN 1410
1390 IFA$="N" THEN 1450
1400 IFA$<>"Y" AND A$<>"N" THEN 1380
1410 CLS:PRINT" You can help a clim
ber up the",TAB(1,1)"mountain by answ
ering questions",TAB(2,2)"about a Mul
tiplication Table"
1420 PRINTTAB(1,5)"While climbing a
correct answer",TAB(1,6)"will mean a
step up and a wrong",TAB(2,7)"answer
will mean a slip back!",TAB(4,9)"Pres
s any key to continue"
1430 *FX15
1440 REPEAT UNTIL INKEY(0)<>-1
1450 CLS:PRINT"Answer questions by t
yping your",TAB(0,2)"answer and then
pressing <RETURN>"
1460 *FX15
1470 PRINT""What is your name?"
1480 INPUT'N$
1490 IFN$=""THEN VDU7,12:PRINT""You
haven't given your name":GOTO1470 ELS
E 1500
1500 CLS:PRINT""Hello ";N$
1510 PRINT""Which table do you want?"
1520 *FX15
1530 INPUT'TZ:IFTZ<2 OR TZ>UX VDU7,1
2:PRINT""You can't have the ";TZ;" ti
mes table":PROCdelay(4):CLS:GOTO1510
ELSE CLS:PRINT""You chose the ";TZ;"
times table"
1540 *FX202,32
1550 ENDPROC
1560 DEF PROCmountain
1570 VDU19,1,6,0,0,0,18,0,1
1580 MOVE0,400:PLOT85,1280,0:PLOT85,
1280,400:MOVE0,400:MOVE100,500:PLOT85
,100,400:PLOT85,200,540:PLOT85,200,40
0:PLOT85,260,660:PLOT85,260,400:PLOT8
5,400,760:PLOT85,400,400:PLOT85,540,8
40:PLOT85,540,400:PLOT85,600,800:PLOT
85,600,400
1590 PLOT85,700,896:PLOT85,700,400:P
LOT85,800,896:PLOT85,800,400:PLOT85,9
00,860:PLOT85,900,400:PLOT85,1000,700
:PLOT85,1000,400:PLOT85,1100,600:PLOT
85,1100,400:PLOT85,1200,580:PLOT85,12
00,400:PLOT85,1280,500:PLOT85,1280,40
0
1600 VDU19,0,6,0,0,0,18,0,0
1610 MOVE0,400:DRAW100,500:DRAW200,5
40:MOVE140,460:DRAW200,540:DRAW260,66
0:DRAW400,760:DRAW540,840:DRAW600,800
:DRAW700,700:MOVE600,800:DRAW700,896:
DRAW800,896:DRAW900,860:DRAW1000,700:
DRAW1100,600:DRAW1200,580:DRAW1280,50
0
1620 VDU19,0,0,0,0,0,19,1,7,0,0,0
1630 ENDPROC
1640 DEF PROCinitialise
1650 PZ=30:UZ=12:QZ=2:X=34:Y=23:ZX=0
1660 ENDPROC
1670 DEF PROCdefine
1680 VDU23,224,1,3,3,1,3,7,15,27
1690 VDU23,225,192,224,224,192,224,2
40,248,236
1700 VDU23,226,51,3,3,3,3,3,15
1710 VDU23,227,230,224,96,96,96,96,9
6,120
1720 VDU23,228,1,3,3,1,3,7,15,27
1730 VDU23,229,192,224,230,204,248,2
40,224,224
1740 VDU23,230,51,3,3,3,3,3,15
1750 VDU23,231,248,248,24,30,0,0,0,0
1760 VDU23,232,1,3,51,25,15,7,3,3
1770 VDU23,233,192,224,224,192,224,2
40,248,236
1780 VDU23,234,15,15,12,60,0,0,0,0
1790 VDU23,235,230,224,96,96,96,96,9
6,120
1800 VDU23,236,3,3,3,3,3,3,15
1810 VDU23,237,224,224,224,96,96,96,
96,120
1820 ENDPROC
1830 DATA5,154,260,8,-20,200,8,10,12
5,9,-45,50,10,0,0,1,1200,300,1,1240,2
00,1,1180,40,1,1060,-50,12,-12,-60
1840 DATA2,10,4,7,11,9,3,1,12,8,6,0,
5

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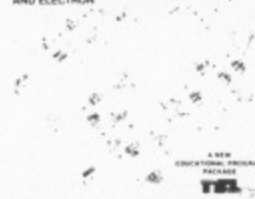
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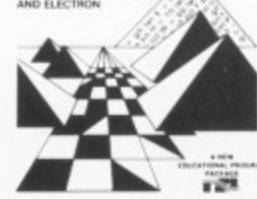


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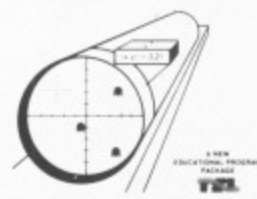
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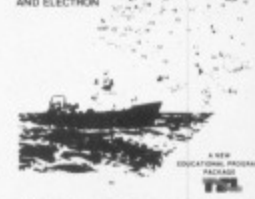
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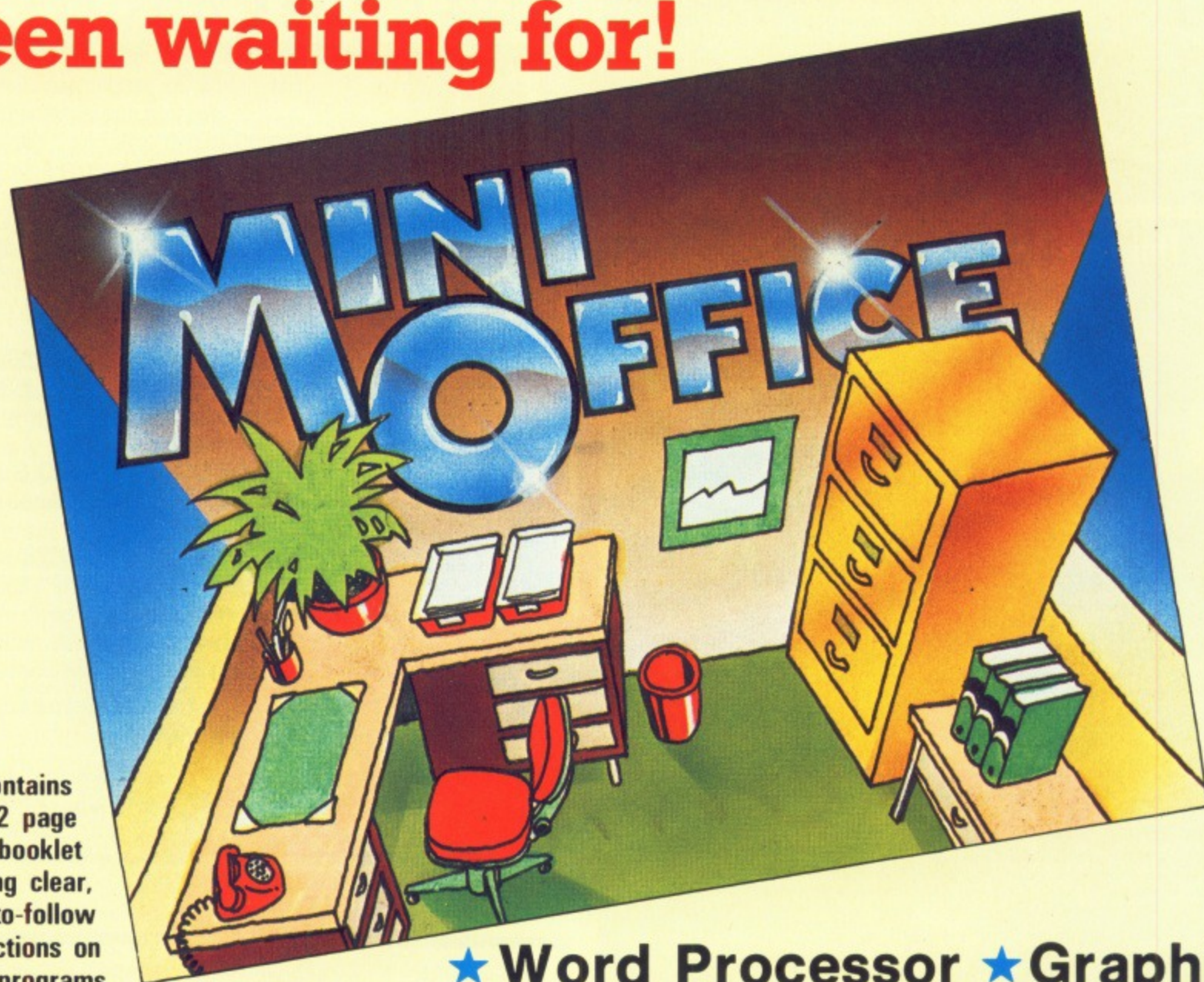


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GOTTIT is an intriguing variation on word games of the Hangman type.

Two players compete to discover a hidden word, the letters of which the computer discloses one by one.

At any time if a player thinks he can deduce the word from the letters shown he presses a key - Z for player one and ? for player two.

The player is then challenged to input the word. If the try is correct that round is won. If not, the second player is invited to have a go. If the try is incorrect the game continues.

An element of luck exists owing to the fact that different words may have corresponding letters in common.

A player must gamble as to whether to try on a particular letter display or to wait for more letters to confirm his guess - with the possibility that his opponent may sneak in before him.

There are three levels of difficulty and you can alter the time between clues being presented from 1 to 30 seconds.

# GETTIT? GOTTIT GOOD!

By DENNIS DIXON

## PROCEDURES

PROCclue	Chooses next letter and presents it.
PROCcorrect	Responds to a correct word return.
PROCendset	Congratulates winner and asks: "Play again?"
PROCerror	Responds to an incorrect word return.
PROCinit	Sets up arrays; zeroes some flags and variables.
PROCintro	Explains game to teacher, accepts choice of difficulty etc, and accepts players' names.
PROCnowin	Responds if neither player finds the word.
PROCpause	Permits frame changing
PROCpick	Chooses word from data.
PROCplay	Controls letter presentation and accepts player's response.
PROCpraise	Praises player's correct word return.
PROCscore	Presents score after each word in set.
PROCoolate	Responds to a slow word return by interjecting player.
PROCtr	Responds to player's interjection, assesses player's attempt, times player's attempt.

## DATA

Easy words 1 to 134. Medium 135 to 364. Difficult 365 to 505.

## VARIABLES

clunum	Counts letters as presented.
clerate	Periodicity of clues.
correct	Flag for word found.
diff	Difficulty level.
letnum	Letter number in the word (left to right).
quest	Counts the ? player's score.
rand	Selects words from data.
setup	Flag for teacher having set up parameters.
toolate	Flag for player response being too slow.
wordnum	Counts words played.
wordset	Chosen number of words for game.
AS	Selected word.
g\$	First letter of player's response word.
gottit\$	Interjection input (Z or ?) by either player.
letter\$	Letter indicated by variable <i>letnum</i> .
quest\$	Player using ? key.
uess\$	Remainder of player's response word.
zed\$	Player using Z key.
free\$	Free guess word.

```
10 REM WORD GAME 'GOTTIT'
20 REM By Dennis Dixon
30 REM (c) Micro User
40 *KEY10:M
50 *KEY10 OLD:M RUN:M
60 PROCinit
70 PROCintro
80 PROCpick
90 PROCplay
100 IFtoolate=1THEN120
110 IFcorrect=1THENPROCpraise ELSEP
ROCnowin
120 PROCscore
130 IFwordnum<wordset THENBOELSE70
140 END
150 REM
160 DEFPROCinit
170 *FX11,0
180 CLS:DIMA$(869):DIMletter$(20):s
etup=0:zed=0:quest=0
190 ENDPROC
200 REM
210 DEFPROCintro
220 CLS:wordnum=0:IFsetup=1THEN510
230 PRINTTAB(15,10)CHR$(141)CHR$(13
3)"GOTTIT"
240 PRINTTAB(15,11)CHR$(141)CHR$(13
3)"GOTTIT"
250 PRINTTAB(14,12)CHR$(141)CHR$(13
3)"*****"
260 PRINTTAB(14,13)CHR$(141)CHR$(13
3)"*****"
```

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```
270 PRINTTAB(6,16)CHR$(131)"A word
game for two players."
280 PRINTTAB(0,23)"Press RETURN to
continue."
290 INPUT "z$:IFz$<>"THEN280
300 PRINTTAB(0,3)"This is a game fo
r two players."
310 CLS:PRINTTAB(0,3)"In addition t
o knowledge, a bit of luck is require
d to be a winner."
320 PRINT"A word is displayed, lett
er by letter."':PRINT"As soon as a pl
ayer thinks he/she knows the word, he
/she may press his/her chosen ke
y. This will halt the display, and th
e player is challenged to input"
330 PRINT"the word. If the try is c
orrect, he/she wins the game; if not
correct, then the second player is in
vited to have a try. If his/her try i
s correct, he/she is the winner; if no
t, the game proceeds."
340 PRINTTAB(0,20)"Press RETURN to
continue."
350 INPUT "z$:IFz$<>"THEN340
360 CLS:PRINTTAB(0,3)"An element of
luck exists, due to the fact that
different words may have corresp
onding letters in common. A play
er will need to decide whether to g
amble on a particular letter display,
"
370 PRINT"or to await more letters
and more positive confirmation
of the word."
380 PRINT"Please";CHR$(129);"note";
CHR$(135);"that any words typed in wi
ll need to be RETURNed by pressing the
";CHR$(131);"RETURN";CHR$(135);"
key; also";CHR$(129);"note";CHR$(135)
;"that the game is"
390 PRINT"played using";CHR$(131);"
lower case letters. Player's n
ames may be RETURNed in capital
s (using the";CHR$(131);"SHIFT";CHR$(
135);"key) but apart from that,";CHR$(
131);"lower case should be used."
400 PRINTTAB(0,20)"Press RETURN to
continue."
410 INPUT "z$:IFz$<>"THEN400
420 CLS:PRINT':INPUT"Choose the nu
mber of words per game, (max. 30)
```

```
and press RETURN....."wordset
430 IFwordset<10Rwordset>30THEN420
440 PRINT:PRINT"Choose the difficul
ty by typing 1, 2 or 3 ( 1 is the
easiest ) and press RETURN.....
.....";INPUT "diff
450 IFdiff<10Rdiff>3THEN440
460 PRINT:PRINT"Choose the periodic
ity in seconds at which clues are
presented ( 1 to 30 ) and press RET
URN.....";INPUT "cluerate
470 IFcluerate<10Rcluerate>30THEN46
0
480 PRINT:PRINTCHR$(130);"You may r
estart the program at any time";CHR$(
130);"by pressing the BREAK key."':se
tup=1
490 PRINTCHR$(131);"Now, explain to
your pupils how the ";CHR$(131);"
game is played, press RETURN and hand
";CHR$(131);"over to them."
500 INPUT "z$:IFz$<>"THEN490
510 CLS:wordnum=0:PRINT':PRINT"Wi
ll the player choosing to use the
letter";CHR$(131);"Z";CHR$(135);"key
please RETURN his/her name."
520 INPUT "zed$
530 IFzed$=""THEN520
540 PRINT':PRINT"Will the player ch
oosing to use the ";CHR$(131);"?"
;CHR$(135);"key please RETURN his/her
name."
550 INPUT "quest$
560 IFquest$=""THEN550
570 ENDPROC
580 REM
590 DEFPROCpick
600 CLS:cluenum=0:correct=0
610 IFdiff=1THENrand=RND(134)
620 IFdiff=2THENrand=RND(230)+134
630 IFdiff=3THENrand=RND(505)+364
640 FORword=1TORand
650 READA$
660 NEXTword
670 FORnum=1TOLEN(A$)
680 letter$(num)=""
690 NEXTnum
700 wordnum=wordnum+1
710 RESTORE
720 ENDPROC
730 REM
740 DEFPROCplay
750 toolate=0
760 PRINTTAB(0,3)CHR$(141);CHR$(129
```

```
);"Word number ";wordnum;" of a set o
f ";wordset
770 PRINTTAB(0,4)CHR$(141);CHR$(129
);"Word number ";wordnum;" of a set o
f ";wordset
780 PRINTTAB(0,8)CHR$(141);CHR$(134
);"Are you READY ?"
790 PRINTTAB(0,9)CHR$(141);CHR$(134
);"Are you READY ?"
800 PRINTTAB(0,10)CHR$(141);CHR$(13
4);"Press space bar to start."
810 PRINTTAB(0,11)CHR$(141);CHR$(13
4);"Press space bar to start."
820 z$=GET$
830 IFz$<>" THEN780
840 CLS:PRINTTAB(20-LEN(A$)DIV2,10)
STRING$(LEN(A$)," -")
850 REPEAT
860 *FX15,0
870 PRINTTAB(0,14)STRING$(200," ")
880 PRINTTAB(0,19)STRING$(80," ")
890 IFcluenum=0THENgottit$=INKEY$(c
luerate*20)ELSEgottit$=INKEY$(cluerat
e*100)
900 IFgottit$<>"Z"ANDgottit$<>"z"AN
Dgottit$<>"?"ANDgottit$<>"/"ANDgottit
$<>" THEN890
910 IFgottit$="Z"ORgottit$="z"ORgot
tit$="?"ORgottit$="/"THENPROCtry ELSE
PROCclue
920 IFcorrect=10Rtoolate=1THENcluen
um=LEN(A$)
930 UNTILcluenum=LEN(A$)
940 ENDPROC
950 REM
960 DEFPROCclue
970 cluenum=cluenum+1
980 letnum=RND(LEN(A$))
990 IFletter$(letnum)<>" THEN980
1000 letter$(letnum)=MID$(A$,letnum,
1)
1010 PRINTTAB(19+letnum-LEN(A$)DIV2,
10)letter$(letnum)
1020 ENDPROC
1030 REM
1040 DEFPROCtry
1050 IFgottit$="Z"ORgottit$="z"THENP
RINTTAB(0,14)"OK then, ";zed$;" , type
in your word."
1060 IFgottit$="?"ORgottit$="/"THENP
RINTTAB(0,14)"OK then, ";quest$;" , ty
pe in your word."
1070 *FX202,48
1080 *FX15,0
1090 g$=INKEY$(400)
```

```

1100 IFg$="Z"ORg$="z"ORg$="?"ORg$="/
"THEN1070
1110 PRINTg$;
1120 IFg$=""THENPROCtoolate
1130 IFtoolate=1THENENDPROC
1140 INPUT"uess$
1150 guess$=g$+uess$
1160 IFguess$=A$THENPROCcorrect ELSE
PROCerror
1170 ENDPROC
1180 REM
1190 DEFPROCtoolate
1200 CLS
1210 IFgottit$="Z"ORgottit$="z"THENP
RINTTAB(0,7)"Sorry, ";zed$:PRINT"you
took too long.":PRINT"I am going to
make ";quest$:PRINT"the winner.":ques
t=quest+1
1220 IFgottit$="?"ORgottit$="/THENP
RINTTAB(0,7)"Sorry, ";quest$:PRINT"yo
u took too long.":PRINT"I am going t
o make ";zed$:PRINT"the winner.":zed=
zed+1
1230 PRINTTAB(0,20)"Press RETURN to
see new score. ";
1240 INPUT"z$:IFz$<>"THEN1230
1250 toolate=1
1260 ENDPROC
1270 REM
1280 DEFPROCcorrect
1290 PRINTTAB(0,14)STRING$(120," ")
1300 IFgottit$="Z"ORgottit$="z"THENP
RINTTAB(0,14)"Well done ";zed$";, you
are correct.":zed=zed+1
1310 IFgottit$="?"ORgottit$="/THENP
RINTTAB(0,14)"Well done ";quest$";, y
ou are correct.":quest=quest+1
1320 correct=1
1330 ENDPROC
1340 REM
1350 DEFPROCerror
1360 PRINTTAB(0,14)STRING$(120," ")
1370 IFgottit$="Z"ORgottit$="z"THENP
RINTTAB(0,14)"No, not correct, ";zed$
";":PRINT:PRINT"Have a free guess, "
;quest$";":PRINT"otherwise press you
r ? key and RETURN."
1380 IFgottit$="?"ORgottit$="/THENP
RINTTAB(0,14)"No, not correct, ";ques
t$";":PRINT:PRINT"Have a free guess,
";zed$";":PRINT"otherwise press you
r Z key and RETURN."
1390 *FX202,4B
1400 INPUT"free$
1410 IFfree$<>A$ANDfree$<>"Z"ANDfree

```

```

$<>"z"ANDfree$<>"?"ANDfree$<>"/" THEN
PRINTTAB(0,19)"No, that is not correc
t.":PROCpause
1420 IFfree$=A$AND(gottit$="Z"ORgott
it$="z")THENgottit$="?":PROCcorrect
1430 IFcorrect=1THENENDPROC
1440 IFfree$=A$AND(gottit$="?"ORgott
it$="/)THENgottit$="Z":PROCcorrect
1450 ENDPROC
1460 REM
1470 DEFPROCpause
1480 PRINTTAB(0,22)"Press RETURN to
continue. ";
1490 INPUT"z$:IFz$<>"THEN1480
1500 PRINTTAB(0,22)STRING$(40," ")
1510 ENDPROC
1520 REM
1530 DEFPROCpraise
1540 CLS:IFgottit$="Z"ORgottit$="z"
HENPRINTTAB(0,7)CHR$(141);CHR$(129)"W
ell done, ";zed$ ELSEPRINTTAB(0,7)CHR
$(141);CHR$(129)"Well done, ";quest$
1550 IFgottit$="Z"ORgottit$="z"THENP
RINTTAB(0,8)CHR$(141);CHR$(129)"Well
done, ";zed$ ELSEPRINTTAB(0,8)CHR$(14
1);CHR$(129)"Well done, ";quest$
1560 PRINTTAB(13,12)CHR$(131)"The wo
rd was"
1570 PRINTTAB(18-LEN(A$)DIV2,14)CHR$
(141);CHR$(131);A$
1580 PRINTTAB(18-LEN(A$)DIV2,15)CHR$
(141);CHR$(131);A$
1590 PRINTTAB(0,20)"Press RETURN to
see new score. ";
1600 INPUT"z$:IFz$<>"THEN1590
1610 ENDPROC
1620 REM
1630 DEFPROCnowin
1640 CLS:PRINTTAB(0,7)CHR$(141);CHR$
(129)"No winner this time; no score c
hange."
1650 PRINTTAB(0,8)CHR$(141);CHR$(129
)"No winner this time; no score chang
e."
1660 PRINTTAB(13,12)CHR$(131)"The wo
rd was"
1670 PRINTTAB(18-LEN(A$)DIV2,14)CHR$
(141);CHR$(131);A$
1680 PRINTTAB(18-LEN(A$)DIV2,15)CHR$
(141);CHR$(131);A$
1690 PRINTTAB(0,20)"Press RETURN to
see score. ";
1700 INPUT"z$:IFz$<>"THEN1690
1710 ENDPROC
1720 REM

```

```

1730 DEFPROCscore
1740 CLS
1750 PRINTTAB(0,3);CHR$(130);"NUMBER
OF WORDS IN SET = ";wordset
1760 PRINTTAB(0,5)CHR$(134)zed$;"...
.....";zed
1770 PRINTTAB(0,7)CHR$(134)quest$;".
.....";quest
1780 IFwordnum=wordset THENPROCendse
t:ENDPROC
1790 IFzed=(wordset)DIV2+1THENPRINTT
AB(0,9)"As you can see ";quest$;":P
RINTzed$;" cannot lose this set.":P
RINT''
1800 IFquest=(wordset)DIV2+1THENPRIN
TTAB(0,9)"As you can see ";zed$;":P
RINTquest$;" cannot lose this set.":P
RINT''
1810 IFzed=(wordset)DIV2+1ORquest=(w
ordset)DIV2+1THENPROCendset:ENDPROC
1820 PRINTTAB(0,20)"Press RETURN to
continue. ";
1830 INPUT"z$:IFz$<>"THEN1820
1840 ENDPROC
1850 REM
1860 DEFPROCendset
1870 IFzed>quest THENPRINTTAB(0,12);
CHR$(130);"Congratulations ";zed$;":
PRINTCHR$(130);"You are the WINNER o
f this set."
1880 IFquest>zed THENPRINTTAB(0,12);
CHR$(130);"Congratulations ";quest$;
":PRINTCHR$(130);"You are the WINNER
of this set."
1890 IFquest=zed THENPRINTTAB(0,12)"
Shared honours this time.
The game was a DRAW."
1900 PRINTTAB(0,16)"Press Y if you w
ish to play again."
1910 again$=GET$
1920 IFagain$<>"Y"ANDagain$<>"y"THEN
1900
1930 zed=0:quest=0:wordnum=wordset
1940 ENDPROC
1950 REM
1960 DATA and,ask,all,add,after,am,a
n,are,apple,arm,bat,band,bag,bet,bell
,bend,book,but,bull,bone,cat,can,
cab,cake,car,cot,chat,chip,chin,dig,d
ip,did,done,day,egg,eat,end,even,east
1970 DATA fan,far,fat,full,fun,feel,
food,farm,fed,fit,gun,get,good,got,go
al,had,hat,head,hear,hut,in,ink,ill,i

```

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nto, it, jet, jab, jog, jump, jot, kit, king, key, lap, log, lot, leg, last, low, let

1980 DATA mat, mate, met, meet, meat, mug, moon, man, mist, mint, not, no, near, nose, new, on, only, old, open, oak, pet, pat, put, pot, pig, quick, queen, rat, red, rip, sat, sit, sun, so, sad, tan, tip, top, two, tea

1990 DATA under, up, use, vet, van, wet, went, will, where, who, yet, yellow, yes, you

2000 DATA abbey, abbot, abide, accelerate, access, accompany, actual, adder, affirm, apprentice, babe, baffle, bagpipes, barren, bass, beauty, bloat, booth, brag, buckle, cabinet, cabbage, carpenter, cauliflower, chafe, character, chubby, circumstance, civil, colic

2010 DATA dabble, decorate, design, degrade, dimension, dingy, duchess, drudge, docile, divine, eager, elaborate, elevate, emblem, enlighten, episode, equate, erupt, exchange, express, fable, factor, falcon, familiar, fend, filly, figure, flour, foam, fourteenth

2020 DATA gable, gallop, garter, gangway, geology, ghastly, giggle, gnat, graft, guide, halter, hamburger, hamlet, helicopter, hermit, horizon, horde, hutch, hypnosis, hydrant, idiot, illegal, illuminate, important, inflate, inject, inquest, insult, iodine, invest

2030 DATA jackboot, jackdaw, jewel, jingle, jockey, jive, judo, jumble, jungle, junction, kangaroo, keel, kettle, kidnap, kilt, kitchen, kneel, know, knit, kipper, ladder, ladle, lamb, lance, lantern, laugh, lever, library, loiter, lollipop

2040 DATA machine, mackerel, magistrate, marine, meteor, mischief, miser, moderate, muscle, mutiny, nail, napkin, nature, needle, nerve, notch, nylon, nurse, notice, nothing, oasis, objective, obstacle, obtain, official, orange, ordeal, otter, ounce, overtake

2050 DATA pace, paddle, painter, panther, partner, passenger, pension, pepper, pigeon, plague, racket, radio, ramble, rash, remove, respect, robot, rummage, rustle, rung, sacrifice, saint, salmon, sample, scarlet, scrounge, second, seesaw, serve, severe

2060 DATA tablet, tapestry, tattoo, teach, telephone, thatch, tight, tongs, tramp, tremble, umbrella, umpire, uncle, underground, unicorn, uniform, upright, usual, united, until, vacant, vacuum, valley, value, vampire, vandalism, vanish, vein, venom, verse

2070 DATA wade, wafer, wages, wallet, warden, wasp, watch, wax, weave, weird, xylo-

hone, yacht, yard, year, yeast, yesterday, yoga, yolk, young, youth

2080 DATA abacus, abated, abattoir, ablation, actuate, acumen, adulterate, affiliate, aileron, alkali, alum, anthrax, antitoxin, apocalypse, apoplexy, aquiline, asphalt, asphyxiation, aspic, attenuate, auk, awry, axiom, axial, aisle

2090 DATA baccarat, bagatelle, baize, ballistics, banshee, barbarous, barbecue, barracuda, bauble, bazooka, bazaar, beaux, bedraggled, bibliography, binary, biographical, blithesome, bludgeon, blurt, bogus, boracic, braille, bunion, burly, butterscotch

2100 DATA cache, caffeine, cajole, calibre, calligraphy, callow, camphor, cannibalistic, capillary, casement, cashmere, cataclysmal, cauldron, caustic, caw, cessation, chamois, chequered, cheroot, cloche, coerce, crypt, crucible, cubism, cygnet

2110 DATA dachshund, dangle, dapple, debilitate, decarbonisation, decry, deem, defer, degenerate, detonate, devoid, diaphanous, digit, digress, dimple, dire, disciple, disgorge, ditty, divest, divot, domain, doublet, dragoon, droll

2120 DATA earl, easel, eaves, echelon, ecology, ecstasy, editorial, effervesce, effigy, elapse, electrotherapy, elixir, encompass, endow, ensign, ermine, espy, etch, eunuch, exalt, exorcise, extricate, eye, extol, ethnic

2130 DATA facia, faction, fang, farce, farrer, fatigue, fauna, feign, feline, ferrous, ferrule, festoon, fettle, feudalism, fidget, fiery, finch, firkin, flagon, flax, forceps, forge, frieze, frugal, fulmar

2140 DATA gable, gaiety, galore, gambit, gantry, garish, garrulous, geophysics, gesticulate, geyser, gherkin, ghetto, gibber, gigolo, goitre, gossamer, grebe, gristle, guise, gurgle, gurnard, guzzle, gypsum, gyrate, grope

2150 DATA haft, haggis, hake, hale, halibut, hallow, hank, hearse, heckle, heifer, helical, heinous, hieroglyph, homage, hooah, hovel, hubbub, hue, humify, humiliate, hunch, hurtle, hydra, hyphen, hypothesis

2160 DATA ichthyology, igloo, ignoble, illegible, illicit, imago, immune, impend, impetus, incantation, incense, indigo, indolent, induce, ionise, iridescent, irk, irony, irradiate, isosceles, isotherm, issue, isthmus, invert, invest

2170 DATA jabber, jackknife, jamb, jangle, jape, jasper, jaunty, jealous, jeopardy, jetsam, jilt, jocular, joggle, jostle, joust, jubilation, judiciary, jugular, juniper, juxtaposition, kaleidoscope, kaolin, kedgeriee, khaki, knightly

2180 DATA laburnum, lacerate, laconic, lacquer, laity, laminate, lamprey, languish, laudanum, lascivious, lecher, lectern, legion, leveret, lichen, lieutenant, lilt, limbo, loganberry, logistics, loin, longevity, loofah, lope, lotion

2190 DATA macaw, madrigal, magenta, mahstick, mafia, malleable, mamba, manacle, mediocrity, megalith, menial, mesmeric, meteor, nettle, micrometer, mimosa, minia, minuet, mnemonic, moccasin, modulate, moult, mucus, myrrh, myxomatosis

2200 DATA narcissus, narcosis, natal, nausea, nebula, negate, neigh, nephew, nestle, neural, neuter, newt, nimble, nocturnal, nurture, nymph, nylon, nudge, nougat, nodule

2210 DATA oakum, obelisk, oblique, obscene, obviate, occult, ocean, ocelot, ochre, octet, ocular, omega, omen, omnivorous, onerous, onion, ophthalmic, opulent, orchid, ordnance, orphan, ovation, owlet, oxide, ozone

2220 DATA palette, papal, paradox, pedant, percolate, permeate, phial, phlox, pierce, piquant, pliable, plumage, posy, prefix, prophylactic, prude, pylon, pyre, pyrometer, proctor, prior, pout, poop, plankton, pinion

2230 DATA quaff, quail, quell, quip, quire, quoit, quotient, raffia, rancid, ratchet, recidivist, recluse, reflex, rhetoric, ribald, ricochet, rotor, roundel, rowel, rue, russet, rustic, revue, remiss, rejuvenate

2240 DATA sachet, saffron, salient, salver, scarab, sceptre, schedule, scimitar, scree, scythe, seance, seethe, sepia, seraph, shekel, shingle, sienna, signet, silhouette, skein, slake, squeegee, strafe, strew, sultry

2250 DATA taboo, tabular, tallow, tapoca, taunt, tedium, tempest, tenacious, tentril, tentative, termite, tertiary, thespian, threw, tier, tinder, torsion, tourniquet, tract, tranquil, trauma, trellis, trifle, tripartite, turmoil

2260 DATA udder, ullage, umber, uncouth, urchin, urge, usher, utility, utterance, usurp, vague, valiant, vanilla, varlet, vector, vegetate, vehicle, veneer, venison, vertigo, vespers, veto, vicinity, viola, virtuoso

2270 DATA waddle, waft, waif, wan, wand, wanton, warbler, warlock, wary, weft, wharf, wheedle, whelk, whelp, what, whiff, wield, wiggle, wilful, winkle, withe, wrack, wrest, wright, wrought

2280 DATA yashaak, yaw, yelp, yeoman, yoke



# LEADER OF THE PACK

From any group a leader will emerge. In the case of Standard Resolution colour monitors the leader provides high quality colour resolution at optimum cost, with maximum compatibility:— the 14" screen CUB 452.

The spectacular success of the CUB 452 range is due to two basic factors: They provide the simplest, most effective utilisation of colour graphics. Secondly CUB 452's are compatible with the widest range of best selling computers, including BBC, ORIC 1, ATMOS, COMMODORE 64, ACORN

ELECTRON, RML 480Z AND, SURPRISINGLY, CUB 452 IS THE ONLY COLOUR MONITOR TO INTERFACE WITH THE SINCLAIR SPECTRUM.

The 452 (H) x 585 (V) tube resolution and 0.64mm pitch eliminates disappointing colour reception and poor character definition associated with domestic T.V.'s and other colour monitors — no wonder CUB 452 is the only colour monitor selected for the Department of Industry's 'Micros in Schools' scheme — it's what you'd expect from the leader of the pack.

## — THE CUB STANDARD

## RESOLUTION

## COLOUR MONITOR



CUB 452 NOW AVAILABLE IN NEW PLASTIC CABINET

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**CUB**  
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MICROVITEC PLC, Futures Way, Bolling Road,  
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Tel: (0274) 390011 Telex 517717



Available from High Street Computer Retailers and branches of: W. H. Smith, Harrods, John Lewis Partnership, John Menzies with selected models available from larger branches of Boots.



# HOUSE

IDEAL for early learners, or those with learning difficulties, House by LEN SCOTT is the sort of simple program infants teachers have been longing for.

Using a controlled vocabulary and straightforward keys, the child is helped to draw a picture featuring a house, garden fence and apple tree, choosing colours as he or she wishes.

Teachers using the program have commented favourably on the way the program not only reinforces elementary word recognition but also acts as a stimulus to much valuable discussion.

## VARIABLES

a% to g%	Recognise which options have been chosen.
W%	Loop for filling in wood at LH of house, used in conjunction with PLOT 77.
F%	Loop using the letter "I" for forming the upright posts in the fence.
FL%	Loop for number of flowers.
L%	Loop for number of leaves on fruit tree.
A%	Selects the number of apples.
P%	Loop for panning notice board until it blanks out the graphic screen.

## PROCEDURES

PROCPAINT	Coloured numbers at the top of the text screen.	PROCKEY	Press any key to continue.
PROCPOINT	Creates the flashing pointers using parameters for variable selection.	PROCPOWER	Using defined characters and random colour and placement of flowers.
PROCMAN	Creates the figure at the door borrowed from <i>The Micro User's</i> colourful Colin.	PROCCLOUD	Uses defined characters for clouds.
PROCDRAW	Loop for reading DATA in place of MOVE, DRAW and PLOT statements.	PROCSUN	Draws and fills the sun.
		PROCTRUNK	Creates trunk from defined characters.
		PROCLEAD	Placements and drawing of leaves in random positions.
		PROCFRUIT	Placement and drawing of the apples.

