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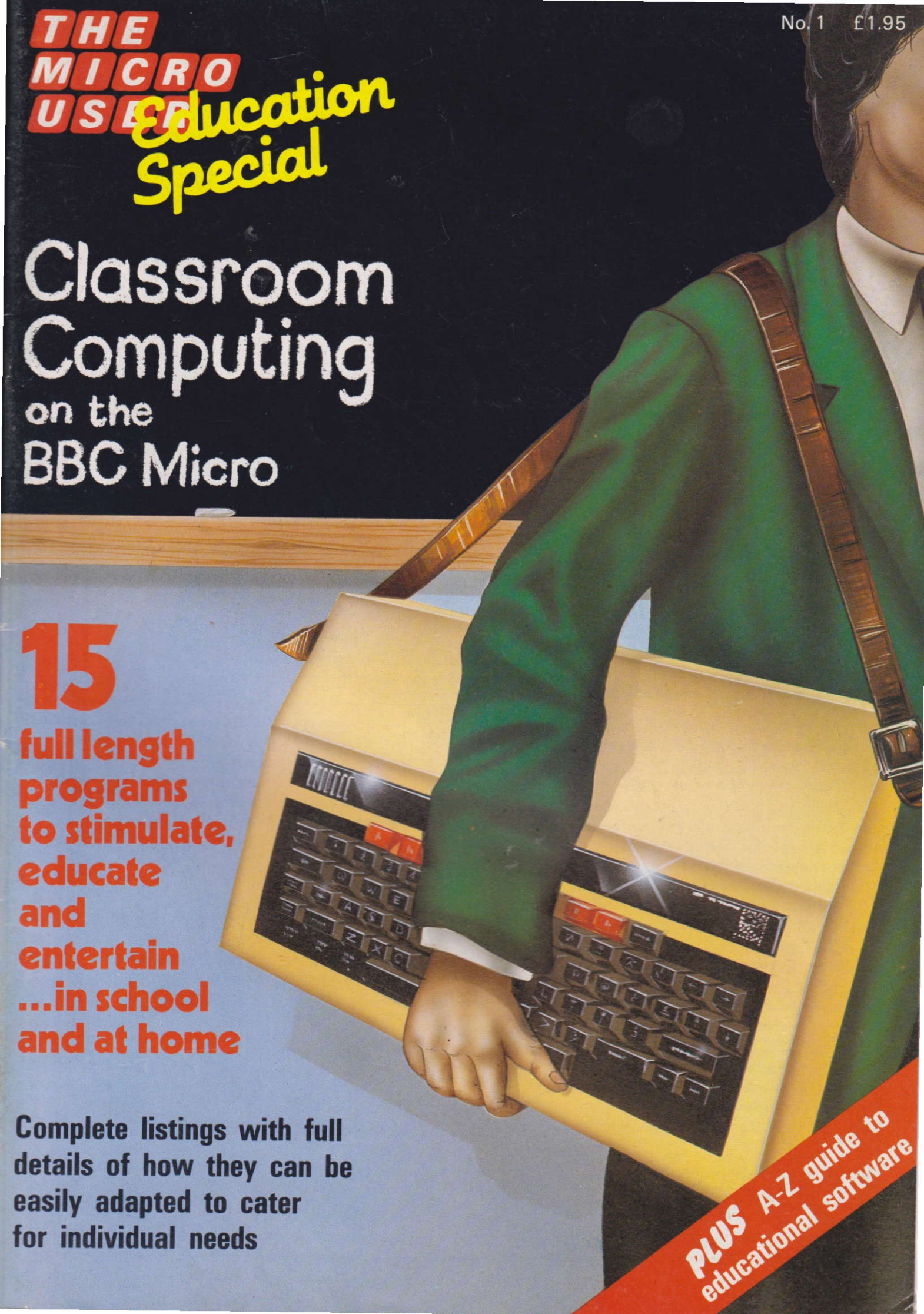

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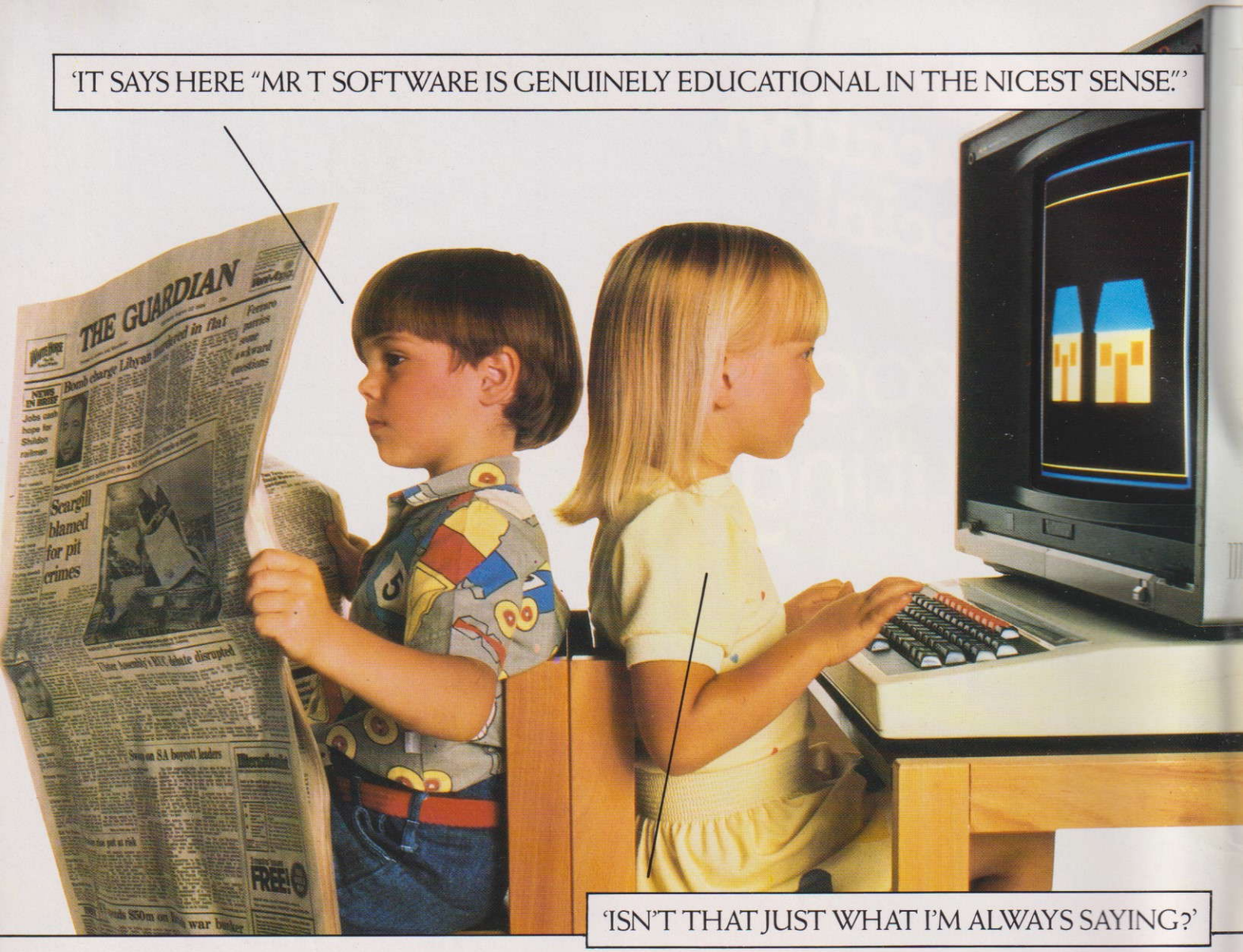

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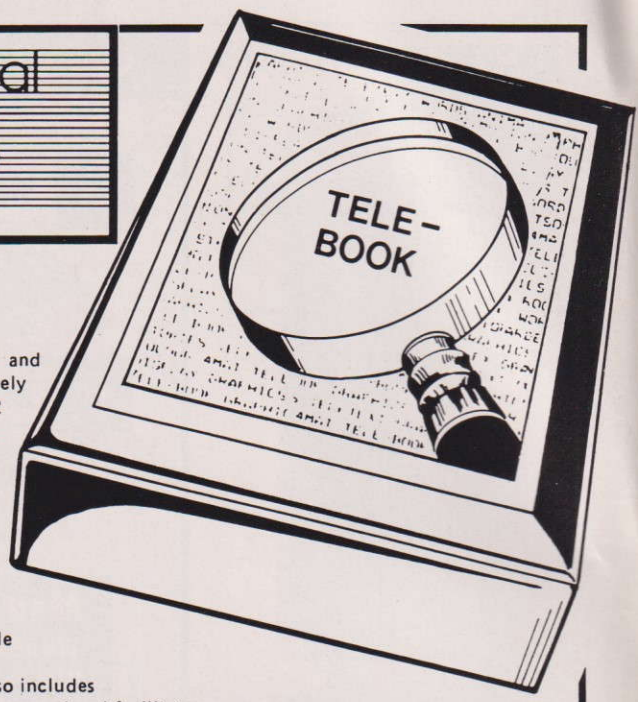

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TELE-BOOK is not another teletext simulator but an extremely flexible menu-driven program which allows 'books' of up to 15 pages of text and graphics to be created on the BBC micro. Some of the many possibilities are: class magazines, simple animations,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

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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 srip, 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.

The disc version (containing two discs) also includes 1. DISC UTILITY - allows 'books' to be merged and facilitates some disc management operations such as compacting, titling, re-naming and locking files. 2. SEARCH - a separate database program allowing schools to store information about their software collections and to make enquiries such as "Which language programs do we have which are suitable for 7 year olds".

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School software in the home

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 prevelant 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 attracts the same range of opinions as there are teaching styles. Bad teaching is bad teaching whatever the medium!

The requirements of the classroom teacher are nevertheless of prime importance whoever is writing the program. In secondary schools the software usually needs to relate to a particular subject if it is to appeal to the teacher. This is less of a requirement at the primary level where software can act more as a stimulus or focus for class project work.

Certainly, when not constrained by a subject-based curriculum, there is greater scope for imaginative educational software. In some areas the teacher is looking to use the computer as another effective teaching aid and needs good software tools, such as word processors or information retrieval packages. This field is probably the best catered for at the moment with a choice between many business packages and specially developed educational versions of the software.

The most difficult use of computers in education to justify is the strict 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-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?

MEP...helping come to grips

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 microprocessors.

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 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.

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

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

teachers with the micro

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.

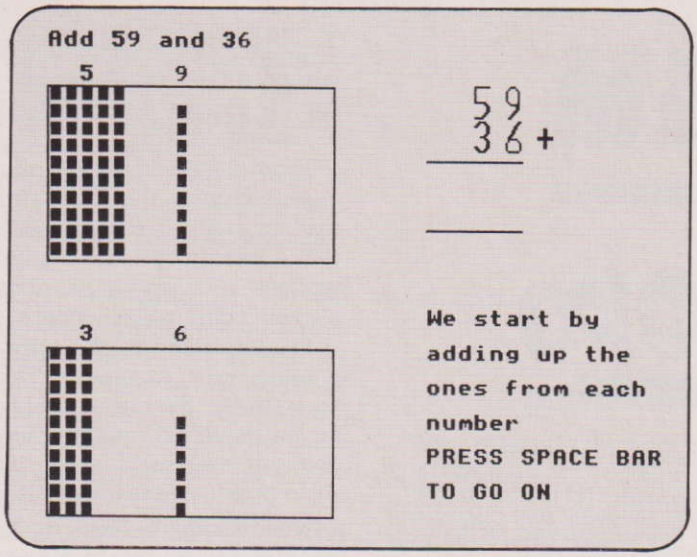
The provision of information about software via Prestel or some other similar system could be attractive to both producer and consumer, since this would enable the latter to determine what is available and to have the program and its documentation squirted to him at the push of a key on the micro.

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.



Addition in the primary classroom

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.

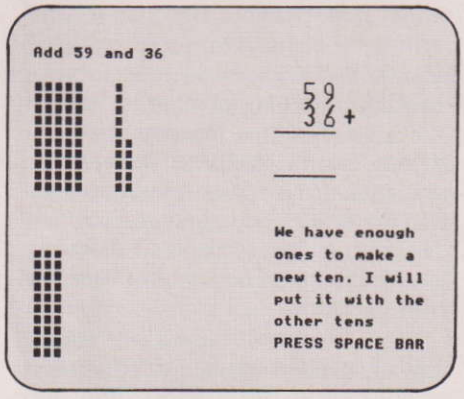
It demonstrates by means of graphics what the class teacher would on other occasions show using standard apparatus.

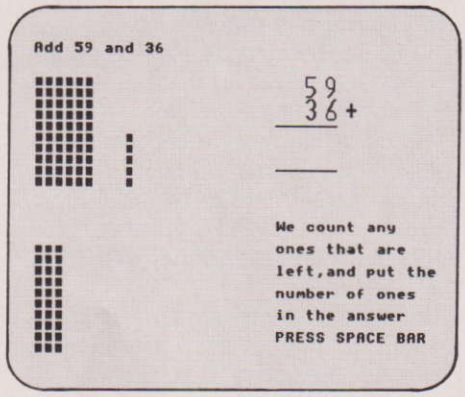
The short first section puts into the micro a number of character definitions. These enable the sum to be displayed using large figures not standardly available in Mode 1.

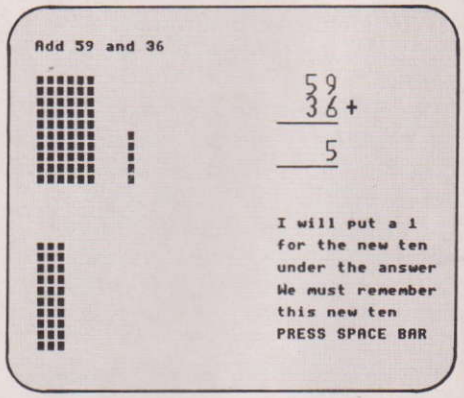
I chose the latter mode, incidentally, because it has a reasonably adequate text display. The text provided by Modes 2 and 5 is squat and ugly, and I prefer to avoid it where possible when writing software for young children.

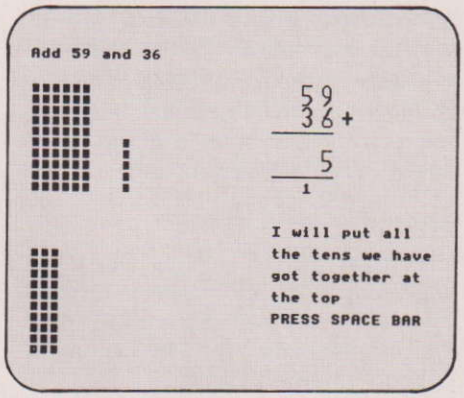
I regret the cramped nature of the listing and the less than helpful procedure names. This is a consequence of memory space limitation.

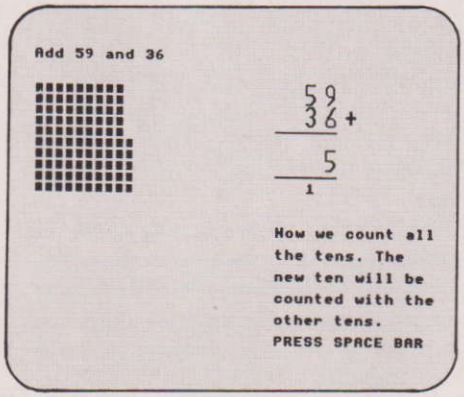
I originally developed the program on a BBC Mode B with a 0.1 operating

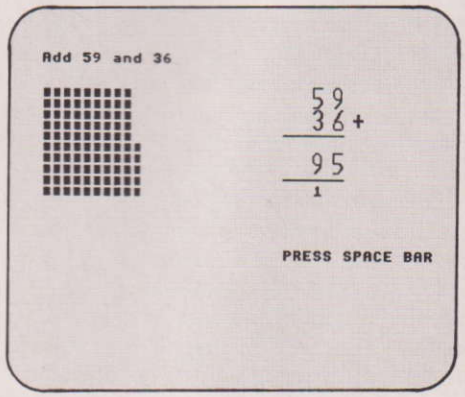












system. When I finally had the thing brought up to date and fitted with the Acorn DFS I discovered what others had found out a long time ago – that the "improvements" were in certain respects rather a nuisance.

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.

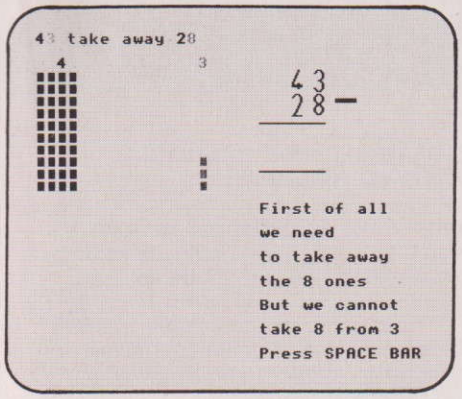
PROGRAM STRUCTURE

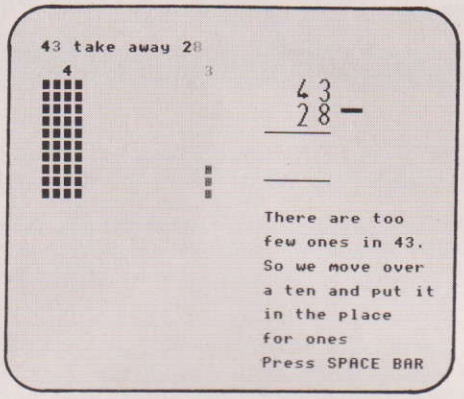
PROCn	Selects the numbers to be added.
PROCd	Displays the numbers in an appropriate form.
Line 270	Sets up the "sum" in the large numerals on the right hand side of the screen.
Lines 480-510	Control the input of the pupil so that he is unable to corrupt the screen display. This approach is repeated elsewhere in the program.
PROCc	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.
PROCnt	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.

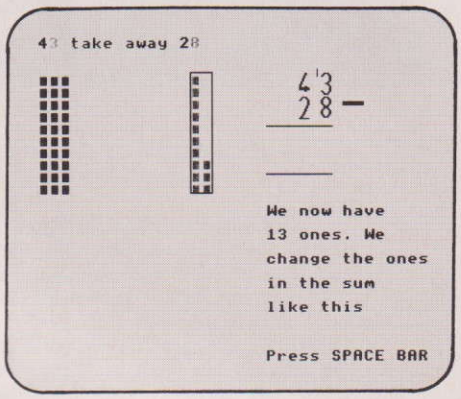
```
    1 VDU23,225,12,12,12,12,12,12,12,12,
12,23,226,12,12,12,12,12,12,12,0,23,2
27,60,102,195,3,3,3,6,6,23,228,12,12,
24,24,48,96,255,0
    2 VDU23,229,60,102,195,3,3,3,6,28
,23,230,6,3,3,3,195,102,60,0,23,231,1
2,12,24,24,48,48,96,96,23,232,192,204
,255,255,12,0,0,0,23,233,255,128,128,
128,128,128,128,252,23,234,6,3,3,3,6,
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 T%(9,2):FORW%=0TO9:FORr=0TO
2:READT%(W%,r):NEXT:NEXT
   30 add$=CHR$245+CHR$10+CHR$8+CHR$2
46:VDU23,1,0;0;0;0;
   40 c=0:*FX11,0
   50 REPEAT:CLS:PROCn:PROCd:PROCadd:
PRINTTAB(24,21)"PRESS SPACE BAR":PROC
sp:c=c+1:UNTILc=2
   60 k=0:REPEAT:CLS:PROCn:PROCd:PROC
p1:PROCm:PROCp2:PROCp3
   70 PROCc:PRINTTAB(24,21)"PRESS SPA
CE BAR":PROCsp:k=k+1:UNTIL k=3
   80 CLS:PRINTTAB(0,3)"Type Y if you
 want this programme again":REPEAT:A$
=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$224):NEXT
  250 FORY%=31-U2 TO30:VDU17,1,31,8,Y
%,224:NEXT
  260 GCOL0,2:MOVE0,30:DRAW580,30:DRA
W580,340:DRAW0,340:DRAW0,30
  270 VDU31,27,6:COLOUR2:VDU T%(T1,1)
,10,8,T%(T1,2),31,29,6,T%(U1,1),10,8,
T%(U1,2),31,27,8,T%(T2,1),10,8,T%(T2,
2),31,29,8,T%(U2,1),10,8,T%(U2,2)
  280 VDU31,31,8:PRINT add$:MOVE768,5
```

From Page 9

```
60:DRAW960,560:MOVE768,688:DRAW960,68
8
  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,T%(u,1),10,8,T%(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 PROCmt
  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,T%(T2+T1+1,1),
10,8,T%(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
$B):PROCt(40)
  530 IFR<>u PROCc:PROCp("No.Please",
"add up the","ones again"," "," "," "
)
  540 UNTILu=R:PROCc
  550 PROCp("Good.Let's","get all","t
he ones","to the top"," "," ")
  560 ENDPROC
  570 DEFPROCc
  580 FORY%=19TO29:PRINTTAB(24,Y%)STR
ING$(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$F):
PROCt(60)
  670 IFq<>U PROCc:PROCp("No.Look","a
gain and","tell me"," "," "," "):PROC
a(9,16)
  680 UNTILq=U
  690 PROCc:PROCp("Good.I","will put"
,"it in"," "," "," ")
  700 u=(N+M)MOD 10:VDU17,2,31,29,12,
T%(u,1),10,8,T%(u,2):ENDPROC
  710 DEFPROCm
  720 VDU31,2,20,32,31,8,5,32,31,2,5,
32
  730 GCOL0,0:MOVE0,500:DRAW580,500:D
RAW580,824:DRAW0,824:DRAW0,500:MOVE0,
30:DRAW580,30:DRAW580,340:DRAW0,340:D
RAW0,30
  740 COLOUR1:Y%=15-U1:L%=-1:REPEAT:V
DU31,8,Y%+1,224,31,8,15-L%,32:L%=L%+1
:Y%=Y%-1:PROCt(20):UNTILY%=4
  750 Y%=30-U2:VDU30:REPEAT:VDU31,8,Y
%+10-U1,32,31,8,Y%,224:Y%=Y%-1:PROCt(
20):UNTILY%=15-10+U1
  760 FORY%=30TO22 STEP-1:VDU31,8,Y%,
32:NEXT
  770 u=(N+M) MOD 10:IFu=0 ENDPROC
  780 COLOUR1:FORY%=41-U2-U1 TO30:VDU
31,9,Y%,224:NEXT:PROCt(10)
  790 COLOUR1:Y%=30:REPEAT:VDU31,9,Y%
,32,31,9,Y%+10-U1-U2,224:PROCt(40):Y%
=Y%-1:VDU30:UNTIL Y%=15
  800 ENDPROC
  810 DEFPROCnt
  820 COLOUR3:X%=8:REPEAT:FORC%=6TO15
:VDU31,X%,C%,32:NEXT:FORC%=6TO15:VDU3
1,X%-1,C%,224:NEXT:X%=X%-1:PROCt(40):
UNTILX%=T1
  830 ENDPROC
  840 DEFPROCp3
  850 PROCt(500):PROCc
  860 PROCp("Tell me what to","put un
der the","tens part of the","answer."
,"","")
  870 PROCa(27,16)
  880 w=0:REPEAT:REPEAT:VDU31,24,29:E
=GET:VDU E:IF NOT(E>47AND E<58)THEN V
DU31,24,29,32,8:*FX15,0
  890 UNTILE>47AND E<58:E=VAL(CHR$E):
PROCt(60)
  900 IFE<>1 PROCc:PRINTTAB(25,19)"No
.Try":PRINTTAB(25,21)"again.":w=w+1
  910 UNTILw=3OR 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
:PROCmt
  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$g):IFg<>T1+T2+1 PROCc
:PRINTTAB(25,19)"Try again"
 1000 UNTIL g=T1+T2+1:PROCc:PRINTTAB(
25,19)"Good.I":PRINTTAB(25,21)"will p
ut":PRINTTAB(25,23)"them in"
 1010 *FX15,0
 1020 PROCt(500):VDU17,2,31,27,12,T%(
T1+T2+1,1),10,8,T%(T1+T2+1,2)
 1030 ENDPROC
 1040 DEFPROCmt
 1050 COLOUR3:X%=0:REPEAT:FORC%=21TO3
0:VDU31,X%,C%,32:NEXT:FORC%=21TO30:VD
U31,X%+T2,C%,224:NEXT:X%=X%+1:UNTILX%
=T1+1
 1060 X%=T1+1:REPEAT:Y%=30:REPEAT:VDU
31,X%,Y%,32,31,X%,Y%-10,224:Y%=Y%-1:U
NTILY%=15:X%=X%+1:PROCt(40):UNTILX%=T
2+T1+1
 1070 ENDPROC
 1080 DEFPROCt(Q):TIME=0:REPEATUNTILT
IME>Q:ENDPROC
 1090 DEFPROCa(J,V):FORS=1TO8:VDU17,1
,31,J,V,94:PROCt(30):VDU31,J,V,32:PRO
Ct(30):NEXT:COLOUR2:ENDPROC
 1100 DEFPROCp(a$,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
```







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.

By ANDREW DAVIS

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.

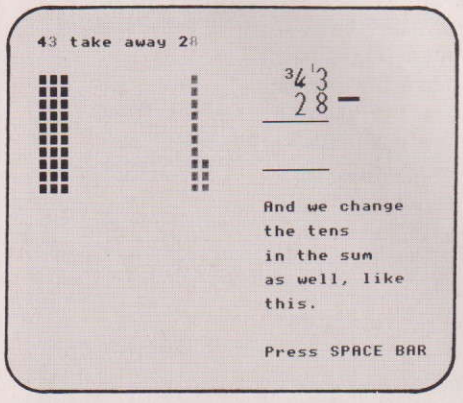
The structure of the program is very simple, though the listing may appear complicated. You are presented with a menu containing two options.

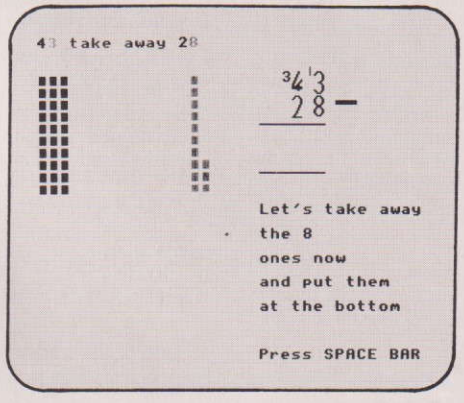
The first gets the computer to show you the subtraction in all its stages. The graphics which accompany the explanation are designed to illustrate the reasons behind each stage.

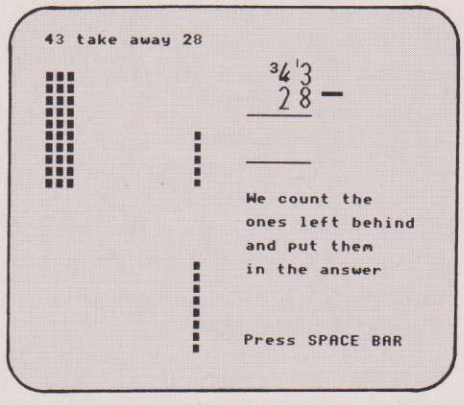
The second option presents very similar material but you are invited to supply answers on several occasions during the process.

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.







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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 it's 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.

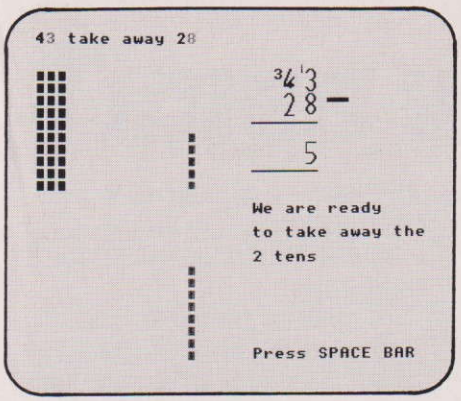
CONSONANT BLENDS: BBC Model B: 1.2 OS

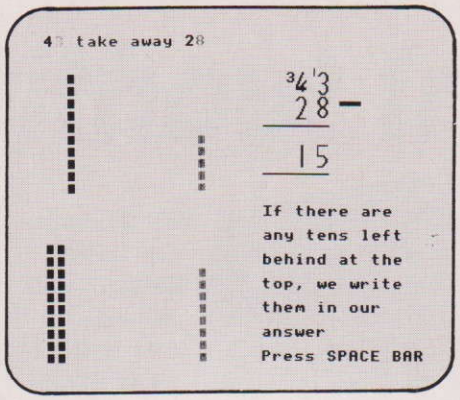
Age range 6 to 9 years

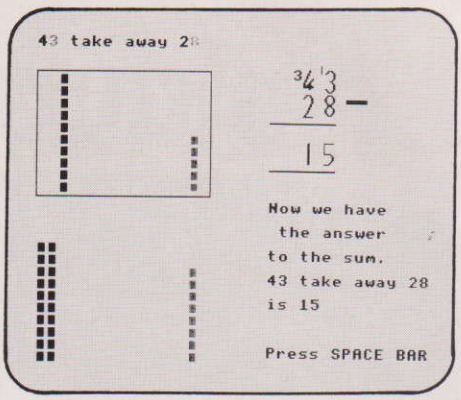
Following on from "Short Vowel Sounds" and "Magic E" this reading program deals with the initial consonant blends, such as tr, bl, sm etc. Options include diagnostic, practice and games modes and can be tailored to the child's individual needs. Games are for 1 or 2 players. Presented with large colourful lettering, pictures and optional sound effects.
Price: Cassette £7.00 + £1.05 VAT. Disc £8.50 + £1.28 VAT.

Orders to Sherston Software, 8 Court Street, Sherston, Malmesbury, Wilts SN16 0LI.

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







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.

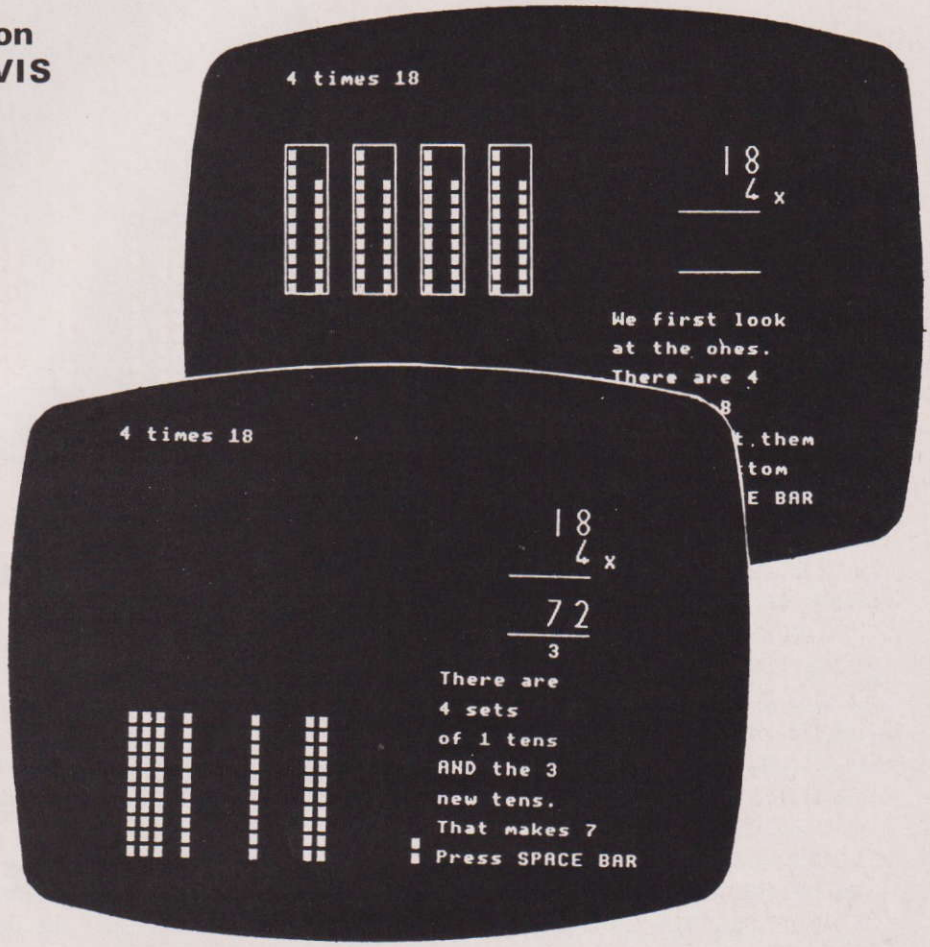
```
  10 IFPAGE=&E00THENVDU6:GOTO50
  20 VDU21:*KEY0*TAPE|M:FORA%=0TO(TO
P-PAGE)STEP4:A%!&E00=A%!PAGE:NEXT|MPA
GE=&E00|MOLD|MRUN|M
  30 *FX138,0,128
  40 END
  50 VDU23,225,12,12,12,12,12,12,12,
12,23,226,12,12,12,12,12,12,12,0,23,2
27,60,102,195,3,3,3,6,6,23,228,12,12,
24,24,48,96,255,0,23,229,60,102,195,3
,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
6,16,16,16,16,16,0,23,251,0,1,3,6,12,
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 T%(9,2):FORA%=0TO9:FORB%=0T
O2:READT%(A%,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:A%=GET:UNTILA%=49ORA%=50
:CLS:PROCH:IFA%=49 PROCn:PROCd:PROCsu
b:PROCsp ELSE PROCn:PROCd:PROCp1:PROC
p2:PROCsp
```

From Page 13

```
  120 CLS:UNTILFALSE:END
  130 DEFPROCn:REPEAT:N%=RND(99):U1%=
N% MOD 10:T1%=N% DIV 10:M%=RND(89)+10
:U2%=M% MOD 10:T2%=M% DIV 10:UNTILN%>
M%+10ANDU1%-U2%<0:ENDPROC
  140 DEFPROCd:COLOUR3:PRINTTAB(0,3);
T1%;:COLOUR1:PRINT;U1%;:COLOUR2:PRINT
;T$;:COLOUR3:PRINT;T2%;:COLOUR1:PRINT
;U2%:COLOUR3:PRINTTAB(2,5);T1%:COLOUR
1:PRINTTAB(15,5);U1%
  150 FORY%=6TO15:COLOUR3:PRINTTAB(0,
Y%)STRING$(T1%,CHR$224):NEXT:IFU1%>0F
ORY%=16-U1%TO15:VDU17,1,31,15,Y%,224:
NEXT
  160 VDU31,27,6,17,2,T%(T1%,1),10,8,
T%(T1%,2),31,29,6,T%(U1%,1),10,8,T%(U
1%,2),31,27,8,T%(T2%,1),10,8,T%(T2%,2
),31,29,8,T%(U2%,1),10,8,T%(U2%,2)
  170 VDU31,31,8,245,245:MOVE768,560:
DRAW960,560:MOVE768,688:DRAW960,688:E
NDPROC
  180 DEFPROCsub:PROCp("First of all"
,"we need","to"+T$,"the "+STR$U2%+" o
nes","But we cannot","take "+STR$U2%+
" from "+STR$U1%):PROCsp
  190 PROCp("There are too","few ones
 in "+STR$N%+".","So we move over","a
 ten and put it","in the place","for
 ones"):PROCsp:PROCm:PROCL
  200 PROCp("We now have",STR$(U1%+10
)+" ones. We","change the ones","in"+
S$,"like this",""):PROCK(3):PROCa(15,
17):PROCu:PROCK(0)
  210 PROCp("And we change","the tens
","in"+S$,"as well, like","this.",""
):PROCq:PROCV:PROCsp:PROCX:PROCp("We c
ount the","ones left behind","and"+P$
,"in"+A$,"","","):PROCsp:A%=U1%+10-U2%:
PROCE
  220 PROCsp:PROCp("We are ready","to
"+T$+"the",STR$T2%+" tens","","","):
PROCsp:PROCmt:PROCsp:PROCp("If there
are","any tens left","behind at the",
"top, we write","them in our","answer
"):IFT1%-T2%-1>0PROCO
  230 PROCsp:PROCfr:PROCp("Now we hav
e",A$,"to"+S$+".",STR$N%+T$+STR$M%,"i
s "+STR$(N%-M%),""):ENDPROC
  240 DEFPROCp1:PROCp(H$,"ones we wan
t","to"+T$,"","","):PROCi(U2%):PROCp
("Good. But we","can't take "+STR$(U2
%),"from "+STR$(U1%)+". We","must bri
ng over","a ten",""):PROCsp:PROCm:PRO
CL
  250 PROCp("Look at the","blocks aga
in.",H$,"ones you see","in "+STR$N%+"
 now.","","):PROCK(3):PROCa(15,17):PROC
R(U1%+10):PROCp("Good. We need","to c
hange the","ones in"+S$,"to show","th
is. I will","do it."):PROCu:PROCK(0)
  260 PROCp("We have moved","a ten ov
er.",H$,"tens are left","in the tens"
,"place"):PROCa(2,17):PROCi(T1%-1):PR
OCp("Good. Let's","change the tens","
in"+S$,"to show this","","","):PROCq:EN
DPROC
  270 DEFPROCc:FORY%=17TO29:PRINTTAB(
24,Y%)SPC(16):NEXT:ENDPROC
  280 DEFPROCX:COLOUR1:IFU1%>0Y%=16:R
EPEAT:VDU31,15,Y%,224,31,15,Y%-U1%,32
:Y%=Y%+1:PROCt(20):UNTILY%=30:Y%=30-U
1%:REPEAT:VDU31,15,Y%,32:Y%=Y%+1:UNTI
LY%=30:Y%=30-U1%:REPEAT:VDU31,14,Y%,2
24:Y%=Y%+1:UNTILY%=30
  290 Y%=16:REPEAT:VDU31,14,Y%,224,31
,14,Y%-10,32:Y%=Y%+1:PROCt(20):UNTILY
%=16+U2%-U1%:REPEAT:VDU31,14,Y%,224,3
1,14,Y%-(U2%-U1%),32:Y%=Y%+1:PROCt(20
):UNTILY%=30-U1%:PROCsp:ENDPROC
  300 DEFPROCm:COLOUR1:X%=T1%-1:REPEA
T:FORC%=6TO15:VDU31,X%,C%,32:NEXT:FOR
C%=6TO15:VDU31,X%+1,C%,224:NEXT:X%=X%
+1:PROCt(40):UNTILX%=14:ENDPROC
  310 DEFPROCp2:PROCV:PROCX:PROCp(H$,
"ones are","left at the top","Then I
can write","them in the","answer"):PR
OCa(14,17):PROCi(U1%+10-U2%):PROCp(G$
,P$,"in"+A$,"","","):PROCE:PROCsp
  320 PROCp("We now need","to"+T$,"th
e tens.",H$,"we"+T$,""):PROCi(T2%):PR
OCp(G$,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(T1%-T2%-1):IFA%>0PROCp(G$,P$,"in"+
A$,"","","):PROCO
  340 IFA%=0PROCt(50):PROCc:PRINTTAB(
24,17)"Good"
  350 PROCsp:PROCfr:PROCp("So we have
","done"+S$+".","What","is"+A$+"?","W
hat is",STR$N%+T$+STR$M%+"?"):PROCR(N
%-M%):PRINTTAB(24,17)"GOOD !":*FX15,1
  360 ENDPROC
  370 DEFPROCmt:PROCt(50):X%=0:COLOUR
3:REPEAT:Y%=6:REPEAT:VDU31,X%,Y%,32,3
1,X%,Y%+10,224:Y%=Y%+1:UNTILY%=20:X%=
X%+1:PROCt(40):UNTILX%=T2%:ENDPROC
  380 X%=0:COLOUR3:REPEAT:Y%=6:REPEAT
:VDU31,X%,Y%,32,31,X%,Y%+10,224:Y%=Y%
+1:UNTILY%=20:X%=X%+1:PROCt(40):UNTIL
X%=T2%:ENDPROC
  390 DEFPROCt(Q):TIME=0:REPEATUNTILT
IME>Q:ENDPROC
  400 DEFPROCa(J%,V%):FORS=1TO8:VDU17
,1,31,J%,V%,254:SOUND1,-8,200,6:VDU31
,J%,V%,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:A%=GET:UNTILA%=32:
PROCc:PROCH:*FX15,1
  440 ENDPROC
  450 DEFPROCu:PROCt(150):MOVE904,844
:GCOL0,2:VDU5,250,4:PROCsp:ENDPROC
  460 DEFPROCq:MOVE864,812:VDU5,251,4
:PRINTTAB(26,6);T1%-1:PROCsp:ENDPROC
  470 DEFPROCi(Z):REPEAT:REPEAT:VDU31
,32,29:A%=GET:UNTILA%>47ANDA%<58:VDUA
%:*FX15,0
  480 A%=VAL(CHR$A%):PROCt(40):IFA%<>
Z PROCc:PRINTTAB(24,17)"Try again !"
  490 UNTILA%=Z:PROCt(50):ENDPROC
  500 DEFPROCL:VDU31,2,5,32,31,15,5,3
2:ENDPROC
  510 DEFPROCH:VDU23,1,0;0;0;0;:ENDPR
OC
  520 DEFPROCV:PROCp("Let's"+T$,"the
"+STR$U2%,"ones now","and"+P$,"at the
 bottom",""):ENDPROC
  530 DEFPROCE:VDU31,29,12,T%(A%,1),1
0,8,T%(A%,2):ENDPROC
  540 DEFPROCO:VDU31,27,12,T%(T1%-T2%
-1,1),10,8,T%(T1%-T2%-1,2):ENDPROC
  550 DEFPROCK(C%):GCOL0,C%:MOVE448,5
12:DRAW448,832:DRAW512,832:DRAW512,51
2:DRAW448,512:GCOL0,2:ENDPROC
  560 DEFPROCR(Z%):REPEAT
  570 REPEAT:VDU31,24,29:A%=GET:UNTIL
A%>47ANDA%<58:VDUA%:REPEAT:B%=GET:UNT
IL(B%>47ANDB%<58)ORB%=127:VDUB%:IFB%=
127THEN570
  580 A%=10*VAL(CHR$A%)+VAL(CHR$B%):P
ROCt(30):PROCc:IFA%<>Z%PRINTTAB(24,17
)"Try again"
  590 UNTILA%=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.

50-80 Defines characters used to make the "big numbers" used in the sum.

90 The array links the big numbers with their corresponding standard numbers.

140 *PROCn,* picks the numbers. The answer never exceeds 99. *M%,* the single digit number does not exceed 5, and *N%,* 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. *U1%* is the units of the top number. *U2%* (which is a holdover from previous programs and doesn't really need to be here), is the units of the bottom number, *U3%* the units of the answer, and *T3%* the tens of the answer.

160 *PROCd* displays the sum at the beginning.

220 *PROCmult* is the main procedure taking the pupil through the sum.

380 *PROCX,* 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.

410 *PROCmt* moves the tens from the top to the bottom, after the units have first been dealt with.

480 *PROCa* makes a flashing arrow which is used twice in the program.

500 *PROCp (a$,b$,c$,d$,e$,f$)* formats the text used throughout the program.

530 *PROCi (Z)* takes any single digit inputs from the pupil.

570 *PROCK(C%,X%)* draws frames round the numbers in the colour desired.

580 *PROCR(Z%)* takes any two digit inputs by the pupil.

630 *PROCY* takes ones to the bottom when there are three "new tens".

720 *PROCtwo* takes ones to the bottom when there are two "new tens".

810 *PROCall,* nearly all the movements of the ones require this.

850 *PROCone* takes ones to the bottom when there is one "new ten".

1030 *PROCgen,* an important procedure used many times in the course of moving the units down.

1050 *PROCmu.* 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.

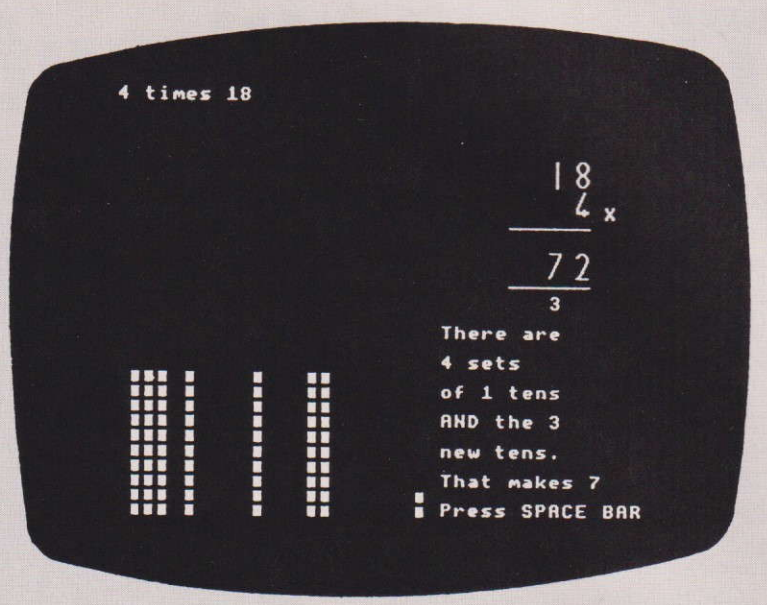
1060 *PROCud* assigns the units moving procedures appropriately.

1110 *PROCp1,* the main procedure in which the pupil helps the micro to do the sum.

1240 *PROCb1* turns the new tens blue.

From Page 15