```

10 REM (c) Micro User
20 MODE 7
30 VDU23;8202;0;0;0;0;
40 PRINT TAB(5,2);CHR$(131);CHR$(1
41);"SHALL WE DRAW A PICTURE?"
50 PRINT TAB(5,3);CHR$(131);CHR$(1
41);"SHALL WE DRAW A PICTURE?"
60 PRINT TAB(2,7);CHR$(131);CHR$(1
41);"A SERIES FOR CHILDREN AGE 4 TO
7"
70 PRINT TAB(2,8);CHR$(131);CHR$(1
41);"A SERIES FOR CHILDREN AGE 4 TO
7"
80 PRINT TAB(2,13);CHR$(131);CHR$(
141);" NUMBER ONE A HOUSE AND GARDE
N"
90 PRINT TAB(2,14);CHR$(131);CHR$(
141);" NUMBER ONE A HOUSE AND GARDE
N"
100 PRINTTAB(7,20)"written by Lin
and Len"
110 PROCKEY
120 PRINTTAB(8,8)"NOTE TO TEACHER"

130 PRINTTAB(2,10)"When a selection
of colour is"
140 PRINTTAB(2,11)"asked for the ch
ildren can choose"
150 PRINTTAB(2,12)"any number from
1 to 9 .The"
160 PRINTTAB(2,13)"alternatives off
ered are only in"
170 PRINTTAB(2,14)"my opinion the b
est combinations"
180 PROCKEY
190 MODE 2
200 VDU23;8202;0;0;0;0;
210 VDU 28,0,31,19,24
220 CLS
230 VDU 24,0;265;1279;1023;
240 VDU4
250 PROCPAINT
260 PROCPOINT(9,1,15,1)
270 COLOUR3:PRINTTAB(0,3)"let us pa
int the sky"
280 PRINTTAB(0,6)"what colour 4 or
6"
290 *FX15,0
300 aZ=GET
310 CLS
320 BCOL 0,aZ+128
330 CL6
340 COLOUR8:PRINTTAB(6,6)"2:COLOUR
7:PRINTTAB(9,6)"or":COLOUR15:PRINTTAB
(13,6)"3"
350 COLOUR3:PRINTTAB(3,3)"how many
clouds"
360 *FX15,0
370 cZ=GET-48
380 IFcZ=2THEN GOTO430ELSE GOTO400
390 CLS

400 VDU5
410 MOVE100,950
420 PROCCLLOUD
430 VDU5
440 MOVE600,1000
450 PROCCLLOUD
460 MOVE625,950
470 PROCCLLOUD
480 MOVE550,975
490 PROCCLLOUD
500 MOVE650,975
510 PROCCLLOUD
520 MOVE1150,850
530 PROCCLLOUD
540 VDU4
550 CLS
560 PROCPAINT
570 COLOUR3:PRINTTAB(0,2)"let us pa
int a field"
580 PRINTTAB(0,4)"what colour is gr
ass"
590 *FX15,0
600 bZ=GET-48
610 IFbZ=2THEN GOTO630 ELSE PRINTTA
B(4,6)"try again"
620 GOTO600
630 BCOL 0,2
640 PROCDRAW
650 FORwZ=525 TO 773
660 PLOT77,200,wZ
670 NEXT
680 BCOL0,0
690 PROCDRAW
700 VDU5
710 FOR FZ=0 TO1300 STEP50
720 MOVE FZ,525
730 VDU 108
740 NEXTFZ
750 VDU4
760 CLS
770 PROCPAINT
780 PROCPOINT(6,1,18,1)
790 COLOUR3:PRINTTAB(0,3)"good now
a house"
800 PRINTTAB(0,5)"lets build the wa
lls";
810 PRINTTAB(0,7)"colour 3 or 7 ?";
820 *FX15,0
830 dZ=GET
840 BCOL0,dZ
850 PROCDRAW
860 CLS
870 PROCPAINT
880 PROCPOINT(0,1,12,1)
890 *FX15,0
900 COLOUR3:PRINTTAB(0,3)"what colo
ur the roof"
910 PRINTTAB(3,5)"1 or 5"
920 eZ=GET
930 BCOL0,eZ-48
940 PROCDRAW

950 CLS
960 PROCPAINT
970 PROCPOINT(9,1,15,1)
980 COLOUR3:PRINTTAB(0,3)"windows a
nd door"
990 PRINTTAB(0,5)"colour 4 or 6"
1000 *FX15,0
1010 fZ=GET
1020 BCOL0,0
1030 PROCDRAW
1040 BCOL0,fZ-48
1050 PROCDRAW
1060 PROCPAINT
1070 BCOL 0,7
1080 PROCDRAW
1090 CLS
1100 PROCPAINT
1110 COLOUR3:PRINTTAB(0,3)"lets see
the flowers grow"
1120 *FX15,0
1130 PROCKEY
1140 VDU 5
1150 FOR FLZ=0 TO 75+RND(175)
1160 PROCFLOWER
1170 NEXT FLZ
1180 BCOL 0,2
1190 VDU 4
1200 PRINT TAB(4,3)"the flower bed"
1210 CLS
1220 PROCPAINT
1230 PROCPOINT(0,1,6,1)
1240 COLOUR3:PRINTTAB(0,3)"what colo
ur the sun"
1250 PRINTTAB(0,5)" 1 or 3 ?"
1260 *FX15,0
1270 gZ=GET
1280 VDU5
1290 BCOL0,gZ-48
1300 PROCCIRCLE(1100,950,35)
1310 VDU4
1320 CLS
1330 PROCPAINT
1340 COLOUR3:PRINTTAB(0,3)"last the
fruit tree"
1350 PRINTTAB(0,5)"how many apples ?
"
1360 *FX15,0
1370 hZ=GET
1380 VDU5
1390 MOVE 1100,600
1400 PROCTRUNK
1410 FOR LZ=0 TO 75
1420 PROCLEAF
1430 NEXT LZ
1440 FOR AZ=0 TO hZ-49
1450 PROCFRUIT
1460 NEXT AZ
1470 VDU4
1480 CLS

```

From Page 36

```

40
2570 DATA500,5,840,420,5,740,420,4,7
90
2580 DATA420,5,790,500,4,740,460,5,8
40
2590 DATA460,4,740,540,5,740,620,5,8
40
2600 DATA620,5,840,540,5,740,540,4,7
40
2610 DATA580,5,840,580,4,790,540,5,7
90
2620 DATA620,4,600,520,4,600,400,85,
680
2630 DATA520,85,680,400,0,0,0,4,600,
400
2640 DATA4,680,400,85,600,265,85,680
2650 DATA265,4,740,265,85,680,400,4,
600
2660 DATA265,4,540,265,85,600,400,0,
0,0
2670 END
2680 DEF PROCKEY
2690 PRINT TAB(9,23)"press any key"
2700 dummy$=GET$
2710 CLS
2720 ENDPROC
2730 DEF PROCFLOWER
2740 VDU 23,240,73,42,28,255,0,0,0,0
2750 VDU 23,241,0,0,0,0,8,73,43,20
2760 Y%=300
2770 X%=RND(200)
2780 Y%=Y%+RND(200)
2790 MOVE X%,Y%
2800 GCOL 0,RND(7)
2810 VDU 240
2820 GCOL 0,4
2830 VDU 8,241
2840 ENDPROC
2850 DEF PROCCLLOUD
2860 GCOL 0,7
2870 VDU23,242,0,0,0,1,7,15,63,127
2880 VDU23,243,0,0,96,248,252,254,25
5,255
2890 VDU23,244,127,127,63,15,7,0,0,0

2900 VDU23,245,255,255,252,252,248,9
6,0,0
2910 VDU242,243
2920 VDUB,8,10,244,245
2930 ENDPROC
2940 DEF PROCCIRCLE(xc%,yc%,r%)
2950 MOVE xc%+r%,yc%
2960 FOR theta%= 0 TO 360 STEP 8
2990 DRAW xc%+r%*COS(RAD(theta%)),yc
%+r%*SIN(RAD(theta%))
3000 NEXT
3010 FOR J%=916 TO 984
3020 PLOT77,1100,J%

```

```

3030 NEXT
3040 ENDPROC
3050 DEF PROCTRUNK
3060 GCOL 0,0
3070 VDU23,246,192,99,98,54,55,55,30
,28
3080 VDU23,247,28,28,28,28,28,28,28,
28
3090 VDU23,248,8,16,48,96,192,128,0,
0
3100 VDU23,249,28,28,60,60,28,60,108
,171
3110 VDU23,250,28,28,30,31,30,28,28,
28
3120 VDU 246,248,8,8,10,247,8,10,250
3130 VDU 8,10,247,8,10,250,8,10,249

3140 ENDPROC
3150 DEF PROCLEAF
3160 VDU23,225,0,32,115,127,62,24,16
,0
3170 Y%=620+RND(150)
3180 X%=1000+RND(200)
3190 MOVE X%,Y%
3200 GCOL 0,2
3210 VDU225
3220 ENDPROC
3230 DEF PROCFRUIT
3240 VDU23,226,0,0,48,56,48,0,0,0,

3250 Y%=620+RND(150)
3260 X%=1000+RND(200)
3270 MOVE X%,Y%
3280 GCOL 0,1
3290 VDU226
3300 ENDPROC
3310 DEF PROCPAINT
3320 COLOUR1:PRINT TAB(0,0)"1":COLOU
R2:PRINT TAB(3,0)"2":COLOUR3:PRINT TA
B(6,0)"3":COLOUR4:PRINTTAB(9,0)"4":CO

```

```

LOUR5:PRINTTAB(12,0)"5":COLOUR6:PRINT
TAB(15,0)"6":COLOUR7:PRINTTAB(18,0)"7
"
3330 ENDPROC
3340 DEF PROCPOINT(p,q,a,n)
3350 COLOUR8
3360 PRINTTAB(p,q)"^^"
3370 COLOUR15
3380 PRINTTAB(a,n)"^^"
3390 ENDPROC
3400 DEF PROCMAN
3410 VDU23,227,28,34,34,0,0,0,0,0
3420 VDU23,228,0,28,156,136,128,227,
128,128
3430 VDU23,229,0,0,0,0,62,28,28,28
3440 VDU23,230,28,28,62,62,0,0,0,0
3450 VDU23,231,0,0,0,0,20,20,20,0
3460 VDU23,232,0,0,0,0,0,0,0,119
3470 MOVE620,460
3480 GCOL 0,5
3490 VDU227
3500 GCOL 0,7
3510 VDUB,228
3520 GCOL 0,1
3530 VDUB,229
3540 GCOL 0,5
3550 VDUB,10,230
3560 GCOL 0,7
3570 VDUB,231
3580 GCOL 0,2
3590 VDUB,232
3600 ENDPROC
3610 DEF PROCDRAW
3620 REPEAT
3630 READk,y,z
3640 PLOTk,y,z
3650 UNTILz=0
3660 ENDPROC
3670 DEF PROCTIME(T)
3680 TIME=0:REPEAT:UNTIL TIME>(T)
3690 ENDPROC

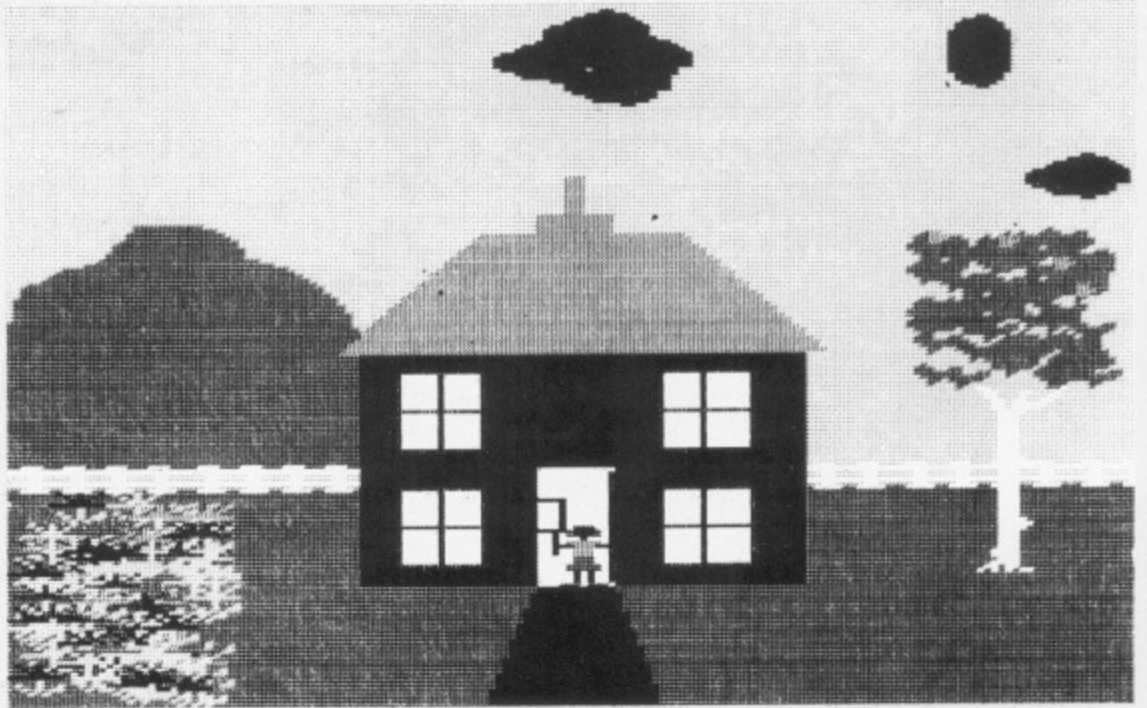
```



```

1490 COLOUR3:PRINTTAB(0,0)"lets see
if anybody"
1500 COLOUR3:PRINTTAB(0,2)"lives in
our house"
1510 COLOUR3:PRINTTAB(0,4)"press B t
o ring bell"
1520 *FX15,0
1530 REPEAT:B$=GET$:UNTIL B$="B" OR
B$="b"
1540 ENVELOPE1,1,0,0,0,50,25,25,127,
-1,-1,-1,126,90
1550 SOUND1,1,150,8
1560 ENVELOPE1,1,0,0,0,100,25,25,127
,-1,-1,-1,126,90
1570 SOUND1,1,140,5
1580 PROCTIME(250)
1590 VDU4
1600 GCOL0,0
1610 MOVE680,520
1620 MOVE600,520
1630 PLOT85,600,510
1640 MOVE680,400
1650 MOVE600,400
1660 PLOT85,600,410
1670 MOVE600,400
1680 MOVE600,520
1690 PLOT85,620,400
1700 PLOT85,620,520
1710 PROCTIME(30)
1720 MOVE680,520
1730 MOVE600,520
1740 PLOT85,600,500
1750 MOVE680,400
1760 MOVE600,400
1770 PLOT85,600,420
1780 MOVE600,400
1790 MOVE600,520
1800 PLOT85,640,400
1810 PLOT85,640,520
1820 PROCTIME(30)
1830 MOVE680,520
1840 MOVE600,520
1850 PLOT85,600,490
1860 MOVE680,400
1870 MOVE600,400
1880 PLOT85,600,430
1890 MOVE600,400
1900 MOVE600,520
1910 PLOT85,660,400
1920 PLOT85,660,520
1930 PROCTIME(30)
1940 MOVE680,520
1950 MOVE600,520
1960 PLOT85,600,480
1970 MOVE680,400
1980 MOVE600,400
1990 MOVE600,520
2000 PLOT85,675,400
2010 PLOT85,675,520

```



```

2020 VDU5
2030 PROCMAN
2040 GCOL0,7
2050 MOVE600,459
2060 DRAW630,459
2070 DRAW630,489
2080 DRAW600,489
2090 VDU4:CLS
2100 PROCTIME(300)
2110 VDU5
2120 GCOL0,0
2130 *FX15,0
2140 VDU26:COLOUR 3:VDU19,3,7,0,0,0
:VDU4:PRINT TAB(3,28)"press any key":
dummy$=GET$
2150 MODE7
2160 VDU23;8202;0;0;0;0;
2170 PRINT TAB(7,2);CHR$(131);CHR$(1
41);"thank you children"
2180 PRINT TAB(7,3);CHR$(131);CHR$(1
41);"thank you children"
2190 PRINT TAB(8,9);CHR$(131);CHR$(1
41);"for building me"
2200 PRINT TAB(8,10);CHR$(131);CHR$(
141);"for building me"
2210 PRINT TAB(8,17);CHR$(131);CHR$(
141);"such a nice house"
2220 PRINT TAB(8,18);CHR$(131);CHR$(
141);"such a nice house"
2230 COLOUR3:PRINTTAB(4,24)"do you w
ant another go Y/N";
2240 RESTORE
2250 IF GET$="Y"THEN GOTO190
2260 DATA4,0,500
2270 DATA4,0,265,85,1279,500,85,1279
,265
2280 DATA4,0,660,5,9,690,5,22,710
2290 DATA5,40,717,5,70,728
2300 DATA5,110,735,5,126,752,5,142,7
60

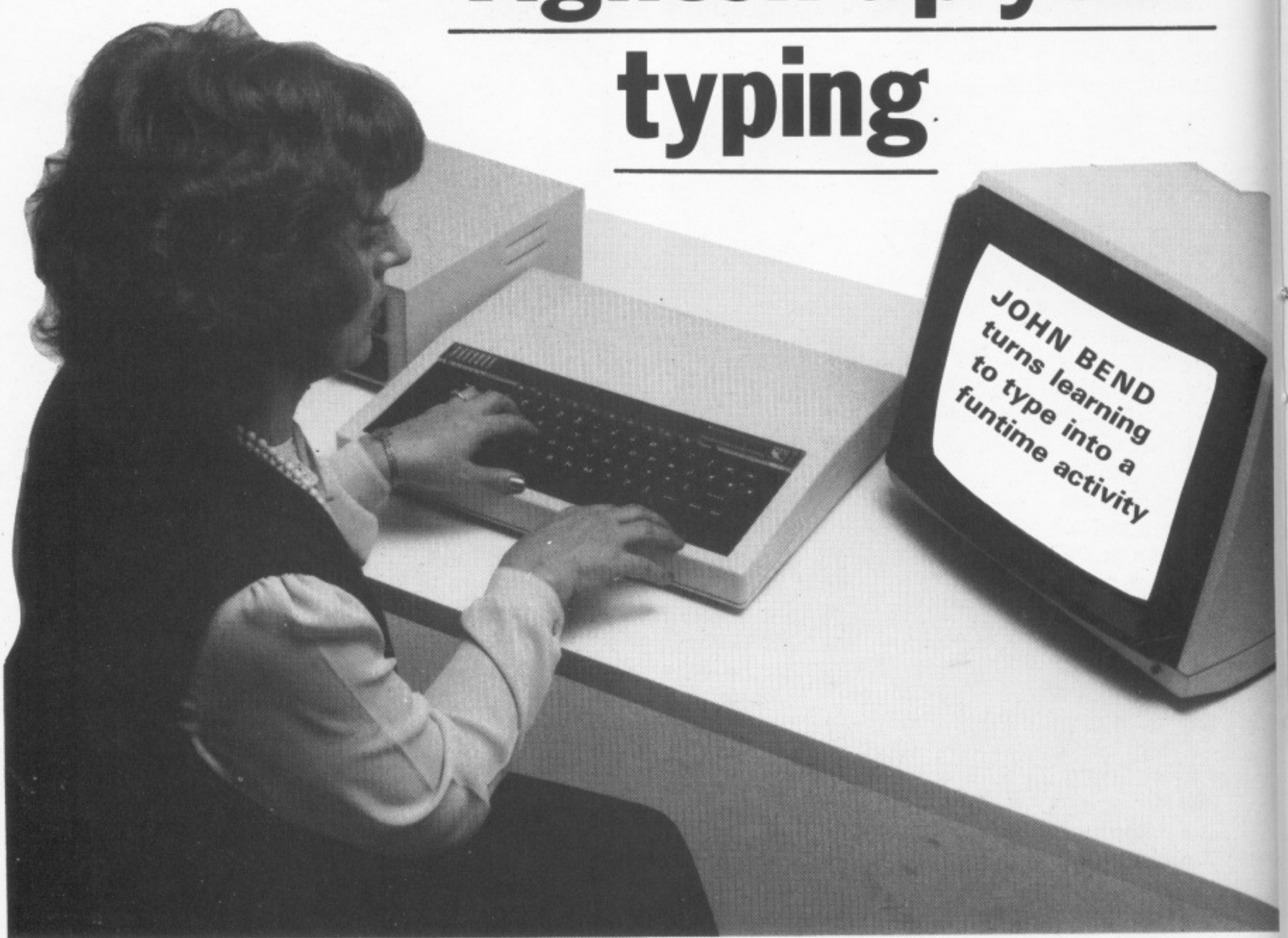
```

```

2310 DATA5,148,772,5,200,775,5,236,7
68
2320 DATA5,260,756,5,270,742,5,290,7
32
2330 DATA5,320,725,5,350,715,5,390,6
80
2340 DATA5,430,525,0,0,0
2350 DATA4,0,520,5,1279,520,4,0,510
2360 DATA5,1279,510,0,0,0,4,400,640
2370 DATA4,400,400,85,900,640,85,900
2380 DATA400,0,0,0,4,380,640,4,540,7
60
2390 DATA85,540,640,85,760,640,4,540
2400 DATA760,85,760,760,4,760,640,85
2410 DATA920,640,4,600,780,4,600,760
2420 DATA85,680,780,85,680,760,4,635
2430 DATA820,4,635,780,85,655,820,85
2440 DATA655,780,0,0,0,4,440,620,4,4
40,540,85
2450 DATA540,620,85,540,540,4,440,50
0
2460 DATA4,440,420,85,540,500,85,540
2470 DATA420,4,740,620,4,740,540,85,
840
2480 DATA620,85,840,540,4,740,500,4,
740
2490 DATA420,85,840,500,85,840,420,0
,0
2500 DATA0,4,540,620,5,440,620,5,440
2510 DATA540,5,540,540,5,540,620,4,4
90
2520 DATA620,5,490,540,4,440,580,5,5
40
2530 DATA580,4,440,500,5,440,420,5,5
40
2540 DATA420,5,540,500,5,440,500,4,4
90
2550 DATA420,5,490,500,4,440,460,5,5
40
2560 DATA460,4,740,420,5,740,500,5,8

```

# Tighten up your typing



**IF you are the sort of person who needs two days to type in a program because you are too busy improving your high score to learn how to type, then this program is for you!**

The theme of the game is an arcade shooting gallery. In each of the seven screens you are presented with 18 targets to shoot down. All you have to do is press the keyboard key to match the letter that pops up underneath the target. Simple enough!

To get the most out of the game, however, don't look at the keys or your fingers. To achieve really high scores you will have to learn to remember where the keys are, as the game scores you in the time taken to press the correct key.

At the higher levels you won't have much time to think. By the time you reach scores in excess of 1,000 you will either have come a long way in learning to touch type, or you have fiddled the program!

You will find the game is divided into levels, each with three sections.

In the first section of each level four keys are introduced. To start these will be A,S,D and F. One of these is selected at random and displayed underneath the target with a warning ping.

At the same time one of the blocks on the display at the foot of the screen (corresponding to the position of the key on the keyboard) will flash. Use this display as a prompt as to which finger to use. You then have a certain time in which to press the correct key. If not you miss the target.

The second section tests your memory for the keys learned so far. The keyboard display will not prompt you, and you would be wise not to look at the keyboard. Should you press a wrong key the game will go back to revise you on the keys, but will not harm your score.

The third section gives you a chance to build up a score. As with all the

sections you need to achieve a rate of 100 per cent to keep your score and progress to the next level.

The micro times your response and works out your score based on the level. The faster you type the more you score.

When you have mastered the three sections you go on to the next level to encounter four more keys.

As you type in this program, enter lines 10 and 20 as listed. Line 10 serves to trap errors, print the fault, line number, and return to command mode. Program the Break key to perform an OLD command. For example:

**\*KEY10 OLD:M**

Should errors occur, make a note of the line number and type of error, press Break, then list the offending line for editing. This procedure is necessary as the key auto-repeat is turned off in the program.

You may want to debug the program before entering the instructions at the



From Page 39

```

220 VDU23,136,0,0,255,255,255,255,2
55,255
230 VDU23,137,255,255,255,255,255,2
55,255,255,255
240 VDU23,138,0,0,126,126,126,126,0
,0
250 VDU23,139,0,1,33,17,9,5,0,28
260 VDU23,140,0,0,8,16,32,64,0,112
270 VDU23,141,0,5,9,17,33,1,0,0
280 VDU23,142,0,64,32,16,8,0,0,0
290 VDU23,143,255,255,255,255,255,2
55,255,255
300 plinth$=CHR$136+CHR$136+CHR$10+
CHR$8+CHR$8+CHR$137+CHR$137
310 splat$=CHR$139+CHR$140+CHR$10+C
HR$8+CHR$8+CHR$141+CHR$142
320 del$=CHR$143+CHR$143+CHR$10+CHR
$8+CHR$8+CHR$143+CHR$143
330 REM main game loop
340 REPEAT
350 FOR glevel%=1 TO 7
360 level%=level%+1
370 REPEAT
380 prompt%=TRUE:base%=glevel%-1
390 MODE2:VDU23;8;0;0;0;:VDU5
400 PROCgame
410 UNTIL rate%>99:SOUND3,5,53,6:PRO
Chold(400)
420 prompt%=FALSE:base%=0
430 MODE2:VDU23;8;0;0;0;:VDU5
440 PROCgame
450 IF rate%<100 THEN GOTO370
460 SOUND1,5,53,6
470 MODE7
480 PRINTTAB(9,6);CHR$141;CHR$136;C
HR$131;"Go For Score!"
490 PRINTTAB(9,7);CHR$141;CHR$136;C
HR$131;"Go For Score!"
500 PROChold(400)
510 prompt%=FALSE:base%=0
520 MODE2:VDU23;8;0;0;0;:VDU5
530 PROCgame
540 IF rate%<100 THEN t%=0
550 gscore%=gscore%+t%
560 MODE7:VDU23;8202;0;0;0;
570 PRINTTAB(5,6);CHR$141;CHR$131;"
SCORE:";t%
580 PRINTTAB(5,7);CHR$141;CHR$131;"
SCORE:";t%
590 IF rate%<99 THEN PRINTTAB(5,12);
CHR$134;"(This level retained)"
600 PROChold(400)
610 IF rate%<99 THEN GOTO370
620 NEXT glevel%
630 time%=time%-50:IF time%<50 THEN

```