```
    5 REM (c) The Micro User
   10 IFPAGE=&E00THENVDU6:GOTO50
   20 VDU21:*KEY0*TAPE¦M:FORA%=0TO(TO
P-PAGE)STEP4:A%!&E00=A%!PAGE:NEXT¦MPA
GE=&E00:MOLD¦MRUN¦M
   30 *FX138,0,128
   40 END
   50 VDU23,225,12,12,12,12,12,12,12,
12,23,226,12,12,12,12,12,12,12,0,23,2
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 T%(9,2):FORA%=0TO9:FORB%=0T
O2:READT%(A%,B%):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:A%=GET:UNTILA%=49ORA%=50
:CLS:PROCH:IFA%=49 PROCn:PROCd:PROCmu
lt:PROCsp ELSE PROCn:PROCd:PROCp1:PRO
Csp
  130 UNTILFALSE:END
  140 DEFPROCn:REPEAT:N%=RND(29):U1%=
N% MOD 10:T1%=N% DIV 10:M%=RND(5):U2%
=M% MOD 10:T3%=(M%*N%)DIV 10:U3%=(M%*
N%)MOD 10:UNTILN%>10ANDM%>1ANDM%*N%<1
00ANDU1%*U2%>9
  150 ENDPROC
  160 DEFPROCd:COLOUR1:PRINTTAB(0,1);
U2%;:COLOUR2:PRINT;" times ";:COLOUR3
:PRINT;T1%;:COLOUR1:PRINT;U1%;
  170 X%=0:REPEAT:FORY%=6TO15:COLOUR3
:PRINTTAB(X%,Y%)STRING$(T1%,CHR$224):
NEXT:IFU1%>0FORY%=16-U1%TO15:VDU17,1,
31,X%+2,Y%,224:NEXT
  180 X%=X%+5:UNTILX%/5=M%
  190 X%=0:REPEAT:PROCK(2,X%):X%=X%+1
60:UNTIL(X%/160)=M%
  200 VDU31,32,6,17,2,T%(T1%,1),10,8,
T%(T1%,2),31,34,6,T%(U1%,1),10,8,T%(U
1%,2),31,34,8,T%(U2%,1),10,8,T%(U2%,2
)
  210 VDU31,36,9,88:MOVE928,560:DRAW1
120,560:MOVE928,688:DRAW1120,688:ENDP
ROC
  220 DEFPROCmult:PROCp("We first loo
k","at the ones.","There are "+STR$U2
%,"sets of "+STR$U1%,"I will put them
","at the bottom"):PROCsp
  230 X%=0:REPEAT:PROCK(0,X%):X%=X%+1
60:UNTIL(X%/160)=M%:PROCud
  240 IF(U1%*U2% DIV 10)>1PROCp("We h
ave "+STR$(U1%*U2% DIV 10),"new tens.
 I will","make them blue","","","")
  250 IF(U1%*U2% DIV 10)=1PROCp("We h
ave one","new ten. I will","make it b
lue","","","")
  260 PROCsp:PROCbl
  270 PROCp("We write how","many new
tens","there are","under the","answer
 like","this"):PROCa(32,15):PRINTTAB(
32,15);U1%*U2% DIV 10
  280 PROCsp:IFU3%>0PROCp("There are
some","ones that we","could not make"
,"tens with. We","write them","in the
 answer")
  290 IFU3%=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,T%(U3%,1),10,8
,T%(U3%,2)
  310 PROCsp:IFT1%>1PROCp("We have "+
STR$M%+" sets","of "+STR$T1%+" tens..
"+STR$(M%*T1%),"tens..still at","the
top. Down","they go to","the bottom")
  320 IFT1%=1PROCp("We still have",ST
R$M%+" 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$M%+" sets
","of "+STR$T1%+" tens","AND the "+ST
R$(U1%*U2% DIV 10),"new tens.","That
makes "+STR$T3%):VDU17,2,31,32,12,T%(
T3%,1),10,8,T%(T3%,2)
  360 ENDPROC
  370 DEFPROCc:FORY%=17TO29:PRINTTAB(
24,Y%)SPC(16):NEXT:ENDPROC
  380 DEFPROCX:PROCall:PROCnext:PROCg
en(0,17,4,3*U1% MOD 20,21):PROCgen(30
-3*U1%,17,5,0,31-(4*U1%-30)):PROCgen(
0,22,5,4*U1%-30,21)
  390 IF5*U1%-40<>0 Y%=12:REPEAT:VDU3
1,22,Y%,224,31,22,Y%-5,32:Y%=Y%+1:PRO
Ct(4):UNTILY%=30
  400 ENDPROC
  410 DEFPROCmt:COLOUR3:t%=4:REPEAT
  420 IFM%>t% X%=t%*5:REPEAT:Y%=6:REP
EAT:VDU31,X%,Y%,32,31,X%,Y%+10,224:Y%
=Y%+1:UNTILY%=20:X%=X%+1:PROCt(40):UN
TILX%=t%*5+T1%
  430 t%=t%-1:UNTILt%=0
  440 C%=0:REPEAT:X%=T1%-1-C%:REPEAT:
FORY%=6TO15:VDU31,X%,Y%,32:NEXT:FORY%
=6TO15:VDU31,X%+1,Y%,224:NEXT:X%=X%+1
:UNTILX%=14-C%:C%=C%+1:UNTILC%=T1%
  450 X%=14:REPEAT:Y%=6:REPEAT:VDU31,
X%,Y%,32,31,X%,Y%+10,224:Y%=Y%+1:UNTI
LY%=20:X%=X%-1:PROCt(40):UNTILX%=14-T
1%
  460 ENDPROC
  470 DEFPROCt(Q):TIME=0:REPEATUNTILT
IME>Q:ENDPROC
```



```
  480 DEFPROCa(J%,V%):FORS=1TO8: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:A%=GET:UNTILA%=32:
PROCc:PROCH:*FX15,1
  520 ENDPROC
  530 DEFPROCi(Z):REPEAT:REPEAT:VDU31
,32,29:A%=GET:UNTILA%>47ANDA%<58:VDUA
%:*FX15,0
  540 A%=VAL(CHR$A%):PROCt(40):IFA%<>
Z PROCc:PRINTTAB(24,17)"Try again !"
  550 UNTILA%=Z:PROCt(50):ENDPROC
  560 DEFPROCH:VDU23,1,0;0;0;0;:ENDPR
OC
  570 DEFPROCK(C%,X%):GCOL0,C%:MOVEX%
,512:DRAWX%+100,512:DRAWX%+100,832:DR
AWX%,832:DRAWX%,512:GCOL0,2:ENDPROC
  580 DEFPROCR(Z%):REPEAT
  590 REPEAT:VDU31,24,29:A%=GET:UNTIL
A%>47ANDA%<58:VDUA%:REPEAT:B%=GET:UNT
IL(B%>47ANDB%<58)ORB%=127:VDUB%:IFB%=
127THEN590
  600 A%=10*VAL(CHR$A%)+VAL(CHR$B%):P
ROCt(30):PROCc:IFA%<>Z%PRINTTAB(24,17
)"Try again"
  610 UNTILA%=Z%: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:PROCall:IF3*U1%>19PROC
next
  640 IF3*U1%<18 PROCz1
  650 IF4*U1%>30PROCgen(0,17,4,3*U1%
MOD 20,21)
  660 IF4*U1%>30ANDU1%=8PROCgen(6,17,
5,0,29)
  670 IF4*U1%>30ANDU1%=9PROCgen(3,17,
5,0,25)
  680 IFU1%=7PROCgen(0,17,4,1,23):PRO
Cgen(0,22,4,8,21):PROCgen(2,22,5,0,26
)
  690 IFU1%=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 IFU3%>0PROCmu(1+(U1%*U2% DIV 10
),U3%)
  710 ENDPROC
  720 DEFPROCtwo:IF2*U1%>8AND NOT(U1%
=4ANDM%=5)PROCall
  730 IFU1%=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(
0,17,3,2,25):PROCgen(0,22,3,6,21)
  740 IFU1%>6AND(M%=3ORM%=4)PROCgen(0
,12,3,2*U1%-10,21):PROCgen(20-2*U1%,1
2,4,0,31-(3*U1%-20))
  750 IFU1%=5PROCgen(0,12,3,0,26):PRO
Cgen(0,17,3,5,21)
  760 IFU1%=5ANDM%=5PROCgen(0,22,4,0,
26)
  770 IFU1%=6PROCgen(0,12,3,2,23):PRO
Cgen(0,17,3,8,21):PROCgen(2,17,4,0,27
)
  780 IFU1%=7ANDM%=4PROCgen(0,17,4,1,
23)
  790 IFU3%>0PROCmu(1+(U1%*U2% DIV 10
),U3%)
  800 ENDPROC
  810 DEFPROCall:COLOUR1:PROCgen(0,2,
2,0,31-U1%):PROCgen(0,7,2,U1%,21)
  820 IF2*U1%<11ENDPROC
  830 PROCgen(10-U1%,7,3,0,31-(2*U1%-
10))
  840 ENDPROC
  850 DEFPROCone
  860 IFU1%>1ANDU1%<6C%=0:D%=0:REPEAT
:PROCgen(0,2+D%,2,C%*U1%,31-(C%+1)*U1
%):C%=C%+1:D%=D%+5:UNTILC%=10 DIV U1%
  870 IFU1%=3PROCgen(0,17,2,9,21):PRO
Cgen(1,17,3,0,29)
  880 IFU1%=3ANDM%=5PROCgen(0,22,3,2,
26)
  890 IFU1%=4PROCgen(0,12,2,8,21):PRO
Cgen(2,12,3,0,29)
  900 IFU1%=4ANDM%=4PROCgen(0,17,3,2,
25)
  910 IFU1%=5ANDM%=3PROCgen(0,12,3,0,
26)
  920 IFU1%>5PROCgen(0,2,2,0,31-U1%):
PROCgen(0,7,2,U1%,21)
  930 IFU1%=6PROCgen(4,7,3,0,29)
  940 IFU1%=6ANDM%=3PROCgen(0,12,3,2,
23)
  950 IFU1%>6PROCgen(10-U1%,7,3,0,31-
(2*U1%-10))
  960 IFU3%>0PROCmu(1+(U1%*U2% DIV 10
),U3%)
  970 ENDPROC
  980 DEFPROCnext:PROCgen(0,12,3,(2*U
1%)MOD 10,21)
  990 PROCgen(20-2*U1%,12,4,0,31-(3*U
1%)MOD 20)
 1000 ENDPROC
 1010 DEFPROCz1:PROCgen(0,12,9,2,23)
 1020 ENDPROC
 1030 DEFPROCgen(a%,b%,c%,d%,e%):COLO
UR1:E%=0:REPEAT:Y%=16-E%-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
%=Y%+1:PROCt(2):UNTILY%=30-E%-d%:E%=E
%+1:UNTILY%=e%:ENDPROC
 1050 DEFPROCmu(A%,U%):X%=A%:REPEAT:F
ORC%=30-U%TO29:VDU31,X%+1,C%,224:NEXT
:FORC%=30-U%TO29:VDU31,X%,C%,32:NEXT:
PROCt(10):X%=X%+1:UNTILX%=22:ENDPROC
 1060 DEFPROCud:IFU1%*U2% DIV 10=4PRO
CX
 1070 IFU1%*U2% DIV 10=3PROCY
 1080 IFU1%*U2% DIV 10=2PROCtwo
 1090 IFU1%*U2% DIV 10=1PROCone
 1100 ENDPROC
 1110 DEFPROCp1:PROCp("We first look"
,"at the ones. We","have "+STR$M%+" s
ets","of "+STR$U1%+".Tell me how","ma
ny ones","that makes."):PROCR(M%*U1%)
 1120 PROCp("Good. I will","put all t
he","ones at the","bottom","",""):PRO
Csp:X%=0:REPEAT:PROCK(0,X%):X%=X%+160
:UNTIL(X%/160)=M%:PROCud
 1130 PROCp("How many new","tens can
we","make from","these ones ?","","")
:PROCi((M%*U1%)DIV 10)
 1140 PROCp("Good. I will","turn them
 blue.","Tell me the","number of ones
","we put in","our answer"):PROCbl:PR
OCi(U3%):PROCp("Good. I will","write
them in","","","","")
 1150 VDU17,2,31,34,12,T%(U3%,1),10,8
,T%(U3%,2):PROCsp:PROCp("Now tell","m
e the number","for the new tens","we
put UNDER","the tens part","of the an
swer"):PROCa(32,15)
 1160 PROCi((M%*U1%)DIV 10):PROCp("Go
od. I will","put it there","","","","
"):PRINTTAB(32,15);(M%*U1%)DIV 10
 1170 PROCsp:IFT1%>1PROCp("At the top
 we","have "+STR$M%+" sets of",STR$T1
%+" tens. How","many tens are","there
 at the top","altogether ?")
 1180 IFT1%=1PROCp("At the top we","h
ave "+STR$M%+" tens. Can","YOU see th
em ?","YOU tell me how","many tens ar
e","still at the top")
 1190 PROCi(M%*T1%)
 1200 PROCp("Good. I will","put them
with","the other tens","at the bottom
","","",""):PROCmt:PROCsp
 1210 PROCp("We have "+STR$M%+" sets"
,"of "+STR$T1%+" tens","AND "+STR$((M
%*U1%)DIV 10)+" new tens.","How many
tens","altogether ?",""):PROCi(T3%)
 1220 PROCp("Good. I will","put them
in","","","","",""):VDU17,2,31,32,12,T%(
T3%,1),10,8,T%(T3%,2)
 1230 ENDPROC
 1240 DEFPROCbl:COLOUR3:X%=1:REPEAT:F
ORY%=20TO29:VDU31,X%,Y%,224:NEXT:X%=X
%+1:UNTILX%=1+(U1%*U2% 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.

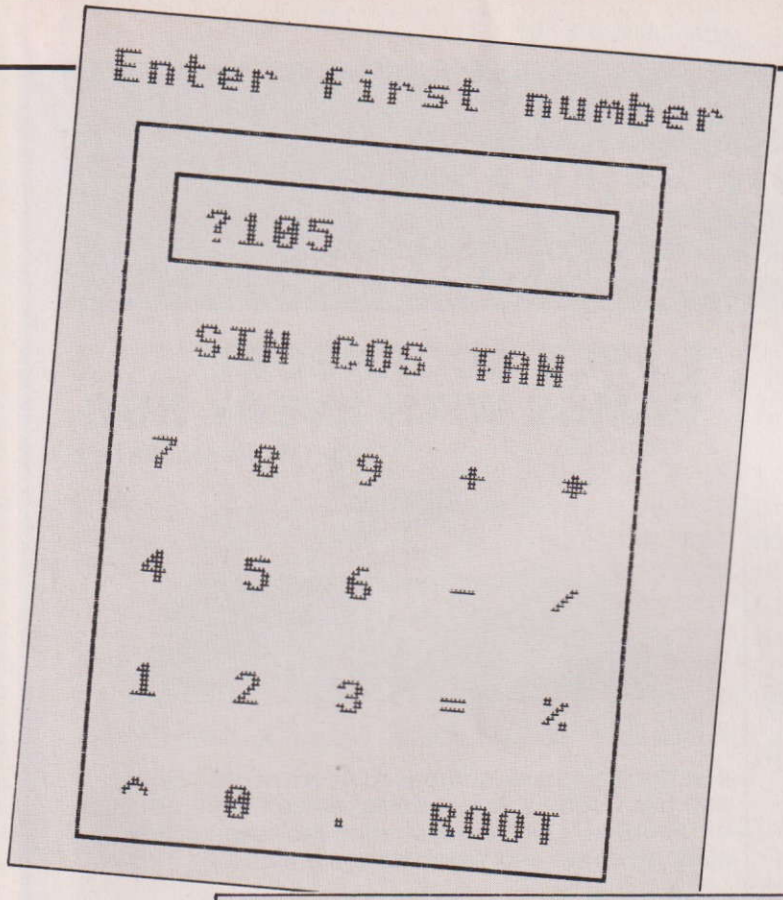
Now the micro will ask you to press =. It will then display the answer in the calculator display.

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.



VARIABLES

A$	Used to select function.
B$	Prints command "Enter next number".
C$	Prints a long space over unwanted text.
D$	Used to select = and to choose between degrees and radians.
E$	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.
PROCtangent	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
(16)
 170 IF A$="A" OR A$="a" THEN GOTO 8
0
 180 IF A$="+" OR A$="+" THEN PROCpl
us
 190 IF A$="*" OR A$="*" THEN PROCmu
ltiply
 200 IF A$="-" OR A$="=" THEN PROCmi
nus
 210 IF A$="/" OR A$="?" THEN PROCdi
vide
 220 IF A$="R" OR A$="r" THEN PROCro
ot
 230 IF A$="S" OR A$="s" THEN PROCsi
ne
 240 IF A$="C" OR A$="c" THEN PROCco
sine
 250 IF A$="T" OR A$="t" THEN PROCta
ngent
 260 IF A$="^" OR A$="^" THEN PROCpo
wers
 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  +  *
"
```

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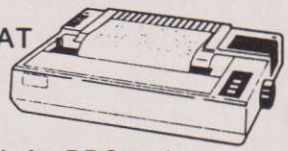

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MNKX1203	Kaga/Taxan KX1203A 12" Amber Monitor	94.92	109.16
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3" Micro Disc £89.00 (inc. VAT)

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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 5¼" 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 5¼ 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.

CUMANA

Ref	Disc Drives	Ex VAT	Inc VAT
DDCASE	Disc Drive Case for 5.25" 1/2 height dr.	6.12	7.04
DDCD200	Cumana 200K dual disc drive 40T	256.20	294.63
DDCD400	Cumana 400K dual disc drive 80T	276.36	317.81
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DDCD800S	Cumana 800K dual disc drive 40/80T	419.16	482.03
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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 additio
n
  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 subtra
ction
  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 roo
ts
  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);"(DEGREES
)":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 anoth
er 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.

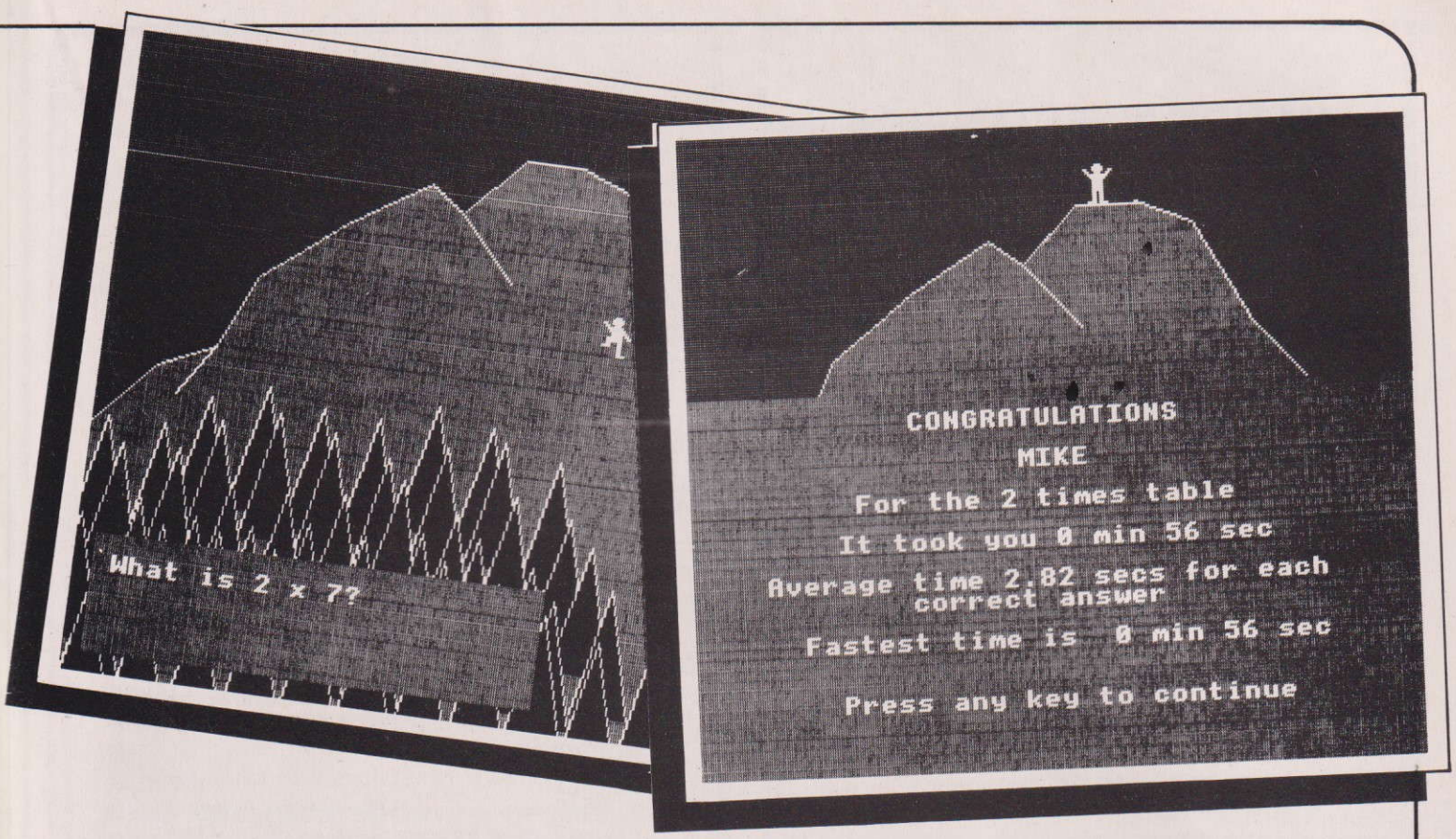
Parents and teachers might like to know that the value of U% in line 1650 sets the highest table allowed – at the moment it is set to 12. Also the value 0% in the same line determines the number of attempts allowed for each question.

PROCEDURES

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

VARIABLES

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




```
  10 REM Table Mountain
  20 REM by David Earle
  25 REM  (C) The Micro User
  30 *FX11
  40 *FX220
  50 ONERRORGOTO90
  60 DIMFT%(12):FOR ft%=1 TO 12:FT%(
ft%)=0:NEXT:N%=0
  70 MODE1:VDU23;8202;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 F%=0 TO 9:READN
o%,St%,Alt%:PROCtree(No%,St%,Alt%):NE
XT
 160 PROCdelay(1):VDU26,18,129,18,0,
31,X,Y,224,225,10,8,8,226,227
 170 SOUND1,-15,P%,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 R%=(40-LEN(N$))/2
 310 PRINTTAB(R%,3);N$
 320 Min%=Time% DIV 6000
 330 Sec%=INT((Time% MOD 6000)/100)
 340 Av=Time%/100/Z%
 350 IF FT%(T%)=0 OR FT%(T%)>Time% F
T%(T%)=Time% ELSE FT%(T%)=FT%(T%)
 360 FM%=FT%(T%)DIV6000:FS%=INT((FT%
(T%)MOD6000)/100)
 370 PRINTTAB(9,5)"For the ";T%;" ti
mes table"
 380 PRINTTAB(8,7)"It took you ";Min
%;" min ";Sec%;" sec"
 390 @%=&2020A:PRINTTAB(4,9)"Average
 time ";Av;" secs for each":@%=10
 400 PRINTTAB(12,10)"correct answer"
 410 PRINTTAB(6,12)"Fastest time is
";FM%;" min ";FS%;" sec"
 420 ENDPROC
 430 DEF PROCtriumph
 440 Time%=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:MOVE700,895:DRAW805,895
 480 FOR W%=200 TO 1000 STEP25:SOUND
1,-15,W%/4,1:SOUND2,-15,W%/5,1:NEXT
 490 PROCdelay(3)
 500 ENDPROC
 510 DEF PROCman(X,Y,G%)
 520 IF INT(G%/2)=G%/2 THEN H%=0 ELS
E H%=4
 530 VDU31,X,Y,32,32,32,31,X,Y+1,32,
228+H%,229+H%,32,31,X,Y+2,32,230+H%,2
31+H%,32,31,X+1,Y+3,32,32,32
 540 ENDPROC
 550 DEF PROCsound(P%)
 560 SOUND1,-15,P%,5
 570 ENDPROC
 580 DEF PROCexercise
 590 TIME=0:G%=0:RESTORE1840
 600 A%=0
 610 READ M%:C%=M%*T%:IF M%=5 THEN R
ESTORE 1840
 620 PROCclear
 630 PRINTTAB(2,26)"What is ";M%;" x
";T%;"?"
 640 *FX15
 650 INPUTTAB(2,28)S%:IFS%>144 THEN
VDU7:PRINTTAB(2,28);SPC(24):GOTO650 E
LSE G%=G%+1:A%=A%+1
 660 IFS%=C% THEN 670 ELSE 700
 670 Z%=Z%+1:P%=P%+4:PROCsound(P%):P
RINTTAB(2,30);S%;" is correct"
 680 X=X-0.6:Y=Y-1:IFY<=3 THEN ENDPR
OC ELSE 690
 690 PROCman(X,Y,G%):PROCdelay(1):GO
TO600
 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,G%)
 720 P%=P%-4:IF P%<10 THEN P%=10
 730 PROCsound(P%)
 740 PRINTTAB(2,30);S%;" is wrong. T
ry again"
 750 IFA%<Q% 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 FORL%=25 TO 30:PRINTTAB(1,L%);S
PC(25):NEXT
 860 ENDPROC
 870 DEF PROCtree(No%,St%,Alt%)
 880 VDU19,3,2,0,0,0,18,0,3
 890 FOR Tree%=0 TO No%
 900 SOUND1,-10,200,1
 910 VDU18,0,3:Var%=RND(50)
 920 MOVESt%,Alt%+Var%:MOVESt%+50,Al
t%+200+Var%:PLOT85,St%+100,Alt%+Var%
 930 VDU18,0,0:MOVESt%,Alt%+Var%:DRA
WSt%+50,Alt%+200+Var%:DRAWSt%+100,Alt
%+Var%
 940 St%=St%+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 FORM%=0 TO U%:C%=M%*T%:A%=0
1100 CLS:PRINT;M%;" x ";T%;" = ?"
1110 *FX15
1120 INPUT'S%:A%=A%+1:CLS:PRINT;M%;"
x ";T%;" = ";S%
1130 IF S%=C% 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 A%<Q% 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   ";M%;" x ";T%;" = ";C%:P
ROCdelay(5):NEXT
1200 ENDPROC
1210 DEF PROCdelay(D%)
1220 FOR Delay%=0 TO (D%*1000):NEXT
1230 ENDPROC
1240 DEF PROCheading
1250 N%=N%+1
1260 VDU28,4,31,36,18,17,0,17,129,12
1270 IFN%>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'T%:IFT%<2 OR T%>U% VDU7,1
2:PRINT'"You can't have the ";T%;" ti
mes table":PROCdelay(4):CLS:GOTO1510
ELSE CLS:PRINT'"You chose the ";T%;"
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 P%=30:U%=12:Q%=2:X=34:Y=23:Z%=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 VDU23,226,51,3,3,3,3,3,3,15
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 VDU23,230,51,3,3,3,3,3,3,15
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 VDU23,236,3,3,3,3,3,3,3,15
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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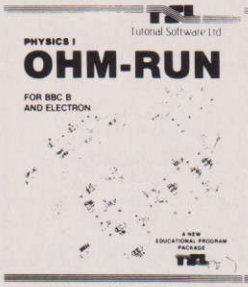

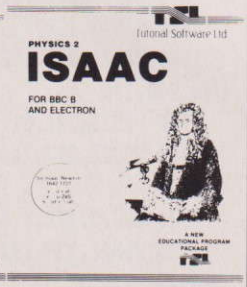

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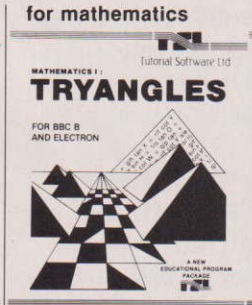

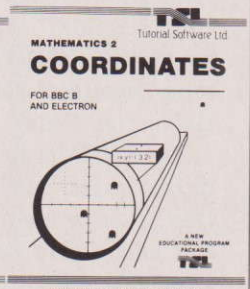

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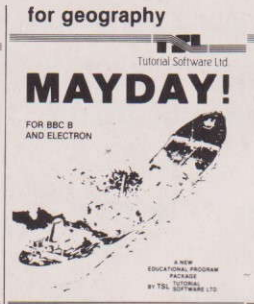

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GETTIT? GOTTIT GOOD!

By DENNIS DIXON

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.

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.
PROCtoolate	Responds to a slow word return by interjecting player.
PROCtry	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

cluenum	Counts letters as presented.
cluerate	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.
A$	Selected word.
g$	First letter of player's response word.
gottit$	Interjection input (Z or ?) by either player.
letter$	Letter indicated by variable *letnum*.
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 THEN80ELSE70
 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$<>""THEN280
  300 PRINTTAB(0,3)"This is a game fo
r two players."'
  310 CLS:PRINTTAB(0,3)"In addition t
o knowledge, a bit of luck is require
d to be a winner."'
  320 PRINT"A word is displayed, lett
er by letter."':PRINT"As soon as a pl
ayer thinks he/she knows the word, he
/she may press his/her      chosen ke
y. This will halt the display, and th
e player is challenged to input"
  330 PRINT"the word. If the try is c
orrect, he/she wins the game; if not
correct, then the second player is in
vited to have a try. If his/her try i
s correct, he/she is thewinner; if no
t, the game proceeds."'
  340 PRINTTAB(0,20)"Press RETURN to
continue.          ";
  350 INPUT" "z$: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$(135);"that any words typed in wi
llneed to be RETURNed by pressing the
     ";CHR$(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 apartfrom that,";CHR$(
131);"lower case should be used."
  400 PRINTTAB(0,20)"Press RETURN to
continue.          ";
  410 INPUT" "z$:IFz$<>""THEN400
  420 CLS:PRINT'':INPUT"Choose the nu
mber of words per game,    (max. 30)
and press RETURN....."wordset
  430 IFwordset<1ORwordset>30THEN420
  440 PRINT:PRINT"Choose the difficul
ty by typing 1, 2    or 3 ( 1 is the
easiest ) and press     RETURN.....
....."";:INPUT" "diff
  450 IFdiff<1ORdiff>3THEN440
  460 PRINT:PRINT"Choose the periodic
ity in seconds at    which clues are
presented ( 1 to 30 )   and press RET
URN....."";:INPUT" "cluerate
  470 IFcluerate<1ORcluerate>30THEN46
0
  480 PRINT:PRINTCHR$(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$="/"THENPROCtry ELSE
PROCclue
  920 IFcorrect=1ORtoolate=1THENcluen
um=LEN(A$)
  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$;",":PRINT"otherwise press you
r Z key and RETURN."'
1390 *FX202,48
1400 INPUT" "free$
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"T
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$;" cannot lose this set.":PRI
NT''
1800 IFquest=(wordset)DIV2+1THENPRIN
TTAB(0,9)"As you can see ";zed$;",":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,cap,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,s
it,sun,so,sad,tan,tip,top,two,tea
 1990 DATA under,up,use,vet,van,wet,w
ent,will,where,who,yet,yellow,yes,you
 2000 DATA abbey,abbot,abide,accelera
te,access,accompany,actual,adder,affi
rm,apprentice,babe,baffle,bagpipes,ba
rren,bass,beauty,bloat,booth,brag,buc
kle,cabinet,cabbage,carpenter,caulifl
ower,chafe,character,chubby,circumsta
nce,civil,colic
 2010 DATA dabble,decorate,design,deg
rade,dimension,dingy,duchess,drudge,d
ocile,divine,eager,elaborate,elevate,
emblem,enlighten,episode,equate,erupt
,exchange,express,fable,factor,falcon
,familiar,fend,filly,figure,flour,foa
m,fourteenth
 2020 DATA gable,gallop,garter,gangwa
y,geology,ghastly,giggle,gnat,graft,g
uide,halter,hamburger,hamlet,helicopt
er,hermit,horizon,horde,hutch,hypnosi
s,hydrant,idiot,illegal,illuminate,im
portant,inflate,inject,inquest,insult
,iodine,invest
 2030 DATA jackboot,jackdaw,jewel,jin
gle,jockey,jive,judo,jumble,jungle,ju
nction,kangaroo,keel,kettle,kidnap,ki
lt,kitchen,kneel,know,knit,kipper,lad
der,ladle,lamb,lance,lantern,laugh,le
ver,library,loiter,lollipop
 2040 DATA machine,mackerel,magistrat
e,marine,meteor,mischief,miser,modera
te,muscle,mutiny,nail,napkin,nature,n
eedle,nerve,notch,nylon,nurse,notice,
nothing,oasis,objective,obstacle,obta
in,official,orange,ordeal,otter,ounce
,overtake
 2050 DATA pace,paddle,painter,panthe
r,partner,passenger,pension,pepper,pi
geon,plague,racket,radio,ramble,rash,
remove,respect,robot,rummage,rustle,r
ung,sacrifice,saint,salmon,sample,sca
rlet,scrounge,second,seesaw,serve,sev
ere
 2060 DATA tablet,tapestry,tattoo,tea
ch,telephone,thatch,tight,tongs,tramp
,tremble,umbrella,umpire,uncle,underg
round,unicorn,uniform,upright,usual,u
nited,until,vacant,vacuum,valley,valu
e,vampire,vandalism,vanish,vein,venom
,verse
 2070 DATA wade,wafer,wages,wallet,wa
rden,wasp,watch,wax,weave,weird,xylop
hone,yacht,yard,year,yeast,yesterday,
yoga,yolk,young,youth
 2080 DATA abacus,abated,abbatoir,abl
ution,actuate,acumen,adulterate,affil
iate,aileron,alkali,alum,anthrax,anti
toxin,apocalypse,apoplexy,aquiline,as
phalt,asphyxiation,aspic,attenuate,au
k,awry,axiom,axial,aisle
 2090 DATA baccarat,bagatelle,baize,b
allistics,banshee,barbarous,barbecue,
barracuda,bauble,bazooka,bazaar,beaux
,bedraggled,bibliography,binary,biogr
aphical,blithesome,bludgeon,blurt,bog
us,boracic,braille,bunion,burly,butte
rscotch
 2100 DATA cache,caffeine,cajole,cali
bre,calligraphy,callow,camphor,cannib
alistic,capillary,casement,cashmere,c
ataclysmal,cauldron,caustic,caw,cessa
tion,chamois,chequered,cheroot,cloche
,coerce,crypt,crucible,cubism,cygnet
 2110 DATA dachshund,dangle,dapple,de
bilitate,decarbonisation,decry,deem,d
efer,degenerate,detonate,devoid,diaph
anous,digit,digress,dimple,dire,disci
ple,disgorge,ditty,divest,divot,domai
n,doublet,dragoon,droll
 2120 DATA earl,easel,eaves,echelon,e
cology,ecstasy,editorial,effervesce,e
ffigy,elapse,electrotherapy,elixir,en
compass,endow,ensign,ermine,espy,etch
,eunuch,exalt,exorcise,extricate,eye,
extol,ethnic
 2130 DATA facia,faction,fang,farce,f
arrier,fatigue,fauna,feign,feline,fer
rous,ferrule,festoon,fettle,feudalism
,fidget,fiery,finch,firkin,flagon,fla
x,forceps,forge,frieze,frugal,fulmar
 2140 DATA gable,gaiety,galore,gambit
,gantry,garish,garrulous,geophysics,g
esticulate,geyser,gherkin,ghetto,gibb
er,gigolo,goitre,gossamer,grebe,grist
le,guise,gurgle,gurnard,guzzle,gypsum
,gyrate,grope
 2150 DATA haft,haggis,hake,hale,hali
but,hallow,hank,hearse,heckle,heifer,
helical,heinous,hieroglyph,homage,hoo
kah,hovel,hubbub,hue,humify,humiliate
,hunch,hurtle,hydra,hyphen,hypothesis
 2160 DATA ichthyology,igloo,ignoble,
illegible,illicit,imago,immune,impend
,impetus,incantation,incense,indigo,i
ndolent,induce,ionise,iridescent,irk,
irony,irradiate,isosceles,isotherm,is
sue,isthmus,invert,invest
 2170 DATA jabber,jacknife,jamb,jangl
e,jape,jasper,jaunty,jealous,jeopardy
,jetsam,jilt,jocular,joggle,jostle,jo
ust,jubilation,judiciary,jugular,juni
per,juxtaposition,kaleidoscope,kaolin
,kedgeree,khaki,knightly
 2180 DATA laburnun,lacerate,laconic,
lacquer,laity,laminate,lamprey,langui
sh,laudanum,lascivious,lecher,lectern
,legion,leveret,lichen,lieutenant,lil
t,limbo,loganberry,logistics,loin,lon
gevity,loofah,lope,lotion
 2190 DATA macaw,madrigal,magenta,mah
lstick,maim,malleable,mamba,manacle,m
ediocre,megalith,menial,mesmerism,met
eor,mettle,micrometer,mimosa,minim,mi
nuet,mnemonic,moccasin,modulate,moult
,mucus,myrrh,myxomatosis
 2200 DATA narcissus,narcosis,natal,n
ausea,nebula,negate,neigh,nephew,nest
le,neural,neuter,newt,nimble,nocturne
,nomadic,nonentity,nostalgia,notch,nu
ptial,nurture,nymph,nylon,nudge,nouga
t,nodule
 2210 DATA oakum,obelisk,oblique,obsc
ene,obviate,occult,ocean,ocelot,ochre
,octet,ocular,omega,omen,omnivorous,o
nerous,onion,ophthalmic,opulant,orchi
d,ordnance,orphan,ovation,owlet,oxide
,ozone
 2220 DATA palette,papal,paradox,peda
nt,percolate,permeate,phial,phlox,pie
rce,piquant,pliable,plumage,posy,pref
ix,prophylactic,prude,pylon,pyre,pyro
meter,proctor,prior,pout,poop,plankto
n,pinion
 2230 DATA quaff,quail,quell,quip,qui
re,quoit,quotient,raffia,rancid,ratch
et,recidivist,recluse,reflex,rhetoric
,ribald,ricochet,rotor,roundel,rowel,
rue,russet,rustic,revue,remiss,rejuvi
nate
 2240 DATA sachet,saffron,salient,sal
ver,scarab,sceptre,schedule,scimitar,
scree,scythe,seance,seethe,sepia,sera
ph,shekel,shingle,sienna,signet,silho
uette,skein,slake,squeegee,strafe,str
ew,sultry
 2250 DATA taboo,tabular,tallow,tapio
ca,taunt,tedium,tempest,tenacious,ten
dril,tentative,termite,tertiary,thesp
ian,threw,tier,tinder,torsion,tourniq
uet,tract,tranquil,trauma,trellis,tri
fle,tripartite,turmoil
 2260 DATA udder,ullage,umber,uncouth
,urchin,urge,usher,utility,utterance,
usurp,vague,valiant,vanilla,varlet,ve
ctor,vegetate,vehicle,veneer,venison,
vertigo,vespers,veto,vicinity,viola,v
irtuoso
 2270 DATA waddle,waft,waif,wan,wand,
wanton,warbler,warlock,wary,weft,whar
f,wheedle,whelk,whelp,whet,whiff,wiel
d,wiggle,wilful,winkle,withe,wrack,wr
est,wright,wrought
 2280 DATA yashmak,yaw,yelp,yeoman,yo
kel
```

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 efective 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

MICROVITEC 452

CUB

COLOUR DISPLAYS

CUB 452 NOW AVAILABLE IN NEW PLASTIC CABINET

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Tel: (0274) 390011 Telex 517717

1984

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.
PROCPOINT	Creates the flashing pointers using parameters for variable selection.
PROCMAN	Creates the figure at the door borrowed from *The Micro User's* colourful Colin.
PROCDRAW	Loop for reading DATA in place of MOVE, DRAW and PLOT statements.
PROCKEY	Press any key to continue.
PROCPOWER	Using defined characters and random colour and placement of flowers.
PROCCLOUD	Uses defined characters for clouds.
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 a%=GET
 310 CLS
 320 GCOL 0,a%+128
 330 CLG
 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 c%=GET-48
 380 IFc%=2THEN GOTO430ELSE GOTO400
 390 CLS
 400 VDU5
 410 MOVE100,950
 420 PROCCLOUD
 430 VDU5
 440 MOVE600,1000
 450 PROCCLOUD
 460 MOVE625,950
 470 PROCCLOUD
 480 MOVE550,975
 490 PROCCLOUD
 500 MOVE650,975
 510 PROCCLOUD
 520 MOVE1150,850
 530 PROCCLOUD
 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 b%=GET-48
 610 IFb%=2THEN GOTO630 ELSE PRINTTA
B(4,6)"try again"
 620 GOTO600
 630 GCOL 0,2
 640 PROCDRAW
 650 FORw%=525 TO 773
 660 PLOT77,200,w%
 670 NEXT
 680 GCOL0,0
 690 PROCDRAW
 700 VDU5
 710 FOR F%=0 TO1300 STEP50
 720 MOVE F%,525
 730 VDU 108
 740 NEXTF%
 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 d%=GET
 840 GCOL0,d%
 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 e%=GET
 930 GCOL0,e%-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 f%=GET
1020 GCOL0,0
1030 PROCDRAW
1040 GCOL0,f%-48
1050 PROCDRAW
1060 PROCPAINT
1070 GCOL 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 FL%=0 TO 75+RND(175)
1160 PROCFLOWER
1170 NEXT FL%
1180 GCOL 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 g%=GET
1280  VDU5
1290 GCOL0,g%-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 h%=GET
1380 VDU5
1390 MOVE 1100,600
1400 PROCTRUNK
1410 FOR L%=0 TO 75
1420 PROCLEAF
1430 NEXT L%
1440 FOR A%=0 TO h%-49
1450 PROCFRUIT
1460 NEXT A%
1470 VDU4
1480 CLS
```

From Page 36

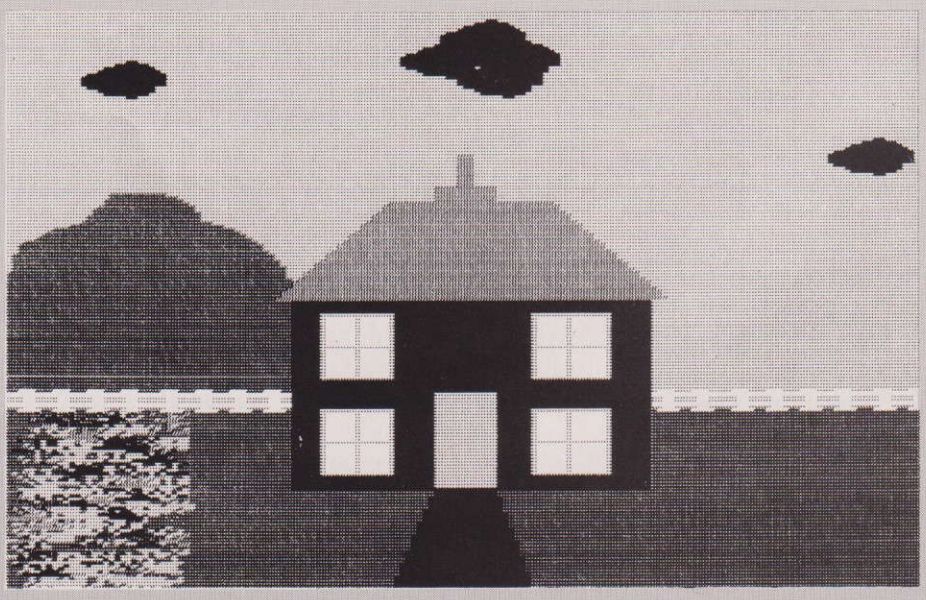
```
40
 2570 DATA500,5,840,420,5,740,420,4,7
90
 2580 DATA420,5,790,500,4,740,460,5,8
40
 2590 DATA460,4,740,540,5,740,620,5,8
40
 2600 DATA620,5,840,540,5,740,540,4,7
40
 2610 DATA580,5,840,580,4,790,540,5,7
90
 2620 DATA620,4,600,520,4,600,400,85,
680
 2630 DATA520,85,680,400,0,0,0,4,600,
400
 2640 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 GCOL0,4
 2830 VDU 8,241
 2840 ENDPROC
 2850 DEF PROCCLOUD
 2860 GCOL0,7
 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 VDU8,8,10,244,245
 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 GCOL0,0
 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

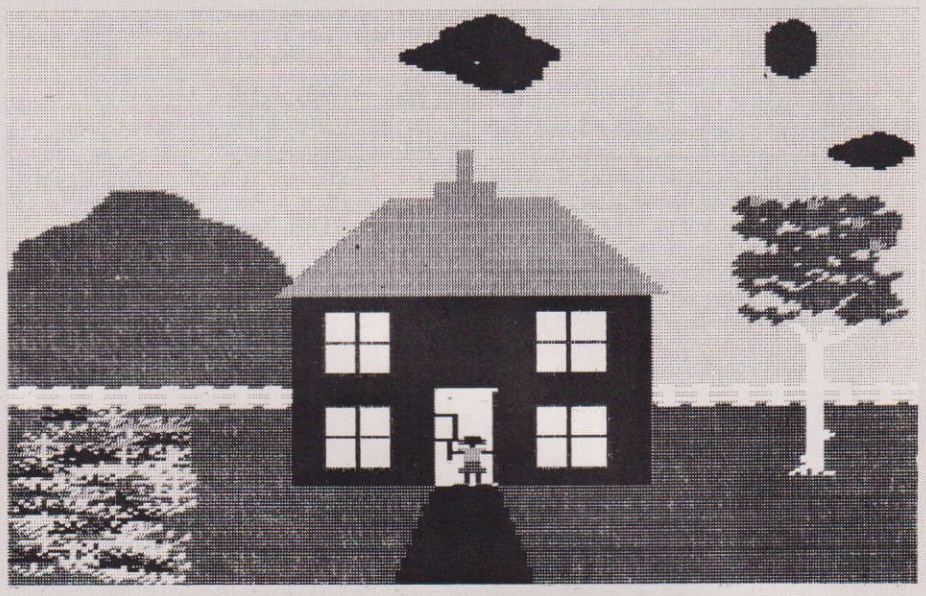
 3130 VDU 8,10,247,8,10,250,8,10,249

 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 GCOL0,2
 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 GCOL0,1
 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 GCOL0,5
 3490 VDU227
 3500 GCOL0,7
 3510 VDU8,228
 3520 GCOL0,1
 3530 VDU8,229
 3540 GCOL0,5
 3550 VDU8,10,230
 3560 GCOL0,7
 3570 VDU8,231
 3580 GCOL0,2
 3590 VDU8,232
 3600 ENDPROC
 3610 DEF PPOCDRAW
 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
```