```

time%=50
640 UNTILO
650 REM
660 DEFPROCgame
670 REM
680 PROCassembletarget(glevel%)
690 GCOLOR,B%:CLG
700 PROCcanopy
710 PROCkeyboard
720 PROCprinttargets
730 PROCshoot(glevel%)
740 PROCdelay(999)
750 ENDPROC
760 REM
770 DEFPROCprinttargets
780 REM
790 FOR Y%=24 TO 12 STEP-6
800 FOR X%=0 TO 5
810 MOVE(X%*(3*64))+96,(Y%*32):GCOL
0,C%:PRINTtarget$
820 MOVE(X%*(3*64))+96,((Y%-2)*32):
GCOLOR,0:PRINTplinth$
830 NEXT X%,Y%
840 ENDPROC
850 REM
860 DEFPROCcanopy
870 REM
880 FOR I%=0 TO 1
890 A$=STRING$(20,CHR$(132+I%))
900 MOVE0,1020
910 IF I% THEN GCOLOR,3 ELSE GCOLOR,1
920 FOR N%=0 TO 3:PRINTA$;:NEXTN%
930 A$=STRING$(20,CHR$(134+I%))
940 MOVE0,(1024-4*32):PRINTA$
950 NEXT I%;A$=""
960 GCOLOR,0:MOVE(4*64),(1024-1*32)
970 PRINT"The Gallery"
980 MOVE(4*64),(1024-3*32):PRINT"SC
ORE:";gscore%
990 ENDPROC
1000 REM
1010 DEFPROCkeyboard
1020 REM
1030 GCOLOR,0
1040 PLOT 4,0,0:PLOT 4,0,(7*32):PLOT
85,1280,(7*32)
1050 PLOT 4,0,0:PLOT 4,1280,0:PLOT85
,1280,(7*32)
1060 GCOLOR,7:MOVE(0*64),(6*32):PRINT
"RATE ";
1070 MOVE(12*64),(6*32):PRINT"LEVEL:
";level%
1080 RESTORE 1900
1090 FOR I%=0 TO 29
1100 READ dummy%,X%,Y%,c%
1110 MOVE(X%*64),(Y%*32):IF prompt% G
COL0,c% ELSE GCOLOR,4

```

```

1120 PRINTCHR$138
1130 NEXT I%
1140 ENDPROC
1150 REM
1160 DEFPROCassembletarget(glevel%)
1170 REM
1180 RESTORE 1980
1190 FOR I%=1 TO glevel%
1200 READ C%,B%
1210 FOR N%=0 TO 3
1220 FOR char%=0 TO 7
1230 READ T%(char%)
1240 NEXT char%
1250 VDU23,(128+N%),T%(0),T%(1),T%(2
),T%(3),T%(4),T%(5),T%(6),T%(7)
1260 NEXT N%,I%
1270 target$=CHR$128+CHR$129+CHR$10+
CHR$8+CHR$8+CHR$130+CHR$131
1280 ENDPROC
1290 REM
1300 DEFPROCshoot(glevel%)
1310 REM
1320 rate%=0:score%=0:t%=0
1330 PROCrate(rate%)
1340 FOR Y%=21 TO 9 STEP-6
1350 FOR X%=2 TO 17 STEP3
1360 N%=4*glevel%-4*base%
1370 I%=RND(N%)+4*base%-1
1380 RESTORE1890
1390 FOR look%=0 TO I%
1400 READ chr%,a%,b%,c%
1410 NEXT look%
1420 PROCdelay(time%*8)
1430 MOVE(X%*64),(Y%*32)+8:GCOLOR,7:P
RINTCHR$(chr%);
1440 IF prompt% THEN MOVE(a%*64),(b%
*32):GCOLOR,c%:PRINTCHR$138
1450 SOUND1,6,157,6
1460 *FX21,0
1470 TIME=0
1480 key%=INKEY(time%)
1490 t%=t%+((500-time%)-TIME)/10
1500 SOUND0,6,4,6
1510 IF prompt% THEN MOVE(a%*64),(b%
*32):GCOLOR,c%:PRINTCHR$138
1520 IF key%=chr% THEN PROChit(X%,Y%
)
1530 rate%=score%*100/18
1540 PROCrate(rate%)
1550 NEXT X%,Y%
1560 ENDPROC
1570 REM
1580 DEFPROCrate(rate%)
1590 REM
1600 A$=STRING$(7,CHR$143)
1610 GCOLOR,0:MOVE(4*64),(6*32):PRINT
A$

```



**THE MICRO USER**  
Education Special

# A-Z guide to Educational Software on the BBC Micro

Title	Supplier	Description
Understanding Chemistry	Garland Computing	Self tuition/revision for CSE/'O' level.
Understanding Physics	Garland Computing	Self tuition/revision for CSE/'O' level.
Understanding the Human Body	Garland Computing	Human biology for 'O' and 'A' level.
Using HAL and the BMC	Bowker Business Services	Load, save and run simulated assembly language programs.
UVF	Oxford Microwave	Ray diagrams and so on for CSE/'O' level.
Views/Faces	Primary Programs	Identikit and perspective picture construction.
Viking England	Fernleaf	Four role playing games.
Vocab	Wida	Authoring package - word activity.
Watts in Your Home	Cambridge University	Evaluating energy consumption.
Weather	Tutorial Software	Teaches symbols, pressure systems, and more.
Where, We're, Wear	Primary Programs	The differences between similar words.
Wilt	Longman	Guess the letters in the word to make the flower grow.
Word Builders	Sherston	An electronic blackboard that builds up words.
Wordhang	Bourne	Educational version of the word game 'hangman'.
Word Prog	Educated Owl	Practice spelling.
Word Spot	Kingfisher	Reading game for the 5-13 year olds.
Wordgram	Daco	As story line but for 9-13.
Wordsquare	Garland Computing	Game to help spelling and word recognition.
World-Wise	Bourne	Two programs to build up information banks on geography subjects.
Write On	System	Helps develop ideas in early literacy.
30 Hour Basic	National Extension College	Contains programs to accompany the book "30 Hour Basic".

## Suppliers of programs featured in this Guide:

**4mation**, Lyden Lea, Rock Park, Barnstaple, Devon;  
**ABC**, 19 Crumstone Court, Killingworth, Tyne and Wear;  
**Acornsoft**, 4a Market Hill, Cambridge; **ASK**, London House, 68 Upper Richmond Road, London SW15;  
**Astrocalc**, 67 Peascroft Road, Hemel Hempstead; **BBS**, 4 Chaumans, Letchworth, Herts; **Beecon**, 16 Kingrove Avenue, Beeston, Notts; **Bourne**, Bourne House, The Hundred, Romsey, Hampshire; **Cambridge University**, The Edinburgh Building, Shaftsbury Road, Cambridge;  
**Carwell**, Faringdon, Oxon; **Chaddington**, 14 Selkirk Close, Worthing; **Chalksoft**, 37 Willowlea Road, Worcester; **Computer Market**, 27 Goosegate, Notts;  
**Daco**, 57 Mackenzie Road, Moseley, Birmingham;  
**Ebury**, 72 Broadwick Street, London W1; **Educated Owl**, 62 Airedale Avenue, Tickhill, Doncaster;  
**Edu-Soft-Co**, 108 Parthenon Drive, Liverpool;  
**Englefield**, High House, Buxton, Norwich, Norfolk;  
**Fernleaf**, 31 Old Road West, Gravesend, Kent; **Garland**, 35 Dean Hill, Plymouth; **Gem**, 1 Oswald Road, Leamington Spa, Warwick; **Golen**, 77 Qualitars, Bracknell, Berks; **Hargreaves**, Updown, Pewley Way, Guildford, Surrey; **Highlight**, 36 Sherbourne Close, Barry, S. Glam; **Kingfisher**, 16 Martock Road, Keynsham, Bristol; **Kosmos**, 1 Pilgrims Close, Harlington, Dunstable, Beds; **LCL**, 26 Avondale Avenue, Staines, Middx; **LIB**, 20 Wandsworth Bridge Road, Hemel Hempstead; **Longman**, Longman House, Burnt Mill, Harlow, Essex; **Marmik**, P.O. Box 11, Shepton Mallet, Somerset; **Merlin Mag**, 75 Kingsland Road, London E8; **Micro-Jenn**, 81 Squirrels Heath Road, Harold Wood, Essex; **Musicaoft**, 12 Fallowfield, Amphill, Beds; **NEC**, 18 Brooklands Avenue, Cambridge; **New Generation**, The Brooklands, Sunnybank, Lycomb Vale, Bath; **Optima Software**, 36 St. Petersburg, Stockport, Cheshire; **Oxford Microwave**, 52 St. Giles, Oxford; **Pandasoft**, Mere View House, Church Street, Wincham, Cheshire; **Pee Bee**, P.O. Box 175, High Wycombe, Bucks; **Primary Programs**, Claypits, Detden Road, Saffron Walden, Essex; **Private Tutor**, 29 Halloway Lane, Chesham Bois, Bucks; **Pissoft**, 13 Whitwell Drive, Llantwit Major, Sth Glam; **Resource Facilities**, Masters Lane, Halifax; **Scholarsoft**, Coniscliffe, Woolisinton Gardens, Newcastle-U-Lyne; **Scorby**, 27 Scalby Avenue, Scarborough; **Science Research**, Newtown Road, Henley-on-Thames, Oxon; **Sherston**, 8 Court Street, Sherston, Malmesbury, Wilts; **Shiva**, 64 Welsh Row, Nantwich, Cheshire; **Simon**, Blansheay Cottage, Droitwich Road, New End, Redditch; **Storm**, Winchester House, Wootton Grove, Sherborne, Dorset; **Swift**, 154 Greenfield Road, Holmfirth, Huddersfield; **System**, 12 Collegiate Crescent, Sheffield; **Thornquard**, 46 Pensby Road, Heswall, Merseyside; **Tutorial**, 23 Thingwall Drive, Irby, Wirral; **Wida**, 2 Nicholas Gardens, London W5.

Title	Supplier	Description
Acids and Alkalis	Scholarsoft	Household products as acids and alkalis.
Additional Fun	Shiva	Five programs on numeracy for children 5-8.
All Fingers Go!	National Extension College	Touch typing course.
Amazing Ollie	Storm	Help children with numerical skills.
Angles	Chalksoft	Teaches you how to use a protractor.
Answer Back General Knowledge	Kosmos	Re-programmable multiple choice quiz.
Angles	Garland Computing	Estimation of angles.
Angle Tutor	Pee Bee	Concept of angle as part of a circle.
Angles/Navigate	Primary Programs	Tests comprehension of 360 degree compass.
Anglezap	Gem	Develops mastery of angles.
Animated Arithmetic	LCL	Teaches using moving colour pictures. 3-8 years.
Arithmetic for Juniors	Micro-Jenn	Tutorial program covering addition, subtraction, multiplication and division of fractions.
Arithmetic Games Set 1	Science Research	Two two-player games. Three difficulty levels.
Arithmetic Games Set 2	Science Research	Two two-player games. Three difficulty levels.
Arithmetic Games Set 3	Science Research	Two games with multiple difficulty levels.
Arithmetic Plus	Fernleaf	Four arithmetic strategy games.
Astrotutor	Astrocalc	Self teaching astrology.
Astrosynthesis	Astrocalc	Teaches astrological interpretation.
Atomic Structure	LIB	Particle and electron shell structure of 107 elements.
Back Home	Wida	Twelve communicate songs for EFL intermediate.
Balloon	Englefield	English language for 4-16 years.
Binary Numbers	Chaddington	Practice addition, subtraction, multiplication and division of binary numbers and also converting into denary.
Block	Oxford Microwave	Simulates the passage of light through a glass block.
British Isles Geography Quiz	Computer Market	250 British place names.
Bubbles	The Softwarehouse	Aid to help the very young to learn to count.

Title	Supplier	Description
Bunsen	Scholarsoft	The parts of a bunsen burner, self teaching.
Capital Letters	Chalksoft	Demonstration of capital letters and numbers.
Caravan Trek	Pee Bee	Game using coordinates, angles and bearings.
Cat and Mouse	Kingfisher	Arithmetic practice against the clock.
CATB	Resource Facilities	Computer assisted tables bingo.
Catch Apple	Kingfisher	Learn multiplication tables.
Chemical Collisions	Cambridge University	Explore the reaction rates of two gases.
Choicemaster	Wida	Multiple choice authoring program.
Clown	Englefield	English language program.
Clozemaster	Wida	Authoring program for building cloze texts.
Cluster of Curves	Chaddington	A set of programs to draw 20 different curves, using polar coordinates, parameters and envelopes of lines and circles.
Code	The Softwarehouse	Learn the international code of flags.
Complete Machine Code	New Generation	Machine code tutor for Basic programmers.
Comprehends-Tu	Pandasoft	Helps you improve your French vocabulary.
Computer Discovery	Science Research	Computer literacy and history for secondary schools.
Computer Pioneers	Bowler Business Services	Learn the names, dates and what they did.
Computer Studies	Bowler Business Services	A six part multiple choice test program.
Contours/Places	Primary Programs	Contoured hill sections and place finder programs.
Coordinates	Tutorial Software	Teaches x and y coordinates and directed numbers.
Coordinates and Lines	Garland Computing	Concepts of coordinates and equations of lines.
Counter	Kingfisher	Counting and number game for the very young.
Cranky	Applied Systems	Test your skills in addition and subtraction.
Crit	Oxford Microware	Explains critical angle and total internal reflection.
Curved Mirrors	Pissoft	Four programs associated with curved mirrors.
Das Schloss	Chalksoft	German wordlist.
Data Handling	Scorby	Introduction to information technology methods.
Datext	Optima	A DIY system for creating and displaying pages of teletext-style information.
D.C. Electricity	Pissoft	Four programs relating to electricity.
Decisions	Shiva	Five program cassette on numeracy for children 5-8.
Demand and Supply	Beecon	Introductory O/A level economics.
Dictionary	Daco	Helps you to use a dictionary efficiently.
Differences	Shiva	Five programs on numeracy for children 5-8.
Directed Numbers	Garland Computing	Positive and negative numbers.
Dotty Pictures	Educational Software	Draw your own pictures.
Early Reading Alphabet Sounds	Pandasoft	Practice for the 4 to 6 year olds in recognising sounds associated with letters.

Title	Supplier	Description
Short Vowel Sounds	Sherston	Teaches, practices, tests the five short vowel sounds.
Speak and Spell	Merlin Magical	Spelling pack for speech chip only.
Speaking French/German/Italian/Spanish	Private Tutor	Visual and aural language learning.
Specific heat Capacity	Pissoft	Four programs on specific heat capacity.
Spell7+/Spell9+	Primary Programs	Spelling aid using the read, cover, write principle.
Spelling Castle	Marnik	Look/cover/write spelling to raise flag. 6 plus.
Spreadreader	Wida	Authoring program - multiple choice questions for speed reading.
Square Puzzles	Scorby	Number work and mental arithmetic.
Squeeze	Applied Systems	Help with basic geometrical concepts.
Stable	Englefield	English language for 7-15 years.
Stock	System	The basic working of a stock control system.
Storyboard	Wida	Text building for word skills and dyslexia/remedial.
Storyboard Plus	Wida	18 stories for EFL intermediate using storyboard technique.
Storyline	Daco	Helps children (7-10) build stories.
Super Draw	Educational Software Co	Graphical drawing program.
Survive	System	Simulates formation of social groups.
Swift Reader	Swift	Eight flashcard programs for children of 4 plus.
Symmetry	Garland Computing	Help develop concepts of symmetry.
Table Adventures	Applied Systems	Factorisation games to help with tables.
Teacher in the Custard	Pee Bee	Basic maths fun.
Tessellations	Cambridge University	Symmetry in 17 groups of shapes.
The French Mistress A and B	Kosmos	Re-programmable French learning aid.
The German Master	Kosmos	Re-programmable German learning aid.
The Spanish Tutor	Kosmos	Re-programmable Spanish learning aid.
The Synth	Musisoft	A micro synthesiser. Experiment and play.
Timetable/Clock	Primary Programs	Allows creation of varied timetables.
Titrations	System	Aids teaching of titrations and calculations involved.
Titre	Oxford Microware	Illustrates acid/base titrations.
Topic Tester	Kingfisher	Multiple choice quiz generator.
Treasure Hunt	Kingfisher	Follow clues to find the treasure.
Triangles/Regular Shapes	Primary Programs	Demonstration of sections with tests.
Triangle Tutor	Pee Bee	Tests knowledge of angles of random triangles.
Try-Angles	Tutorial Software	Teaches angles, ratios, sin, cos etc.
Typeasy	Carswell Computers	Complete typing course.
Type Invaders	Carswell Computers	Correct typing skills invading letters and words.

Title	Supplier	Description
Number Puzzler	Applied Systems	Noughts and crosses game to improve addition and subtraction.
Nursery Rhymes 1 to 3	Longman	Traditional nursery rhymes with animation.
Ohms Run	Tutorial Software	Teaches DC circuits, resistors, cells, and so on.
Ollie Octopus	Storm	Sketch pad.
One to Nine	Acornsoft	Helps pre-school children learn the basic skills of numeracy.
Order	Resource Facilities	Shows the eight major sorting algorithms.
Ordering	Shiva	Five programs on numeracy for children 5-8.
Pick-a-Letter	Marmik	Help the dog cross the river. 6 plus.
Picture Puzzles	LCL	3D graphics in early learning fun.
Piston	Oxford Microware	Explains a four-stroke internal combustion engine.
Play with Words	Pee Bee	Helps set questions on the current syllabus.
Playing with Places	Shiva	Five programs on numeracy for children 5-8.
Podd	Applied Systems	Match the spelling with selected words.
Polygon Tutor	Pee Bee	Tests knowledge of angles of polygons.
Population Growth	Cambridge University	Population changes from birth and death rates.
Prism	Oxford Microware	Illustrates refraction and total internal reflection.
Putting Numbers in Order	Scholarsoft	Three programs, progress from single digits to decimals.
Quelle Tete	Cambridge University	French vocabulary illustrations.
Railroad	Englefield	Maths program for 5-15 years.
Rainy Days	Pandasoft	Word and memory games for the 9 to 14 year olds.
Ratio	Garland Computing	Simplification and estimation of ratios.
Reading Scales	Educated Owl	How to read scales and balances.
Readlevel	Daco	Gives the reading age of any piece of text.
Readright	Daco	Helps with early reading.
Readwell	Daco	As Readright with extras.
Regress	Resource Facilities	Draws the line of best fit for a set of data.
Ripple	Oxford Microware	Simulates a ripple tank.
Robin Graphics Design	Educational Software	Design your own shapes.
Round the World	Oxford Microware	Humanities program 8-14 years.
Sentence Practice	Educated owl	French, German or English versions.
Sentence Starter	Educated Owl	Tests syntax, grammar and so on.
Sets	Garland Computing	Helps to test concepts of sets.
Sets and Operators	Shiva	Five program cassette on numeracy for children 5-8.
Spacex	4mation	Childrens adventure.
Shadows	Oxford Microware	Illustrates the formation of shadows.
Shares For All	Shiva	Five programs on numeracy for children 5-8.

Title	Supplier	Description
Early Reading Bedtime Tales	Pandasoft	Helps 6 to 8 year olds improve their reading skills.
Education1	Simon	Mapdraw and histogram.
Education2	Simon	Tree class - tree recognition.
Education3	Simon	Revision for O/CSE chemistry.
Educational 1	Golem	Six programs covering maths, spelling and time.
Educational 2	Golem	Six programs covering maths, memory, cubes and spelling.
Eiffel Tower	Chalksoft	French vocabulary program.
Electricity	Primary Programs	Three circuit simulation programs.
Elementary Statistics	Garland Computing	Collect and display data.
Emergency Rescue	The Softwarehouse	Teaches coordinates while you rescue parachutists.
Face Maker	Applied Systems	Build up faces on the screen.
Find the Missing Length	Scholarsoft	Two programs on area and perimeter.
Fire Fight	Highlight	Consonant blends.
First Count	Scholarsoft	Counting, addition and subtraction.
First Moves	Longman	An introduction to chess.
Flags	The Softwarehouse	Identify the twelve flags printed on the screen.
Fletchers Castle	Fernleaf	Historical role playing.
Flowers of Crystal	4mation	Childrens adventure in Mode 7.
Four Rules	Shiva	Five programs on numeracy for children 5-8.
Fractions	Garland Computing	Adding and subtracting fractions.
French Vocab Tutor 1 and 2	Hargreaves	Learning and test routines for 1,000 words.
French Connections	Cambridge University	Graphical exercises in French.
Fruit Drop	Simon	Laws of probability in a graphics dice game.
Fun with Numbers	Golem	Basic counting and addition.
Fun with Words	Golem	Five programs.
Games of Deduction	Fernleaf	Four programs for logical thinking.
Games of Logic	Golem	Five thought provoking games.
Granny's Garden	4mation	Childrens adventure in Mode 7.
Gapkit	Wida	Authoring program for writing gap-fill exercises.
Graph	Oxford Microware	Graph plotting program.
Greater and Smaller Than	Scholarsoft	Three programs progress from single digits to decimals.
Grpstat	Thornguard	Calculation and comparison of data.
Happy Times	Shiva	Five programs on numeracy for children 5-8.
Hide and Seek	Applied Systems	Short term memory retention test.
High Wire	Englefield	Tables program for 5-15 years.
History Revision	Swift	Revise Lenin's and Stalin's Russia. Text, graphs and text.

Title	Supplier	Description
Hooked on Numbers	Acornsoft	An alternative way for the young child to manipulate numbers.
Horse in Motion	Lib	Horse animation program.
Hot Cakes	Private tutor	How to read company accounts.
Hotline	Chalksoft	General knowledge quiz.
Infant Maths Snap	Sherston	Practice numbers, sets and number names.
Intervention	System	A business simulation.
Invader Maths	Scorby	Games to speed up mental arithmetic.
Invertebrates/Vertebrates	Scholarsoft	Multichoice to select the correct group.
Isaac	Tutorial Software	Teaches mass, weight, Newton's laws, and so on.
Jigsaw and Sliding Puzzles	Golem	Six puzzling programs.
Juggle Puzzle	Applied Systems	Sliding block puzzle.
Kopflager	Cambridge University	German vocabulary illustrated.
L-Trap	Gem	Understanding transformation geometry.
Launching Logic	Shiva	Five program cassette on numeracy for children 5-8.
Learn Addition	ABC	Basic addition for 5-6 year olds.
Learn Division	ABC	Program covering sharing and repeated subtraction.
Learn Multiplication	ABC	Program covering equivalent sets, repeated addition and arrays.
Learn Subtraction	ABC	Basic subtraction for 5-7 year olds.
Lenses	Pissoft	Four programs associated with lenses.
Let's Count	Applied Systems	Games to help the very young learn to count.
Letterbugs	Highlight	Unscrambling hidden words.
Lift	Cambridge University	Velocities and accelerations.
Lift Off With Numbers	Shiva	Numeracy for children 5-8.
Linreg	Thornguard	Calculates the line of best fit for a set of data.
Lissaj	Oxford Microwave	Facilitates the teaching of Lissajou's figures.
Logifrench1	Wida	Question and answer on imperfect and perfect.
Logifrench2	Wida	Question and answer on future and conditional.
Lorry/Farm	Primary Programs	Simulation of running a farm and delivering loads.
Magic E	Sherston	Teaches everything about the magic E.
Magic E	Highlight	Magic 'e' spelling rule.
Making Ends Meet	Cambridge University	Explore post-school financial problems.
Marklist	Optima	A database for handling lists of pupils' exam results or assessment scores.
Masterkey	Longman	Typing course.
Maths 1/2/3/4/5	Simon	Packages of 10 different programs for the young.
Maths Snap	Sherston	Practice number bonds, up to four players.

Title	Supplier	Description
Maths Topics I/II	Cambridge University	I. Symmetry and vectors. II. Percentage, fractions and decimals.
Mathspell	Garland Computing	Displays arithmetic tables.
Matrices	Chaddington	Add, subtract and multiply your own matrices.
Mayday	Tutorial Software	Teaches OS symbols, grid references.
Measuring Temperature	Educated Owl	How to read a laboratory thermometer.
Measurement 1, 2 and 3	Oxford Microwave	Explains the various techniques for reading measurements.
Menu Master Suite	Shumwari Ass	Recipes from "Practical Cookery".
Microba	Resource Facilities	Biology adventure game.
Micro-Niners	Micro Jenn	A word game involving the recognition of nine letter words.
Monster Maze	Kingfisher	Arithmetic test game.
Monte Carlo	Gem	Game based on the laws of probability.
Moving Molecules	Cambridge University	Kinetic theory in graphics.
Micro English	LCL	English language O-level.
Micro Maths	LCL	24 program O-level revision course.
Micro Stories	Wida	24 stories for EFL intermediate or mother tongue primary.
Micros Made Easy	Science Research	Computer awareness for the absolute beginner.
Micro Discovery	Science research	Computer literacy for junior and middle schools.
Million Mazes	LCL	Millions of mazes of three different types.
Money Plus	Ferleaf	Money - practice and management.
Morse Code Tutor	Thornguard	Morse code tutor and keyboard generator.
Motion Geometry	Garland Computing	Draw shapes and reflect, rotate, translate, enlarge.
Mr T Tells The Time	Edbury	Four games teaching time telling.
Mr T's Money Box	Edbury	Two programs on coin handling.
Mr T's Measuring Games	Edbury	Two measuring games.
Mr T's Shape Games	Edbury	Two games on shape handling.
Mr T's Alphabet Games	Edbury	Pre-reading letter recognition.
Mr T's Number Games	Edbury	Two games on counting and matching numbers.
Mr Wolf	Kingfisher	Teaches how to tell the time.
Multitest	System	A multi lingual utility.
Music Tutor	Garland Computing	Enter notes - displayed on a treble clef.
National Income Models	Beecon	Economics A level. Interactive graphics.
Number Bond Boxes	Primary Programs	Number bonds and multiplication tables.
Number Chaser	Applied Systems	A game to help improve estimating skills.
Number Formation	The Educational Software	Teaches number concepts.
Number Gulper	Applied Systems	Game to help with mental arithmetic.