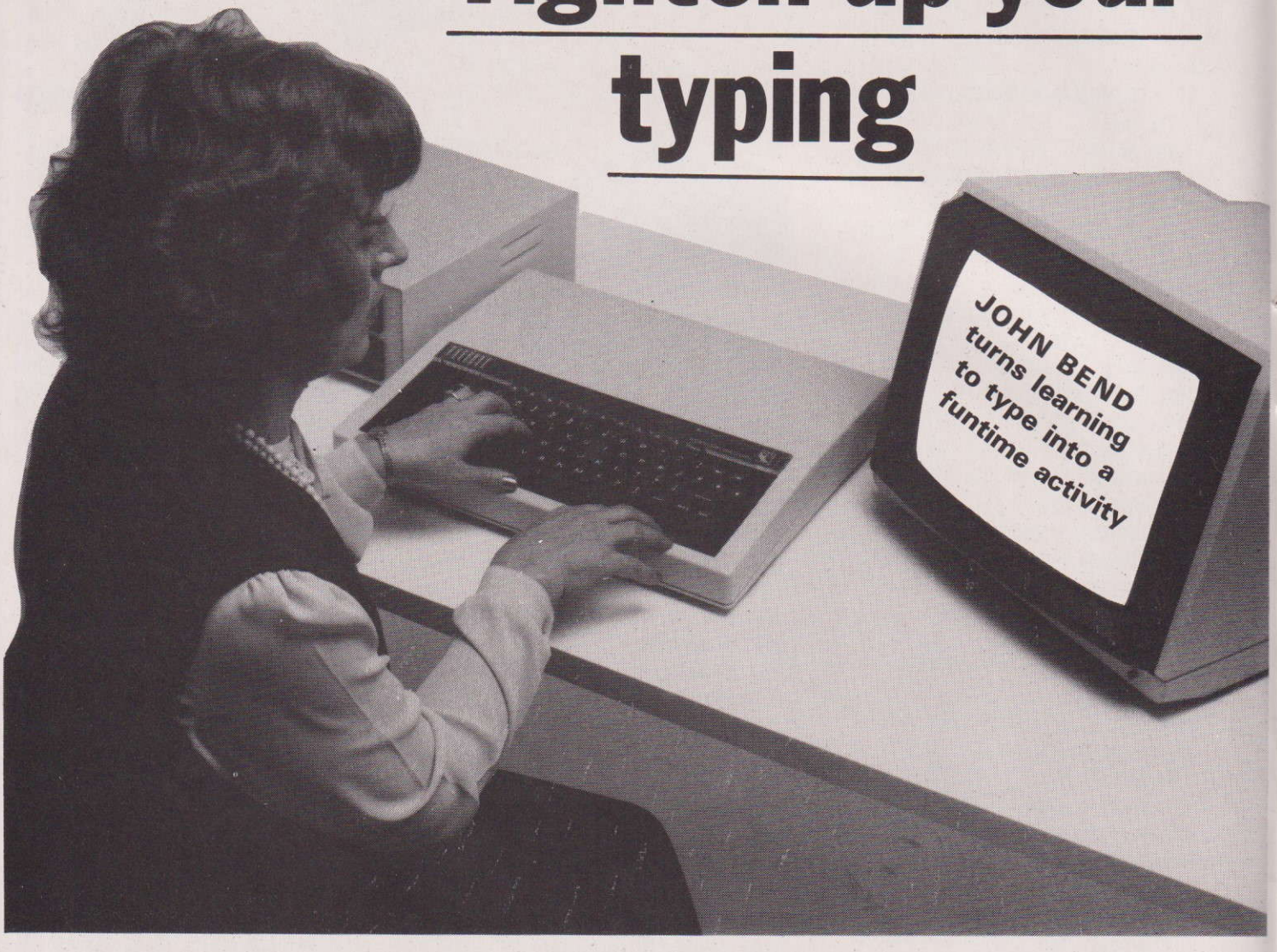


```
 1490 COLOUR3:PRINTTAB(0,0)"lets see
if anybody"
 1500 COLOUR3:PRINTTAB(0,2)"lives in
our house"
 1510 COLOUR3:PRINTTAB(0,4)"press B t
o ring bell"
 1520  *FX15,0
 1530  REPEAT:B$=GET$:UNTIL B$="B" OR
B$="b"
 1540 ENVELOPE1,1,0,0,0,50,25,25,127,
-1,-1,-1,126,90
 1550 SOUND1,1,150,8
 1560 ENVELOPE1,1,0,0,0,100,25,25,127
,-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.

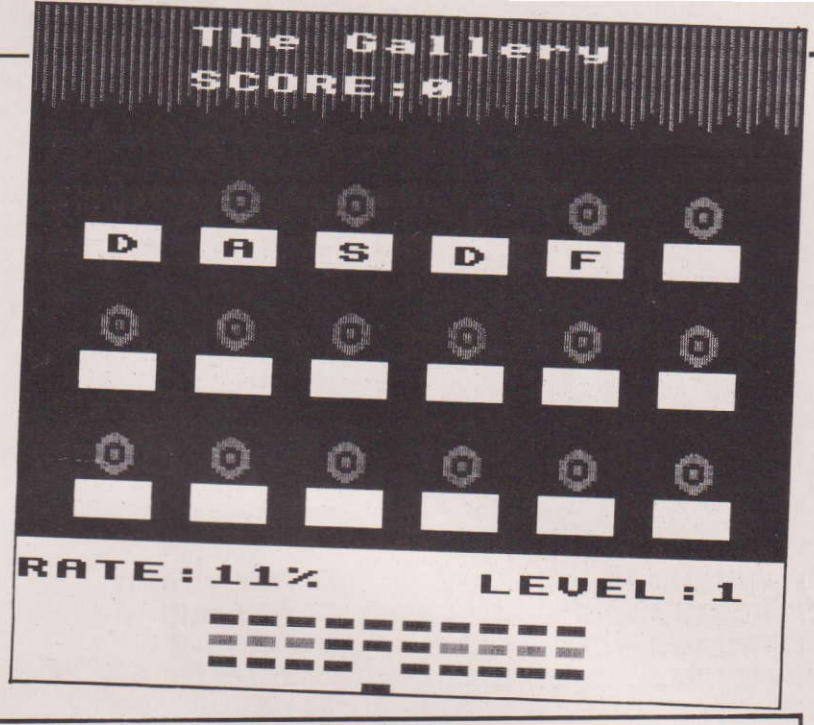
When you have mastered the three sections you go on to the next level to encounter four more keys.

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



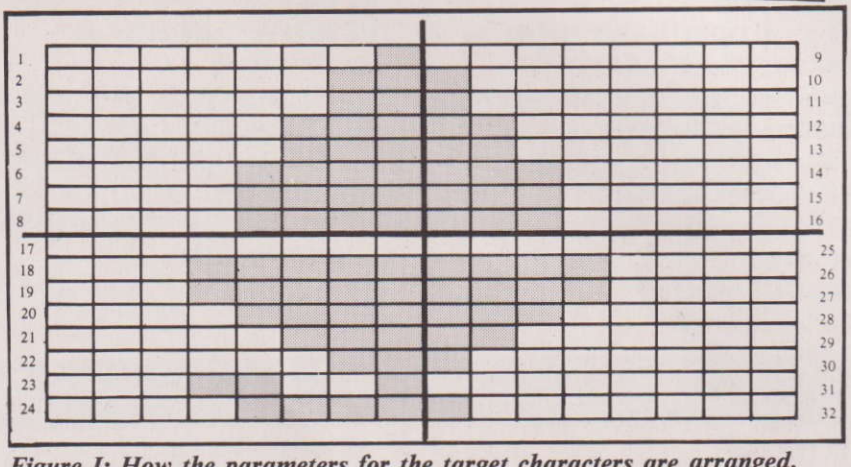


Figure I: How the parameters for the target characters are arranged. Note: In Modes 2 and 5 characters are distorted to appear wider than they are high.

end of the listing, so just insert a REM into line 40:

40 REM PROCinstructions

Lines 2270 onwards may then be entered later.

When you are satisfied that the game is running as it should, delete line 10, and remove the REM from line 20. This will allow the Escape key to be used to hold the program.

Remember, when typing in your program it is wise to save it as you go – just in case the worst happens, and you lose the whole thing.

By and large the program should be self explanatory. But here are some notes that may help you in debugging or extending the program.

In the main game loop, the call **VDU23;8;0;0;0;** turns off the TV interface to give a sharper display. It may not be a legal call on earlier OS machines, so if you have problems then omit it.

Where characters are plotted on the screen, such as in *PROCprinttargets*, I have left the coordinates as factorals to make the process easier to understand. The game is clock dependent, so time wasted here is unimportant.

A minor point, but worthy of mention, is the use of the STRING$ command (Page 359, User Guide), in *PROCcanopy*. This speeds up the drawing of the canopy considerably. To restrict memory consumption, the string is set to NUL when finished with in line 950.

PROCassembletarget is worth explaining. In both the interest of saving memory and in leaving the program easier to change, this routine generates the game character from the data table as it is required.

The character details are read from the table, and assigned to the array *T%*. This is then used to hold the parameters for the VDU23 call. Four such calls are made, and the characters are assembled into a string in line 1270.

Using this method means it is very straightforward to insert characters of your own design into the game. Should you wish to add to the number of target characters, just add to the data table and increase the loop size in line 350 to the new number of characters defined in the table. Figure I will help you understand the layout of the characters.

Finally, here is a useful point about the data table. The first parameter in the data table for any target character is the logical foreground colour, or the colour of the target. The second is the logical background colour.

Care was taken in choosing lively combinations, without causing display problems on a TV. Of course they may be altered as you wish. For a list of available colours, see Page 223 of the User Guide. The remaining 32 parameters are the character details as outlined above.

```
  5 REM (c) Micro User
  10 ON ERROR MODE7:REPORT:PRINT" at
line ";ERL:END
  20 REM  ON ERROR PROChold(0):level
%=level%-1:GOTO290
  30 MODE7:VDU23;8202;0;0;0;:K%=TRUE
  40 PROCinstructions
  50 DIM T%(7)
  60 level%=0:gscore%=0:time%=400
  70 REM set colour 1 flash rate
  80 *FX9,8
  90 REM set colour 2 flash rate
  100 *FX10,8
  110 REM kill key repeat
  120 *FX11,0
  130 ENVELOPE6,1,0,0,0,9,9,9,126,-5,
-1,-1,90,90
  140 ENVELOPE5,1,2,-4,0,9,9,2,126,-5
,-1,-1,126,126
  150 REM CHR$128 to CHR$131 reserved
  160 REMVDU23,85,102,102,102,102,110
,126,54,0
  170 REMVDU23,86,102,102,102,102,36,
60,24,0
  180 VDU23,132,170,170,170,170,170,1
70,170,170,170
  190 VDU23,133,85,85,85,85,85,85,85,
85
  200 VDU23,134,170,170,42,42,42,40,8
,8
  210 VDU23,135,85,85,84,84,84,20,16,
16
```

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 FORglevel%=1TO 7
  360 level%=level%+1
  370 REPEAT
  380 prompt%=TRUE:base%=glevel%-1
  390 MODE2:VDU23;8;0;0;0;:VDU5
  400 PROCgame
  410 UNTILrate%>99:SOUND3,5,53,6:PRO
Chold(400)
  420 prompt%=FALSE:base%=0
  430 MODE2:VDU23;8;0;0;0;:VDU5
  440 PROCgame
  450 IFrate%<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 IFrate%<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 IFrate%<99 THEN PRINTTAB(5,12);
CHR$134;"(This level retained)"
  600 PROChold(400)
  610 IFrate%<99 THEN GOTO370
  620 NEXTglevel%
  630 time%=time%-50:IFtime%<50 THEN
time%=50
  640 UNTILO
  650 REM
  660 DEFPROCgame
  670 REM
  680 PROCassembletarget(glevel%)
  690 GCOL0,B%:CLG
  700 PROCcanopy
  710 PROCkeyboard
  720 PROCprinttargets
  730 PROCshoot(glevel%)
  740 PROCdelay(999)
  750 ENDPROC
  760 REM
  770 DEFPROCprinttargets
  780 REM
  790 FOR Y%=24 TO 12 STEP-6
  800 FOR X%=0 TO 5
  810 MOVE(X%*(3*64))+96,(Y%*32):GCOL
0,C%:PRINTtarget$
  820 MOVE(X%*(3*64))+96,((Y%-2)*32):
GCOL0,0:PRINTplinth$
  830 NEXT X%,Y%
  840 ENDPROC
  850 REM
  860 DEFPROCcanopy
  870 REM
  880 FORI%=0TO 1
  890 A$=STRING$(20,CHR$(132+I%))
  900 MOVE0,1020
  910 IFI% THEN GCOL0,3 ELSE GCOL0,1
  920 FORN%=0TO 3:PRINTA$;:NEXTN%
  930 A$=STRING$(20,CHR$(134+I%))
  940 MOVE0,(1024-4*32):PRINTA$
  950 NEXTI%:A$=""
  960 GCOL0,0: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 GCOL0,0
 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 GCOL0,7:MOVE(0*64),(6*32):PRINT
"RATE ";
 1070 MOVE(12*64),(6*32):PRINT"LEVEL:
";level%
 1080 RESTORE 1900
 1090 FORI%=0TO 29
 1100 READ dummy%,X%,Y%,c%
 1110 MOVE(X%*64),(Y%*32):IFprompt% G
COL0,c% ELSE GCOL0,4
 1120 PRINTCHR$138
 1130 NEXTI%
 1140 ENDPROC
 1150 REM
 1160 DEFPROCassembletarget(glevel%)
 1170 REM
 1180 RESTORE 1980
 1190 FORI%=1TO glevel%
 1200 READ C%,B%
 1210 FORN%=0TO 3
 1220 FORchar%=0TO 7
 1230 READ T%(char%)
 1240 NEXTchar%
 1250 VDU23,(128+N%),T%(0),T%(1),T%(2
),T%(3),T%(4),T%(5),T%(6),T%(7)
 1260 NEXTN%,I%
 1270 target$=CHR$128+CHR$129+CHR$10+
CHR$8+CHR$8+CHR$130+CHR$131
 1280 ENDPROC
 1290 REM
 1300 DEFPROCshoot(glevel%)
 1310 REM
 1320 rate%=0:score%=0:t%=0
 1330 PROCrate(rate%)
 1340 FORY%=21 TO 9 STEP-6
 1350 FORX%=2 TO 17 STEP3
 1360 N%=4*glevel%-4*base%
 1370 I%=RND(N%)+4*base%-1
 1380 RESTORE1890
 1390 FOR look%=0TO I%
 1400 READ chr%,a%,b%,c%
 1410 NEXT look%
 1420 PROCdelay(time%*8)
 1430 MOVE(X%*64),(Y%*32)+8:GCOL0,7:P
RINTCHR$(chr%);
 1440 IF prompt% THEN MOVE(a%*64),(b%
*32):GCOL4,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):GCOL4,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$143)
 1610 GCOL0,0:MOVE(4*64),(6*32):PRINT
 A$
```

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 Microware	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; **Carswell,** Faringdon, Oxon; **Chaddington,** 14 Selkirk Close, Worthing; **Chalksoft,** 37 Willowslea Road, Worcester; **Computer Market,** 27 Goosegate, Notts; **Daco,** 57 Mackenzre Road, Moseley, Birmingham; **Ebury,** 72 Broadwick Street, London W1; **Educated Owl,** 62 Airedale Avenue, Tickhill, Doncaster; **Edu-Soft-Co,** 108 Parthenan 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, Warwicks; **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 Hempsted; **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; **Musicsoft,** 12 Fallowfield, Ampthill, Beds; **NEC,** 18 Brooklands Avenue, Cambridge; **New Generation,** The Brooklands, Sunnybank, Lycomb Vale, Bath; **Optima Software,** 36 St. Petersgate, Stockport, Cheshire; **Oxford Microware,** 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; **Psisoft,** 13 Whitewell Drive, Llantwit Major, Sth Glam; **Resource Facilities,** Masters Lane, Halifax; **Scholarsoft,** Coniscliffe, Woolsington 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, Wooton Grove, Sherborne, Dorset; **Swift,** 154 Greenfield Road, Holmfirth, Huddersfield; **System,** 12 Collegiate Crescent, Sheffield; **Thornguard,** 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 Microware	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.
Comprends-Tu	Pandasoft	Helps you improve your French vocabulary.
Computer Discovery	Science Research	Computer literacy and history for secondary schools.
Computer Pioneers	Bowker Business Services	Learn the names, dates and what they did.
Computer Studies	Bowker 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	Psisoft	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	Psisoft	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	Psisoft	Four programs on specific heat capacity.
Spell7+/Spell9+	Primary Programs	Spelling aid using the read, cover, write principle.
Spelling Castle	Marmik	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	Musicsoft	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.
Kopfjager	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	Psisoft	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 Microware	Facilitates the teaching of Lissajou's figures.
Logifrench1	Wida	Question and answer on imperfect and perfect.
Log:frence2	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 Microware	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	Fernleaf	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 GCOL0,7:MOVE(4*64),(6*32):PRINT
":";rate%;"%";
 1630 A$=""
 1640 ENDPROC
 1650 REM
 1660 DEFPROChit(x%,y%)
 1670 REM
 1680 SOUND0,6,0,6
 1690 MOVE(x%*64)-24,(y%+3)*32:GCOL0,
0
 1700 PRINTsplat$
 1710 MOVE(x%*64)-32,(y%+3)*32:GCOL0,
(B%-128):PRINTdel$
 1720 score%=score%+1
 1730 ENDPROC
 1740 REM
 1750 DEFPROCdelay(dummy%)
 1760 REM
 1770 FOR I%=0 TO dummy%
 1780 NEXTI%
 1790 ENDPROC
 1800 REM
 1810 DEFPROChold(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
,60,0,0,0,0,0,0,0,0
 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 DEFPROCinstructions
 2290 REM
 2300 PROCtitle
 2310 PRINTTAB(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 PRINTCHR$129;CHR$141;"
A S D F  J K L ;"
 2390 PRINTCHR$129;CHR$141;"
A S D F  J K L ;"
 2400 PRINT"Do not look at the comput
er keyboard!"
 2410 PRINT"For each new set of keys
the keyboard"
 2420 PRINT"display will flash to pro
mpt you."
 2430 PRINT"The display is so arrange
d to guide you which fingers you shou
ld use."
 2440 PRINT"For the space bar (bottom
 key) use your thumb."
 2450 dummy%=GET
 2460 PROCtitle
 2470 PRINTTAB(0,5);"As you progress
through the levels"
 2480 PRINT"the game gets faster- lea
ving you"
 2490 PRINT"with less time to think!"
 2500 PRINT'"-But higher scores can b
e achieved!"
 2510 dummy%=GET
 2520 PROCtitle
 2530 PRINTTAB(0,5)"Each level has th
ree divisions:"
 2540 PRINT'"The first introduces the
 new keys."
 2550 PRINT'"The next revises keys wi
thout prompting."
 2560 PRINT"The last gives you a chan
ce to build up a score."
 2570 PRINT"The faster you type- the
more you score."
 2580 PRINT'"You must reach 100% to k
eep your score!"
 2590 dummy%=GET
 2600 PROCtitle
 2610 PRINTTAB(0,5);"Use the 'ESCAPE'
 key to hold the game."
 2620 PRINT'"REMEMBER:-"
 2630 PRINT"If you cheat you only che
at yourself!"
 2640 dummy%=GET
 2650 K%=FALSE:PROCtitle
 2660 PRINTTAB(0,5);"Do you want the
instructions again";
 2670 INPUTA$
 2680 IF MID$(A$,1,1)="Y" THEN RUN
 2690 ENDPROC
 2700 PROCtitle
 2710 PRINTTAB(0,5);
 2720 *RUN"gallery"
 2730 DEFPROCtitle
 2740 VDU12
 2750 PRINTCHR$157;CHR$134;CHR$132;CH
R$141;"         The Gallery"
 2760 PRINTCHR$157;CHR$134;CHR$132;CH
R$141;"         The Gallery"
 2770 PRINT'CHR$130;"This game will s
tart you touch-typing!"
 2780 IFK% THEN PRINTTAB(0,23);CHR$13
4;CHR$136;"      Press key to continu
e."
 2790 ENDPROC
```

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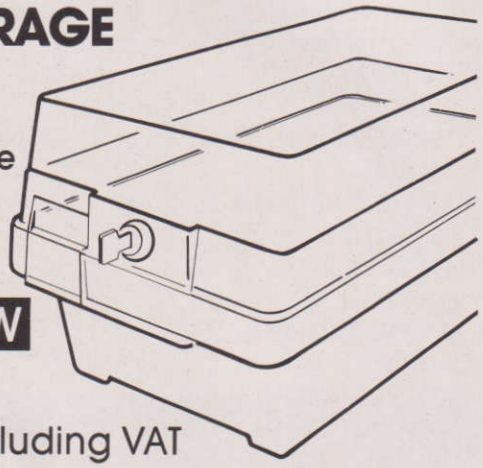

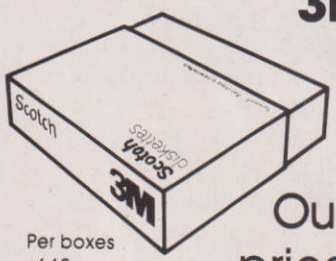

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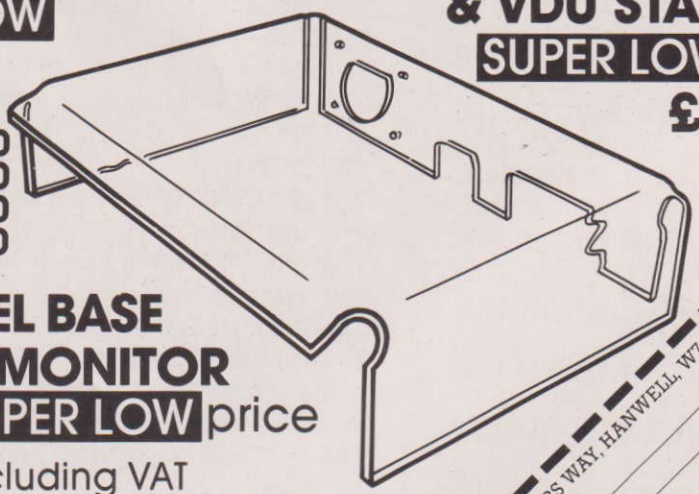

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MU10/3

Guess Whatnumber?

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

```
Ask a question and press RETURN

IS IT SMALLER THAN 35
NO
Press space bar to continue
                                    GREATER
                                    THAN
                                    MORE THAN
                                    BIGGER
                                    THAN
                  36 37 38 39 40    OVER
                                    SMALLER
 41    43 44 45 46 47 48    50      THAN
                                    LESS THAN
                                    UNDER
                                    DIVIDE
                                    SHARE
                                    MULTIPLE
                                    FACTOR
                                    IS IT
There are 5 questions left.
```

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 × 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 × 10 number square.

PROGRAM STRUCTURE

10-40 Take the program to PAGE=&E00.

80 Stores the positions of the numbers to enable colour changes to be made, and so on.

120 *PROCA*, the opening instructions.

170 *PROCQ*, the main body of the program – the questions and answers.

200-240 The crucial input routine.

250 Changes any lower case input to upper case and strips off spaces.

260-300 Deal with various inappropriate entries.

270 Provides an error message for short entries which don't include words like IT IS, IS IT, OVER or SHARE. FNinstr 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.

280 *FNgr (x$)*, 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.

282 *FNwh* 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.

650 *PROCgrid*, displays the 10 × 10 square of numbers.

740 Wipes out appropriate numbers according to the answer to questions involving "more than", etc.

770 *PROCgrsh*, part of the process by which numbers are coloured according to their factors.

850 *PROCngrsh*, wipes out the appropriate numbers if the answer is "no" to a question about factors.

870 Reads a character at a screen position (see User Guide).

1000 *PROCI*, a further stage in the illumination of the numbers if and when their factors are revealed.

1080 The function for turning lower case letters into upper case.

2000 *FNwh*, finds all the numbers in the input sentence.

3000 *FNinstr(A$,B$)*, ensures that INSTR does not search for a string in a string shorter still.

```
  5 REM (c) The Micro User
  10 IFPAGE=&E00THENVDU6:GOTO50
  20 VDU21:*KEY0*TAPE|M:FORA%=0TO(TO
P-PAGE)STEP4:A%!&E00=A%!PAGE:NEXT:MPA
GE=&E00:MOLD:MRUN:M
  30 *FX138,0,128
  40 END
  50 ONERROR CLEAR:GOTO60
  60 O$=CHR$13+CHR$10+CHR$10:i%=0:j%
=0:k%=0:*FX11,0
  70 VDU23,224,255,0,0,0,0,0,0,0
  80 DIM g%(100,2):C=1:FORC%=1TO100:
FORD%=0TO1:READg%(C%,D%):NEXT:NEXT
  90 REPEAT:FORC%=1TO100:g%(C%,2)=0:
NEXT:ANS=FALSE:C=1:q=0:MODE1:VDU 23;8
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:A%=GET:UNTILA%=49ORA%=50
```

From Page 47

```
:IFA%=49PROCA:f%=3:PROCQ ELSE PROCA:f
%=0:FORW%=1TO2:VDU19,W%,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:A%=GET:UNTILA%>48ANDA%<58:VDUA%:GO
%=VAL(CHR$A%):PROCsp(30):N=RND(100):C
LS:VDU23,1,0;0;0;0;:Q=0:ENDPROC
  170 DEFPROCQ:PROCgrid(f%):REPEAT
  180 TAG=0:PROCc(0,7):PRINTTAB(0,0)"
Ask a question and press RETURN"
  190 *FX4,2
  200 x$="":B%=1:PROCc(1,7):VDU31,0,3
:H%=0:REPEAT:REPEAT:A%=GET:UNTILA%=13
ORA%=32OR(A%>47ANDA%<58)OR(A%>64ANDA%
<91)OR(A%>96ANDA%<123)ORA%=127:*FX15,
1
  210 IFA%=127AND POS>0VDU127:H%=H%-1
:x$=MID$(x$,1,LEN(x$)-1)
  220 IFA%<>127ANDA%<>13ANDH%>0PRINT;
CHR$A%;:x$=x$+CHR$A%:H%=H%+1
  230 IFH%=0ANDA%<>127ANDA%<>13ANDA%<
>32PRINT;CHR$A%;:x$=x$+CHR$A%:H%=H%+1
  240 UNTILA%=13ORH%=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$)<8 TAG=1:P
ROCeq:GOTO390
  310 IF FNinstr(x$,"GREATERTHAN")>0
OR FNinstr(x$,"MORETHAN")>0OR FNinstr
(x$,"BIGGERTHAN")>0OR FNinstr(x$,"OVE
R")>0 TAG=1:i%=1
  320 IF FNinstr(x$,"SMALLERTHAN")>0O
R FNinstr(x$,"LESSTHAN")>0OR FNinstr(
x$,"UNDER")>0 TAG=1:j%=1
  330 IF FNinstr(x$,"DIVISIBLE")>0OR
FNinstr(x$,"DIVIDE")>0OR FNinstr(x$,"
SHARE")>0OR FNinstr(x$,"MULTIPLE")>0O
R FNinstr(x$,"FACTOR")>0 TAG=1:k%=1
  340 IF(i%+j%>1)OR(i%+k%>1)OR(j%+k%>
1)PROCb("Only one question at a time
!"):i%=0:j%=0:k%=0:GOTO180
  350 IFi%=1PROCmore
  360 IFj%=1PROCsm
  370 IFk%=1PROCsh
  390 Q=Q+1:i%=0:j%=0:k%=0
  400 IF TAG=0 PROCnu
  410 PROCs:PROCsp(7)
  420 UNTIL Q=60%OR ANS=TRUE
  430 IF ANS=FALSE PROCb("Oh dear ! Y
ou didn't get it. It was "+STR$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:FORE%=48TO57:IFINSTR(x$,CHR
$E%)>0 u=1
  480 NEXT
  490 IF u=1 THEN a=VAL(q$) ELSE a=50
00
  500 =a
  510 DEFPROCeq:v=FNgr(x$):PROCc(0,7)
:IF N<>v PRINTTAB(0,2)"NO"ELSE PRINTT
AB(0,2)"YES! YOU'VE GOT IT"+0$+"YOU T
OOK ONLY "+STR$(Q+1)+" QUESTIONS":ANS
=TRUE
  520 ENDPROC
  530 DEFPROCsp(R%):COLOUR3:PRINTTAB(
0,R%)"Press space bar to continue":RE
PEAT:A%=GET:UNTILA%=32:PROCc(R%,R%):*
FX15,1
  540 ENDPROC
  550 DEFPROCsm:v=FNgr(x$):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$):IF N MOD v
=0 THEN PRINTTAB(0,5)"YES":PROCgrsh E
LSE PRINTTAB(0,5)"NO":PROCngrsh
  590 ENDPROC
  600 DEFPROCsmg1:PROCv:FORX%=v TO 10
0:IFX%<100 PRINT;SPC3; ELSE PRINT;SPC
4
  610 PROCZ:NEXT:ENDPROC
  620 DEFPROCsmg2:VDU31,0,10:FORX%=1T
O v-1:PRINT;SPC3;:PROCZ
  630 NEXT:ENDPROC
  640 DEFPROCnu:Q=Q-1:PROCc(0,7):PRIN
TTAB(0,3)"I didn't understand you. Tr
y different"''"words":ENDPROC
  650 DEFPROCgrid(f%):COLOURf%:VDU31,
0,10:FORX%=1TO 100:IFX%<10 PRINT;"  "
;X%; ELSE PRINT;" ";X%;
  660 PROCZ:NEXT:COLOUR2
  670 PRINTTAB(31,8)"GREATER":PRINTTA
B(31,9)"THAN":PRINTTAB(31,11)"MORE TH
AN":PRINTTAB(31,13)"BIGGER":PRINTTAB(
31,14)"THAN":PRINTTAB(31,16)"OVER":PR
INTTAB(31,17)"SMALLER":PRINTTAB(31,18
)"THAN":PRINTTAB(31,20)"LESS THAN"
  680 PRINTTAB(31,21)"UNDER":PRINTTAB
(31,23)"DIVIDE":PRINTTAB(31,24)"SHARE
":PRINTTAB(31,25)"MULTIPLE":PRINTTAB(
31,27)"FACTOR":PRINTTAB(31,29)"IS IT"
:COLOUR3:ENDPROC
  690 DEFPROCv:IF(v MOD 10)=0 THEN VD
U 31,27,8+((v DIV 10)*2)ELSE VDU31,((
v MOD 10)-1)*3,10+((v DIV 10)*2)
  700 ENDPROC
  710 DEFPROCgrg2:VDU31,0,10:FORX%=1T
O z:PRINT;SPC3;:PROCZ:NEXT:ENDPROC
  720 DEFPROCmore:z=FNgr(x$):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 PROCI:ENDPRO
C
  780 FORX%=v TO 100 STEP v:COLOUR C:
VDU31,g%(X%,0),g%(X%,1):A$=FNREADCH(P
OS+2,VPOS):IF A$=" "THEN 820 ELSE 790
```

```
 790 IF q>0 ANDg%(X%,2)=0 THEN 820 E
LSE800
 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 A%,LAST
X,LASTY,C
 880 LASTX=POS:LASTY=VPOS:VDU31,X,Y:
A%=135:C=USR(&FFF4):C=C AND &FFFF:C=C
 DIV &100
 890 VDU31,LASTX,LASTY
 900 =CHR$(C)
 910 DEFPROCp
 920 COLOUR C:IF X%<10 PRINT;"  ";X%
; ELSE PRINT;" ";X%;
 930 ENDPROC
 940 DATA 0,10,3,10,6,10,9,10,12,10,
15,10,18,10,21,10,24,10,27,10,0,12,3,
12,6,12,9,12,12,12,15,12,18,12,21,12,
24,12,27,12
 950 DATA 0,14,3,14,6,14,9,14,12,14,
15,14,18,14,21,14,24,14,27,14,0,16,3,
16,6,16,9,16,12,16,15,16,18,16,21,16,
24,16,27,16
 960 DATA 0,18,3,18,6,18,9,18,12,18,
15,18,18,18,21,18,24,18,27,18,0,20,3,
20,6,20,9,20,12,20,15,20,18,20,21,20,
24,20,27,20
 970 DATA 0,22,3,22,6,22,9,22,12,22,
15,22,18,22,21,22,24,22,27,22,0,24,3,
24,6,24,9,24,12,24,15,24,18,24,21,24,
24,24,27,24
 980 DATA 0,26,3,26,6,26,9,26,12,26,
15,26,18,26,21,26,24,26,27,26,0,28,3,
28,6,28,9,28,12,28,15,28,18,28,21,28,
24,28,27,28
 990 DEFPROCc(X%,Y%):FORS%=X%TOY%:PR
INTTAB(0,S%);SPC40:NEXT:ENDPROC
 1000 DEFPROCI:GCOL0,1:FORX%=v TO 100
 STEP v:VDU31,g%(X%,0),g%(X%,1):A$=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$:PROCsp(7):ENDPROC
 1050 DEFPROCs:PRINTTAB(0,30)"There a
re ";GO%-Q;" questions left.":ENDPROC
 1060 DEFPROCZ:IF POS>27 VDU13,10,10
 1070 ENDPROC
 1080 DEF FNch(x$):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$)
 2030 u=0:FORE%=48TO57:IFINSTR(x$,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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Full notes on using the disc are included. **£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)

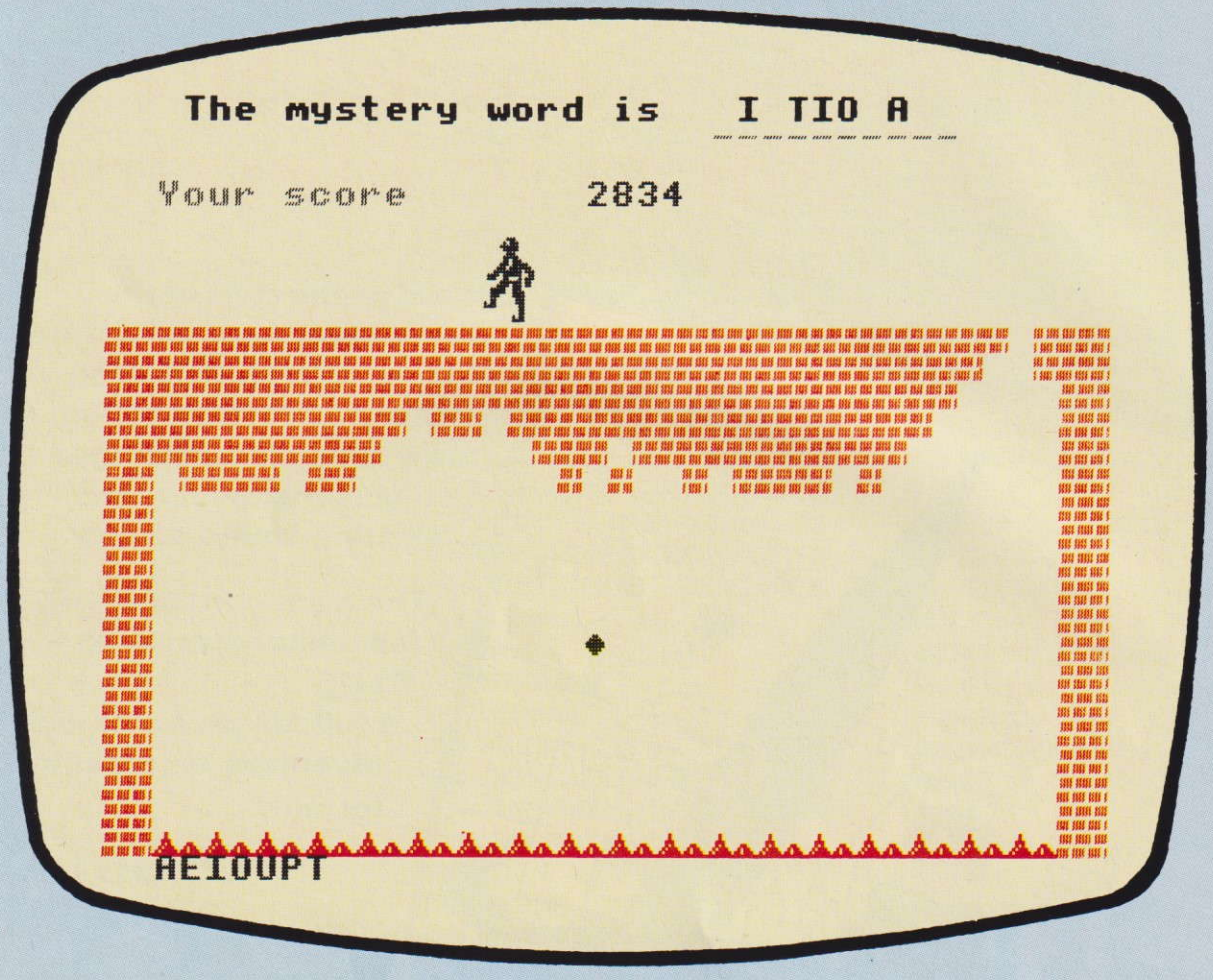
replacing *nnn* with the new number of words.

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.
PROCWORD	Chooses random word.
PROCVAR	Sets up variables.
PROCCHARS	Defines characters and envelopes.
PROCWALL	Draws bridge and water.
PROCBALL	Prints and moves ball.
PROCGUESS	Determines whether the word contains a given letter.
PROCMUSIC	Plays a melody.
PROCSCORE	Prints score on screen.
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%	Used as part of main loop.
F%	Determines whether music is to be played.
S%	Score.
B%	Horizontal position of man.
X%	Horizontal position of ball.
Y%	Vertical position of ball.
H%	Used to increase or decrease X%.
V%	Used to increase or decrease Y%.
W%	Lower limit of ball.
D%	Level of difficulty. Determines thickness of bridge.
Q	Used to select random word.
L%	Length of word.
E%	Used to see if word contains a given letter.
O%	Horizontal position of used letters.
P%,G%	Determine pitch of each note.
A%	Vertical position of man when falling.




```
  10 REM (c) Micro User
  20 MODE7:PROCINTRO:MODE1
  30 DIM MAC% 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 I%=0 TO 3
 100 PROCBALL
 110 L$=INKEY$(1)
 120 IF L$<>""PROCGUESS
 130 NEXT
 140 IF F%=1 PROCMUSIC
 150 S%=S%-1:PROCSCORE
 160 VDU31,B%,11:PROCREAD:IF C=32 PR
OCFALL:GOTO 80
 170 VDU31,B%,8:CALL CODE%:B%=B%-1
 180 IF B%=0 B%=36:SOUND0,-15,50,5:V
DU31,1,8:PROCRID
 190 GOTO 90
 200 DEFPROCBALL
 210 COLOUR2:VDU31,X%,Y%,32:X%=X%+H%
:Y%=Y%+V%:VDU31,X%,Y%:A%=135
 220 PROCREAD
 230 IF C<>32 THEN V%=1:SOUND1,1,150
,3
 240 IF X%=37 H%=-1:Y%=Y%-1
 250 IF X%=2 H%=1
 260 IF W%>27 W%=27
 270 IF Y%>W% V%=-1
 280 IF Y%=11 V%=1
 290 VDU31,X%,Y%,226
 300 ENDPROC
 310DEFPROCVAR
 320 O%=2:V%=-1:H%=1:X%=RND(20):Y%=R
ND(5)+14:B%=36:W%=26:S%=2000:G%=0
 330ENDPROC
 340DEFPROCCHARS
 350 ENVELOPE1,0,0,0,0,0,0,0,120,-1,
-1,-2,100,100
 360 ENVELOPE2,3,0,0,0,0,0,0,121,-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,&80,&C0
,&E0
 450VDU23,236,&7B,&7F,&5F,&5F,&58,&7
F,&1D,&3D
 460VDU23,237,&E0,&A0,&A0,&A0,&A0,&8
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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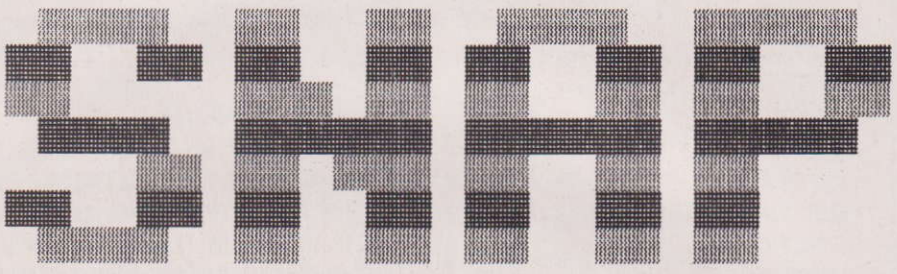
From Page 51

```
55,255,255
  550BRICK$=CHR$(224)+CHR$(225)
  560 WAVE$=CHR$(240)+CHR$(241)
  570VDU23;8202;0;0;0;
  580ENDPROC
  590DEFPROCWALL
  600 COLOUR1:PRINTTAB(2,6)"Your scor
e is"
  610 FOR Y=11 TO 12+D%
  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+D% TO 29
  710 PRINTTAB(0,Y)BRICK$
  720 PRINTTAB(38,Y)BRICK$
  730 NEXT Y
  740ENDPROC
  750DEFPROCASS
  760 CODE%=MAC%+1
  770 NUM%=MAC%+2
  780 ?NUM%=1
  790 FOR PASS=0 TO 2 STEP 2
  800 P%=CODE%
  810[OPT PASS
  820 LDA#17:JSR&FFEE:LDA#1:JSR&FFEE
  830 LDA NUM%
  840 CMP#1:BEQ FIR%
  850 JSR TWO%
  860RTS
  870 .FIR%
  880 LDA#6:JSR&FFEE
  890 LDA#228:JSR&FFEE:LDA#229:JSR&FF
EE:LDA#32:JSR&FFEE:JSRBAC%
  900 LDA#230:JSR&FFEE:LDA#231:JSR&FF
EE:LDA#32:JSR&FFEE:JSR BAC%
  910 LDA#232:JSR&FFEE:LDA#233:JSR&FF
EE:LDA#32:JSR&FFEE
  920 LDA#3:STA NUM%
  930RTS
  940.TWO%
  950 LDA#6:JSR&FFEE
  960 LDA#234:JSR&FFEE:LDA#235:JSR&FF
EE:LDA#32:JSR&FFEE:JSR BAC%
  970 LDA#236:JSR&FFEE:LDA#237:JSR&FF
EE:LDA#32:JSR&FFEE:JSR BAC%
  980 LDA#238:JSR&FFEE:LDA#239:JSR&FF
EE:LDA#32:JSR&FFEE
  990 LDA#1:STA NUM%
 1000RTS
 1010 .BAC%
 1020 LDA#8:JSR&FFEE:LDA#8:JSR&FFEE:L
DA#8:JSR&FFEE:LDA#10:JSR&FFEE
 1030 RTS
 1040]
 1050NEXT
 1060ENDPROC
 1070DEFPROCWORD
 1080 RESTORE 1130:M%=0
 1090 FOR Q=1 TO RND(32)
 1100READ WORD$
 1110NEXT Q
 1120 L%=LEN(WORD$):A$=STRING$(L%,"-"
):COLOUR3:PRINTTAB(3,3)"The mystery w
ord is                ":PRINTTAB(24,
4)"                ":COLOUR 1:PRINTTAB
(24,4)A$:RESTORE 1440
 1130 DATA SHY,WHY,HOLD,TIMETABLE,GAM
E,MARMALADE,COLOUR,EQUILIBRIUM,CIVILI
ZATION,FORMAL,EUROPE,AMERICA,TODAY,ZO
O,ZIP,LOCOMOTION,TRANSISTOR,PLANT,HOU
SE,HORSE,BRUISE,BEGIN,CACTUS,LEAFLET,
DICTIONARY,KEY,CASSETTE,RECORD,EAR,DR
UM,APPLE,PEAR,
 1140ENDPROC
 1150DEFPROCGUESS
 1160 G=LEN(L$)
 1170 FOR E%=1 TO L%
 1180 VDU31,E%+23,3:PROCREAD
 1190 IF MID$(WORD$,E%,G)=L$ AND C<>A
SC(L$) THEN PROCCORRECT
 1200NEXT
 1210 *FX21,0
 1220 W%=W%-1
 1230 COLOUR2
 1240 PRINTTAB(O%,30)L$
 1250 O%=O%+1
 1260 IF O%>38 O%=0
 1270ENDPROC
 1280DEFPROCCORRECT
 1290 COLOUR3:PRINTTAB(E%+23,3)L$:S%=
S%+200:M%=M%+1
 1300 IF M%=L% THEN PROCWIN
 1310 PROCSCORE
 1320 W%=W%+1
 1330 ENDPROC
 1340DEFPROCSCORE
 1350 PRINTTAB(13,6)S%
 1360ENDPROC
 1370DEFPROCREAD
 1380C=USR(&FFF4)
 1390C=C AND &FFFF
 1400C=C DIV &100
 1410ENDPROC
 1420ENDPROC
 1430 DEFPROCMUSIC
 1440 DATA69,81,97,69,81,97,69,81,97,
81,69,81,97,69,81,97,81,97,89,81,73,8
9,101,89,101,73,89,101,89,73,89,73,81
,97,109,97,109,97,81,69,73,81,89,97,1
01,109,97,101,89,97,101,89,97,101,89,
97,81,69,81,0,0
 1450 READ P%
 1460 IF P%=0 RESTORE1440:G%=G%+(RND(
1)*96-48):GOTO 1450
 1470 SOUND&12,2,P%+G%,1
 1480 SOUND&11,2,P%+G%+1,1
 1490 ENDPROC
 1500DEFPROCRID
 1510VDU32,32,10,127,127,10,32,32
 1520ENDPROC
 1530DEFPROCFALL
 1540 S%=0
 1550 PROCSCORE
 1560 VDU31,B%,8,32,32,32
 1570 FOR A%=8 TO 25
 1580VDU31,B%,A%,32,32,8,8,10
 1590CALL CODE%
 1600 SOUND1,-15,100-(A%*4),1
 1610NEXT A%
 1620 VDU31,B%,26:PROCRID
 1630 SOUND0,-15,6,8
 1640 PRINTTAB(10,20)"The word was  "
;WORD$
 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 Scor
e is   ";S%
 1720 COLOUR1:PRINTTAB(8,10)"--- CONG
RATULATIONS ---"
 1730 PRINTTAB(0,15)"You have saved t
he bridge from collapse"
 1740 PRINTTAB(5,20)"PRESS 'TAB' FOR
ANOTHER GAME"
 1750 IF INKEY(-97) THEN 1760 ELSE 17
50
 1760 CLS
 1770 L$=" "
 1780 PROCWORD:RESTORE1440:PROCVAR:PR
OCWALL
 1790ENDPROC
 1800DEFPROCINTRO
 1810 PRINTTAB(10,5) CHR$(130);CHR$(1
41);"Bridge Breaker"
 1820 PRINTTAB(10,6) CHR$(130);CHR$(1
41);"Bridge Breaker"
 1830 PRINTTAB(1,16)"The object of th
is game is to guess     the word befo
re the bridge is knocked   down.Point
s are scored for each         correct
 letter.A wrong letter increases the
rate at which the bridge is         D
EMOLISHED !"
 1840 INPUTTAB(5,10)"Do you want musi
c (Y/N) "A$
 1850 IF A$="Y" F%=1 ELSE F%=0
 1860 PRINTTAB(7,12)"( 4 is easy )"
 1870 INPUTTAB(2,10)"Please enter dif
ficulty level(1 TO 4)"D%
 1880ENDPROC
```

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



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 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 lives%=0
190 PROChigh
200 PROCend
210 UNTIL change OR quit
220 UNTIL quit
230 END
240
250 DEFPROCinit
260 r%=RND(-TIME)
270 ENVELOPE 1,1,0,0,0,0,50,25,25,127
,-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 rested REPEAT . . . UNTIL loops.

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

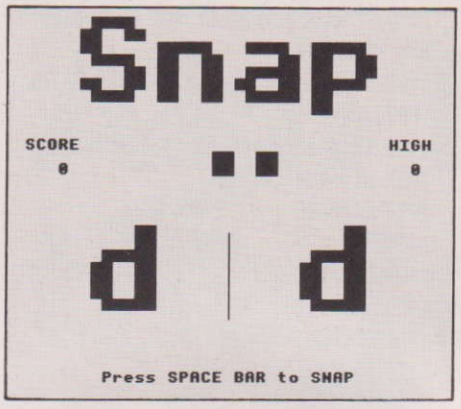
The middle loop sets up each new game and repeats until the player wishes to change the speed or character set, etc.

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 *(1%)* checks each bit in turn to see whether it is 0 or 1 by "ANDing" with *2^I%* (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 @%=04
  370 high%=0
  380 quit=FALSE
  390 vol%=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 whenthere 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 minimumof 0.4 seconds. A
lternatively, you can  keep the time
fixed."
  500 ENDPROC
  510
  520 DEFPROClevel
  530 PROCfc(1)
  540 FOR I%=0 TO 3
  550 PROCmessage(I%)
  560 IF I%=0 THEN stime%=VAL(FNget("
12345"))
  570 IF I%=1 THEN sup$=(FNget("YyNn"
))
  580 IF I%=2 THEN set%=VAL(FNget("12
3"))
  590 IF I%=3 THEN sound$=(FNget("YyN
n"))
  600 NEXT
  610 IF set%=3 THEN range%=94 ELSE r
ange%=26
  620 start%=(4-set%)*32
  630 IF sound$="Y" OR sound$="y" THE
N vol%=1 ELSE vol%=0
  640 change=FALSE
  650 ENDPROC
  660
  670 DEFPROCtitle(col%)
  680 PROCfc(0)
  690 FOR I%=0 TO 3
  700 READ char$
  710 PROCdisplay(ASC(char$),5+7*I%,1
,col%)
  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) high%
  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%,ml%,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 ml%=&BF00+c%*8
1220 def%=ml%?k%
1230 FOR l%=0 TO 7
1240 IF def% AND 2^l% THEN PRINT TAB
(7+x%-l%,y%+k%);CHR$(255)
1250 NEXT,
1260 ENDPROC
1270
1280 DEFPROCreact
1290 SOUND1,1*vol%,1,2
1300 *FX21,0
1310 VDU19,2,3,0,0,0
1320 TIME=0
1330 REPEAT
1340 IF INKEY(-99) THEN react=TRUE
1350 GCOL0,0
1360 MOVE624,480:DRAW 624,480-INT(28
0*TIME/rt%)
1370 UNTIL TIME>rt% OR react
1380 IF char1%=char2% AND react THEN
PROCsnap
1390 IF char1%=char2% AND NOT react
THEN PROCmiss
1400 IF char1%<>char2% AND react THE
N PROCjumpy
1410 IF char1%<>char2% AND NOT react
THEN score%=score%+1
1420 ENDPROC
1430
1440 DEFPROCsnap
1450 VDU19,1,15,0,0,0
1460 SOUND0,-15*vol%,4,4
1470 PROCwait(1)
1480 VDU19,1,1,0,0,0
1490 score%=score%+5
1500 ENDPROC
1510
1520 DEFPROCmiss
1530 PROCmessage(6)
1540 SOUND1,2*vol%,97,20
1550 PROCwait(1)
1560 lives%=lives%-1
1570 ENDPROC
1580
1590 DEFPROCjumpy
1600 PROCmessage(5)
1610 FOR l%=131 TO 81 STEP-5
1620 SOUND 0,-15*vol%,3,1
1630 SOUND 1,0,l%,1
1640 NEXT
1650 PROCwait(1)
1660 lives%=lives%-1
1670 ENDPROC
1680
1690 DEFPROCscore
1700 COLOUR3
1710 PRINT TAB(1,13) score%
1720 IF lives%<3 THEN PROCdisplay(46
,19-4*lives%,7,0)
1730 ENDPROC
1740
1750 DEFPROChigh
1760 IF score%>high% THEN high%=scor
e%
1770 COLOUR3
1780 PRINT TAB(33,13) high%
1790 ENDPROC
1800
1810 DEFPROCend
1820 CLG
1830 PROCmusic
1840 COLOUR2
1850 PRINTTAB(10,19);"G A M E    O V
E R"
1860 PROCwait(2)
1870 PROCmessage(7)
1880 PROCfc(1)
1890 ans$=FNget("AaCcQq")
1900 IF ans$="A" OR ans$="a" THEN CL
G 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
```