```

1620 GCDLO,7:MOVE(4*64),(6*32):PRINT
":rate%:"%;
1630 A$=""
1640 ENDPROC
1650 REM
1660 DEFPROC hit(x%,y%)
1670 REM
1680 SOUND0,6,0,6
1690 MOVE(x%*64)-24,(y%+3)*32:GCDLO,
0
1700 PRINT splat$
1710 MOVE(x%*64)-32,(y%+3)*32:GCDLO,
(B%*128):PRINT del$
1720 score%=score%+1
1730 ENDPROC
1740 REM
1750 DEFPROC delay(dummy%)
1760 REM
1770 FOR I%=0 TO dummy%
1780 NEXT I%
1790 ENDPROC
1800 REM
1810 DEFPROC hold(N%)
1820 REM
1830 TIME=1:REPEAT
1840 dummy%=FALSE
1850 dummy%=INKEY(0)
1860 UNTIL TIME=N% OR dummy%<>-1
1870 ENDPROC
1880 REM
1890 REM keyboard data
1900 DATA 65,5,3,1,83,6,3,1,68,7,3,1
,70,8,3,1
1910 DATA 74,11,3,1,75,12,3,1,76,13,
3,1,59,14,3,1
1920 DATA 71,9,3,2,72,10,3,2,84,9,4,
2,89,10,4,2
1930 DATA 69,7,4,2,82,8,4,2,85,11,4,
2,73,12,4,2
1940 DATA 81,5,4,2,87,6,4,2,79,13,4,
2,80,14,4,2
1950 DATA 86,8,2,2,32,9,1,2,66,10,2,
2,78,11,2,2
1960 DATA 90,5,2,2,88,6,2,2,67,7,2,2
,77,12,2,2
1970 DATA 44,13,2,2,46,14,2,2
1980 REM target data
1990 REM roundal
2000 DATA 1,135
2010 DATA 1,3,7,7,14,12,13,13,128,19
2,224,224,112,48,176,176
2020 DATA 13,13,12,14,7,7,3,1,176,17
6,48,112,224,224,192,128
2030 REM duck
2040 DATA 3,132
2050 DATA 60,126,235,255,231,195,126
,60,0,0,0,0,0,0,0

```

```

2060 DATA 60,127,255,255,255,255,127
,63,1,227,255,254,252,252,248,240
2070 REM acorn
2080 DATA 2,129
2090 DATA 1,3,3,7,7,15,15,15,0,128,1
28,192,192,224,224,224
2100 DATA 0,31,31,15,7,3,25,15,0,240
,240,224,192,128,0,128
2110 REM elephant
2120 DATA 4,134
2130 DATA 0,8,29,23,31,31,31,31,0,0,
224,240,248,252,252,252
2140 DATA 23,23,23,55,6,6,6,6,252,25
2,252,248,216,24,24,24
2150 REM snapper ghost
2160 DATA 1,135
2170 DATA 3,7,5,13,15,15,13,10,128,1
92,64,96,224,224,96,160
2180 DATA 15,15,15,15,15,15,10,10,22
4,224,224,224,224,224,160,160
2190 REM computer
2200 DATA 4,130
2210 DATA 7,15,12,8,8,8,8,24,224,240
,48,16,16,16,16,24
2220 DATA 28,31,31,16,16,16,31,31,56
,248,248,8,8,8,248,248
2230 REM invader
2240 DATA 4,129
2250 DATA 1,11,7,5,5,7,7,4,128,208,2
24,160,160,224,224,32
2260 DATA 5,7,3,3,7,6,4,12,160,224,1
92,192,224,96,32,48
2270 REM
2280 DEFPROC instructions
2290 REM
2300 PROC title
2310 PRINT TAB(0,5)"There are seven l
evels this game."
2320 PRINT "At the beginning of each
level four keys"
2330 PRINT "are introduced."
2340 PRINT "The display at the bottom
of the screen"
2350 PRINT "represents the keyboard."
2360 PRINT "Keep your fingers on the
keys shown in red."
2370 PRINT "These are:"
2380 PRINT CHR$(129);CHR$(141);"
A S D F J K L ;"
2390 PRINT CHR$(129);CHR$(141);"
A S D F J K L ;"
2400 PRINT "Do not look at the comput
er keyboard!"
2410 PRINT "For each new set of keys
the keyboard"
2420 PRINT "display will flash to pro
mpt you."

```

```

2430 PRINT "The display is so arrange
d to guide you which fingers you shou
ld use."
2440 PRINT "For the space bar (bottom
key) use your thumb."
2450 dummy%=GET
2460 PROC title
2470 PRINT TAB(0,5);"As you progress
through the levels"
2480 PRINT "the game gets faster- lea
ving you"
2490 PRINT "with less time to think!"
2500 PRINT "'-But higher scores can b
e achieved!"
2510 dummy%=GET
2520 PROC title
2530 PRINT TAB(0,5)"Each level has th
ree divisions:"
2540 PRINT "'The first introduces the
new keys."
2550 PRINT "'The next revises keys wi
thout prompting."
2560 PRINT "The last gives you a chan
ce to build up a score."
2570 PRINT "The faster you type- the
more you score."
2580 PRINT "'You must reach 100% to k
eep your score!"
2590 dummy%=GET
2600 PROC title
2610 PRINT TAB(0,5);"Use the 'ESCAPE'
key to hold the game."
2620 PRINT "REMEMBER:--"
2630 PRINT "If you cheat you only che
at yourself!"
2640 dummy%=GET
2650 K%=FALSE:PROC title
2660 PRINT TAB(0,5);"Do you want the
instructions again";
2670 INPUT A$
2680 IF MID$(A$,1,1)="Y" THEN RUN
2690 ENDPROC
2700 PROC title
2710 PRINT TAB(0,5);
2720 *RUN"gallery"
2730 DEFPROC title
2740 VDU12
2750 PRINT CHR$(157);CHR$(134);CHR$(132);CH
R$(141);" The Gallery"
2760 PRINT CHR$(157);CHR$(134);CHR$(132);CH
R$(141);" The Gallery"
2770 PRINT CHR$(130);"This game will s
tart you touch-typing!"
2780 IF K% THEN PRINT TAB(0,23);CHR$(13
4);CHR$(136);" Press key to continu
e."
2790 ENDPROC

```

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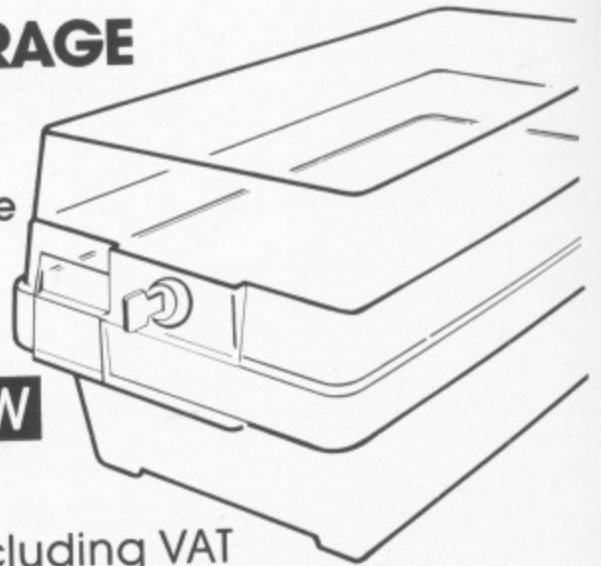
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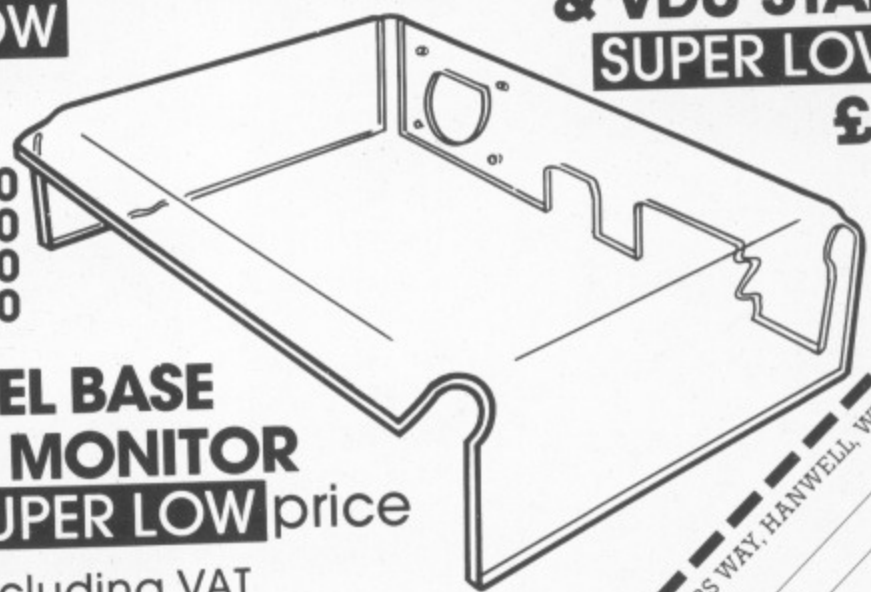
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# Guess Whatnumber?

## A variation on the well-known number guessing game by ANDREW DAVIS

THERE is a well known game called "Guess my number" in which someone thinks of a number and someone else tries to guess what it is by asking questions such as: "Is it more than 50?" "Is 4 a factor?" and so on.

It is a favourite device of primary teachers, and can involve a surprising amount of analytical thinking and mental arithmetic. The object of the game is to work out the number using as few questions as possible.

Some disadvantages are to be found in playing the game with the whole class. Less able or timid children may be reluctant to ask questions. They will be accused of wasting a go, and so on. This program for the BBC Micro avoids such problems.

I understand there are micro versions of this already, although I have not seen them. The present offering, however, is no mere mechanical version of a human thinking of a number.

The first option of the menu, "Play the game with help", displays the numbers 1 to 100 arranged in a 10 x 10 grid.

As the questions are typed in and answered by the micro, various things happen to the numbers, so that the child sees the way in which the questions are narrowing the possibilities.

I won't describe what happens here - the program should speak for itself. It may need trying several times before some of the finer points can be appreciated.

A variety of vocabulary may be used in asking the questions, and substantial differences in syntax will be tolerated.

Upper or lower case letters will work, or a mixture. Too few or too many spaces will be ignored.

A crucial proviso is that the question must contain a number. But if you try to cheat, and ask about more than one number at a time, the micro responds with an appropriate error message.

Most of the vocabulary the micro understands is displayed at the right hand side of the 10 x 10 number square.

- |          |  |      |   |
|----------|--|------|---|
| 10-40    | Take the program to PAGE=&E00.   | 650  | <i>PROCgrid</i> , displays the 10 x 10 square of numbers.   |
| 80       | Stores the positions of the numbers to enable colour changes to be made, and so on.  | 740  | Wipes out appropriate numbers according to the answer to questions involving "more than", etc.            |
| 120      | <i>PROCA</i> , the opening instructions.   | 770  | <i>PROCgrsh</i> , part of the process by which numbers are coloured according to their factors.           |
| 170      | <i>PROCO</i> , the main body of the program - the questions and answers.   | 850  | <i>PROCngrsh</i> , wipes out the appropriate numbers if the answer is "no" to a question about factors.   |
| 200-240  | The crucial input routine.   | 870  | Reads a character at a screen position (see User Guide).  |
| 250      | Changes any lower case input to upper case and strips off spaces.  | 1000 | <i>PROCI</i> , a further stage in the illumination of the numbers if and when their factors are revealed. |
| 260-300  | Deal with various inappropriate entries.   | 1080 | The function for turning lower case letters into upper case.  |
| 270      | Provides an error message for short entries which don't include words like IT IS, IS IT, OVER or SHARE. <i>FNinstr</i> is a function which avoids the bug in INSTR (see User Guide) which is present in all but the most recent 1.2 operating systems. | 2000 | <i>FNwh</i> , finds all the numbers in the input sentence.  |
| 280      | <i>FNgr(x\$)</i> , the function that picks out the appropriate number from the pupil's question so that the micro can deal with it. Set to 5000 if no number is found.   | 3000 | <i>FNinstr(A\$,B\$)</i> , ensures that INSTR does not search for a string in a string shorter still.      |
| 282      | <i>FNwh</i> picks all the numbers out of the input. If the question tries to deal with more than one number at a time - such as: "Is it 4 less than 20?" - this line rules it out as illegitimate.   |      |   |
| 300, 305 | Seek to prevent attempts to ask two questions at the same time.  |      |   |
| 310-330  | Pick out the crucial bits of vocabulary from the questions.  |      |   |
| 340      | Tries to prevent the user from cheating by asking questions using more than one significant piece of vocabulary at the same time.  |      |   |
| 450      | Finds the number in the question.  |      |   |

Ask a question and press RETURN

IS IT SMALLER THAN 35

NO

Press space bar to continue

										GREATER THAN
										MORE THAN
										BIGGER THAN
										OVER SMALLER THAN
41										LESS THAN UNDER
										DIVIDE SHARE MULTIPLE
										FACTOR
										IS IT

There are 5 questions left.

### PROGRAM STRUCTURE

```

5 REM (c) The Micro User
10 IFPAGE=&E00THENVDU6:GOTO50
20 VDU21:*KEY0*TAPE:M:FORAX=0TO(10
P-PAGE)STEP4:AX!&E00=AX!PAGE:NEXT:MPA
GE=&E00:MOLD:MRUN:M
30 *FX138,0,128
40 END
50 ONERROR CLEAR:GOTO60
60 D$=CHR$13+CHR$10+CHR$10:iX=0:jX
=0:kX=0:*FX11,0
70 VDU23,224,255,0,0,0,0,0,0,0
80 DIM g%(100,2):C=1:FORC%=1TO100:
FORDX=0TO1:READg%(C%,DX):NEXT:NEXT
90 REPEAT:FORC%=1TO100:g%(C%,2)=0:
NEXT:ANS=FALSE:C=1:q=0:MODE1:VDU 23;B
202;0;0;0;PRINTTAB(0,2)"1. Play the
game with help.""2. Play the game w
ith no help.""Type 1 OR 2"
100 REPEAT:AX=GET:UNTILAX=49ORAX=50

```

## From Page 47

```

:IFAZ=49PROCA:FZ=3:PROCC ELSE PROCA:f
Z=0:FORMX=1TO2:VDU19,WX,0;0;:NEXT:PRO
CQ:VDU20
  110 UNTILFALSE:END
  120 DEFPROCA:CLS
  130 PRINTTAB(0,2)"I have thought of
a number." "It is between 0 and 100
. You may "ask me questions to work
"out the number. If I understand y
ou, I "answer yes or no"
  140 PRINT "All your questions must
contain a "number." "For instance
:-":COLOUR2:PRINT "Is it more than
50." "Can it be shared equally among
4 people" "Is 7 a factor":COLOUR3:P
ROCsp(27):CLS
  150 PRINTTAB(0,5)"If you want to gu
ess the number, just "type IS IT 26
, IS IT 58, etc. But "remember..eac
h guess counts as a "question"
  160 PRINTTAB(0,15)"How many questio
ns do you think you "need ? Choose
a number from 1 to 9":REPEAT:VDU31,0,
24:AZ=GET:UNTILAZ>48ANDAZ<58:VDUAZ:60
Z=VAL(CHR$AZ):PROCsp(30):N=RND(100):C
LS:VDU23,1,0;0;0;0;Q=0:ENDPROC
  170 DEFPROCQ:PROCgrid(fZ):REPEAT
  180 TAG=0:PROCc(0,7):PRINTTAB(0,0)"
Ask a question and press RETURN"
  190 *FX4,2
  200 X$="":BZ=1:PROCc(1,7):VDU31,0,3
:HZ=0:REPEAT:REPEAT:AZ=GET:UNTILAZ=13
ORAZ=32OR(AZ>47ANDAZ<58)OR(AZ>64ANDAZ
<91)OR(AZ>96ANDAZ<123)ORAZ=127:*FX15,
1
  210 IFAZ=127AND POS>0VDU127:HZ=HZ-1
:X$=MID$(X$,1,LEN(X$)-1)
  220 IFAZ<>127ANDAZ<>13ANDHZ>0PRINT;
CHR$AZ;:X$=X$+CHR$AZ:HZ=HZ+1
  230 IFHZ=0ANDAZ<>127ANDAZ<>13ANDAZ<
>32PRINT;CHR$AZ;:X$=X$+CHR$AZ:HZ=HZ+1
  240 UNTILAZ=13ORHZ=40:*FX4,0
  250 X$=FNch(x$)
  260 IFLEN(X$)<5PROCb("Silly !"):GOT
O180
  270 IF FNinstr(x$,"ISIT")=0AND FNin
str(x$,"ITIS")=0 AND FNinstr(x$,"OVER
")=0AND FNinstr(x$,"SHARE")=0 AND FNi
nstr(x$,"UNDER")=0AND LEN(X$)<7PROCb(
"Not enough to understand !"):GOTO180
  280 W=FNgr(x$):IFW=5000PROCb("I nee
d a number in your question !"):GOTO1
80
  282 W1=FNwh(x$):IF W<>W1 PROCb("Onl
y ask about one number please"):GOTO1
80
  285 IF W>100PROCb("Number too big !
"):GOTO180
  290 IFW=0PROCb("Sorry. I can't deal

```

```

with zero"):GOTO180
  300 IF FNinstr(x$,"AND")>0OR FNinst
r(x$,"BUT")>0OR FNinstr(x$,"YET")>0OR
FNinstr(x$,"THOUGH")>0OR FNinstr(x$,
"WHILE")>0OR FNinstr(x$,"WITH")>0PROC
b("Only one question at a time !"):GO
TO180
  305 IF FNinstr(x$,"OR")>0AND FNinst
r(x$,"MORE")=0AND FNinstr(x$,"FACTOR"
)=0PROCb("Only one question at a time
!"):GOTO180
  307 IF(FNinstr(x$,"ISIT")>0OR FNins
tr(x$,"ITIS")>0)AND LEN(X$)<8 TAG=1:P
ROCeq:GOTO390
  310 IF FNinstr(x$,"GREATER")>0
OR FNinstr(x$,"MORE")>0OR FNinstr
(x$,"BIGGER")>0OR FNinstr(x$,"OVE
R")>0 TAG=1:iZ=1
  320 IF FNinstr(x$,"SMALLER")>0O
R FNinstr(x$,"LESSTHAN")>0OR FNinstr(
x$,"UNDER")>0 TAG=1:jZ=1
  330 IF FNinstr(x$,"DIVISIBLE")>0O
R FNinstr(x$,"DIVIDE")>0OR FNinstr(x$,
"SHARE")>0OR FNinstr(x$,"MULTIPLE")>0O
R FNinstr(x$,"FACTOR")>0 TAG=1:kZ=1
  340 IF(iZ+jZ)>1OR(iZ+kZ)>1OR(jZ+kZ)
>1)PROCb("Only one question at a time
!"):iZ=0:jZ=0:kZ=0:GOTO180
  350 IFiZ=1PROCmore
  360 IFjZ=1PROCsm
  370 IFkZ=1PROCsh
  390 Q=Q+1:iZ=0:jZ=0:kZ=0
  400 IF TAG=0 PROCnu
  410 PROCs:PROCsp(7)
  420 UNTIL Q=60ZOR ANS=TRUE
  430 IF ANS=FALSE PROCb("Oh dear ! Y
ou didn't get it. It was "+STR$N)
  440 ENDPROC
  450 DEF FNgr(x$):LOCAL q$:X=0:q$=""
:a=5000:REPEAT:G$=MID$(X$,LEN(X$)-X,1
):IF ASC(G$)>47 AND ASC(G$)<58 q$=G$+
q$
  460 X=X+1:UNTIL X=LEN(X$)OR(LEN(q$)
>0AND NOT(ASC(MID$(X$,LEN(X$)-X,1))>4
7 AND ASC(MID$(X$,LEN(X$)-X,1)<58))
  470 u=0:FOREX=48TO57:IFINSTR(X$,CHR
$EX)>0 u=1
  480 NEXT
  490 IF u=1 THEN a=VAL(q$) ELSE a=50
00
  500 =a
  510 DEFPROCeq:v=FNgr(x$):PROCc(0,7)
:IF N<>v PRINTTAB(0,2)"NO"ELSE PRINTT
AB(0,2)"YES! YOU'VE GOT IT"+O$+"YOU T
OOK ONLY "+STR$(Q+1)+" QUESTIONS":ANS
=TRUE
  520 ENDPROC
  530 DEFPROCsp(RX):COLOUR3:PRINTTAB(
0,RX)"Press space bar to continue":RE
PEAT:AZ=GET:UNTILAZ=32:PROCc(RX,RX):*

```

```

FX15,1
  540 ENDPROC
  550 DEFPROCsm:v=FNgr(x$):IF N<v PRI
NTTAB(0,5)"YES";SPC(37)ELSE PRINTTAB(
0,5)"NO";SPC38
  560 IF N<v THEN PROCsmg1 ELSE PROCs
mg2
  570 ENDPROC
  580 DEFPROCsh:v=FNgr(x$):IF N MOD v
=0 THEN PRINTTAB(0,5)"YES":PROCgrsh E
LSE PRINTTAB(0,5)"NO":PROCngrsh
  590 ENDPROC
  600 DEFPROCsmg1:PROCv:FORX=v TO 10
0:IFX<100 PRINT;SPC3; ELSE PRINT;SPC
4
  610 PROCZ:NEXT:ENDPROC
  620 DEFPROCsmg2:VDU31,0,10:FORX=1T
O v-1:PRINT;SPC3;:PROCZ
  630 NEXT:ENDPROC
  640 DEFPROCnu:Q=Q-1:PROCc(0,7):PRIN
TTAB(0,3)"I didn't understand you. Tr
y different " "words":ENDPROC
  650 DEFPROCgrid(fZ):COLOURfZ:VDU31,
0,10:FORX=1TO 100:IFX<10 PRINT;" "
;XZ; ELSE PRINT;" "XZ;
  660 PROCZ:NEXT:COLOUR2
  670 PRINTTAB(31,8)"GREATER":PRINTT
A(31,9)"THAN":PRINTTAB(31,11)"MORE TH
AN":PRINTTAB(31,13)"BIGGER":PRINTTAB(
31,14)"THAN":PRINTTAB(31,16)"OVER":PR
INTTAB(31,17)"SMALLER":PRINTTAB(31,18
)"THAN":PRINTTAB(31,20)"LESS THAN"
  680 PRINTTAB(31,21)"UNDER":PRINTTAB
(31,23)"DIVIDE":PRINTTAB(31,24)"SHARE
":PRINTTAB(31,25)"MULTIPLE":PRINTTAB(
31,27)"FACTOR":PRINTTAB(31,29)"IS IT"
:COLOUR3:ENDPROC
  690 DEFPROCv:IF(v MOD 10)=0 THEN VD
U 31,27,8+((v DIV 10)*2)ELSE VDU31,((
v MOD 10)-1)*3,10+((v DIV 10)*2)
  700 ENDPROC
  710 DEFPROCgrg2:VDU31,0,10:FORX=1T
O z:PRINT;SPC3;:PROCZ:NEXT:ENDPROC
  720 DEFPROCmore:z=FNgr(x$):TAG=1:IF
N>z THEN PRINTTAB(0,5)"YES";SPC(37):
PROCgrg2 ELSE PRINTTAB(0,5)"NO";SPC38
:PROCgrg1
  730 ENDPROC
  740 DEFPROCgrg1:IF (z MOD 10)=9 THE
N VDU 31,27,10+((z DIV 10)*2)ELSE VDU
31,((z MOD 10))*3,10+(((z+1) DIV 10)*
2)
  750 FORX=z+1 TO 100:IFX<100 PRINT
;SPC3; ELSE PRINT;SPC4
  760 PROCZ:NEXT:ENDPROC
  770 DEFPROCgrsh:IF C=3 PROC1:ENDPRO
C
  780 FORX=v TO 100 STEP v:COLOUR C:
VDU31,gZ(XZ,0),gZ(XZ,1):A$=FNREADCH(P
OS+2,VPOS):IF A$=" "THEN B20 ELSE 790

```



```

790 IF q>0 ANDg%(X%,2)=0 THEN 820 E
LSEB00
800 IFX%<10 PRINT;" ";X%; ELSE PRI
NT;" ";X%;
810 IFg%(X%,2)=0 THEN g%(X%,2)=1 E
LSE g%(X%,2)=2
820 NEXT
830 C=C+1
840 q=q+1:ENDPROC
850 DEFPROCngrsh:FORX%=v TO 100STEP
v:IFX%<100 PRINTTAB(g%(X%,0),g%(X%,1
));" "ELSE PRINTTAB(g%(X%,0),g%(X%,
1));" "
860 NEXT:ENDPROC
870 DEF FNREADCH(X,Y):LOCAL AX, LAST
X, LASTY, C
880 LASTX=POS:LASTY=VPOS:VDU31,X,Y:
AX=135:C=USR(&FFF4):C=C AND &FFFF:C=C
DIV &100
890 VDU31, LASTX, LASTY
900 =CHR$(C)
910 DEFPROCp
920 COLOUR C:IF X%<10 PRINT;" ";X%
; ELSE PRINT;" ";X%;
930 ENDPROC
940 DATA 0,10,3,10,6,10,9,10,12,10,

```

```

15,10,18,10,21,10,24,10,27,10,0,12,3,
12,6,12,9,12,12,12,15,12,18,12,21,12,
24,12,27,12
950 DATA 0,14,3,14,6,14,9,14,12,14,
15,14,18,14,21,14,24,14,27,14,0,16,3,
16,6,16,9,16,12,16,15,16,18,16,21,16,
24,16,27,16
960 DATA 0,18,3,18,6,18,9,18,12,18,
15,18,18,18,21,18,24,18,27,18,0,20,3,
20,6,20,9,20,12,20,15,20,18,20,21,20,
24,20,27,20
970 DATA 0,22,3,22,6,22,9,22,12,22,
15,22,18,22,21,22,24,22,27,22,0,24,3,
24,6,24,9,24,12,24,15,24,18,24,21,24,
24,24,27,24
980 DATA 0,26,3,26,6,26,9,26,12,26,
15,26,18,26,21,26,24,26,27,26,0,28,3,
28,6,28,9,28,12,28,15,28,18,28,21,28,
24,28,27,28
990 DEFPROCc(X%,Y%):FORS%=X%TOY%:PR
INTTAB(0,S%);SPC40:NEXT:ENDPROC
1000 DEFPROCI:GCDO,1:FORX%=v TO 100
STEP v:VDU31,g%(X%,0),g%(X%,1):A$=FN
READCH(POS+2,VPOS):MOVEg%(X%,0)*32,99
2-g%(X%,1)*32:IF A$=" "THEN 1030 ELSE
1010

```

```

1010 IF q>1 ANDg%(X%,2)<2 THEN 1030
ELSE 1020
1020 VDU5,32,224,224,4
1030 NEXT:VDU23;8202;0;0;0;:ENDPROC
1040 DEFPROCb(U%):PROCC(0,7):PRINTTA
B(0,2);U$:PROCCsp(7):ENDPROC
1050 DEFPROCc:PRINTTAB(0,30)"There a
re ";G%-Q;" questions left.":ENDPROC
1060 DEFPROCZ:IF POS>27 VDU13,10,10
1070 ENDPROC
1080 DEF FNch(x%):LOCAL T,C$,B$:B$="
":FOR T=1 TO LEN(x%):C$=MID$(x%,T,1):
IF C$>"Z"C$=CHR$(ASC(C$)-32)
1090 IF C$=" "ORC$=" "C$=" "
1100 B$=B$+C$:NEXT:=B$
2000 DEF FNwh(x%):LOCAL q$:X=0:q$="
":REPEAT:G$=MID$(x%,LEN(x%)-X,1):IF AS
C(G$)>47 AND ASC(G$)<58 q$=G$+q$
2010 X=X+1:UNTIL X=LEN(x%)
2030 u=0:FORE%=48TO57:IF INSTR(x%,CHR
$E%)>0 u=1
2040 NEXT
2050 IF u=1 THEN a=VAL(q$)
2060 =a
3000 DEF FNinstr(A$,B$)
3010 IF LEN(B$)>LEN(A$) THEN=0
3020 =INSTR(A$,B$)

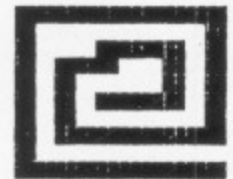
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£25

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**Guess the password and save your fellow citizens in PETER MUJTABA's word game**

# BRIDGE BREAKER

THE citizens of Beebsville live on an island in the North Sea. Their only link with the rest of civilisation is a small bridge. But it is constantly under attack from the dreaded Bug.

There is only one way to save the bridge from collapse. You must guess the password which will inactivate the Bug and hence save the bridge and the people who cross it.

To form the password you have to guess individual letters. If the password

contains a given letter the rate at which the bridge is being demolished will remain constant. If, however, the password does not contain the letter the rate of demolition will increase.

The passwords can be changed by

altering the words in the data statement at line 1130. If the number of words is altered change line 1090:

1090 FOR Q=1 TO RND(nnn)  
replacing *nnn* with the new number of words.

## PROCEDURES

**PROCINTRO**

Describes the game. Selects whether music is to be played. Selects level of difficulty.

**PROCASS**

Assembles CODE% which prints the man on the screen. Chooses random word.

**PROCWORD**

Sets up variables. Defines characters and envelopes. Draws bridge and water.

**PROCVAR**  
**PROCCHARS**

**PROCWALL**

Prints and moves ball.

**PROCBALL**

**PROCGUESS**

Determines whether the word contains a given letter. Plays a melody. Prints score on screen.

**PROCMUSIC**  
**PROCSCORE**

**PROCREAD**

Reads character at the current text position.

**PROCFALL**

Moves man downwards.

**PROCRID**

Deletes man when he reaches the end of bridge.

**PROCCORRECT**

Increases score. Sees if the word is complete.

**PROCWIN**

Greets winner and prints his score.

## VARIABLES

I%  
F%

Used as part of main loop. Determines whether music is to be played.

S%  
B%  
X%  
Y%  
H%

Score.  
Horizontal position of man.  
Horizontal position of ball.  
Vertical position of ball.

V%

Used to increase or decrease X%.

W%  
D%

Used to increase or decrease Y%.

Q

Lower limit of ball. Level of difficulty. Determines thickness of bridge.

L%  
E%

Used to select random word.

O%

Length of word. Used to see if word contains a given letter.

P%,G%

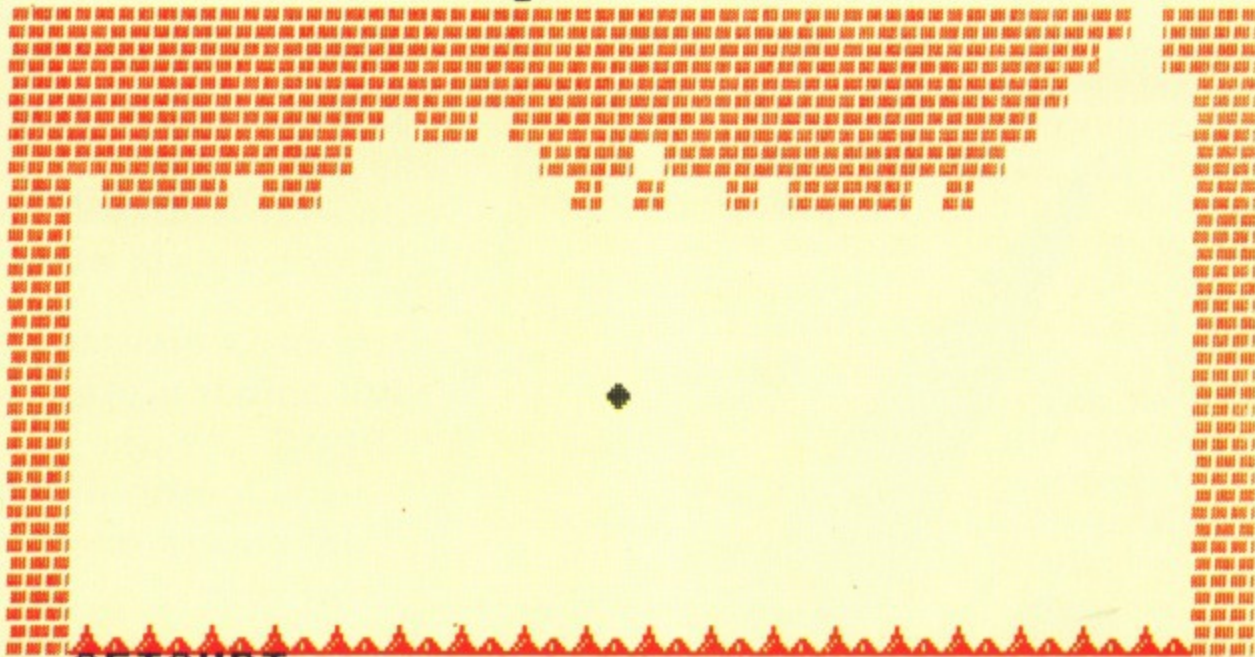
Horizontal position of used letters.

A%

Determine pitch of each note. Vertical position of man when falling.

The mystery word is I TIO A

Your score 2834



```

10 REM (c) Micro User
20 MODE7:PROCINTRO:MODE1
30 DIM MACX 500
40 PROCASS
50 RESTORE 1130
60 *FX11,0
70 VDU19,0,4,0,0,0,19,3,6,0,0,0,19
,1,2,0,0,0,28,0,31,39,0
80 COLOUR128:CLS:PROCWORD:RESTORE1
440:PROCVAR:PROCCHARS:PROCWALL
90 FOR IX=0 TO 3
100 PROCBALL
110 L$=INKEY$(1)
120 IF L$(<)"PROCGUESS
130 NEXT
140 IF FX=1 PROCMUSIC
150 SX=SX-1:PROCScore
160 VDU31,BX,11:PROCREAD:IF C=32 PR
OCFALL:GOTO 80
170 VDU31,BX,8:CALL CODEX:BX=BX-1
180 IF BX=0 BX=36:SOUND0,-15,50,5:V
DU31,1,8:PROCRID
190 GOTO 90
200 DEFPROCBALL
210 COLOUR2:VDU31,XX,YY,32:XX=XX+HX
:YY=YY+VX:VDU31,XX,YY:AX=135
220 PROCREAD
230 IF C<>32 THEN VX=1:SOUND1,1,150
,3
240 IF XX=37 HX=-1:YY=YY-1
250 IF XX=2 HX=1
260 IF WX>27 WX=27
270 IF YX>WX VX=-1
280 IF YX=11 VX=1
290 VDU31,XX,YY,226
300 ENDPROC
310DEFPROCVAR
320 OX=2:VX=-1:HX=1:XX=RND(20):YY=R
ND(5)+14:BX=36:WX=26:SZ=2000:GX=0
330ENDPROC
340DEFPROCCHARS
350 ENVELOPE1,0,0,0,0,0,0,120,-1,
-1,-2,100,100
360 ENVELOPE2,3,0,0,0,0,0,121,-1,
-1,-1,80,70
370VDU23,228,&1,&2,&7,&3,&1,&3,&3,&
7
380VDU23,229,&C0,&E0,&E0,&E0,&C0,&E
0,&70,&7C
390VDU23,230,&E,&1F,&7B,&73,&7,&F,&
3E,&3E
400VDU23,231,&FE,&F7,&F3,&17,&F6,&7
6,&70,&78
410VDU23,232,&38,&30,&B0,&F0,&0,&0,
&0,&0
420VDU23,233,&78,&38,&38,&18,&18,&1
8,&58,&78
430VDU23,234,&6,&B,&1F,&F,&E,&1F,&3
F,&3B
440VDU23,235,&0,&0,&0,&0,&0,&B0,&C0
,&E0
450VDU23,236,&7B,&7F,&5F,&5F,&58,&7
F,&1D,&3D
460VDU23,237,&E0,&A0,&A0,&A0,&A0,&B
0,&C0,&C0
470VDU23,238,&3D,&38,&38,&30,&30,&3
0,&F0,&E0
480VDU23,239,&FC,&FC,&C,&C,&0,&0,&0
,&0
490VDU23,224,0,123,123,123,0,247,24
7,247
500VDU23,225,0,239,239,239,0,189,18
9,189
510 VDU23,240,0,8,8,28,20,46,95,255
520 VDU23,241,0,0,0,0,24,44,110,255
530VDU23,226,0,24,60,126,126,60,24,
0
540 VDU23,227,255,255,255,255,255,2

```

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```

55,255,255
550BRICK$=CHR$(224)+CHR$(225)
560 WAVE$=CHR$(240)+CHR$(241)
570VDU23;B202;0;0;0;
580ENDPROC
590DEFPROCWALL
600 COLOUR1:PRINTTAB(2,6)"Your score is"
610 FOR Y=11 TO 12+DX
620FOR T=0 TO 38 STEP 2
630 COLOUR1
640PRINTTAB(T,Y)BRICK$
650 COLOUR3
660 PRINTTAB(T,29)WAVE$
670NEXT T
680NEXT Y
690 COLOUR1
700 FOR Y=12+DX TO 29
710 PRINTTAB(0,Y)BRICK$
720 PRINTTAB(38,Y)BRICK$
730 NEXT Y
740ENDPROC
750DEFPROCASS
760 CODEX=MACX+1
770 NUMX=MACX+2
780 ?NUMX=1
790 FOR PASS=0 TO 2 STEP 2
800 PX=CODEX
810[OPT PASS
820 LDA#17:JSR&FFEE:LDA#1:JSR&FFEE
830 LDA NUMX
840 CMP#1:BEQ FIRX
850 JSR TWOX
860RTS
870 .FIRX
880 LDA#6:JSR&FFEE
890 LDA#228:JSR&FFEE:LDA#229:JSR&FFEE:LDA#32:JSR&FFEE:JSR&BACX
900 LDA#230:JSR&FFEE:LDA#231:JSR&FFEE:LDA#32:JSR&FFEE:JSR&BACX
910 LDA#232:JSR&FFEE:LDA#233:JSR&FFEE:LDA#32:JSR&FFEE
920 LDA#3:STA NUMX
930RTS
940.TWOX
950 LDA#6:JSR&FFEE
960 LDA#234:JSR&FFEE:LDA#235:JSR&FFEE:LDA#32:JSR&FFEE:JSR&BACX
970 LDA#236:JSR&FFEE:LDA#237:JSR&FFEE:LDA#32:JSR&FFEE:JSR&BACX
980 LDA#238:JSR&FFEE:LDA#239:JSR&FFEE:LDA#32:JSR&FFEE
990 LDA#1:STA NUMX
1000RTS
1010 .BACX
1020 LDA#8:JSR&FFEE:LDA#8:JSR&FFEE:LDA#8:JSR&FFEE:LDA#10:JSR&FFEE
1030 RTS
1040]
1050NEXT
1060ENDPROC
1070DEFPROCWORD
1080 RESTORE 1130:MX=0
1090 FOR Q=1 TO RND(32)
1100READ WORD$
1110NEXT Q
1120 LX=LEN(WORD$):A$=STRING$(LX,"-"):COLOUR3:PRINTTAB(3,3)"The mystery word is "":PRINTTAB(24,4)" "":COLOUR 1:PRINTTAB(24,4)A$:RESTORE 1440
1130 DATA SHY,WHY,HOLD,TIMETABLE,GAME,MARMALADE,COLOUR,EQUILIBRIUM,CIVILIZATION,FORMAL,EUROPE,AMERICA,TODAY,ZOO,ZIP,LOCOMOTION,TRANSISTOR,PLANT,HOUSE,HORSE,BRUISE,BEGIN,CACTUS,LEAFLET,DICTIONARY,KEY,CASSETTE,RECORD,EAR,DRUM,APPLE,PEAR,
1140ENDPROC
1150DEFPROC GUESS
1160 G=LEN(L$)
1170 FOR E%=1 TO LX
1180 VDU31,E%+23,3:PROCREAD
1190 IF MID$(WORD$,E%,G)=L$ AND C(>A)SC(L$) THEN PROCCORRECT
1200NEXT
1210 *FX21,0
1220 W%=W%-1
1230 COLOUR2
1240 PRINTTAB(0X,30)L$
1250 0X=0X+1
1260 IF 0X>38 0X=0
1270ENDPROC
1280DEFPROCCORRECT
1290 COLOUR3:PRINTTAB(E%+23,3)L$:SX=SX+200:MX=MX+1
1300 IF MX=LX THEN PROCWIN
1310 PROCSCORE
1320 WX=WX+1
1330 ENDPROC
1340DEFPROCSCORE
1350 PRINTTAB(13,6)SX
1360ENDPROC
1370DEFPROCREAD
1380C=USR(&FFF4)
1390C=C AND &FFFF
1400C=C DIV &100
1410ENDPROC
1420ENDPROC
1430 DEFPROC MUSIC
1440 DATA69,81,97,69,81,97,69,81,97,81,69,81,97,69,81,97,81,97,89,81,73,89,101,89,101,73,89,101,89,73,89,73,81,97,109,97,109,97,81,69,73,81,89,97,101,109,97,101,89,97,101,89,97,101,89,97,81,69,81,0,0
1450 READ PX
1460 IF PX=0 RESTORE1440:GX=GX+(RND(
1)*96-48):GOTO 1450
1470 SOUND&12,2,PX+GX,1
1480 SOUND&11,2,PX+GX+1,1
1490 ENDPROC
1500DEFPROCRIID
1510VDU32,32,10,127,127,10,32,32
1520ENDPROC
1530DEFPROCFALL
1540 SX=0
1550 PROCSCORE
1560 VDU31,B%,8,32,32,32
1570 FOR AX=8 TO 25
1580VDU31,B%,AX,32,32,8,8,10
1590CALL CODEX
1600 SOUND1,-15,100-(AX*4),1
1610NEXT AX
1620 VDU31,B%,26:PROCRID
1630 SOUND0,-15,6,8
1640 PRINTTAB(10,20)"The word was "
;WORD$
1650 FOR X=0 TO 10000:NEXT
1660 *FX21,0
1670ENDPROC
1680DEFPROCWIN
1690 FOR X=0 TO 5000:NEXT
1700CLS
1710 COLOUR3:PRINTTAB(8,7)"Your Score is "":SX
1720 COLOUR1:PRINTTAB(8,10)"--- CONGRATULATIONS ---"
1730 PRINTTAB(0,15)"You have saved the bridge from collapse"
1740 PRINTTAB(5,20)"PRESS 'TAB' FOR ANOTHER GAME"
1750 IF INKEY(-97) THEN 1760 ELSE 1750
1760 CLS
1770 L$=" "
1780 PROCWORD:RESTORE1440:PROCVAR:PROCWALL
1790ENDPROC
1800DEFPROCINTRO
1810 PRINTTAB(10,5) CHR$(130);CHR$(141);"Bridge Breaker"
1820 PRINTTAB(10,6) CHR$(130);CHR$(141);"Bridge Breaker"
1830 PRINTTAB(1,16)"The object of this game is to guess the word before the bridge is knocked down.Points are scored for each correct letter.A wrong letter increases the rate at which the bridge is D
EMOLISHED !"
1840 INPUTTAB(5,10)"Do you want music (Y/N) "A$
1850 IF A$="Y" FX=1 ELSE FX=0
1860 PRINTTAB(7,12)"( 4 is easy )"
1870 INPUTTAB(2,10)"Please enter difficulty level(1 TO 4)"DX
1880ENDPROC

```

THE idea for developing this game came from witnessing the frustration of very young children who want to play computer games but can't coordinate the number of fingers required.

Snap requires the player to press only one key – apart from the choices at the start to set the level. However because of the different levels of play possible it should provide a challenge for all the family.

It is an educational game, as shape recognition is an important pre-reading skill. It uses enlarged versions of the character shapes on the keyboard.

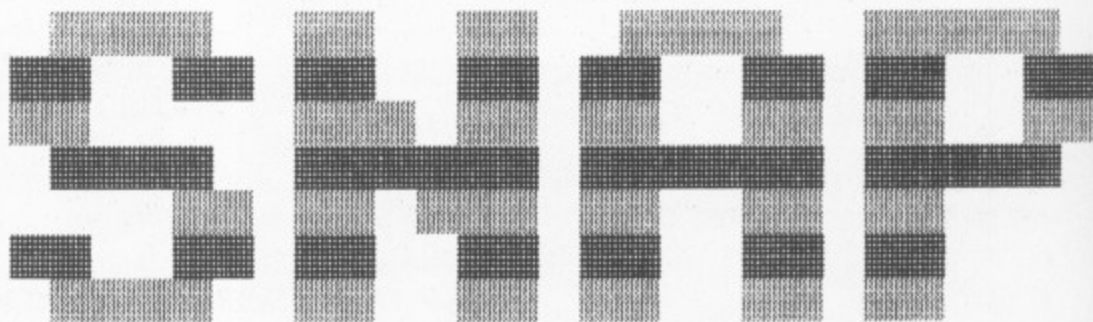
The player is asked to input an initial reaction time of one to five seconds and then to state whether he or she wants this to speed-up or to stay constant.

The speed-up option causes the reaction time available for “snapping” to decrease by 0.1 seconds each go until it reaches a minimum value of 0.4 seconds.

The constant reaction time option is really provided for any child who cannot understand that having mastered the skill required for this game it gets progressively harder rather than easier!

Next, a character set is chosen. Set

## Learn pre-reading skills with this shape recognition game from JOHN TISSANDIER



One is the 26 small letters, Set Two the capital letters and Set Three all the characters available, including numbers and punctuation marks.

Finally there is a sound on or off option.

The idea of the game is to snap any identical pairs of characters that appear.

There are five points for a snap, and

one point every time the characters are different and the player doesn't react.

The player loses a life if he or she misses a snap or reacts when there isn't one. The player has three lives, represented by the squares under the title.

The diminishing line in the centre of

### VARIABLES

char\$ Characters in title.  
char 1%, char 2% Ascii values of characters to be displayed.  
change TRUE if player wants to change speed, sound, and so on.  
d% Pass on delay in seconds to PROCwait (d%).  
du% Duration of notes in tune.  
def% Definition of character to be displayed.  
get\$ Player's response to various choices.  
high% High score.  
lives% Number of lives left, initially three.  
m\$ Text of messages displayed at the bottom of the screen.  
m% Number of message to be displayed.  
ml% Memory location of character definition in ROM.  
p1%, p2% Pitch of notes in tune.  
quit TRUE if player wishes to end program.  
range% One of the variables that determines the character set. For letters it is 26.  
react TRUE if the player has pressed spacebar.  
rt% Reaction time.  
set% Character set chosen by player.  
stime% Start reaction time.  
start% The other variable that determines the character set. For capital letters it is 64 . . . . +RND(26).  
score% Score.  
sup\$ Speed up, yes or no?  
vol% If sound\$ = "y" then vol% = 1, that is, sound on, else vol% = 0.

```

10 REM SNAP
20 REM J.M TISSANDIER
30 REM (c) Micro User 1984
40 MODE1
50 PROCinit
60
70 REPEAT
80 PROCinstruct
90 PROClevel
100 PROCscreen
110 REPEAT
120 PROCinitgame
130 REPEAT
140 PROCinitgo
150 PROCcharacters
160 PROCreact
170 PROCscore
180 UNTIL livesZ=0
190 PROChigh
200 PROCend
210 UNTIL change OR quit
220 UNTIL quit
230 END
240
250 DEFPROCinit
260 rZ=RND(-TIME)
270 ENVELOPE 1,1,0,0,0,50,25,25,12
,-1,-1,-1,90,30

```

the screen indicates how much time is left. Pressing the spacebar when the time line is not showing results in no action.

During the game the program responds with appropriate messages and sounds.

The program consists of three nested REPEAT...UNTIL loops.

The innermost loop sets up and implements each go. It repeats until the player has no more lives.

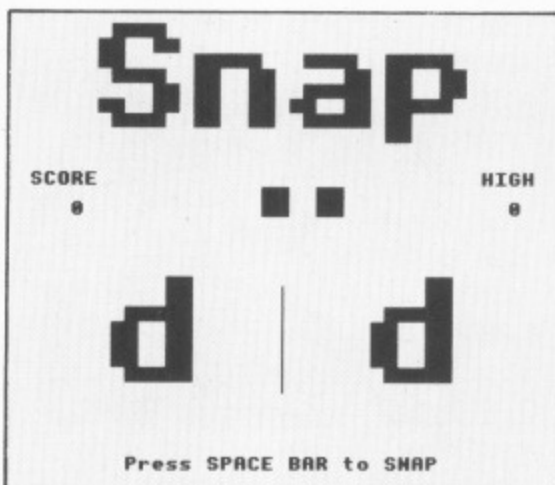
The middle loop sets up each new game and repeats until the player wishes to change the speed or character set, etc.

The outer loop gives the instructions and sets the level. It repeats until the player quits the program.

The names given to the procedures make their purpose fairly clear.

PROCcharacters randomly chooses two characters to display. PROCdisplay places them on the screen with the parameters *c%* as the Ascii code of the character, *x%* and *y%* the coordinates, and *col%* the colour.

The procedure works out the memory location in ROM of the definition of a character. The outer loop (*k%*) reads the eight bytes that make up the eight



rows of the character.

For each row (or byte) the inner loop (*l%*) checks each bit in turn to see whether it is 0 or 1 by "ANDing" with  $2^{l\%}$  (such as 1, 2, 4, 8, 16, 32, 64, 128).

If the answer is TRUE then the character has a 1 (that is, a pixel on) at that point and CHR\$(255) - defined in the program as a solid block - is printed on the screen in the appropriate position.

Notice also line 1200 which produces the stripes in the title.

## MODIFICATIONS

- The minimum reaction time is set at 40/100 seconds and the rate of decrease at 10/100 seconds. These can both be changed at line 1020.

- The frequency of snaps is set very simply by line 1080.

```
IF RND(3) = 2 THEN char2%
= char1%
```

The frequency can be increased or decreased by changing the random number.

- As set up, changing level does not zero the high score. If this is preferred, add line 645 *high% = 0*.

- The purpose of having a constant time option has already been explained. The trouble is that if the initial time is set high the game has no natural end apart from boredom!

Therefore, line 180 could be altered to:

```
UNTIL lives% = 0 OR score%
= some set limit
```

perhaps input at the start with the other options.

```
280 ENVELOPE 2,1,70,16,2,2,0,0,126,
0,0,-126,126,126
290 ENVELOPE 3,1,0,0,0,0,0,0,126,-4
0,-100,126,100
300 ENVELOPE 4,1,0,0,0,0,0,0,126,-1
0,-5,126,0
310 VDU23,255,255,255,255,255,255,2
55,255,255
320 VDU19,3,6,0,0,0
330 *FX9,5
340 *FX10,5
350 *FX229,1
360 @X=04
370 highX=0
380 quit=FALSE
390 volX=1
400 ENDPROC
410
420 DEFPROCinstruct
430 RESTORE 2380
440 PROCtitle(4)
450 PROCmusic : PROCwait(2)
460 PRINT"" If the two characters
displayed are the same, press the
space bar."
470 PRINT"" You have three lives.
You lose a life if you miss a SNAP,
or if you react when there is no SNAP.
```

```
480 PRINT"" You score five points
for a SNAP and one point every time
the characters are different and you
don't react."
490 PRINT"" Every round the react
ion time is reduced by 0.1 secon
ds, down to a minimum of 0.4 seconds. A
lternatively, you can keep the time
fixed."
500 ENDPROC
510
520 DEFPROClevel
530 PROCfc(1)
540 FOR lX=0 TO 3
550 PROCmessage(lX)
560 IF lX=0 THEN stimeX=VAL(FNget("
12345"))
570 IF lX=1 THEN sup$(FNget("YyNn"
))
580 IF lX=2 THEN setX=VAL(FNget("12
3"))
590 IF lX=3 THEN sound$(FNget("YyN
n"))
600 NEXT
610 IF setX=3 THEN rangeX=94 ELSE r
angeX=26
620 startX=(4-setX)*32
```

```
630 IF sound$="Y" OR sound$="y" THE
N volX=1 ELSE volX=0
640 change=FALSE
650 ENDPROC
660
670 DEFPROCtitle(colX)
680 PROCfc(0)
690 FOR lX=0 TO 3
700 READ char$
710 PROCdisplay(ASC(char$),5+7*lX,1
,colX)
720 NEXT
730 ENDPROC
740
750 DEFPROCscreen
760 CLS
770 RESTORE 2390
780 PROCtitle(1)
790 COLOUR3
800 PRINT TAB(1,11);"SCORE"
810 PRINT TAB(34,11);"HIGH"
820 PRINT TAB(33,13) highX
830 VDU24,0;0;1279;544;
840 ENDPROC
850
860 DEFPROCinitgame
870 PROCfc(0)
```

From Page 55

```

880 rt%=stime%*100
890 lives%=3
900 score%=0
910 PROCscore
920 FOR l%=0 TO 2
930 PROCdisplay(46,l%*4+11,7,3)
940 NEXT
950 ENDPROC
960
970 DEFPROCinitgo
980 CLG
990 VDU19,2,0,0,0,0
1000 PROCmessage(4)
1010 GCOL0,3:MOVE624,200:DRAW624,480
1020 IF (sup%="Y" OR sup%="y") AND r
t%>40 THEN rt%=rt%-10
1030 react=FALSE
1040 ENDPROC
1050
1060 DEFPROCcharacters
1070 char1%=FNrandchar
1080 IF RND(3)=2 THEN char2%=char1%
ELSE char2%=FNrandchar
1090 PROCdisplay(char1%,6,18,2)
1100 PROCdisplay(char2%,25,18,2)
1110 ENDPROC
1120
1130 DEFFNrandchar
1140 =(start%+RND(range%))
1150
1160 DEFPROCdisplay(c%,x%,y%,col%)
1170 LOCAL k%,l%,m%,def%
1180 IF col%<4 THEN COLOUR col%
1190 FOR k%=0 TO 7
1200 IF col%=4 THEN COLOUR (k% MOD 2
)+1
1210 m%=&BF00+c%*8
1220 def%=m%?k%
1230 FOR l%=0 TO 7
1240 IF def% AND 2^l% THEN PRINT TAB
(7+x%-1%,y%+k%);CHR$(255)
1250 NEXT,
1260 ENDPROC
1270
1280 DEFPROCreact
1290 SOUND1,1*vol%,1,2
1300 *FX21,0
1310 VDU19,2,3,0,0,0
1320 TIME=0
1330 REPEAT
1340 IF INKEY(-99) THEN react=TRUE
1350 GCOL0,0
1360 MOVE624,480:DRAW 624,480-INT(28
0*TIME/rt%)
1370 UNTIL TIME>rt% OR react
1380 IF char1%=char2% AND react THEN
PROCsnap

```

```

1390 IF char1%=char2% AND NOT react
THEN PROCmiss
1400 IF char1%<>char2% AND react THE
M PROCjumpy
1410 IF char1%<>char2% AND NOT react
THEN score%=score%+1
1420 ENDPROC
1430
1440 DEFPROCsnap
1450 VDU19,1,15,0,0,0
1460 SOUND0,-15*vol%,4,4
1470 PROCwait(1)
1480 VDU19,1,1,0,0,0
1490 score%=score%+5
1500 ENDPROC
1510
1520 DEFPROCmiss
1530 PROCmessage(6)
1540 SOUND1,2*vol%,97,20
1550 PROCwait(1)
1560 lives%=lives%-1
1570 ENDPROC
1580
1590 DEFPROCjumpy
1600 PROCmessage(5)
1610 FOR l%=131 TO 81 STEP-5
1620 SOUND 0,-15*vol%,3,1
1630 SOUND 1,0,l%,1
1640 NEXT
1650 PROCwait(1)
1660 lives%=lives%-1
1670 ENDPROC
1680
1690 DEFPROCscore
1700 COLOUR3
1710 PRINT TAB(1,13) score%
1720 IF lives%<3 THEN PROCdisplay(46
,19-4*lives%,7,0)
1730 ENDPROC
1740
1750 DEFPROChigh
1760 IF score%>high% THEN high%=scor
e%
1770 COLOUR3
1780 PRINT TAB(33,13) high%
1790 ENDPROC
1800
1810 DEFPROCend
1820 CLG
1830 PROCmusic
1840 COLOUR2
1850 PRINTTAB(10,19);"B A M E   D V
E R"
1860 PROCwait(2)
1870 PROCmessage(7)
1880 PROCfc(1)
1890 ans%=FNget("AaCcQq")
1900 IF ans%="A" OR ans%="a" THEN CL
6 ELSE CLS
1910 IF ans%="C" OR ans%="c" THEN ch

```

```

ange=TRUE
1920 IF ans%="Q" OR ans%="q" THEN qu
it=TRUE
1930 ENDPROC
1940
1950 DEFPROCmessage(m%)
1960 LOCAL x%
1970 IF m%=0 THEN m%="Choose start t
ime in seconds (1-5) "
1980 IF m%=1 THEN m%="Speed-up (Y/N)
?"
1990 IF m%=2 THEN m%="Choose charact
er set (1-3) "
2000 IF m%=3 THEN m%="Sound (Y/N)?"
2010 IF m%=4 THEN m%="Press SPACE BA
R to SNAP"
2020 IF m%=5 THEN m%="Look again!"
2030 IF m%=6 THEN m%="Wake up!"
2040 IF m%=7 THEN m%="A-another gam
e C-change Q-quit "
2050 x%=19-INT(LEN(m%)/2)
2060 COLOUR3
2070 PRINTTAB(2,30);STRING$(34," ")
2080 PRINTTAB(x%,30);m%;
2090 ENDPROC
2100
2110 DEFFNget(string%)
2120 REPEAT
2130 get%=GET$
2140 UNTIL INSTR(string%,get%)
2150 =get%
2160
2170 DEFPROCmusic
2180 IF vol%=0 THEN ENDPROC
2190 RESTORE 2410
2200 FOR l%=0 TO 7
2210 READ p1%,p2%,du%
2220 SOUND &201,3,p1%,du%
2230 SOUND &202,4,p2%,du%
2240 SOUND &203,3,p2%-48,du%
2250 NEXT
2260 ENDPROC
2270
2280 DEFPROCfc(o%)
2290 REM Flashing cursor.
2300 VDU23,1,o%;0;0;0;
2310 ENDPROC
2320
2330 DEFPROCwait(d%)
2340 t%=TIME
2350 REPEAT UNTIL TIME>t%+100*d%
2360 ENDPROC
2370
2380 DATA S,N,A,P
2390 DATA S,n,a,p
2400
2410 DATA 129,97,10,109,97,10
2420 DATA 117,101,10,137,101,10
2430 DATA 129,97,7,137,101,3
2440 DATA 125,89,10,129,97,15

```



42

# Aim for the target number

MANIPULATION is a compulsive, thought provoking maths game. It can form the basis for hours of useful work, both in the classroom and the home.

Concerned with number bonds up to 100, the pupil is given a target figure, and then three other figures with which to reach that target.

The player can use the expressions +, -, \* and /, together with brackets if necessary.

For example, if you were presented with target number:

42

and the figures:

3 2 16

you could enter:

$3 * (16 - 2)$

To make life simpler, fractional answers are not allowed.

A valuable feature of the program is that it may not be able to reach the target exactly with the three figures supplied.

In this case, you have to enter the combination of signs, figures and brackets that will allow you to get nearer the target.

This prompts players to look for alternative strategies for getting there.

For example, if the target figure above were 44, not 42, which of the following would be correct?

$3 * (16 - 2)$

or:

$3 * 16 + 2$

or something else?

The micro gives the player 30 seconds to think about the answer while it randomly guesses the answers and stores its best result.

At the end of this period, the player has another 15 seconds to type in the answer. Both player and micro are awarded 100 points each, less the difference between the target figure and their answer for each try.

The player is awarded an additional bonus of five points for a direct hit, and a penalty of one point per second for taking too long in answering.

The game ends when either the micro or the player reaches a score of 1,000.

+

\*

## PROCEDURES

- INITIALISE** Positions picture on screen of TV, safeguards accidental breaking and lists program, runs program if key f0 is hit, disables auto repeat, switches off cursor, dimensions arrays, variables for teletext colour codes, initialises total micro score and total player score.
- INSTRUCTION** Gives option of skipping this procedure.
- HEADLINE** Prints in double height.
- CENTRALISE** Centralises print on screen.
- DECISION** Accepts YES or NO.
- PAGE** Waits for space bar hit before continuing.
- PRINT** Collects text from DATA and prints on screen.
- RANDOMISE** Randomises four numbers for the game.
- DISPLAY** Displays these numbers on screen.
- WAIT** Delays continuation.
- MANIPULATE** Gives micro 30 seconds to make random guesses at answer.
- TIMER** Gives visual and audible time display.
- TIME-UP** Indicates end of time with ascending arpeggio.
- INPUT** Accepts input and calculates time taken to enter it.
- CHECK ERROR** Checks input for errors.
- CALCULATE** Informs of errors in listing or play: Restarts program if Escape is pressed.
- COMPARE SCORE** Calculates input equation and prints result on screen.
- END** Prints micro's best effort. Prints player and micro scores up to date. Player can take as long as desired to compare micro result with his/her own before continuing.
- DATA** Concludes game when either score reaches 1,000 and gives option for another game. Data for screen text. Notice pairs of quotes within a string (line 1960). Also single quotes can be printed from DATA provided they don't come at the beginning or end of the string.

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\*All packages require 32k memory

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From Page 57

```

10 REM (c) Micro User
30 ON ERROR GOTO 120
40 PROC_INITIALIZE:PROC_INSTRUCTIO
N
50 REPEAT PROC_RANDOMIZE
60 PROC_DISPLAY(N,R(1),R(2),R(3))
70 PROC_MANIPULATE:PROC_INPUT
80 PROC_CHECK:PROC_CALCULATE
90 PROC_COMPARE:PROC_SCORE
100 UNTIL TCS>999 OR TPS>999
110 PROC_END:REPEAT UNTIL 0
120 PROC_ERROR
160 DEF PROC_INITIALIZE
170 *TV255
180 *KEY100LD:M:INL:IM
190 *KEY0:DRUN:IM
200 *FX11,0
210 VDU 23:8202:0:0:0;
220 DIM R(3),R$(3),F$(2),I$(3),I(3)
230 R$=CHR$129:G$=CHR$130:Y$=CHR$13
1:M$=CHR$133:C$=CHR$134:F$=CHR$136
240 TCS=0:TPS=0
250 ENDPROC
270 DEF PROC_INSTRUCTION:CLS
280 PROC_HEADLINE(2,Y$+"Manipulatio
n"):PROC_WAIT(2)
290 PROC_CENTRALIZE(5,G$+"Do you wi
sh instruction (Y/N)?"):PROC_DECISIO
N:IF NOT Y THEN 450
300 PRINT"....."
310 PROC_PRINT(4,C$,10)
320 PRINT"....." For example"
330 PROC_PAGE:PROC_DISPLAY(84,29,3,
1)
340 PROC_WAIT(5)
350 PRINT':PROC_PRINT(5,C$,0)
360 PRINT M$+ " - * /"C$"and the bra
ckets"M$( )"
370 PROC_WAIT(10)
380 PRINT" Example (29-1)*3";
390 PROC_WAIT(5):PRINT G$ ("=84")
400 PROC_PAGE
410 PRINT:PROC_PRINT(6,C$,10)
420 PRINT':PROC_PRINT(3,R$,10)
430 PRINT':PROC_PRINT(6,G$,10)
440 PROC_WAIT(10)
450 PROC_CENTRALIZE(21,M$+"When you
are ready to play_ ")
460 PROC_PAGE
470 PROC_HEADLINE(10,Y$+"Enjoy your
game ")
480 PROC_WAIT(2):CLS
490 ENDPROC
510 DEF PROC_HEADLINE(T,S$)
520 S$=CHR$141+S$+" "
530 FOR L=T TO T+1
540 PROC_CENTRALIZE(L,S$)

```

```

550 NEXT
560 ENDPROC
580 DEF PROC_CENTRALIZE(T,S$)
590 PRINT TAB(INT((40-LEN(S$))/2),T
)S$
600 ENDPROC
620 DEF PROC_DECISION
630 REPEAT G=GET
640 UNTIL G=78 OR G=89 OR G=110 OR
G=121
650 IF G=78 OR G=110 Y=0 ELSE Y=-1
660 ENDPROC
680 DEF PROC_PAGE:PROC_WAIT(2)
690 PROC_CENTRALIZE(23,Y$+" PRESS S
PACE BAR TO CONTINUE ")
700 REPEAT UNTIL GET=32:CLS
710 ENDPROC
730 DEF PROC_PRINT(S,C$,W)
740 IF S=1 PRINT TAB(0); ELSE PRINT
TAB(10);
750 FOR L=1 TO S:READ D$:PRINT C$;D
$
760 NEXT:PROC_WAIT(W)
770 ENDPROC
790 DEF PROC_RANDOMIZE
800 N=RND(100):R(1)=RND(50)
810 R(2)=RND(20):R(3)=RND(10)
820 ENDPROC
840 DEF PROC_DISPLAY(N1,N2,N3,N4)
850 N$=STR$(N2)+STRING$(10,"")+STR
$(N3)+STRING$(10,"")+STR$(N4)
860 PRINT'STRING$(40,"*")
870 PROC_HEADLINE(3,Y$+STR$(N1)+ "
")
880 PROC_CENTRALIZE(8,G$+N$+" ")
890 PRINT'STRING$(40,"*")
900 ENDPROC
920 DEF PROC_WAIT(W)
930 FOR L=1 TO W*1000:NEXT
940 ENDPROC
960 DEF PROC_MANIPULATE
970 HD=1000:TIME=0:HP=0
980 PRINT TAB(5,23)STRING$(30,"*")
990 REPEAT PROC_TIMER
1000 FOR L=1 TO 3
1010 R=RND(3):H=R(L):R(L)=R(R):R(R)=
H
1020 NEXT
1030 FOR L=1 TO 2
1040 R=RND(4):F$(L)=MID$("+*/",R,1)
1050 NEXT
1060 FOR L=1 TO 3
1070 R$(L)=STR$(R(L))
1080 NEXT
1090 A$="(+R$(1)+F$(1)+R$(2)+)" +F$
(2)+R$(3):A=EVAL(A$):CD=ABS(N-A)
1100 IF INT(A)<>A THEN 1120
1110 IF CD<HD HD=CD:HA$=A$:HA=A
1120 UNTIL TIME>3000

```

```

1130 ENDPROC
1150 DEF PROC_TIMER
1160 P=(TIME DIV 100)*4
1170 IF P>HP SOUND 1,-12,P,1:HP=P
1180 PRINT TAB(4,22)R$ TAB(TIME/100+
5,22)"*"
1190 ENDPROC
1210 DEF PROC_TIME_UP
1220 FOR P=120 TO 252 STEP 12
1230 SOUND 1,-12,P,1
1240 NEXT
1250 ENDPROC
1270 DEF PROC_INPUT:PROC_TIME_UP
1280 REPEAT PRINT TAB(0,13)C$:
1290 INPUT"YOUR ANSWER ",I$
1300 VDU 7:E=EVAL(I$)
1310 IF INT(E)<>E T=TIME:PRINT F$:R$
"EQUATION RESULTS IN A FRACTION":PROC
_WAIT(5):PRINT TAB(12,13)SPC(67)TAB(0
,14)R$"TRY AGAIN":TIME=T
1320 UNTIL INT(E)=E
1330 IF TIME>4500 P=INT((TIME-4500)/
100):PRINT F$:R$"YOU TOOK TOO LONG TO
ANSWER "R$ " PENALTY ";P" POINTS" EL
SE P=0
1340 ENDPROC
1360 DEF PROC_CHECK:LOCAL M$:B$=I$
1370 FOR BU=1 TO 3:L=LEN(B$)+1
1380 FOR B=2 TO L
1390 M$=MID$(B$,B,1)
1400 IF M$="+"OR M$="-"OR M$="*"OR M
$="/"OR M$=""I$(BU)=LEFT$(B$,B-1):HB
=B:B=L
1410 LI=LEN(I$(BU))-1
1420 IF LEFT$(I$(BU),1)="(" I$(BU)=R
IGHT$(I$(BU),LI) ELSE IF RIGHT$(I$(BU
),1)=")" I$(BU)=LEFT$(I$(BU),LI)
1430 NEXT
1440 B$=RIGHT$(B$,L-HB-1)
1450 NEXT
1460 FOR L=1 TO 3:I(L)=VAL(I$(L))
1470 IF I(L)=R(1)OR I(L)=R(2)OR I(L)
=R(3) THEN 1510
1480 PRINT':RESTORE 1940
1490 PROC_PRINT(1,F$+R$,0)
1500 PROC_ERROR:L=3
1510 NEXT
1520 IF I(1)+I(2)+I(3)<>R(1)+R(2)+R(
3) PRINT':RESTORE 1950:PROC_PRINT(1,F
$+R$,0):PROC_ERROR
1530 ENDPROC
1550 DEF PROC_ERROR
1560 IF ERR=17 THEN 1600
1570 REPORT:PRINT" at line #";ERL
1580 RESTORE 1960:PROC_PRINT(5,M$,0)
1590 END
1600 PRINT'TAB(7)"We will restart th

```

## From Page 59

e game."