A number game to stretch your brain, by ADRIAN DROVER

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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	Checks input for errors.
ERROR	Informs of errors in listing or play: Restarts program if Escape is pressed.
CALCULATE	Calculates input equasion and prints result on screen.
COMPARE	Prints micro's best effort.
SCORE	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.
END	Concludes game when either score reaches 1,000 and gives option for another game.
DATA	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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```
  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 *KEY10OLD|M|NL.|M
 190 *KEY0|ORUN|M
 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
```

→

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```
e game."
 1610 PROC_WAIT(10):RUN
 1620 ENDPROC
 1640 DEF PROC_CALCULATE:B=0
 1650 T=EVAL(I$):PD=ABS(N-T)
 1660 IF PD=0 B=5:PRINT F$;G$"BONUS "
;B" POINTS"
 1670 PRINT TAB(23,13)"=";T" (";PD" O
FF)"
 1680 ENDPROC
 1700 DEF PROC_COMPARE
 1710 PRINT''C$"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 a
ccending, tone ends you have anothe
r 15 seconds, to type in your equati
on.
 1920 DATA DO NOT INCLUDE THE EQUALS,
  SIGN OR THE TOTAL IN YOUR EQUATION
.,  THE COMPUTER WILL DO THIS FOR Y
OU'
 1930 DATA If your equation results i
n, 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 st
ops to enter, your equation.
 1940 DATA YOU HAVE USED AN INCORRECT
 NUMBER
 1950 DATA YOU HAVE NOT USED THE CORR
ECT 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 B
REAK KEY, to list.
```


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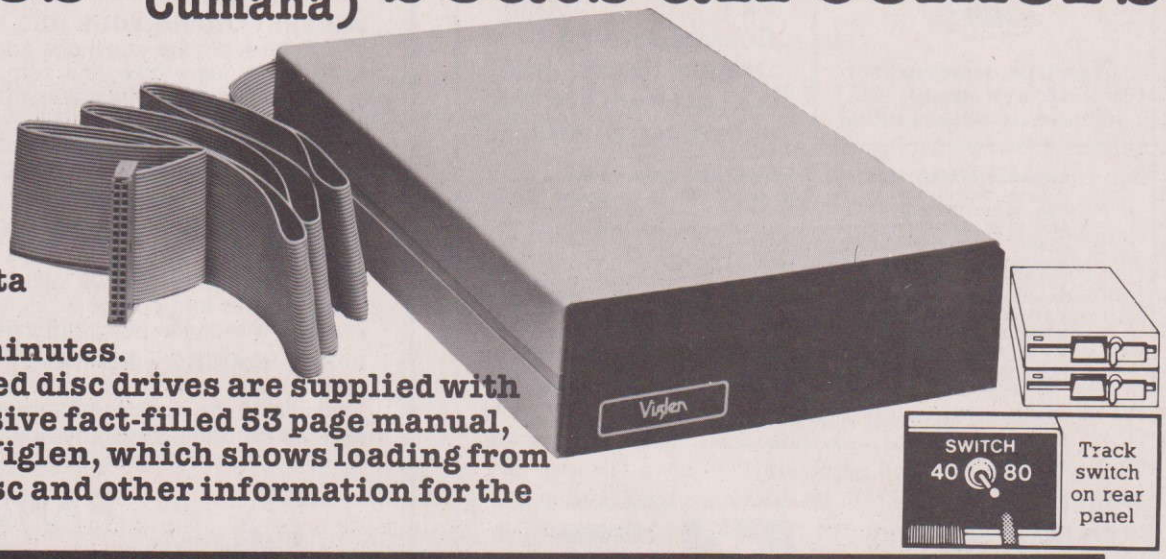

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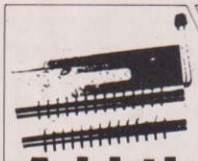

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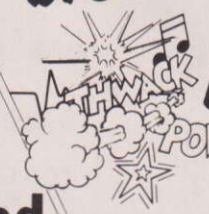

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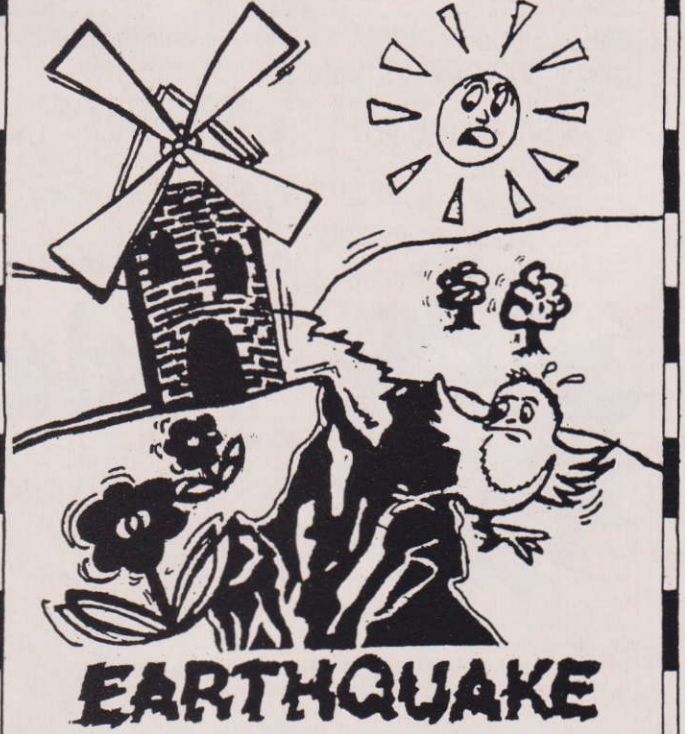

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Playing around with matrices

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 beasties.

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 2×3 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 ith row and the jth column of the resultant matrix is, we look at the ith row of the first matrix, and at the jth 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:

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

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 5×3 will become 3×5, 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

→

From Page 63

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 UNTILA$="stop"
 190 *FX202,32
 200 END
 210 REM************************
 220 REM************************
 230 IFA$="" THEN RETURN
 231 IFLENA$=1 AND A$>="a" AND A$<="
z" THEN res=ASC(A$)-96:PROCdis(res):R
ETURN
 232 IFLENA$<4 THEN PROCerror(1):RET
URN
 240 err=FALSE
 250 IFA$="vars" PROCvars:RETURN
 260 lop$="":rop$="":ass$="":resi=0:
resj=0:res=0
 270 assig=INSTR(A$," = ")
 280 IFassig>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 IFmult>0 lop$=LEFT$(A$,mult-1):
rop$=MID$(A$,mult+3,1)
 360 IFadd>0 lop$=LEFT$(A$,add-1):ro
p$=MID$(A$,add+3,1)
 370 IFsub>0 lop$=LEFT$(A$,sub-1):rc
p$=MID$(A$,sub+3,1)
 380 IFtrans>0 rop$=MID$(A$,trans+6,
1)
 390 IFset>0 ass$=LEFT$(A$,set-1):A$
=RIGHT$(A$,LENA$-set-3)
 400 IFLENA$=1 res=ASCA$-96:IFres<1
ORres>26 PROCerror(1):RETURN
 420 IFlop$>"" lno=ASC(lop$)-96 ELSE
lno=0
 430 IFrop$>"" rno=ASCrop$-96 ELSErn
o=0
 440 IFass$>"" ano=ASCass$-96 ELSEan
o=0
 450
 460 IFlno<0 ORlno>26 PROCerror(1):R
ETURN
 470 IFrno<0 ORrno>26 PROCerror(1):R
ETURN
 480 IFano<0 ORano>26 PROCerror(1):R
ETURN
 500 IFmult>0 PROCmult(lno,rno):GOTO
560
 510 IFadd>0 PROCadd(lno,rno,1):GOTO
560
 520 IFsub>0 PROCadd(lno,rno,2):GOTO
560
 530 IFtrans>0 PROCtrans(rno):GOTO56
0
 540 IFset>0 assig=1:PROCset:GOTO560
 550 IFres<1 GOTO590
 560 where%(0,1)=spare:where%(0,2)=r
esi:where%(0,3)=resj
 570 IFassig>0 PROCassig ELSE IF NOT
err PROCdis(res)
 590 RETURN
 600 REM************************
 610 DEFFNfetch(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 DEFPROCadd(l,r,sig)
 680 lmaxi=where%(l,2):lmaxj=where%(
l,3)
 690 rmaxi=where%(r,2):rmaxj=where%(
r,3)
 700 IFlmaxi<>rmaxi ORlmaxj<>rmaxj P
ROCerror(2):ENDPROC
 720 FORJ%=1TOlmaxj
 730 FORI%=1TOlmaxi
 740 a=FNfetch(l,I%,J%)
 750 b=FNfetch(r,I%,J%)
 760 IFsig=1 c=a+b
 770 IFsig=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 DEFPROCmult(l,r)
```

```
  850 lmaxi=where%(l,2):lmaxj=where%(
l,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(l,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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BBC Lightpen Programs

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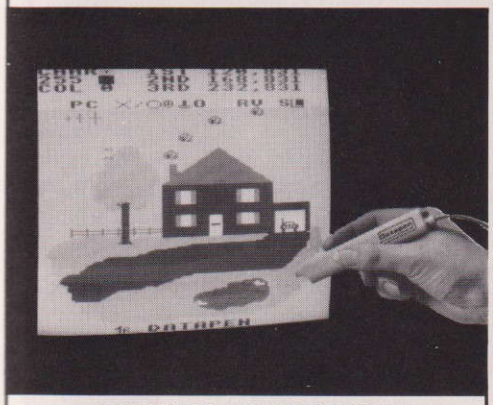

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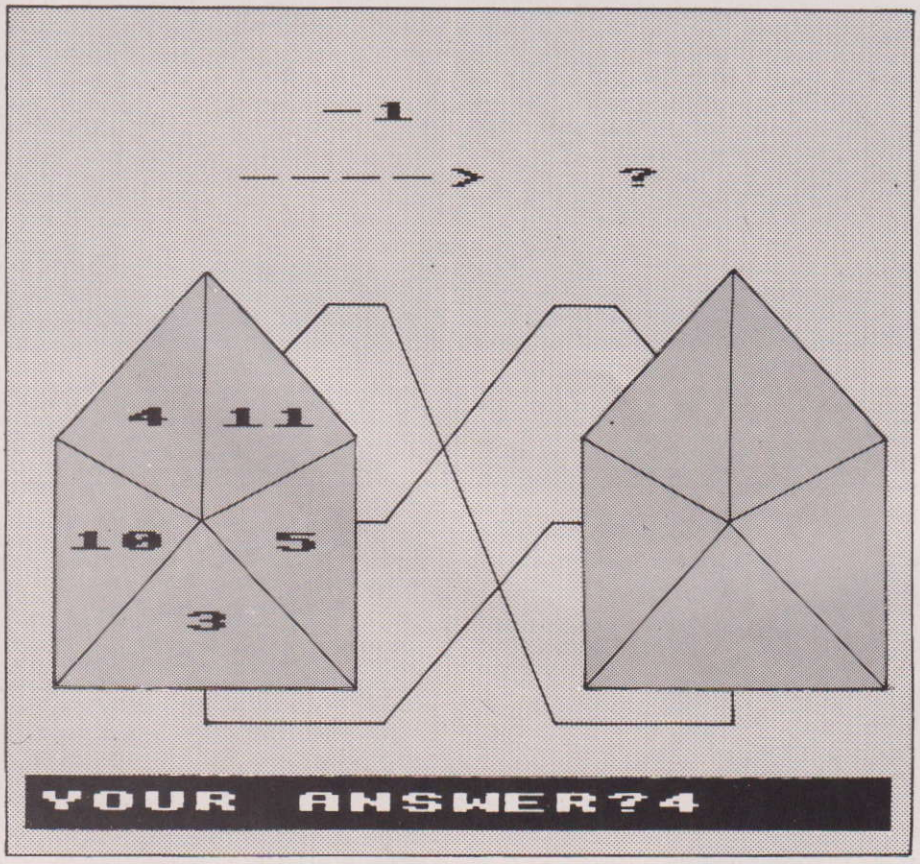


HIDDEN Answers was written in response to a cry for help from my youngest daughter aged six.

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 excercise.

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 excercises 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

INTRO Displays title screen and accepts input of selected difficulty level.

GINIT Sets remaining logical colours to their initial values, plots infill to the two polygons using PLOT 85 command and then calls PROCPOLY to draw two pentagonal frames around infill.

POLY Draws frames to the two polygons.

NINIT 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.

WRITE 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.

MIN Determines minimum value of all source numbers to enable a check against negative answers (used in PROCNINIT).

SUM 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.

WRONG The default windows are first restored, then depending on location of source number under consideration, appropriate PROC-DRAW procedure is called to draw first 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).

RIGHT 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.

DRAW 1 to DRAW 10 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.

SCORE 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.

ENVELOPE Sets three Envelopes used.

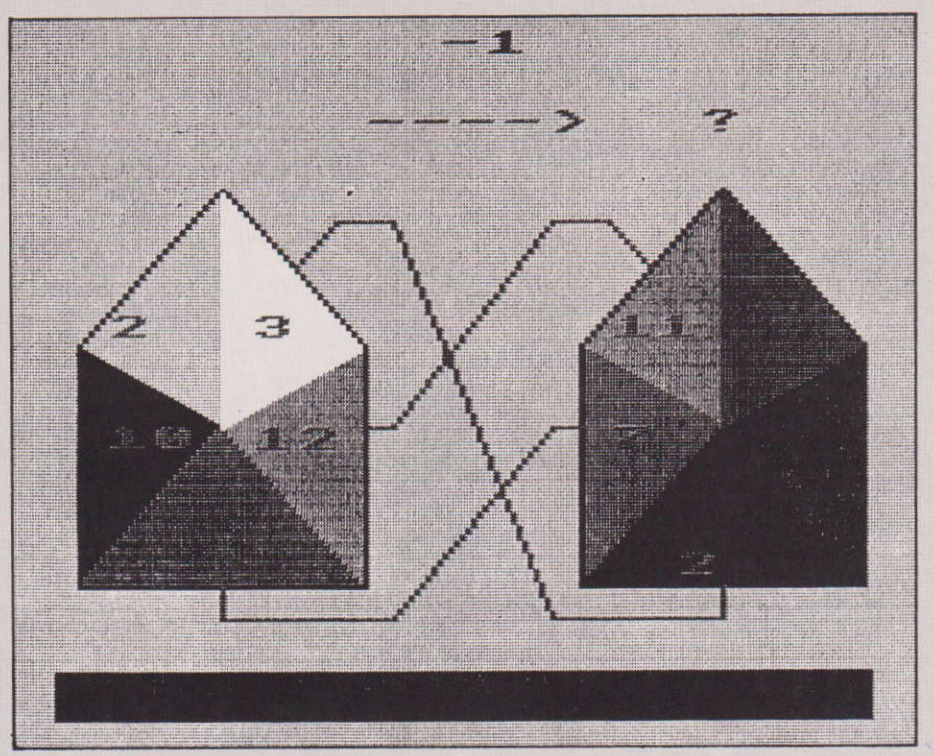
DELAY Controls pauses used in PROCDRAW 1-10.

END Displays finish screen.