```

1610 PROC_WAIT(10):RUN
1620 ENDPROC
1640 DEF PROC_CALCULATE:B=0
1650 T=VAL(I$):PD=ABS(N-T)
1660 IF PD=0 B=5:PRINT F$;G$"BDNUS "
;B" POINTS"
1670 PRINT TAB(23,13)"=";T (";PD" O
FF)"
1690 ENDPROC
1700 DEF PROC_COMPARE
1710 PRINT "C$MY ANSWER ";HA$="";HA
" (";HD" OFF)"
1720 ENDPROC
1740 DEF PROC_SCORE
1750 CS=100-HD:PS=100-PD-P+B
1760 TCS=TCS+CS:TPS=TPS+PS
1770 PRINT M$MY SCORE",CS," YOURS "
,PS" TOTAL",TCS," ",TPS:PROC_PAGE
1780 ENDPROC
1800 DEF PROC_END:D=TCS-TPS

```

```

1810 IF D<=0 PROC_CENTRALIZE(5,C$+"W
ELL DONE ")

```

```

1820 IF D>0 S$="I beat you by "+STR$(
D)+" points"ELSE IF D<0 S$="You "+b
eat me by "+STR$(-D)+" points" ELSE S
$="It was a dead heat"

```

```

1830 PROC_CENTRALIZE(10,C$+S$+" ")
1840 PROC_HEADLINE(15,G$+"Another Ga
me (Y/N)? ")

```

```

1850 PROC_DECISION
1860 IF Y RUN ELSE PROC_CENTRALIZE(2
0,Y$+"THANK YOU FOR PLAYING ")

```

```

1870 ENDPROC
1890 DATA The Random Number Generato
r, will pick a number between 1 and 1
00;, then 3 more random numbers:,
1_50; 1_20; 1_10.

```

```

1900 DATA The object then is to try
to, get as close as you can to the fir
st, number by making an equation of
the, others with the addition of
the, arithmetical functions

```

```

1910 DATA The computer will give you
, 30 seconds to think about your ans

```

wer, in which time it will be making its, own calculations. When the ascending, tone ends you have another 15 seconds, to type in your equation.

1920 DATA DO NOT INCLUDE THE EQUALS, SIGN OR THE TOTAL IN YOUR EQUATION ., THE COMPUTER WILL DO THIS FOR YOU!

1930 DATA If your equation results in, a fraction it will be disallowed.,

A penalty of 1 point per second will, be imposed if you take more than 15, seconds after the tone stops to enter, your equation.

1940 DATA YOU HAVE USED AN INCORRECT NUMBER

1950 DATA YOU HAVE NOT USED THE CORRECT NUMBERS

1960 DATA (IF ERROR MESSAGE READS, ""No such variable at line #1300"" , YOU MAY HAVE MADE AN ILLEGAL EN TRY)., Press KEY f0 to restart or BREAK KEY, to list.

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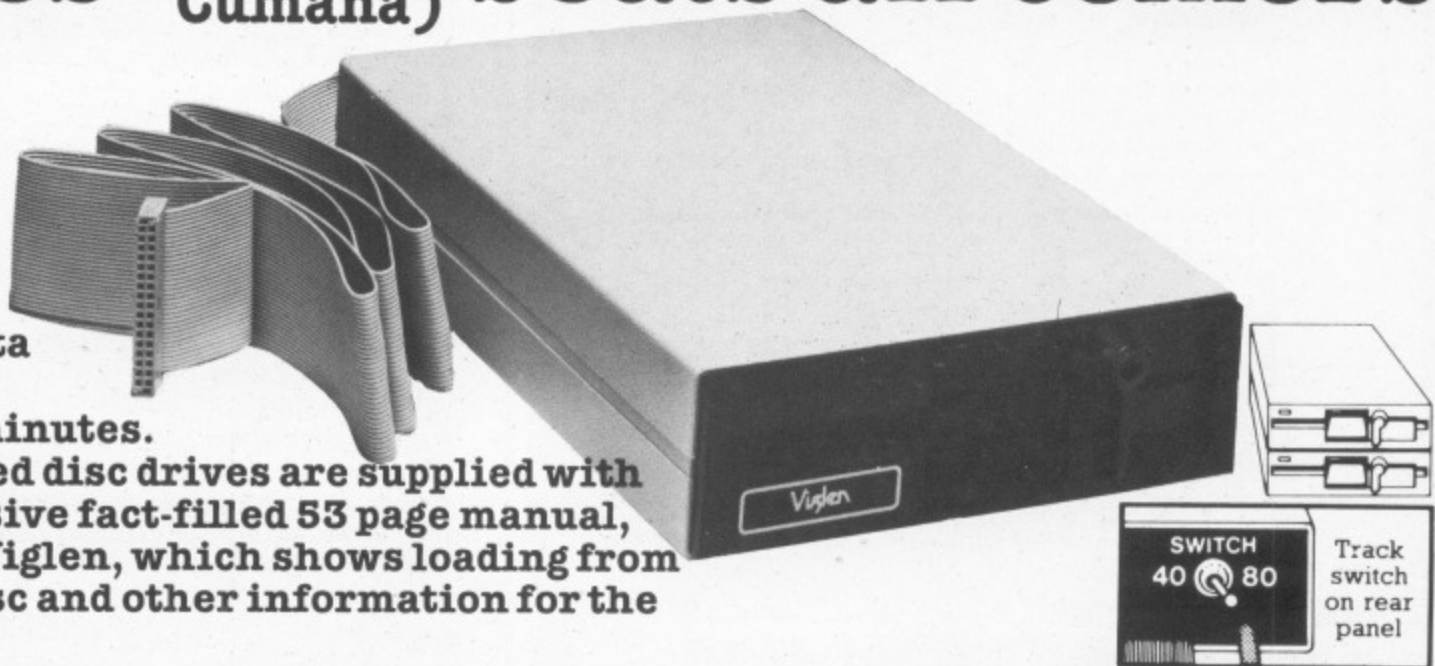


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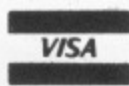
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# Playing around with matrices

By  
ALAN  
SOUTHALL

IN the March 1984 issue of *The Micro User* we looked at some ways of handling arrays on the BBC Micro. We can extend these ideas from one dimensional arrays to two dimensional arrays – called matrices.

Basic already has tools for setting up matrices via the DIM statement, and we can use this to set up a matrix like this:

**DIMmatrix(5,10)**

which would give us a numeric array with 66 entries. Remember that the first parameter runs from 0 to 5 and the second from 0 to 10 giving us a  $6 \times 11 = 66$ .

However, there are inherent difficulties with this as Basic does not allow the dimension of an array to be changed once it has been set up, and is not very helpful in manipulating these beasts.

Why, you may well ask, would we want to play around with these matrices at all?

The answer is quite simply that apart from their appearance on the maths syllabus at many schools, they have many applications in science, economics and many other unrelated fields.

For example, we may have a matrix which details how many units we used each quarter on gas, electricity and rates. We may then also have another matrix which contains as its elements the cost per unit of each of these commodities for each quarter.

It is then possible to combine these to tell us how much we have actually paid for each quarter.

There are several well defined rules for manipulating matrices. To start with, we will refer to a matrix as having size  $m$  by  $n$ , if it has  $m$  rows and  $n$  columns.

For example a  $2 \times 3$  matrix might look like:

$$\begin{pmatrix} 3 & 1 & 4 \\ -2 & 0 & 7 \end{pmatrix}$$

We define addition of matrices only if those involved are exactly the same size, that is, the same number of rows and columns. If the two matrices were both  $m \times n$ , then the resulting matrix will also be  $m \times n$ .

To find out what the entries are in this

resultant matrix, we just add the corresponding elements in the other two matrices.

For example:

$$\begin{pmatrix} 3 & 1 & 4 \\ -2 & 0 & 7 \end{pmatrix} + \begin{pmatrix} 1 & 3 & -1 \\ 5 & 1 & 6 \end{pmatrix} = \begin{pmatrix} 4 & 4 & 3 \\ 3 & 1 & 13 \end{pmatrix}$$

Similarly, we may subtract matrices of the same size from one another.

We can also multiply them together, though this is slightly more complex. They do not have to have exactly the same size, but instead we insist that the number of columns in the first matrix must be equal to the number of rows in the second.

So for example, we may multiply a matrix of size  $m \times n$  by a matrix of size  $n \times p$ . Strictly we multiply the  $n \times p$  by the  $m \times n$  matrix as the order is important.

The resultant matrix here is size  $m \times p$ . Hence we have:

$$(m \times n) \times (n \times p) = (m \times p)$$

How do we work out what the elements are in the resulting matrix? This is the hard part, as we must perform a sum.

If we wish to find out what the element in the  $i$ th row and the  $j$ th column of the resultant matrix is, we look at the  $i$ th row of the first matrix, and at the  $j$ th column of the second matrix.

We then imagine ourselves walking along this row and down the column simultaneously, and we multiply the corresponding elements and sum these results to give us our entry.

For example:

$$\begin{matrix} \rightarrow & \begin{pmatrix} 3 & 1 & 4 \\ -2 & 0 & 7 \end{pmatrix} \\ \times & \begin{pmatrix} 1 & 5 & 2 \\ 3 & 1 & 4 \\ -1 & 6 & 7 \end{pmatrix} \\ & \downarrow \end{matrix}$$

which will give a corresponding matrix result:

$$\begin{pmatrix} 2 & 40 & 38 \\ -9 & 32 & 45 \end{pmatrix}$$

For example, the element (2,3) is

worked out as  $-2 \times 2 + 0 \times 4 + 7 \times 7 = 45$

If that has still left you confused, try running the program a few times and look at the results.

One last operation you can perform on the matrices is to transpose them, that is, all the rows and all the columns are interchanged. A matrix which was previously  $5 \times 3$  will become  $3 \times 5$ , and the second row in the original matrix will now be the second column in the new matrix.

How do we achieve this on the BBC micro? As mentioned previously, Basic is averse to tampering with matrices, so we must bypass the DIM statement and choose our own methods for storing the matrices.

This is simpler to achieve than it might appear, though we shall only consider those matrices whose entries are integers, for reasons that will become apparent.

Acorn gave us some powerful tools when they designed the BBC micro, in particular those of indirection operators.

If we consider the operation of the ! operator, this allows us to address four bytes anywhere in memory, and you may recall that the BBC micro stores integers in sections of memory four bytes long.

It is therefore not difficult to see how we may place integers in memory. We only need to take care of where everything is stored. We must exercise great care though, as BBC Basic is very greedy and uses up memory wherever it feels like for different kinds of storage.

In effect, we cheat and fool Basic into thinking that its upper memory bound is lower than usual, which we do by reducing the value of HIMEM to a lower level – even though this clears nearly 22k of memory for us to use.

Basic is not allowed in there, so we may put our matrix elements in this space without fear of corruption from Basic.

The program detailed allows the use of up to 26 matrices, which are accessed

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by name, though these names are restricted to being lower case single letters.

A Basic array *where%* helps us find out where our matrices lie in memory and their size.

The first element of each array starts at its starting address and successive memory locations contain the other elements working along each row in turn.

A function *FNfetch(vno,i,j)* uses this information to fetch the (i,j)th element out of matrix number vno.

Several commands are allowed to manipulate the matrices. On running the program a "#" sign will appear on the screen. This is the input prompt. Use Return to terminate all inputs.

Entering a single letter will display the matrix associated with that letter if it's present. If not define it as shown below. As long as the matrix has reasonably sized entries these values will be

presented on the screen in a standard form.

To add two matrices together we type  $a + b$ , and similarly we have commands  $a - b$  and  $a * b$ . Note the spaces between the matrix names and the operator. The program expects these, so its  $a + b$  not  $a+b$ .

Such commands will automatically display their result, though we may elect instead to store the result in a matrix, which will suppress printing.

We may of course see this result by just typing the letter of the resulting variable. For example:  $a = b * c$

In order to transpose a matrix we enter:

**trans c**

*As usual, we may assign this value to some other variable.*

Typing:

**vars**

will result in the presentation of a list of current matrices together with their sizes.

When we wish to set up a new matrix,

we can type say:

**f set**

for matrix *f* and we would then be asked for details of its size and then for its elements, which again are entered in standard format.

This would, of course, be the first thing we'd do on running the program, so it has some matrixes to work with.

For the more adventurous, try adapting the program to cope with floating point numbers – even though this in general will take up more than four bytes and require more careful manipulation of memory.

You need not use standard floating point format, so long as you use a consistent way of putting numbers into memory and then extracting them.

Another possible improvement would be to include some form of garbage disposal to use when clearing variables or reassigning them, simply by altering the starting locations of existing variables and shifting the appropriate portion of memory down.

```

10 REM (C) The Micro User
20 REM by Alan Southall
40 ONERROR PROCerror(999)
50 *TV255
60 MODE7
70 DIMwhere%(26,3)
80 HIMEM=TOP+2500
90 spare=HIMEM
100 A$=STRING$(255," ")
110 lop$=A$:rop$=A$:ass$=A$
120 *FX202,48
140 REPEAT
150 INPUTLINE"#" "A$
160 GOSUB 230
180 UNTIL A$="stop"
190 *FX202,32
200 END
210 REM*****
220 REM*****
230 IF A$="" THEN RETURN
231 IF LENA$(1) AND A$="a" AND A$(1)="
z" THEN res=ASC(A$)-96:PROCdis(res):R
ETURN
232 IF LENA$(4) THEN PROCerror(1):R
ETURN
240 err=FALSE
250 IF A$="vars" PROCvars:RETURN
260 lop$="":rop$="":ass$="":res:=0:
resj:=0:res=0
270 assig=INSTR(A$," = ")
280 IF assig>0 ass$=LEFT$(A$,assig-1
):A$=RIGHT$(A$,LENA$-assig-2)
290 mult=INSTR(A$," * ")
300 add=INSTR(A$," + ")
310 sub=INSTR(A$," - ")
311 IF LENA$(7) THEN trans=0:GOTO329
320 trans=INSTR(A$,"trans ")
329 IF LENA$(5) THEN set=0:GOTO350
330 set=INSTR(A$," set")
350 IF mult>0 lop$=LEFT$(A$,mult-1):
rop$=MID$(A$,mult+3,1)
360 IF add>0 lop$=LEFT$(A$,add-1):ro
p$=MID$(A$,add+3,1)
370 IF sub>0 lop$=LEFT$(A$,sub-1):ro
p$=MID$(A$,sub+3,1)
380 IF trans>0 rop$=MID$(A$,trans+6,
1)
390 IF set>0 ass$=LEFT$(A$,set-1):A$
=RIGHT$(A$,LENA$-set-3)
400 IF LENA$(1) res=ASC(A$)-96:IF res<1
OR res>26 PROCerror(1):RETURN
420 IF lop$>" " lno=ASC(lop$)-96 ELSE
lno=0
430 IF rop$>" " rno=ASC(rop$)-96 ELSE r
no=0
440 IF ass$>" " anc=ASC(ass$)-96 ELSE an
c=0
450
460 IF lno<0 OR lno>26 PROCerror(1):R
ETURN
470 IF rno<0 OR rno>26 PROCerror(1):R
ETURN
480 IF anc<0 OR anc>26 PROCerror(1):R
ETURN
500 IF mult>0 PROCmult(lno,rno):GOTO
560
510 IF add>0 PROCadd(lno,rno,1):GOTO
560
520 IF sub>0 PROCadd(lno,rno,2):GOTO
560
530 IF trans>0 PROCtrans(rno):GOTO56
0
540 IF set>0 assig=1:PROCset:GOTO560
550 IF res<1 GOTO590
560 where%(0,1)=spare:where%(0,2)=r
esi:where%(0,3)=resj
570 IF assig>0 PROCassig ELSE IF NOT
err PROCdis(res)
590 RETURN
600 REM*****
610 DEF FNfetch(vno,i,j)
620 startad=where%(vno,1)
630 maxi=where%(vno,2)
640 ad=startad+4*(i-1+maxi*(j-1))
650 =!ad
670 DEF PROCadd(l,r,siq)
680 lmaxi=where%(l,2):lmaxj=where%(
l,3)
690 rmaxi=where%(r,2):rmaxj=where%(
r,3)
700 IF lmaxi<>rmaxi OR lmaxj<>rmaxj P
ROCerror(2):ENDPROC
720 FOR J%=1 TO lmaxj
730 FOR I%=1 TO lmaxi
740 a=FNfetch(l,I%,J%)
750 b=FNfetch(r,I%,J%)
760 IF siq=1 c=a+b
770 IF siq=2 c=a-b
780 offset=4*(I%-1+maxi*(J%-1))
790 spare!offset=c
800 NEXT: NEXT
810 resi=lmaxi:resj=lmaxj
820 ENDPROC
830 REM*****
840 DEF PROCmult(l,r)

```



```

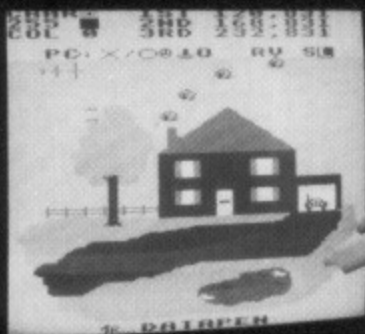
850 lmaxi=where%(1,2):lmaxj=where%(
1,3)
860 rmaxi=where%(r,2):rmaxj=where%(
r,3)
870 IFlmaxi(<)rmaxj PROCerror(2):END
PROC
880 resi=rmaxi:resj=lmaxj
890 FORJ%=1TOresj
900 FORI%=1TOresi
910 sum%=0
920 FORK%=1TOlmaxi
930 a%=FNfetch(1,K%,J%)
940 b%=FNfetch(r,I%,K%)
950 c%=a%*b%
960 sum%=sum%+c%
970 NEXT
980 offset=4*(I%-1+resi*(J%-1))
990 spare!offset=sum%
1000 NEXT:NEXT
1020 ENDPROC
1030 REM*****
1040 DEFPROCassig
1050 where%(ano,1)=spare
1060 where%(ano,2)=resi
1070 where%(ano,3)=resj
1080 spare=spare+4*resi*resj
1090 ENDPROC
1100 REM*****
1110 DEFPROCdis(n)
1120 startad=where%(n,1)
1130 IFstartad=0 ENDPROC
1140 lmaxi=where%(n,2)
1150 lmaxj=where%(n,3)
1160 FORJ%=1TOlmaxj
1170 FORI%=1TOlmaxi
1180 a=FNfetch(n,I%,J%)
1190 PRINTTAB(6*I%-4);a;
1200 NEXT:PRINT:NEXT
1210 ENDPROC
1230 REM*****
1240 DEFPROCset
1250 CLS:PRINTCHR$(ano+96)
1260 INPUT'TAB(10)"Rows : "resj,TAB(
25,VPOS-1)"Cols : "resi
1270 FORJ%=1TOresj
1280 FORI%=1TOresi
1290 INPUTTAB(6*I%-4,5+2*J%)c%
1300 offset=4*(I%-1+resi*(J%-1))
1310 spare!offset=c%
1320 NEXT:NEXT
1330 ENDPROC
1340 REM*****
1350 DEFPROCerror(N)
1360 err=TRUE
1370 IFN=1 PRINT"Illegal Variable ":
ENDPROC
1380 IFN=2 PRINT"Wrong size ":ENDPRO
C
1390 IFN=999 REPORT:PRINT" at ";ERL:
GOTO140
1400 ENDPROC
1410 REM*****
1420 DEFPROCtrans(r)
1430 maxi=where%(r,2):maxj=where%(r,
3)
1440 FORJ%=1TOmaxj
1450 FORI%=1TOmaxi
1460 a=FNfetch(r,I%,J%)
1470 offset=4*(J%-1+maxj*(I%-1))
1480 spare!offset=a
1490 NEXT:NEXT
1500 resi=maxj:resj=maxi
1510 ENDPROC
1520 REM*****
1530 DEFPROCvars
1540 FORI%=1TO26
1550 IFwhere%(I%,1)=0 GOTO1570
1560 PRINTCHR$(I%+96);" ";whe
re%(I%,3);" X ";where%(I%,2)
1570 NEXT
1580 ENDPROC

```

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R.P. STONE helps iron out a few learning difficulties for six year olds

# Reveal the hidden mystery of mapping maths!

**HIDDEN Answers** was written in response to a cry for help from my youngest daughter aged six.

She was having difficulty understanding a maths learning technique called mapping maths being used at her school.

A short chat to her teacher revealed the hidden mysteries of the technique and hence this program.

When in use it has no pretensions to being anything other than a practice method, but nevertheless it has proved an interesting programming exercise.

The technique basically involves the drawing of two pentagons. In the left one are inserted five numbers. The right one is left blank.

Part of a simple mathematical formula is then written at the top of the page (such as "+6") and, taking each of the five source numbers in turn, the pupil works out the answer, writes it in one of the segments of the right hand pentagon and connects the source number to the answer with a line.

The micro takes the place of the teacher (only in the program, I hasten to add) and randomly generates the source numbers, and the mathematical formula.

The answers are then computed and allocated random positions in the answer pentagon. Note that the range of source numbers, the mathematical constant and the selection of the mathematical operator are governed by a difficulty level selection.

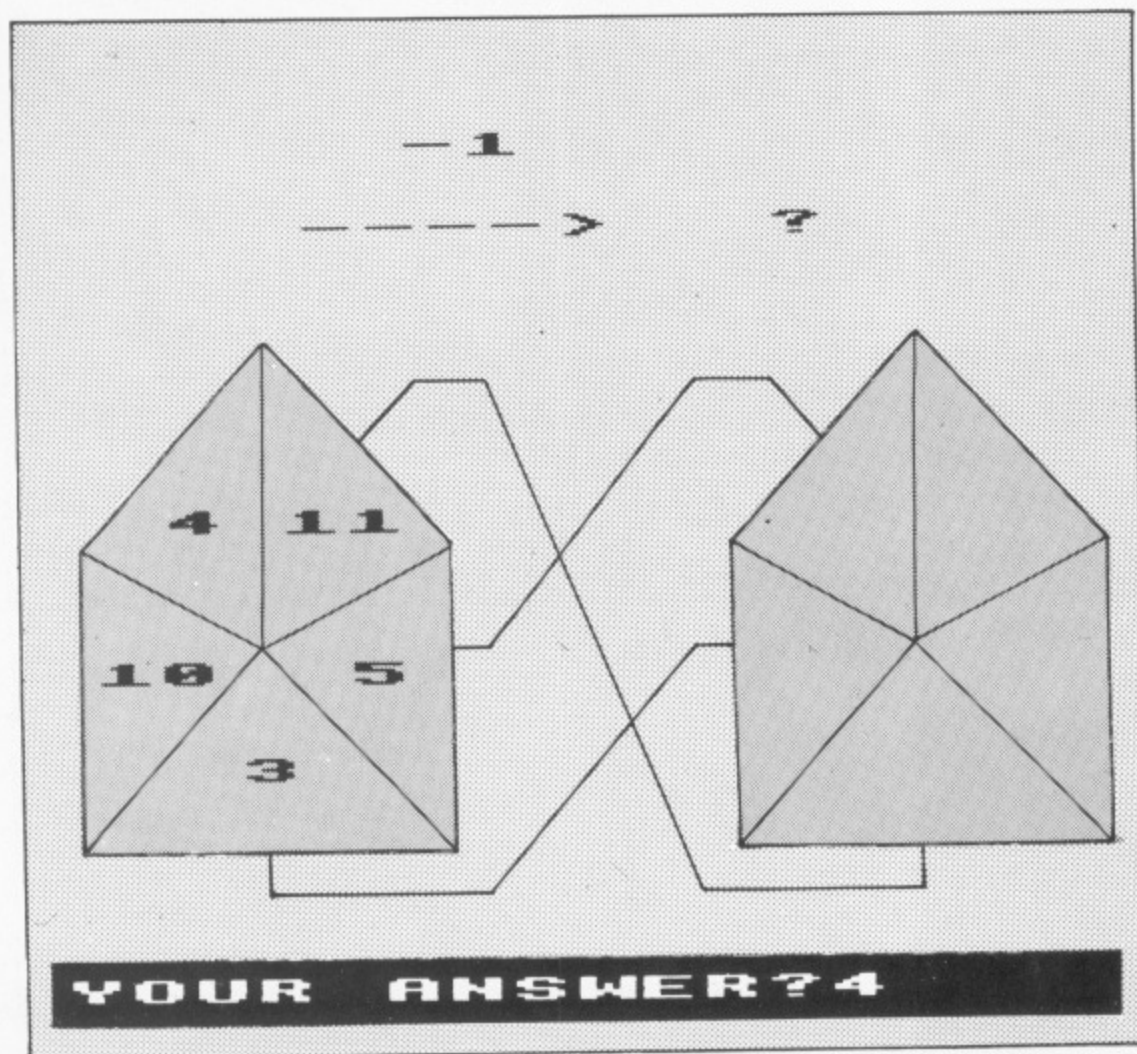
The screen is then set up with the source numbers written in the source pentagon, the formula written at the top of the screen and the answer pentagon coloured blue.

It will soon become apparent why Mode 2 had to be used, even though the number of different colours used is limited.

In order to ask the question, the micro flashes one of the segments in the source pentagon to show which number is to be used first. A text screen opens up at the bottom and prompts for an answer.

When the answer is input, the micro starts to draw the connecting line from the source segment towards the answer pentagon. If the answer is incorrect, the line stops half way and an appropriate sound is generated to signify a wrong answer.

The text window then prompts for a second try. If the answer is correct, however, the line connecting the source number to the segment in the answer pentagon containing the answer is



completed.

The colour of the answer segment is also changed to yellow revealing the hidden answer and congratulatory sounds and a message are given.

It can be seen that a total of 10 logical colours are therefore necessary to fill in the two pentagons. Initially the five in the source pentagon are given actual colour yellow and the five in the answer pentagon are given the actual colour blue.

When asking a question the source segment is given the actual colour

flashing yellow/blue and restored to its original yellow when the question/answer/evaluate sequence is completed.

When a correct answer is given, the actual colour of the relevant answer segment is changed to yellow.

If the pupil gets the answer wrong twice, the text window gives the correct answer, the answer segment stays blue and the next source number is considered.

When all five exercises have been completed, a score sheet is shown giving the number of correct answers,

difficulty level, and percentage score. To get 100 per cent the pupil must get five answers correct at difficulty level three.

He or she is then given the chance to have another go.

The concept of the program is simple – aren't all the best concepts simple? – but my daughter has enjoyed using it and now has no problem with the technique in school. In fact she has fewer problems with her maths altogether.

## PROCEDURES

<b>INTRO</b>	Displays title screen and accepts input of selected difficulty level.	
<b>GINIT</b>	Sets remaining logical colours to their initial values, plots infill to the two polygons using PLOT 85 command and then calls PROC POLY to draw two pentagonal frames around infill.	
<b>POLY NINIT</b>	Draws frames to the two polygons. First sets array Available ( ) equal to zero, randomly selects maths operator and range of source numbers and constant are determined by the value of the Difficulty Level, D1. Two values are given: Ra and Rb. Ra is used for multiplication exercises, otherwise Rb is used. The procedure then randomly selects source numbers and the constant. Checks are inserted that will repeat these selections if negative answers are likely to result. EVAL is then used to compute the five answer numbers and these are randomly allocated positions (Aloc( )) in the answer polygon. The array Available ( ) is used to check availability of each randomly generated allocation. Finally values are set for coordinates for printing the answers.	third of line connecting source to answer. The text window is set up next, a prompt is printed asking for a second attempt (if Wrong = 0) or giving the correct answer (if Wrong = 1) and an appropriate noise is made using ENVELOPE 1. (Wrong is initially set to zero on entering PROCsum and is changed to 1 after first call of PROCWRONG).
<b>WRITE</b>	Using VDU5 the source numbers, mathematical equation, arrow and query are printed on screen. VDU5 is necessary to "fine-tune" positions of the large Mode 2 characters.	
<b>MIN</b>	Determines minimum value of all source numbers to enable a check against negative answers (used in PROCNINIT).	
<b>SUM</b>	Selects each source segment in turn, changes relevant actual colour to flashing yellow/blue with VDU19, sets up a text window with VDU28 and prompts for an answer. The reply is then tested and PROCRIGHT or PROCWRONG is called. On returning to PROCsum, the source sector colour is restored to yellow with VDU19 and the next source number is selected.	
<b>WRONG</b>	The default windows are first restored, then depending on location of source number under consideration, appropriate PROCDRAW procedure is called to draw first	<b>RIGHT</b> Essentially similar to PROCWRONG except that after drawing first third of connecting line, the value of Aloc ( ) determines which PROCDRAW procedure is called to draw last third of line. The middle third is then drawn connecting the two free ends whose coordinates were set in the PROCDRAW procedures that were called. Using VDU19 and current value of Aloc ( ) the colour of relevant answer segment is then changed to yellow. A VDU5 command is combined with VDU19 and answer is then precisely printed in the now yellow segment using coordinates set in PROCNINIT. VDU4 separates text window while a congratulatory sound is generated using ENVELOPE 2. A "correct" message is then printed in text window and RIGHT is increased by 1. ABORT is set to 1 to indicate that program must now pass onto next source number.
		<b>DRAW 1 to DRAW 10</b> Draw first and last thirds of the five connecting lines. The lines are drawn in steps accompanied by a sound using ENVELOPE 3. A delay is inserted after each sound to pause the line drawing stages while the sounds are completed. At end of each procedure, coordinates of the free end of line are set.
		<b>SCORE</b> Computes scores and displays score screen (Mf = multiplying factor to convert number correct to percentage score Pge). An option is then given to have another go.
		<b>ENVELOPE DELAY</b> Sets three Envelopes used. Controls pauses used in PROCDRAW 1-10.
		<b>END</b> Displays finish screen.

From Page 67

```

10 REM HIDDEN ANSWERS
15 REM (c) Micro User
20 MODE2
30 DIMSource(5),Answer(5),Available(5),Aloc(5),X(5),Y(5)
40 VDU19,10,1,0;19,12,6,0;19,13,4,0;
50 PROCINTRO
60 REPEAT
70 PROCGINIT
80 PROCNINIT
90 PROCENVELOPE
100 PROCWRITE
110 PROCSUM
120 PROCSCORE
130 UNTIL X$="N"
140 PROCEND
150 END
151 DEFPROCINTRO
152 COLOUR140:COLOUR13
153 CLS
154 PRINT TAB(3,7);"HIDDEN ANSWERS"
155 PRINT TAB(3,8);"-----"
156 COLOUR10
157 PRINT TAB(7,13);"Choose";TAB(5,15);"Difficulty";TAB(7,17);"Level";TAB(6,19);"(1,2or3)"
158 INPUT TAB(9,22),D1
159 ENDPROC
160 DEFPROCBINIT
161 VDU19,0,3,0;19,1,3,0;19,2,3,0;19,3,3,0;19,4,3,0;19,5,4,0;19,6,4,0;19,7,4,0;19,8,4,0;19,9,4,0;19,11,0,0;19,14,3,0;
170 COLOUR140
190 CLS
200 GCOL0,4
210 MOVE300,700
220 MOVE100,500
230 PLOT85,300,400
240 GCOL0,3
250 PLOT85,100,200
260 GCOL0,2
270 PLOT85,500,200
280 MOVE300,400
290 GCOL0,1
300 PLOT85,500,500
310 GCOL0,0
320 PLOT85,300,700
330 GCOL0,9
340 MOVE1000,700
350 MOVE800,500
360 PLOT85,1000,400
370 GCOL0,8
380 PLOT85,800,200
390 GCOL0,7
400 PLOT85,1200,200

```

```

410 MOVE1000,400
420 GCOL0,6
430 PLOT85,1200,500
440 GCOL0,5
450 PLOT85,1000,700
460 GCOL0,11
470 PROCPOLY(300,700)
480 PROCPOLY(1000,700)
490 ENDPROC
500 DEFPROCPOLY(X,Y)
510 MOVEX,Y
520 DRAWX-200,Y-200
530 DRAWX-200,Y-500
540 DRAWX+200,Y-500
550 DRAWX+200,Y-200
560 DRAWX,Y
570 ENDPROC
580 DEFPROCNINIT:OK=0
585 FOR N=1 TO 5:Available(N)=0:NEXT
T
590 Sum=RND(3)
595 IF D1=1 Ra=6:Rb=12:Mf=12 ELSE IF D1=2 Ra=12:Rb=12:Mf=16 ELSE Ra=12:Rb=20:Mf=20
600 IF Sum=1 Sum$="+" ELSE IF Sum=2 Sum$="-" ELSE IF Sum=3 Sum$="*"
610 IF Sum=3 Range=Ra ELSE Range=Rb
615 REPEAT
620 FOR A=1 TO 5
630 Source(A)=RND(Range)
640 NEXT
650 PROCMIN
660 T=TIME
670 REPEAT
680 IF TIME>(T+300) RUN
690 CONSTANT=RND(Range)
700 UNTIL (Sum$="+" OR Sum$="*" OR (Sum$="-" AND CONSTANT<MIN)) OR TIME>(T+300)
705 IF Sum$="+" OR Sum$="*" OR (Sum$="-" AND CONSTANT<MIN) OK=1
706 UNTIL OK=1
710 FOR A=1 TO 5
720 Answer(A)=EVAL(STR$(Source(A))+Sum$+STR$(CONSTANT))
730 FLAG=0
740 REPEAT
750 Choice=RND(5)
760 IF Available(Choice)=0 Position=Choice:Available(Choice)=1:FLAG=1
770 UNTIL FLAG=1
780 Aloc(A)=Position
790 NEXT
800 X(1)=1040:Y(1)=540:X(2)=1040:Y(2)=400:X(3)=940:Y(3)=240:X(4)=840:Y(4)=400:X(5)=840:Y(5)=540
810 ENDPROC
820 DEFPROCWRITE:VDU5
830 GCOL0,10:MOVE340,540

```

```

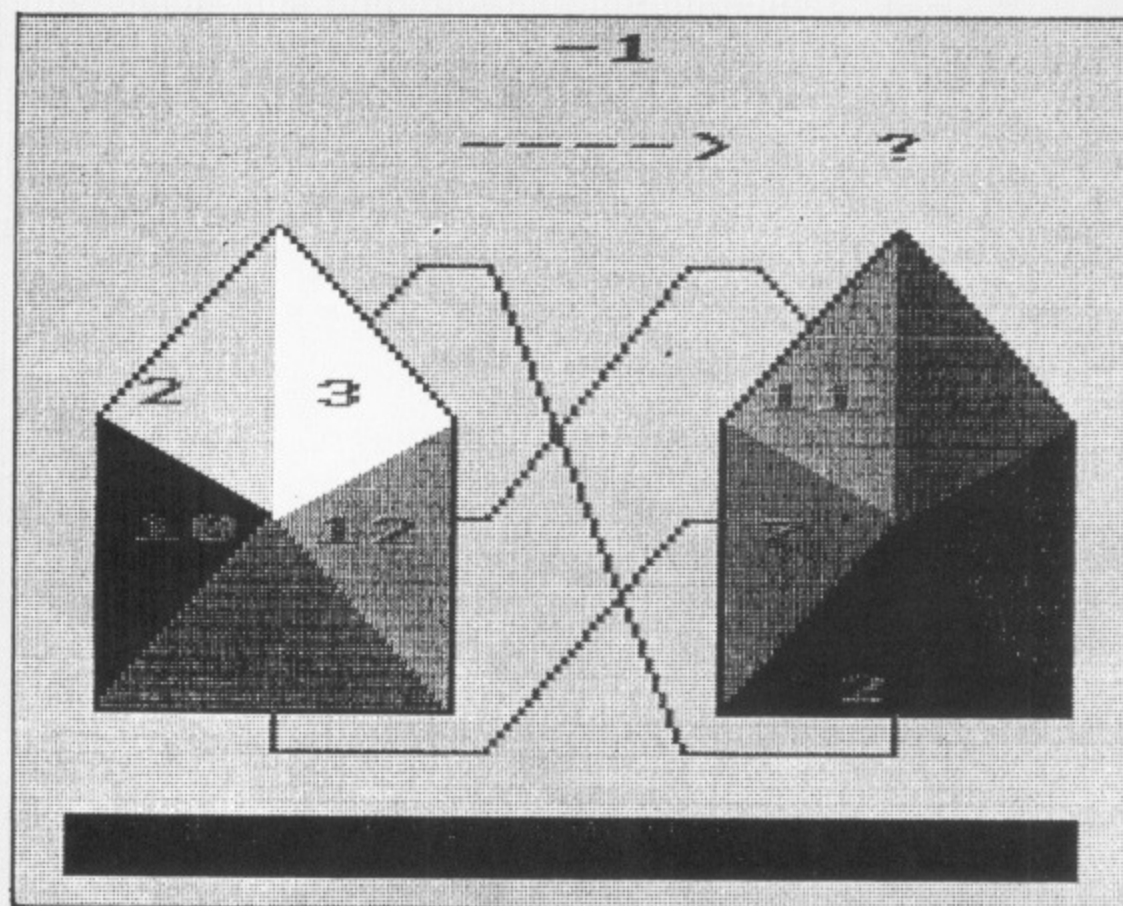
840 PRINT;Source(1)
850 MOVE340,400
860 PRINT;Source(2)
870 MOVE240,240
880 PRINT;Source(3)
890 MOVE140,400
900 PRINT;Source(4)
910 MOVE140,540
920 PRINT;Source(5)
930 MOVE600,900
940 PRINT;Sum$;CONSTANT:MOVE500,800
950 PRINT;"---->":MOVE970,800
960 PRINT;"?":VDU4
970 ENDPROC
980 DEFPROCMIN
990 MIN=Source(1)
1000 FOR A=2 TO 5
1010 IF Source(A)<MIN MIN=Source(A)
1020 NEXT
1030 ENDPROC
1040 DEFPROCSUM
1050 RIGHT=0
1060 FORA=1 TO 5:Wrong=0:ABORT=0
1070 REPEAT
1080 VDU19,A-1,11,0;
1090 VDU28,1,30,18,29
1100 COLOUR139
1110 COLOUR14
1120 CLS
1130 INPUT"YOUR ANSWER",Reply
1140 IF Reply=Answer(A) PROCRIGHT ELSE PROCWRONG:Wrong=1
1150 UNTIL ABORT=1
1160 VDU19,A-1,3,0;
1170 NEXT
1180 FOR DELAY=1 TO 5000:NEXT
1190 ENDPROC
1200 DEFPROCWRONG
1201 VDU26
1202 IF A=1 PROCDRAW1 ELSE IF A=2 PROCDRAW2 ELSE IF A=3 PROCDRAW3 ELSE IF A=4 PROCDRAW4 ELSE IF A=5 PROCDRAW5
1203 VDU28,1,30,18,29:COLOUR139:COLOUR14
1210 CLS
1220 IF Wrong=0 PRINT"WRONG,TRY AGAIN" ELSE PRINT"NO,ANSWER IS ";Answer(A):ABORT=1
1230 SOUND1,1,100,20
1240 FOR DELAY=1 TO 5000:NEXT
1250 ENDPROC
1260 DEFPROCENVELOPE
1270 ENVELOPE1,6,126,0,0,206,0,0,60,0,0,-60,60,60
1280 ENVELOPE2,2,6,0,0,255,0,0,60,0,0,-60,60,60
1285 ENVELOPE3,1,0,0,0,0,0,0,60,-1,-1,-1,60,0
1290 ENDPROC

```

```

1300 DEFPROCRIGHT:VDU26
1310 IF A=1 PROCDRAW1 ELSE IF A=2 PR
OCDRAW2 ELSE IF A=3 PROCDRAW3 ELSE IF
A=4 PROCDRAW4 ELSE IF A=5 PROCDRAW5
1320 IF Aloc(A)=1 PROCDRAW6 ELSE IF
Aloc(A)=2 PROCDRAW7 ELSE IF Aloc(A)=3
PROCDRAW8 ELSE IF Aloc(A)=4 PROCDRAW
9 ELSE IF Aloc(A)=5 PROCDRAW10
1330 MOVEX1,Y1:DRAWX2,Y2
1340 VDU19,Aloc(A)+4,3;0;5
1350 BCOLO,10:MOVEX(Aloc(A)),Y(Aloc(
A))
1360 PRINT;Answer(A)
1370 VDU4
1380 SOUND1,2,4,50
1390 VDU28,1,30,18,29:COLOUR139:COLO
UR14
1400 CLS
1410 PRINT"CORRECT"
1420 FOR DELAY=1 TO 5000:NEXT
1430 RIGHT=RIGHT+1:ABORT=1
1440 ENDPROC
1450 DEFPROCDRAW1
1460 BCOLO,13
1470 MOVE400,600
1480 DRAW460,660:SOUND1,3,40,6:PROCD
ELAY
1490 DRAW540,660:SOUND1,3,50,6:PROCD
ELAY
1500 X1=540:Y1=660
1510 ENDPROC
1520 DEFPROCDRAW2
1530 BCOLO,13
1540 MOVE500,400
1550 DRAW540,400:SOUND1,3,40,6:PROCD
ELAY
1560 X1=540:Y1=400
1570 ENDPROC
1580 DEFPROCDRAW3
1590 BCOLO,13
1600 MOVE300,200
1610 DRAW300,160:SOUND1,3,40,6:PROCD
ELAY
1620 DRAW540,160:SOUND1,3,50,6:PROCD
ELAY
1630 X1=540:Y1=160
1640 ENDPROC
1650 DEFPROCDRAW4
1660 BCOLO,13
1670 MOVE100,360
1680 DRAW60,360:SOUND1,3,40,6:PROCD
ELAY
1690 DRAW60,120:SOUND1,3,50,6:PROCD
ELAY
1700 DRAW540,120:SOUND1,3,60,6:PROCD
ELAY
1710 X1=540:Y1=120
1720 ENDPROC
1730 DEFPROCDRAW5

```



```

1740 BCOLO,13
1750 MOVE200,600
1760 DRAW100,740:SOUND1,3,40,6:PROCD
ELAY
1770 DRAW540,740:SOUND1,3,50,6:PROCD
ELAY
1780 X1=540:Y1=740
1790 ENDPROC
1800 DEFPROCDRAW6
1810 BCOLO,13
1820 MOVE1100,600
1830 DRAW1200,740:SOUND1,3,70,6:PROCD
ELAY
1840 DRAW760,740:SOUND1,3,80,6:PROCD
ELAY
1850 X2=760:Y2=740
1860 ENDPROC
1870 DEFPROCDRAW7
1880 BCOLO,13
1890 MOVE1200,360
1900 DRAW1240,360:SOUND1,3,70,6:PROCD
ELAY
1910 DRAW1240,120:SOUND1,3,80,6:PROCD
ELAY
1920 DRAW760,120:SOUND1,3,90,6:PROCD
ELAY
1930 X2=760:Y2=120
1940 ENDPROC
1950 DEFPROCDRAW8
1960 BCOLO,13
1970 MOVE1000,200
1980 DRAW1000,160:SOUND1,3,70,6:PROCD
ELAY
1990 DRAW760,160:SOUND1,3,80,6:PROCD
ELAY
2000 X2=760:Y2=160
2010 ENDPROC
2020 DEFPROCDRAW9
2030 BCOLO,13
2040 MOVE800,400
2050 DRAW760,400:SOUND1,3,70,6:PROCD
ELAY
2060 X2=760:Y2=400
2070 ENDPROC
2080 DEFPROCDRAW10
2090 BCOLO,13
2100 MOVE900,600
2110 DRAW840,660:SOUND1,3,70,6:PROCD
ELAY
2120 DRAW760,660:SOUND1,3,80,6:PROCD
ELAY
2130 X2=760:Y2=660
2140 ENDPROC
2150 DEFPROCSCORE
2160 VDU26
2170 COLOUR140:COLOUR10
2180 CLS:Pge=RIGHT*Mf
2190 PRINT TAB(3,5);"YOUR SCORE WAS"
;TAB(5,10);RIGHT;" CORRECT";TAB(3,15)
;"(Difficulty ";D1;)" ;TAB(3,20);"(Gr
ading ";Pge;"Z)";TAB(2,25);"ANOTHER G
D?(Y/N)"
2210 REPEAT
2220 INPUT TAB(10,30),Reply$:X$=LEFT
$(Reply$,1)
2230 UNTIL X$="Y" OR X$="N"
2250 ENDPROC
2255 :
2260 DEFPROCEND
2270 COLOUR140:COLOUR10
2280 CLS
2290 PRINT TAB(6,10);"GOODBYE"
2300 ENDPROC
2310 :
2320 DEFPROCDELAY
2330 FOR DELAY=1 TO 500
2340 NEXT
2350 ENDPROC

```

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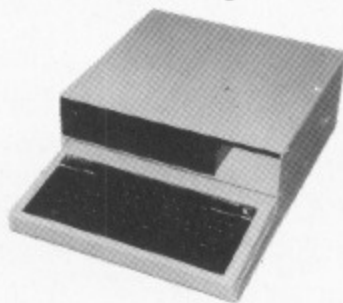
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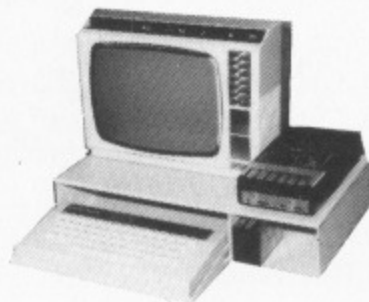
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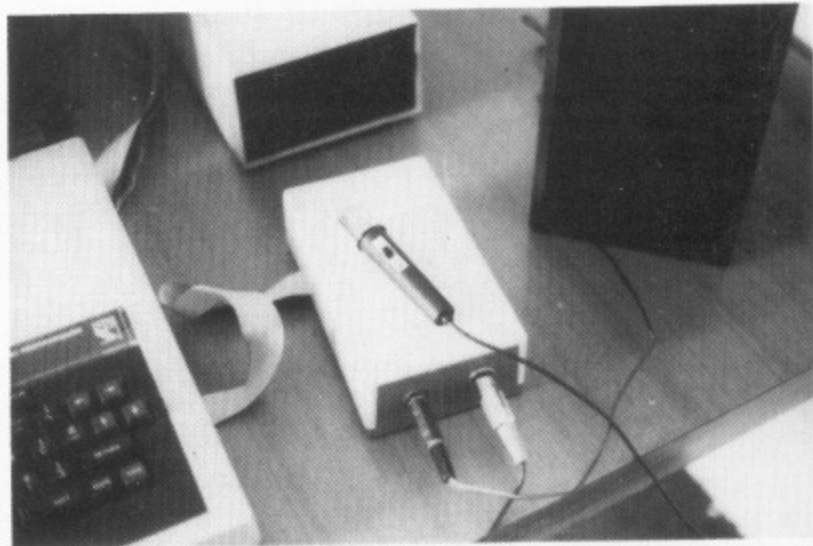
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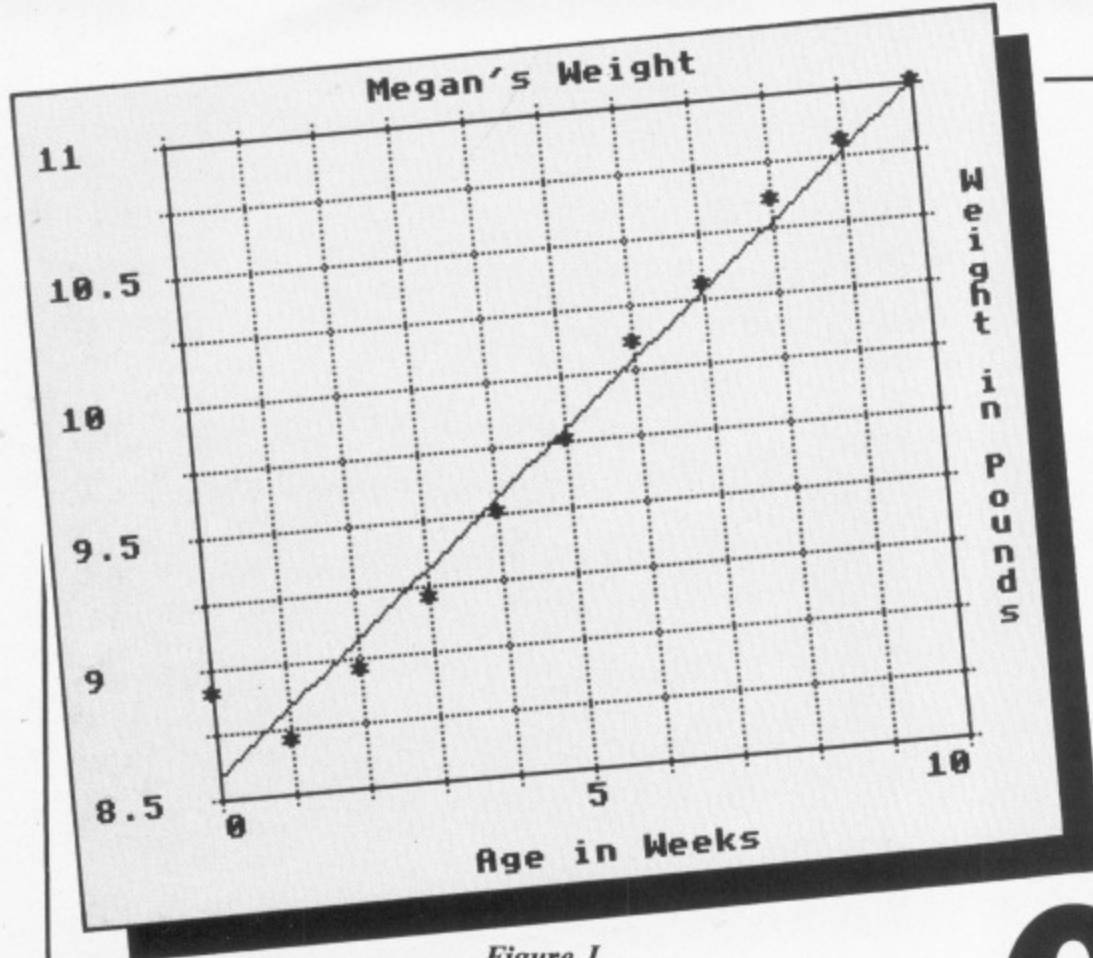


Figure 1

CURVEFIT finds the "best fit" curve through a set of input points and then allows the curve to be seen on the screen.

The program is menu driven and provides helpful error messages for a number of common user mistakes. Data points are entered with very easy to use full screen input and may be saved for future updating. Any one of five different equations can be used to fit the data.

Fitting curves is valuable for forecasting or interpolating. It is also useful in computer programming where a simple equation can replace long tables of numbers with resultant memory savings.

The theory and details of curve fitting can be found in any good book on statistics, so we won't go into that.

This program uses the least square method on either the original equation or its transformation. The equations listed in Table I are available.

The program attempts to determine the coefficients a and b which best fit the x and y data you supply. At least two x,y pairs are required to determine the curve. Accuracy decreases as the difference between the x and/or y values becomes small.

The program is quite large and requires 32k RAM, but it may be run on a disc based system. REM statements have been left out to provide room for indentation and meaningful variable names.

After loading and running a menu appears and a choice can be made by either entering the number or first letter of the desired option. Quit is used to exit the program or return to the main menu.

Type the number 1 or C to access

menu 1. Option 1 allows you to select any of the equations listed in Table I. You may return to this option at any time to try a different equation. Selection of any option will return you to the main menu.

You must enter data either through Edit or by recalling data which has already been entered before plotting. Enter Edit from the main menu by either typing 2 or E.

When in Edit you may use the cursor control arrows to select an x or y cell. A number is typed in and the Return key or cursor arrow key used to make the program accept the entry.

After entry any cell can be changed by reselecting the cell and entering a new value using the same sequence.

A cell can be blanked out using the red function key f0. At least two data points must be entered to obtain a plot.

The lowest and highest values used for scaling the plot are set with Edit. The smallest x value entered will set the lowest x on the scale, with the largest value of x specifying the highest value.

Specifying an x value without an accompanying y value is allowable.

Replace long tables of numbers with a simple equation – and save memory too – in this extremely useful program by FRANK MILBURN

# Plot it with Curvefit

Minimum and maximum y values may be specified in a similar way. This allows you to scale the plot selectively.

Cell numbering starts at 0 and runs through to a maximum of 99. Because large numbers of points slow the program down, the program has a built in default stop at cell 20. This may be reset at any time by respecifying the maximum number of points in option 3.5.

When you have finished entering your points return to the main menu by typing Q for quit or pressing Escape.

A plot can sometimes be improved by adding titles from options 3.1, 3.2, and 3.3. Enter option 3 then select each title individually.

The red f0 function key will erase a title provided nothing else has been entered on the entry line. After keying in your title press Return to get it accepted. Also available in option 3 are grid lines and a printer option.

To get a print of the plot you will have to supply a screen dump routine in procedure PROCsdump. The example shown in Figures I and II was generated

Turn to Page 74

Type Curve	Equation	Remarks
Linear	$y=a+bx$	
Hyperbolic	$1/y=a+bx$	y must not be 0
Logarithmic	$y=a+b \ln x$	x must be positive
Exponential	$y=ae^{bx}$	y must be positive
Power	$y=ax^b$	x and y must be positive

Table 1: Types of equation available





## From Page 72

with an Epson FX-80. You select option 4 (plot option) from the main menu after specifying the printer option "ON" in option 3.4.

After entering data it is simple to get a graphical idea of how well your data has been fit using option 4 in the main menu. The \* symbol is used to indicate the points you have entered and a line giving the best fit is also drawn. Press any key to return to the main menu.

Option 5 gives a report listing points and the difference in calculated and actual values. If the printer option (option 3.4 from the main menu) is ON the report will be sent to the printer and

screen. For a long report you can stop the screen from scrolling by holding down the Ctrl and Shift keys together.

The coefficients for the equation are given as well as R, a measure of the "goodness" of the fit. You can interpolate and extrapolate by specifying an x value without an accompanying y value in the Edit option. Press any key to return to the main menu.

Option 6 allows data to be saved for future work. The data will be saved in a file called "DATA". In a cassette-based system position your tape carefully before saving or recalling the data.

Finally Quit or option 7 will return you to Basic from the main program. But first you are prompted to make sure

you really want to exit. This could help prevent losing data you really meant to save before exiting.

By the way, don't be put off by the long instructions. The program is a lot easier to use than to explain!

The program starts by calling an initialisation procedure and then setting up the main menu. Note the use of a common menu procedure (PROCmenu) with an alphanumeric array to hold the choices. The ON choice GOTO construction is used to select an option. This structure is used for all the menus.

An error recovery section follows the main menu. All errors encountered by Basic are handled here and control returned to the main program.

```

10 REM ** CURVEFIT V1.0    by F.H
    Milburn
15 REM (C) The Micro User
20 MODE7
30 *KEY0-1E3B:M
40 *KEY10 OLDIM
50 PROCinit
60 ON ERROR GOTO 350
70 exit%=FALSE
80 REPEAT
90  @%=10
100  MODE7
110  A$="C U R V E F I T"
120  menu$(0)="Select from choices
below"
130  menu$(1)="Curvefit options"
140  menu$(2)="Edit X,Y data"
150  menu$(3)="Report/plot options
"
160  menu$(4)="Plot data"
170  menu$(5)="Make report"
180  menu$(6)="Save/recall data"
190  PROCmenu(6)
200  ON choice% GOTO 210,220,230,2
40,260,280,290
210  PROCcurveopt: GOTO 320
220  PROCedit: GOTO 320
230  PROCplotreplot: GOTO 320
240  PROCworking: IF FNok PROCle
astqr: MODE4: PROCplot: MODE7
250  GOTO 320
260  PROCworking: IF FNok PROCle
astqr: PROCreport
270  GOTO 320
280  PROCsavrecall: GOTO 320
290  A$="Do you really want to Q
UIT? (*+y$+"Y"+w$+"or"+y$+"N"+w$+" )"
300  CLS: PRINT TAB(1,7)A$: quit
$=BET$
310  IF quit$="y" OR quit$="Y" C
LS:exit%=TRUE:PRINT`y$END`
320  UNTIL exit%
330  *FX4,0
340  END
350IF ERR=17 GOTO 80
360 REPORT: PRINT" at line ";ERL
370 X=BET: GOTO 80
380 STOP
390DEF PROCerror(errornumber%,error
value)
400 SOUND 1,-15,53,5
410 error%=TRUE
420 ON errornumber% GOTO 430,450,47
0,490,510,530,550,570,590
430  PRINT TAB(1,7);r$;"Your choic
e was not on the menu"
440  PRINT TAB(1);" Choose a numbe
r in the range 1,2,...";errorvalue: G
OTO 600
450  PRINT TAB(1,7);r$;"WARNING";w
$;"Entry too long and part lost"
460  PRINT TAB(1);" Check your tit
le and change if needed": GOTO 600
470  PRINT r$;"Your entry was not
in the correct range"
480  PRINT TAB(1);" It must be bet
ween 20 and 99 points": GOTO 600
490  PRINT TAB(1,7);r$;"The Y valu
e in cell ";errorvalue;" is 0"
500  PRINT TAB(1);" Change to non-
zero for hyperbolic fit": GOTO 600
510  PRINT TAB(1,7);r$;"The X valu
e in cell ";errorvalue;" is 0 or less
"
520  PRINT TAB(1);" Change to grea
ter than 0 for log fit": GOTO 600
530  PRINT TAB(1,7);r$;"The Y valu
e in cell ";errorvalue;" is 0 or less
"
540  PRINT TAB(1);" Change to grea
ter than 0 for exp fit": GOTO 600
550  PRINT TAB(1,7);r$;"The X valu
e in cell ";errorvalue;" is 0 or less
"
560  PRINT TAB(1);" Change to grea
ter than 0 for power fit": GOTO 600
570  PRINT TAB(1,7);r$;"The Y valu
e in cell ";errorvalue;" is 0 or less
"
580  PRINT TAB(1);" Change to grea
ter than 0 for power fit": GOTO 600
590  PRINT TAB(1,7);r$;"Insufficie
nt or questionable data": GOTO 600
600  wait=INKEY(500):PRINT TAB(1,7)S
TRING$(39," ");TAB(1,8)STRING$(39," "
)
610  ENDPROC
620DEF PROCcurveopt
630  A$="CURVEFIT OPTIONS"
640  menu$(1)="Straight line"
650  menu$(2)="Hyperbolic"
660  menu$(3)="Log"
670  menu$(4)="Exponential"
680  menu$(5)="Power"
690  exit%=FALSE
700  menu$(0)="Current Option is "+S
TR$(option%)
710  menu$(0)=menu$(0)+CHR$(10)+bs$+
bs$+bs$+y$+"---"
720  PROCmenu(5)
730  IF choice% < 6 option%=choice%:
option$=menu$(choice%)
740  ENDPROC
750DEF PROCedit
760  LOCAL exit%

```

```

770 exitZ=FALSE
780 VDU23,1,0;0;0;0;
790 PROCscreenedit
800 REPEAT
810 A$="": IZ=VZ
820 REPEAT
830 X=GET: X$=CHR$(X)
840 IF (X > 39 AND X < 58) OR X
=69 OR X=101 A$=A$+X$
850 IF X=127 A$=LEFT$(A$,LEN(A$
)-1)
860 IF LEN(A$)>15 SOUND 1,-15,5
3,5
870 PRINT TAB(23,23)STRING$(16,"
")
880 PRINT TAB(22,23)y$;A$
890 UNTIL X>135 OR X=13 OR X=64 O
R X=81 OR X=113 OR LEN(A$)>15
900 PRINT TAB(23,23)STRING$(16,"
")
910 IF A$<> "" AND HZ=1 X(IZ)=VAL
(A$)
920 IF A$<> "" AND HZ=-1 Y(IZ)=VA
L(A$)
930 IF X=64 OR X=192 HZ=1: VZ=1:
PROCscreenedit
940 IF X=81 OR X=113 exitZ=TRUE
950 IF X=136 OR X=137 HZ=HZ*-1
960 IF X=138 PROClinedit(IZ,HZ,VZ
+1): VZ=VZ+1
970 IF X=139 PROClinedit(IZ,HZ,VZ
+1): VZ=VZ-1
980 IF VZ>SZ+19 OR VZ<SZ PROCscre
enedit
990 IZ=VZ
1000 PROClinedit(IZ,HZ,VZ)
1010 UNTIL exitZ
1020 ENDPROC
1030DEF PROCplotrepop
1040 LOCAL exitZ
1050 exitZ=FALSE
1060 REPEAT
1070 A$="PLOT/REPORT OPTIONS"
1080 menu$(0)="Select from choices
below"
1090 menu$(1)="Title"
1100 menu$(2)="X title"
1110 menu$(3)="Y title"
1120 menu$(4)="Printer"
1130 menu$(5)="Maximum points"
1140 menu$(6)="Grid lines"
1150 PROCmenu(6)
1160 DN choiceZ GOTO 1170,1220,127
0,1320,1410,1470,1560
1170 A$="Current Title"
1180 menu$(0)=title$
1190 PROCquery
1200 IF X$<>"" title$=X$
1210 GOTO 1570
1220 A$="Current X Title"
1230 menu$(0)=Xtitle$
1240 PROCquery
1250 IF X$<> "" Xtitle$=X$
1260 GOTO 1570
1270 A$="Current Y Title"
1280 menu$(0)=Ytitle$
1290 PROCquery
1300 IF X$<> "" Ytitle$=X$
1310 GOTO 1570
1320 A$="PRINTER"
1330 menu$(0)="Off": IF printerZ
=TRUE menu$(0)="On"
1340 menu$(0)="Printer option is
currently"+y$+menu$(0)
1350 menu$(1)="Print results ("+
y$+"DN"+w$+"")"
1360 menu$(2)="Screen only ("+
y$+"OFF"+w$+"")"
1370 PROCmenu(2)
1380 IF choiceZ=1 printerZ=TRUE
1390 IF choiceZ=2 printerZ=FALSE
1400 GOTO 1570
1410 A$="Maximum number of point
s currently is"
1420 menu$(0)=STR$(ptsZ)
1430 PROCquery
1440 X=VAL(X$)
1450 IF X>19 AND X<100 ptsZ=X EL
SE PROCerror(3,0)
1460 GOTO 1570
1470 A$="GRID LINES ON GRAPH"
1480 menu$(0)="Off": IF gridZ=TR
UE menu$(0)="On"
1490 menu$(0)="Grid lines are cu
rrently"+y$+menu$(0)
1500 menu$(1)="Display grid line
s ("+y$+"DN"+w$+"")"
1510 menu$(2)="No grid lines ("+
y$+"OFF"+w$+"")"
1520 PROCmenu(2)
1530 IF choiceZ=1 gridZ=TRUE
1540 IF choiceZ=2 gridZ=FALSE
1550 GOTO 1570
1560 exitZ=TRUE
1570 UNTIL exitZ=TRUE
1580 ENDPROC
1590DEF PROCplot
1600 PROCgraph
1610 PROCpoint
1620 PROCcurve
1630 IF printerZ=TRUE PROCsdump
1640 x=GET
1650 ENDPROC
1660DEF PROCworking
1670 CLS
1680 PRINT TAB(10,10)dh$;y$;"W O R K
I N G"
1690 PRINT TAB(10)dh$;y$;"W O R K I
N G"
1700 ENDPROC
1710DEF PROCreport
1720 @Z=&01000309
1730 CLS
1735 REM Control characters for EPSO
N FX-80
1740 IF printerZ=TRUE VDU2,1,27,1,33
,1,58,1,27,1,65,1,10
1750 PRINT: PRINT: PRINT
1760 PRINT: PRINT TAB(5);"X";TAB(15)
;"Y";TAB(22)"CALC Y";TAB(32)"Y-CALC Y
"
1770 A$=" "+STRING$(9,"=")
1780 PRINT STRING$(4,A$)
1790 FOR IZ=0 TO ptsZ
1800 IF X(IZ)=-1E38 GOTO 1840
1810 Ycalc=FNycalc(X(IZ),optionZ
)
1820 IF Y(IZ)<>-1E38 PRINT X(IZ)
TAB(10)Y(IZ)TAB(20)Ycalc TAB(30)Y(IZ)
-Ycalc
1830 IF Y(IZ)=-1E38 PRINT X(IZ)T
AB(20)Ycalc
1840 IF X(IZ)=-1E38 AND Y(IZ)<>-1E
38 PRINT FNxcalc(Y(IZ),optionZ)TAB(10
)Y(IZ)
1850 NEXT
1860 @Z=10
1870 PRINT: PRINT: PRINT " ";STRING$
(39,"-")
1880 PRINT: PRINT " ";option$;" curv
e fit"
1890 PRINT: PRINT " Equation is ";fo
rm$(optionZ)
1900 PRINT " where A0=";A0" and A
1=";A1
1910 PRINT " Coefficient of correla
tion" " R2=";R2" R=";R
1920 VDU1,27,1,64,3
1930 x=GET
1940 ENDPROC
1950DEF PROCmenu(maxZ)
1960 CLS: VDU 23,1,0;0;0;0;
1970 *FX4,1
1980 PRINT TAB(20-LEN(A$)/2,2);dh$;y
$;A$
1990 PRINT TAB(20-LEN(A$)/2);dh$;y$;
A$
2000 PRINT TAB(20-LEN(menu$(0))/2,5)
;menu$(0)
2010 FOR IZ=1 TO maxZ
2020 IF maxZ >= IZ PRINT TAB(7,2+I
Z+7);y$;IZ;" ";w$;menu$(IZ)
2030 NEXT

```

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```

2040 PRINT TAB(7,2*IX+7);y$;maxZ+1;w
$;" Quit"
2050 REPEAT: errorZ=FALSE: #FX21,0
2060 choiceZ=GET
2070 FOR IX=1 TO maxZ
2080 IF choiceZ=ASC(menu$(IX)) c
hoiceZ=IX
2090 IF choiceZ=ASC(menu$(IX))+3
2 choiceZ=IX
2100 NEXT
2110 IF choiceZ=81 OR choiceZ=113
choiceZ=maxZ+1
2120 IF choiceZ>8 choiceZ=choiceZ-
48
2130 IF choiceZ>maxZ+1 OR choiceZ<
1 PROCerror(1,maxZ+1)
2140 UNTIL NOT errorZ
2150 ENDPROC
2160DEF PROClinedit(IX,HZ,VZ)
2170 left$=w$: right$=w$: backleft$=
b$: backright$=b$
2180 IF IX<>VZ GOTO 2210
2190 IF HZ=1 backleft$=w$ ELSE bac
kright$=w$
2200 IF HZ=1 left$=b$ ELSE right$=
b$
2210 X$=STR$(X(IX))
2220 IF X(IX) >-1E38 X$=STRING$(16-L
EN(X$),"")+X$ ELSE X$=STRING$(16," "
)
2230 Y$=STR$(Y(IX))
2240 IF Y(IX) >-1E38 Y$=STRING$(16-L
EN(Y$),"")+Y$ ELSE Y$=STRING$(16," "
)
2250 I$=STR$(IX)
2260 IF LEN(I$)<2 I$=" "+I$
2270 PRINT TAB(0,IX-SZ+2)I$;backleft
$;bg$;left$;X$;backright$;bg$;right$;
Y$
2280 ENDPROC
2290DEF PROCscreenedit
2300 CLS
2310 IF VZ>ptsZ VZ=0
2320 IF VZ<0 VZ=ptsZ
2330 SZ=VZ
2340 IF SZ>ptsZ-19 SZ=ptsZ-19
2350 PRINT TAB(11,1)"X";TAB(30,1)"Y"
2360 FOR IX=SZ TO SZ+19
2370 PROClinedit(IX,HZ,VZ)
2380 NEXT
2390 PRINT TAB(0,23)r$;"Q";w$;"Quit"
;r$;"f0";w$;"Erase";r$;"E";w$;"Top"
2400 PRINT TAB(0,24)" Use cursor arr
ow keys to select cell";TAB(0,0)
2410 ENDPROC
2420DEF PROCquery

```

```

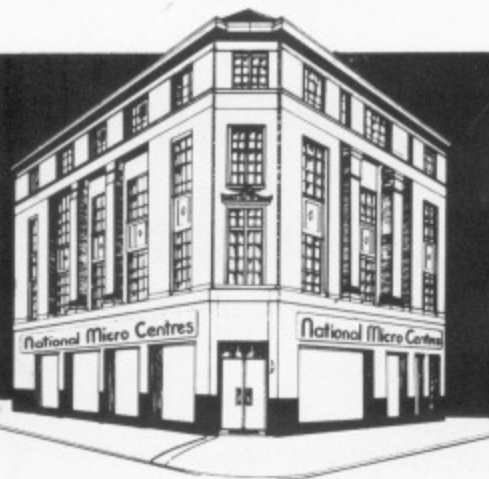
2430 CLS: VDU23,1,1;0;0;0;
2440 PRINT TAB(20-LEN(A$)/2,2)A$
2450 PRINT 'y$;dh$TAB(19-LEN(menu$(0
))/2,4)menu$(0)
2460 PRINT y$;dh$TAB(19-LEN(menu$(0
)/2)menu$(0)
2470 PRINT TAB(1,10)r$;"f0";w$;"Eras
e,";r$;" RETURN";w$;"Exit"
2480 PRINT TAB(2,12)"Please enter ch
anges and RETURN"
2490 PRINT TAB(1,19)y$: INPUT TAB(2,
19) X$
2500 IF VAL(X$)=-1E38 X$=" "
2510 IF LEN(X$) > 39 PROCerror(2,39)
2520 IF LEN(X$) > 39 X$=LEFT$(X$,39)
2530 ENDPROC
2540DEF PROCleastsqr
2550 Xsum=0: Ysum=0: XYsum=0: X2sum=
0: Y2sum=0: numptsZ=0
2560 FOR IX=0 TO ptsZ
2570 IF X(IX)=-1E38 OR Y(IX)=-1E38
GOTO 2660
2580 X=FNXtransform(X(IX),option
Z)
2590 Y=FNytransform(Y(IX),option
Z)
2600 Xsum=Xsum+X
2610 Ysum=Ysum+Y
2620 X2sum=X2sum+X*X
2630 Y2sum=Y2sum+Y*Y
2640 XYsum=XYsum+X*Y
2650 numptsZ=numptsZ+1
2660 NEXT
2670 divisor=X2sum*numptsZ-Xsum*Xsum
2680 IF divisor=0 PROCerror(9,0): EN
DPROC
2690 a=(Ysum*X2sum-Xsum*XYsum)/divis
or
2700 A0=FNAttransform(a,optionZ)
2710 A1=(numptsZ*XYsum-Xsum*Ysum)/di
visor
2720 R2=a*Ysum+A1*XYsum-1/numptsZ*Ys
um*Ysum
2730 R2=R2/(Y2sum-1/numptsZ*Ysum*Ysu
m)
2740 R=R2/R2*SQR(ABS(R2))
2750 ENDPROC
2760DEF PROCinit
2770 VDU23,1,0;0;0;0;
2780 y$=CHR$(131)
2790 r$=CHR$(129)
2800 b$=CHR$(132)
2810 w$=CHR$(135)
2820 bs$=CHR$(8)
2830 bg$=CHR$(157)
2840 dh$=CHR$(141)
2850 PROCworking
2860 Xtitle$=""

```

```

2870 Ytitle$=""
2880 printerZ=FALSE
2890 gridZ=FALSE
2900 title$=""
2910 HZ=1: VZ=1
2920 option$="Straight line"
2930 optionZ=1
2940 DIM form$(5)
2950 form$(1)="Y = A0 + A1*X"
2960 form$(2)="Y = 1/(A0 + A1*X)"
2970 form$(3)="Y = A0 + A1*LN(X)"
2980 form$(4)="Y = A0*EXP(A1*X)"
2990 form$(5)="Y = A0*X^A1"
3000 ptsZ=20
3010 DIM X(99),Y(99),menu$(7)
3020 FOR I=0 TO 99
3030 X(I)=-1E38: Y(I)=-1E38
3040 NEXT
3050 ENDPROC
3060DEF PROCgraph
3070 @Z=&0100050A
3080 VDU29,179;123;
3090 Xmin=1E38: Xmax=-1E38: Ymin=1E3
8: Ymax=-1E38
3100 FOR IX=0 TO ptsZ
3110 IF X(IX) > Xmax AND X(IX)<>-
1E38 Xmax=X(IX)
3120 IF X(IX) < Xmin AND X(IX)<>-
1E38 Xmin=X(IX)
3130 IF Y(IX) > Ymax AND Y(IX)<>-
1E38 Ymax=Y(IX)
3140 IF Y(IX) < Ymin AND Y(IX)<>-
1E38 Ymin=Y(IX)
3150 NEXT
3160 MOVE 500-(LEN(title$)/40*640),8
60
3170 VDU5: PRINT title$: VDU4
3180 MOVE 518-(LEN(Xtitle$)/40*640),
-90
3190 VDU5: PRINT Xtitle$: VDU
3200 JZ=400+LEN(Ytitle$)*20
3210 VDU5
3220 FOR IX=1 TO LEN(Ytitle$)
3230 JZ=JZ-35
3240 MOVE 1050,JZ
3250 PRINT MID$(Ytitle$,IX,1)
3260 NEXT
3270 VDU4
3280 MOVE 0,0: DRAW 1000,0: DRAW 100
0,800: DRAW 0,800: DRAW 0,0
3290 stepZ=100
3300 IF gridZ lengthZ=812 ELSE lengt
hZ=12
3310 FOR IX=0 TO 10
3320 MOVE stepZ*IX,-12
3330 PLOT 21,stepZ*IX,lengthZ
3340 NEXT

```



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```

3350 stepZ=80
3360 IF gridZ lengthX=1012 ELSE leng
thZ=12
3370 FOR IX=0 TO 10
3380 MOVE -12,stepZ*IX
3390 PLOT 21,lengthZ,stepZ*IX
3400 NEXT
3410 X$=STR$(Xmin)
3420 MOVE 0,-20
3430 VDU5: PRINT X$
3440 X$=STR$((Xmax-Xmin)/2+Xmin)
3450 MOVE 500-(LEN(X$)/2*32),-20
3460 PRINT X$
3470 X$=STR$(Xmax)
3480 MOVE 1000-(LEN(X$)*32),-20
3490 PRINT X$
3500 X$=STR$(Ymin): exp=FNexponent(Y
min): man$=STR$(FNmantissa(Ymin))
3510 MOVE -175,10
3520 IF ABS(exp)<3 PRINT X$ ELSE PRI
NTman$:MOVE-175,-24:PRINT "E"+STR$(ex
p)
3530 stepZ=160
3540 FOR IZ=1 TO 5
3550 MOVE -175,stepZ*IZ+10
3560 Y=(Ymax-Ymin)/5*IZ+Ymin
3570 X$=STR$(Y): exp=FNexponent(Y)
: man$=STR$(FNmantissa(Y))
3580 IF ABS(exp)<3 PRINT X$
3590 IF ABS(exp)>3 PRINTman$:MOVE
-175,stepZ*IZ-22:PRINT "E"+STR$(exp)
3600 NEXT
3610 VDU4
3620 ENDPROC
3630DEF FNxtransform(X,optionZ)
3640 LOCAL store
3650 store=X
3660 IF optionZ=3 OR optionZ=5 store
=LN(X)
3670 =store
3680DEF FNYtransform(Y,optionZ)
3690 LOCAL store
3700 store=Y
3710 IF optionZ=4 OR optionZ=5 store
=LN(Y)
3720 IF optionZ=2 store=1/Y
3730 =store
3740DEF FNatransform(A,optionZ)
3750 LOCAL store
3760 store=A
3770 IF optionZ=4 OR optionZ=5 store
=EXP(A)
3780 =store
3790DEF PROCpoint
3800 VDU5
3810 FOR IZ=0 TO ptsZ
3820 IF X(IZ)=-1E38 OR Y(IZ)=-1E38

```

```

80TO 3870
3830 XZ=FNscreen(X(IZ),1000,Xmin
,Xmax)
3840 YZ=FNscreen(Y(IZ),800,Ymin,
Ymax)
3850 MOVE XZ-16,YZ+16
3860 IF XZ>0 AND YZ>0 AND XZ<=
1000 AND YZ<=800 PRINT "*"
3870 NEXT
3880 VDU4
3890 ENDPROC
3900DEF PROCcurve
3910 MOVE 0,INT(800*(FNycalc(Xmin,op
tionZ)-Ymin)/(Ymax-Ymin))
3920 X=Xmin
3930 Xdelt=(Xmax-Xmin)*.01
3940 FOR I=1 TO 100
3950 X=X+Xdelt
3960 Y=FNycalc(X,optionZ)
3970 XZ=FNscreen(X,1000,Xmin,Xmax)
3980 YZ=FNscreen(Y,800,Ymin,Ymax)
3990 IF XZ>0 AND YZ>0 AND XZ<=10
00 AND YZ<=800 DRAW XZ,YZ ELSE MOVE X
Z,YZ
4000 NEXT
4010 ENDPROC
4020DEF FNscreen(x,lz,min,max)
4030 LOCAL X
4040 X=((1E-10*lz*(x-min))/(max-min)
)*1E10
4050 IF X>5000 X=5000
4060 IF X<-5000 X=-5000
4070 =INT(X)
4080DEF FNYcalc(X,optionZ)
4090 ON optionZ GOTO 4100,4110,4120,
4130,4140
4100 =X*A1+A0
4110 div=X*A1+A0:IF div=0 =0 ELSE
=1/div
4120 =A1*LN(X)+A0
4130 =A0*EXP(A1*X)
4140 =A0*X^A1
4150DEF FNxcalc(Y,optionZ)
4160 ON optionZ GOTO 4170,4180,4190,
4200,4210
4170 =(Y-A0)/A1
4180 =(1/Y-A0)/A1
4190 =EXP((Y-A0)/A1)
4200 =LN(Y/A0)/A1
4210 =(Y/A0)^(1/A1)
4220DEF PROCsdump
4230 REM Insert your own screen dump
program or call here
4240 CALL &1900
4245 ENDPROC
4250DEF FNok
4260 ok=TRUE
4270 ON optionZ GOTO 4280,4290,4320,
4350,4380

```

```

4280 GOTO 4420
4290 FOR IZ=0 TO ptsZ
4300 IF Y(IZ)=0 AND X(IZ)<>-1E38
ok=FALSE: PROCerror(4,IZ)
4310 NEXT: GOTO 4420
4320 FOR IZ=0 TO ptsZ
4330 IF X(IZ)<=0 AND X(IZ)<>-1E3
8 ok=FALSE: PROCerror(5,IZ)
4340 NEXT: GOTO 4420
4350 FOR IZ=0 TO ptsZ
4360 IF Y(IZ)<=0 AND Y(IZ)<>-1E3
8 ok=FALSE: PROCerror(6,IZ)
4370 NEXT: GOTO 4420
4380 FOR IZ=0 TO ptsZ
4390 IF X(IZ)<=0 AND X(IZ)<>-1E3
8 ok=FALSE: PROCerror(7,IZ)
4400 IF Y(IZ)<=0 AND Y(IZ)<>-1E3
8 ok=FALSE: PROCerror(8,IZ)
4410 NEXT: GOTO 4420
4420 =ok
4430DEF FNexponent(value)
4440 LOCAL X: X=ABS(value): IF value
=0 =0
4450 IF X>1E-37 =INT(LOB(X)) ELSE =-
37
4460DEF FNmantissa(value)
4470 LOCAL X: X=ABS(value)
4480 IF value=0 =0 ELSE =value/10^FN
exponent(X)
4490DEF PROCsavrecall
4500 A$="SAVE & RECALL DATA"
4510 menu$(1)="Save data"
4520 menu$(2)="Recall data"
4530 PROCmenu(2): IF choiceZ=3 ENDPR
OC
4540 CLS: PRINT
4550 IF choiceZ=1 PROCsave ELSE PROC
recall
4560 ENDPROC
4570DEF PROCsave
4580 PRINT
4590 PRINT "Saving";y$;"DATA"
4600 X=OPENDOUT("DATA")
4610 PRINT#X,title$,Xtitle$,Ytitle$,
printerZ,gridZ,HZ,VZ,optionZ,ptsZ
4620 FOR IZ=0 TO 99: PRINT#X,X(IZ),Y
(IZ): NEXT
4630 CLOSE#X
4640 ENDPROC
4650DEF PROCrecall
4660 PRINT
4670 PRINT "Loading";y$;"DATA"
4680 X=("DATA")
4690 INPUT#X,title$,Xtitle$,Ytitle$,
printerZ,gridZ,HZ,VZ,optionZ,ptsZ
4700 FOR IZ=0 TO 99: INPUT#X,X(IZ),Y
(IZ): NEXT
4710 CLOSE#X
4720 ENDPROC

```

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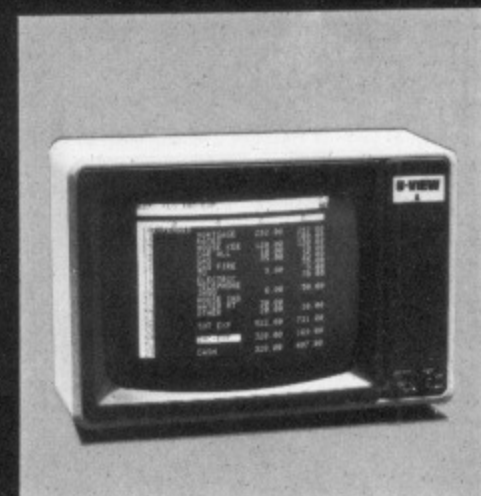
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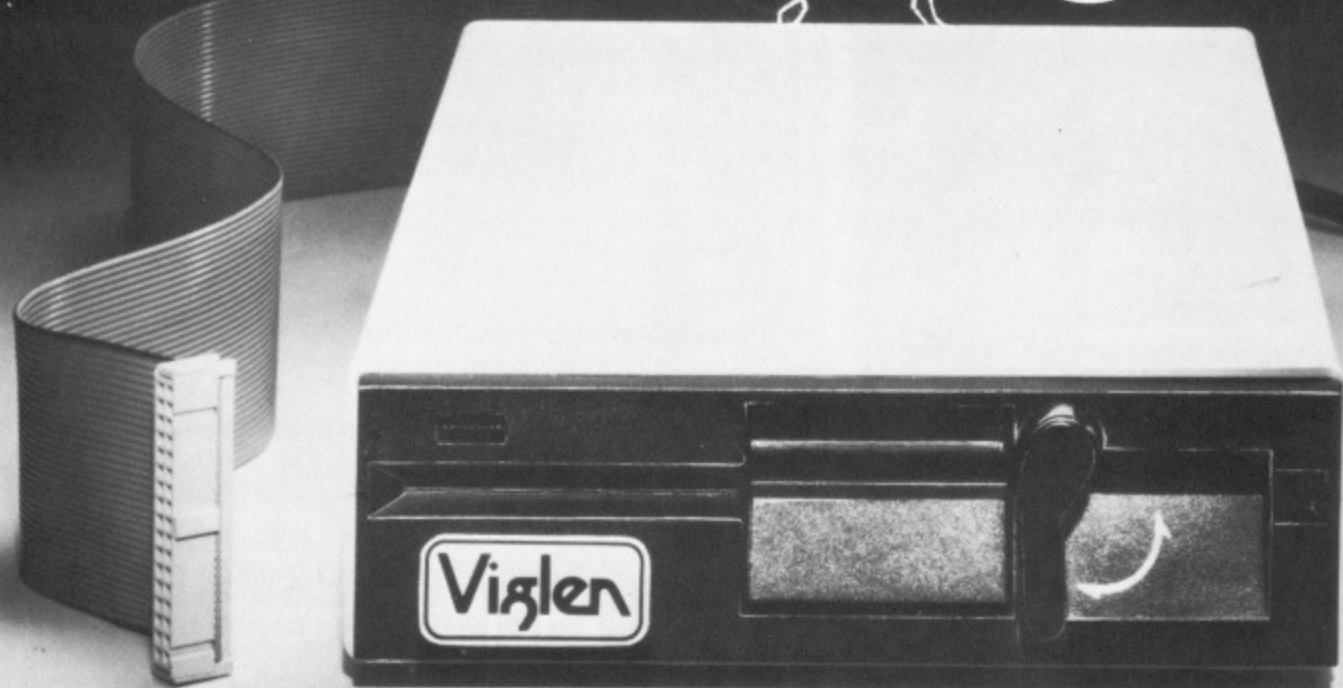


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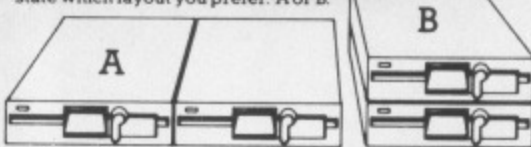
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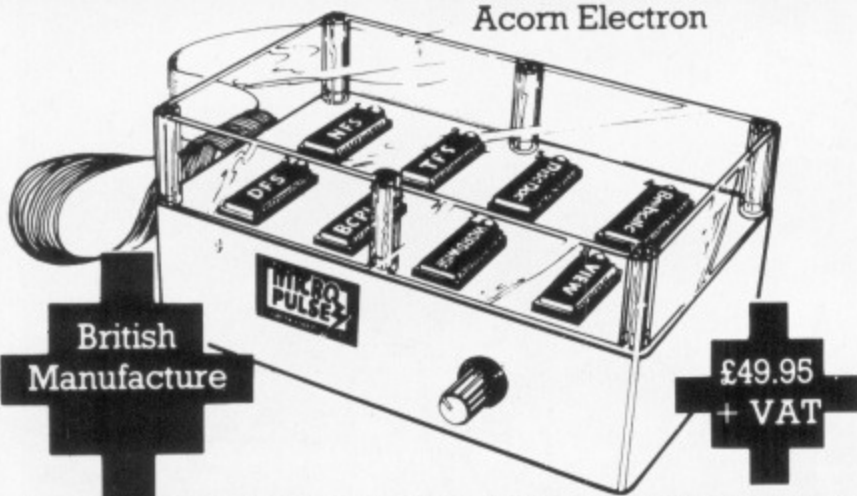
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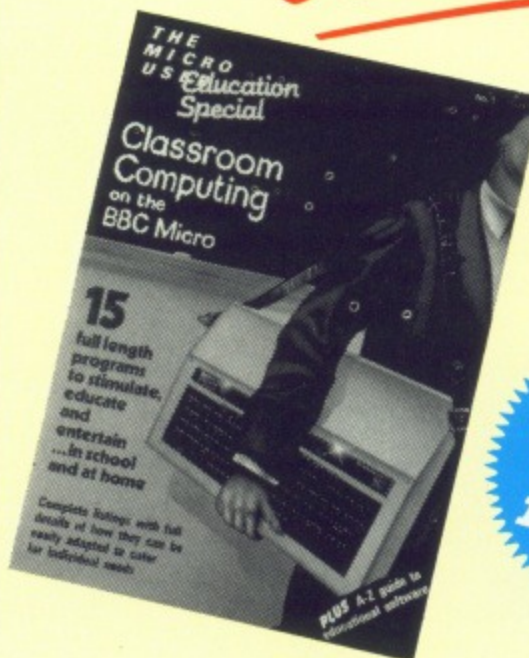
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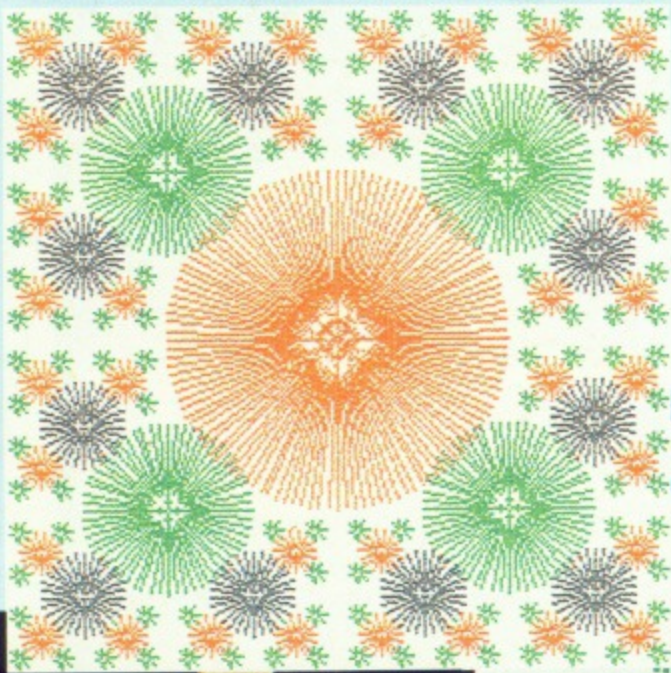
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