From Page 67

```
   10 REM HIDDEN ANSWERS
   15 REM (c) Micro User
   20 MODE2
   30 DIMSource(5),Answer(5),Availabl
e(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$="N"
  140 PROCEND
  150 END
  151 DEFPROCINTRO
  152 COLOUR140:COLOUR13
  153 CLS
  154 PRINT TAB(3,7);"HIDDEN ANSWERS"
  155 PRINT TAB(3,8);"--------------"
  156 COLOUR10
  157 PRINT TAB(7,13);"Choose";TAB(5,
15);"Difficulty";TAB(7,17);"Level";TA
B(6,19);"(1,2or3)"
  158 INPUT TAB(9,22),D1
  159 ENDPROC
  160 DEFPROCGINIT
  161 VDU19,0,3;0;19,1,3;0;19,2,3;0;1
9,3,3;0;19,4,3;0;19,5,4;0;19,6,4;0;19
,7,4;0;19,8,4;0;19,9,4;0;19,11,0;0;19
,14,3;0;
  170  COLOUR140
  190 CLS
  200 GCOL0,4
  210 MOVE300,700
  220 MOVE100,500
  230 PLOT85,300,400
  240 GCOL0,3
  250 PLOT85,100,200
  260 GCOL0,2
  270 PLOT85,500,200
  280 MOVE300,400
  290 GCOL0,1
  300 PLOT85,500,500
  310 GCOL0,0
  320 PLOT85,300,700
  330 GCOL0,9
  340 MOVE1000,700
  350 MOVE800,500
  360 PLOT85,1000,400
  370 GCOL0,8
  380 PLOT85,800,200
  390 GCOL0,7
  400 PLOT85,1200,200
  410 MOVE1000,400
  420 GCOL0,6
  430 PLOT85,1200,500
  440 GCOL0,5
  450 PLOT85,1000,700
  460 GCOL0,11
  470 PROCPOLY(300,700)
  480 PROCPOLY(1000,700)
  490 ENDPROC
  500 DEFPROCPOLY(X,Y)
  510 MOVEX,Y
  520 DRAWX-200,Y-200
  530 DRAWX-200,Y-500
  540 DRAWX+200,Y-500
  550 DRAWX+200,Y-200
  560 DRAWX,Y
  570 ENDPROC
  580 DEFPROCNINIT:OK=0
  585 FOR N=1 TO 5:Available(N)=0:NEX
T
  590 Sum=RND(3)
  595 IF D1=1 Ra=6:Rb=12:Mf=12 ELSE I
F D1=2 Ra=12:Rb=12:Mf=16 ELSE Ra=12:R
b=20:Mf=20
  600 IF Sum=1 Sum$="+" 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 EL
SE 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 PR
OCDRAW2 ELSE IF A=3 PROCDRAW3 ELSE IF
 A=4 PROCDRAW4 ELSE IF A=5 PROCDRAW5
 1203 VDU28,1,30,18,29:COLOUR139:COLO
UR14
 1210 CLS
 1220  IF Wrong=0 PRINT"WRONG,TRY AGA
IN" 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 GCOL0,10: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 GCOL0,13
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 GCOL0,13
1540 MOVE500,400
1550 DRAW540,400:SOUND1,3,40,6:PROCD
ELAY
1560 X1=540:Y1=400
1570 ENDPROC
1580 DEFPROCDRAW3
1590 GCOL0,13
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 GCOL0,13
1670 MOVE100,360
1680 DRAW60,360:SOUND1,3,40,6:PROCDE
LAY
1690 DRAW60,120:SOUND1,3,50,6:PROCDE
LAY
1700 DRAW540,120:SOUND1,3,60,6:PROCD
ELAY
1710 X1=540:Y1=120
1720 ENDPROC
1730 DEFPROCDRAW5
```




```
1740 GCOL0,13
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 GCOL0,13
1820 MOVE1100,600
1830 DRAW1200,740:SOUND1,3,70,6:PROC
DELAY
1840 DRAW760,740:SOUND1,3,80,6:PROCD
ELAY
1850 X2=760:Y2=740
1860 ENDPROC
1870 DEFPROCDRAW7
1880 GCOL0,13
1890 MOVE1200,360
1900 DRAW1240,360:SOUND1,3,70,6:PROC
DELAY
1910 DRAW1240,120:SOUND1,3,80,6:PROC
DELAY
1920 DRAW760,120:SOUND1,3,90,6:PROCD
ELAY
1930 X2=760:Y2=120
1940 ENDPROC
1950 DEFPROCDRAW8
1960 GCOL0,13
1970 MOVE1000,200
1980 DRAW1000,160:SOUND1,3,70,6:PROC
DELAY
1990 DRAW760,160:SOUND1,3,80,6:PROCD
ELAY
2000 X2=760:Y2=160
2010 ENDPROC
2020 DEFPROCDRAW9
2030 GCOL0,13
2040 MOVE800,400
2050 DRAW760,400:SOUND1,3,70,6:PROCD
ELAY
2060 X2=760:Y2=400
2070 ENDPROC
2080 DEFPROCDRAW10
2090 GCOL0,13
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 ";Dl;")";TAB(3,20);"(Gr
ading ";Pge;"%)";TAB(2,25);"ANOTHER G
O?(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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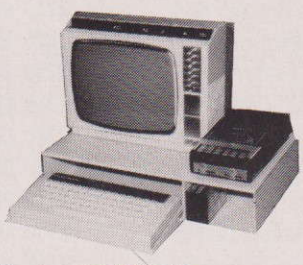

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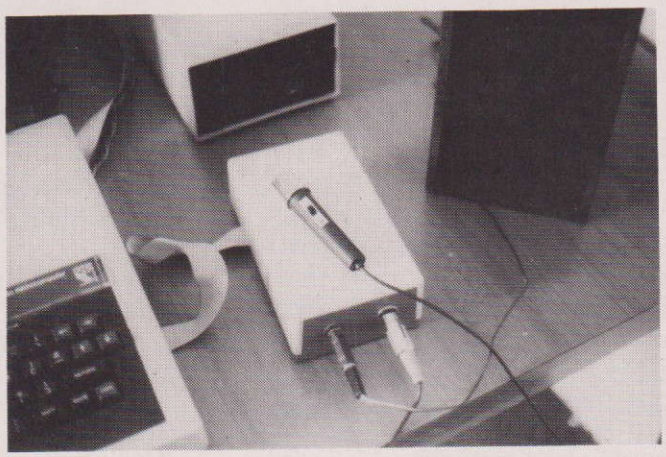

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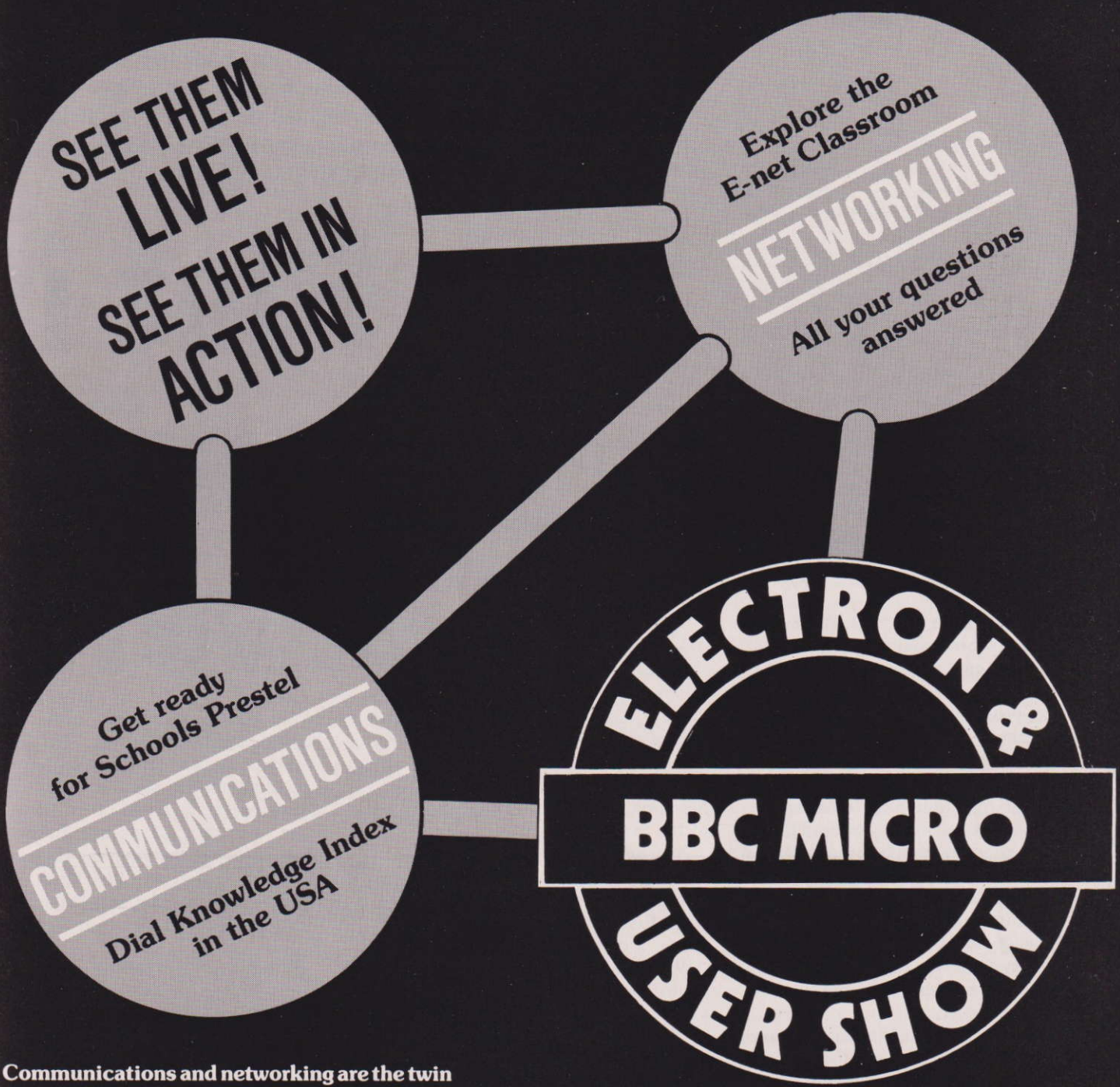

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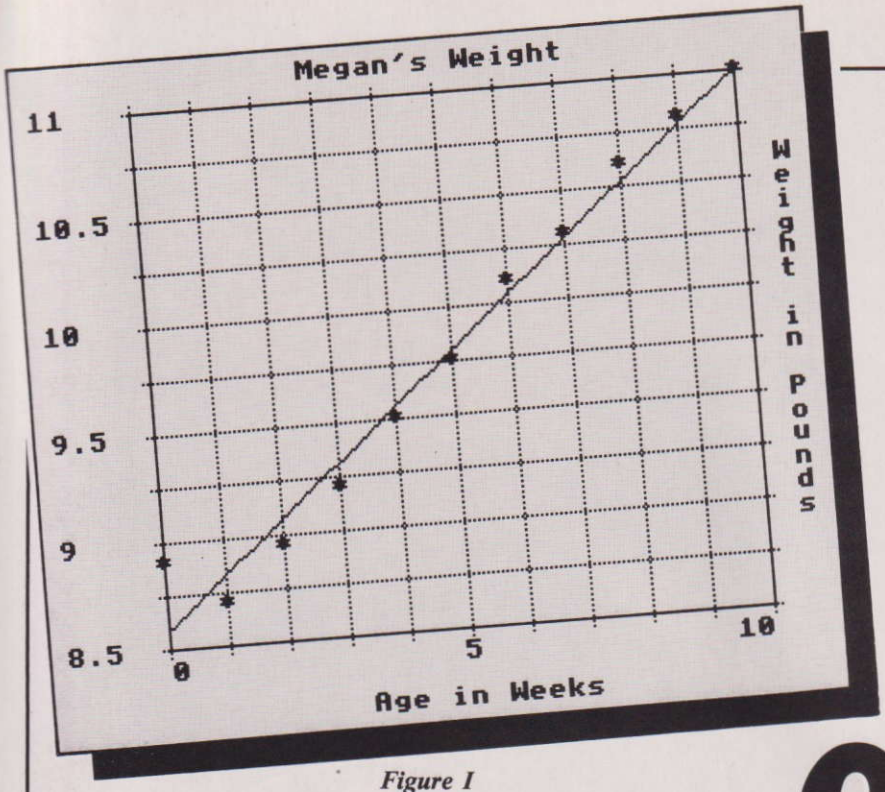

Figure I

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

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. 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

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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

PROGRAM STRUCTURE

PROCerror Attempts to intercept common user errors and provides helpful messages to allow correction.

PROCcurveopt Sets up the menu for selecting a curve fitting option.

PROCedit Main routine for the full screen editing feature. Accepts input from the user then calls PROCscreenedit and PROClinedit to display information. A loop is set up which repeats until Q or q is input and flags an exit. The inner loop reads one character at a time until the user has finished entering data for a cell. It then stores the numeric value of the entry into the appropriate x or y array.

S%,I%,H% and V% Set the starting location, current array element, horizontal position, and vertical position for the edit screen. Resident integer variables are used to speed this section up but it could be greatly improved with machine code.

PROCplotreport Sets up the menu for input of plot and report options.

PROCplot Driver routine for the plot routine.

PROCworking Simple routine which informs the user when the program has started work on a particularly long calculation.

PROCreport Generates the report option. Use is made of @% to format and functions FNXcalc and FNYcalc to calculate X and Y values.

PROCmenu Generalised menu input routine. The variable max% specifies the number of menu options not counting Quit. A$ and menu$(0) hold the title and instructions while specific options are held in menu$(1)-menu$(max%). Error checking is done to make sure the option specified is valid.

PROClinedit Changes one line on the Edit screen. Teletext control codes specify the background and foreground colours of the screen. The numbers going into the cells are padded to right justify them. A value of −1E38 is used throughout the program to denote a null value.

PROCscreenedit Used to initialise the screen or scroll it in the Edit. It builds up the screen line by line using PROClinedit. User instructions are then printed at the bottom of the screen.

PROCquery Generalised routine for entering character strings.

PROCleastsqr Performs the least squares curve fit. A loop is set up to cycle through the points and sum the necessary quantities. An appropriate GOTO skips over any null portions of the array (those which contain the value −1E38). The coefficients are then determined, transformed if needed, and R calculated.

PROCinit Initialises a number of major program variables. Teletext colour codes are stored in meaningful but short names (e.g. y$=yellow and bs$=back space). A default value is then given to all variables the user can alter.

PROCgraph Draws the outline of the graph, scales it, and positions the titles. The section which prints the vertical scale examines the string to ensure it does not print over the axis. If the number would otherwise run over the axis it is printed in exponential format over two lines.

FNXtransform, FNYtransform, FNAtransform These make the transformations necessary to perform the least squares calculations of other than linear functions.

PROCpoint Plots user input points on the graph.

PROCcurve Draws the curve determined by the program to be the best fit onto the screen.

FNscreen Calculates the screen coordinates of a point given the value, screen length, and maximum/minimum value to be plotted.

FNYcalc Calculates a Y value from the appropriate equation given any X value.

FNXcalc Calculates an X value from the appropriate equation given any Y value.

PROCsdump Makes a call to a machine code routine loaded before running the program. You may insert your own screen dump here or leave the option out if you do not have a graphics printer.

FNok Checks the X and Y arrays to ensure the conditions listed in Table I are met.

FNexponent Determines the exponent for any number.

FNmantissa Finds the mantissa of a number.

PROCsave Saves all variables which can be directly altered by the user. The variables are saved on a file called "DATA". You might wish to alter the program such that other files can be specified.

PROCrecall Retrieves the major variables from "DATA".

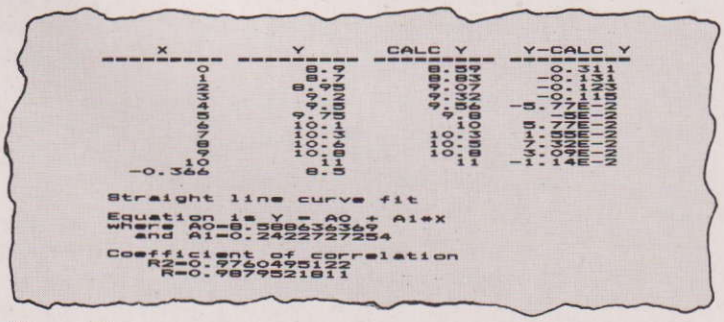

Figure II

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 (PROC-menu) 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 *KEY0-1E38!M
  40 *KEY10 OLD!M
  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       PROCplotrepopt: GOTO 320
 240       PROCworking: IF FNok PROCle
astsqr: MODE4: PROCplot: MODE7
 250       GOTO 320
 260       PROCworking: IF FNok PROCle
astsqr: 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
$=GET$
 310       IF quit$="y" OR quit$="Y" C
LS:exit%=TRUE:PRINT''y$"END"'
 320 UNTIL exit%
 330 *FX4,0
 340 END
 350IF ERR=17 GOTO 80
 360 REPORT: PRINT" at line ";ERL
 370 X=GET: GOTO 80
 380 STOP
 390DEF PROCerror(errornumber%,error
value)
 400 SOUND 1,-15,53,5
 410 error%=TRUE
 420 ON errornumber% GOTO 430,450,47
0,490,510,530,550,570,590
 430    PRINT TAB(1,7);r$;"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$;"The Y valu
e in cell ";errorvalue;" is 0"
 500    PRINT TAB(1);" Change to non-
zero for hyberbolic fit": GOTO 600
 510    PRINT TAB(1,7);r$;"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 exit%=FALSE
780 VDU23,1,0;0;0;0;
790 PROCscreenedit
800 REPEAT
810   A$="": I%=V%
820   REPEAT
830     X=GET: X$=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$<> "" AND H%=1 X(I%)=VAL
(A$)
920   IF A$<> "" AND H%=-1 Y(I%)=VA
L(A$)
930   IF X=64 OR X=192 H%=1: V%=1:
PROCscreenedit
940   IF X=81 OR X=113 exit%=TRUE
950   IF X=136 OR X=137 H%=H%*-1
960   IF X=138 PROClinedit(I%,H%,V%
+1): V%=V%+1
970   IF X=139 PROClinedit(I%,H%,V%
+1): V%=V%-1
980   IF V%>S%+19 OR V%<S% PROCscre
enedit
990   I%=V%
1000  PROClinedit(I%,H%,V%)
1010 UNTIL exit%
1020 ENDPROC
1030DEF PROCplotrepopt
1040 LOCAL exit%
1050 exit%=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   ON choice% 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 printer%
=TRUE menu$(0)="On"
1340     menu$(0)="Printer option is
currently"+y$+menu$(0)
1350     menu$(1)="Print results ("+
y$+"ON"+w$+")"
1360     menu$(2)="Screen only   ("+
y$+"OFF"+w$+")"
1370     PROCmenu(2)
1380     IF choice%=1 printer%=TRUE
1390     IF choice%=2 printer%=FALSE
1400     GOTO 1570
1410     A$="Maximum number of point
s currently is"
1420     menu$(0)=STR$(pts%)
1430     PROCquery
1440     X=VAL(X$)
1450     IF X>19 AND X<100 pts%=X EL
SE PROCerror(3,0)
1460     GOTO 1570
1470     A$="GRID LINES ON GRAPH"
1480     menu$(0)="Off": IF grid%=TR
UE menu$(0)="On"
1490     menu$(0)="Grid lines are cu
rrently"+y$+menu$(0)
1500     menu$(1)="Display grid line
s ("+y$+"ON"+w$+")"
1510     menu$(2)="No grid lines ("+
y$+"OFF"+w$+")"
1520     PROCmenu(2)
1530     IF choice%=1 grid%=TRUE
1540     IF choice%=2 grid%=FALSE
1550     GOTO 1570
1560     exit%=TRUE
1570 UNTIL exit%=TRUE
1580 ENDPROC
1590DEF PROCplot
1600 PROCgraph
1610 PROCpoint
1620 PROCcurve
1630 IF printer%=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 @%=&01000309
1730 CLS
1735 REM Control characters for EPSO
N FX-80
1740 IF printer%=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 I%=0 TO pts%
1800   IF X(I%)=-1E38 GOTO 1840
1810     Ycalc=FNYcalc(X(I%),option%
)
1820     IF Y(I%)<>-1E38 PRINT X(I%)
TAB(10)Y(I%)TAB(20)Ycalc TAB(30)Y(I%)
-Ycalc
1830     IF Y(I%)=-1E38 PRINT X(I%)T
AB(20)Ycalc
1840   IF X(I%)=-1E38 AND Y(I%)<>-1E
38 PRINT FNXcalc(Y(I%),option%)TAB(10
)Y(I%)
1850 NEXT
1860 @%=10
1870 PRINT: PRINT: PRINT " ";STRING$
(39,"-")
1880 PRINT: PRINT " ";option$;" curv
e fit"
1890 PRINT: PRINT " Equation is ";fo
rm$(option%)
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(max%)
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 I%=1 TO max%
2020   IF max% >= I% PRINT TAB(7,2*I
%+7);y$;I%;" ";w$;menu$(I%)
2030 NEXT
```

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```
 2040 PRINT TAB(7,2*I%+7);y$;max%+1;w
$;" Quit"
 2050 REPEAT: error%=FALSE: *FX21,0
 2060   choice%=GET
 2070   FOR I%=1 TO max%
 2080     IF choice%=ASC(menu$(I%)) c
hoice%=I%
 2090     IF choice%=ASC(menu$(I%))+3
2 choice%=I%
 2100   NEXT
 2110   IF choice%=81 OR choice%=113
 choice%=max%+1
 2120   IF choice%>8 choice%=choice%-
48
 2130   IF choice%>max%+1 OR choice%<
1 PROCerror(1,max%+1)
 2140 UNTIL NOT error%
 2150 ENDPROC
 2160DEF PROClinedit(I%,H%,V%)
 2170 left$=w$: right$=w$: backleft$=
b$: backright$=b$
 2180 IF I%<>V% GOTO 2210
 2190   IF H%=1 backleft$=w$ ELSE bac
kright$=w$
 2200   IF H%=1 left$=b$ ELSE right$=
b$
 2210 X$=STR$(X(I%))
 2220 IF X(I%) >-1E38 X$=STRING$(16-L
EN(X$)," ")+X$ ELSE X$=STRING$(16," "
)
 2230 Y$=STR$(Y(I%))
 2240 IF Y(I%) >-1E38 Y$=STRING$(16-L
EN(Y$)," ")+Y$ ELSE Y$=STRING$(16," "
)
 2250 I$=STR$(I%)
 2260 IF LEN(I$)<2 I$=" "+I$
 2270 PRINT TAB(0,I%-S%+2)I$;backleft
$;bg$;left$;X$;backright$;bg$;right$;
Y$
 2280 ENDPROC
 2290DEF PROCscreenedit
 2300 CLS
 2310 IF V%>pts% V%=0
 2320 IF V%<0 V%=pts%
 2330 S%=V%
 2340 IF S%>pts%-19 S%=pts%-19
 2350 PRINT TAB(11,1)"X";TAB(30,1)"Y"
 2360 FOR I%=S% TO S%+19
 2370   PROClinedit(I%,H%,V%)
 2380 NEXT
 2390 PRINT TAB(0,23)r$;"Q";w$;"Quit"
;r$;"f0";w$;"Erase";r$;"@";w$;"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$,39)
 2530 ENDPROC
 2540DEF PROCleastsqr
 2550 Xsum=0: Ysum=0: XYsum=0: X2sum=
0: Y2sum=0: numpts%=0
 2560 FOR I%=0 TO pts%
 2570   IF X(I%)=-1E38 OR Y(I%)=-1E38
 GOTO 2660
 2580     X=FNXtransform(X(I%),option
%)
 2590     Y=FNYtransform(Y(I%),option
%)
 2600     Xsum=Xsum+X
 2610     Ysum=Ysum+Y
 2620     X2sum=X2sum+X*X
 2630     Y2sum=Y2sum+Y*Y
 2640     XYsum=XYsum+X*Y
 2650     numpts%=numpts%+1
 2660 NEXT
 2670 divisor=X2sum*numpts%-Xsum*Xsum
 2680 IF divisor=0 PROCerror(9,0): EN
DPROC
 2690 a=(Ysum*X2sum-Xsum*XYsum)/divis
or
 2700 A0=FNAtransform(a,option%)
 2710 A1=(numpts%*XYsum-Xsum*Ysum)/di
visor
 2720 R2=a*Ysum+A1*XYsum-1/numpts%*Ys
um*Ysum
 2730 R2=R2/(Y2sum-1/numpts%*Ysum*Ysu
m)
 2740 R=R2/R2*SQR(ABS(R2))
 2750 ENDPROC
 2760DEF PROCinit
 2770 VDU23,1,0;0;0;0;
 2780 y$=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$=""
 2880 printer%=FALSE
 2890 grid%=FALSE
 2900 title$=""
 2910 H%=1: V%=1
 2920 option$="Straight line"
 2930 option%=1
 2940 DIM form$(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$(5)="Y = A0*X^A1"
 3000 pts%=20
 3010 DIM X(99),Y(99),menu$(7)
 3020 FOR I=0 TO 99
 3030   X(I)=-1E38: Y(I)=-1E38
 3040 NEXT
 3050 ENDPROC
 3060DEF PROCgraph
 3070 @%=&0100050A
 3080 VDU29,179;123;
 3090 Xmin=1E38: Xmax=-1E38: Ymin=1E3
8: Ymax=-1E38
 3100 FOR I%=0 TO pts%
 3110   IF X(I%) > Xmax  AND X(I%)<>-
1E38 Xmax=X(I%)
 3120   IF X(I%) < Xmin  AND X(I%)<>-
1E38 Xmin=X(I%)
 3130   IF Y(I%) > Ymax  AND Y(I%)<>-
1E38 Ymax=Y(I%)
 3140   IF Y(I%) < Ymin  AND Y(I%)<>-
1E38 Ymin=Y(I%)
 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 J%=400+LEN(Ytitle$)*20
 3210 VDU5
 3220 FOR I%=1 TO LEN(Ytitle$)
 3230   J%=J%-35
 3240   MOVE 1050,J%
 3250   PRINT MID$(Ytitle$,I%,1)
 3260 NEXT
 3270 VDU4
 3280 MOVE 0,0: DRAW 1000,0: DRAW 100
0,800: DRAW 0,800: DRAW 0,0
 3290 step%=100
 3300 IF grid% length%=812 ELSE lengt
h%=12
 3310 FOR I%=0 TO 10
 3320   MOVE step%*I%,-12
 3330   PLOT 21,step%*I%,length%
 3340 NEXT
```

→

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From Page 77

```
 3350 step%=80
 3360 IF grid% length%=1012 ELSE leng
th%=12
 3370 FOR I%=0 TO 10
 3380   MOVE -12,step%*I%
 3390   PLOT 21,length%,step%*I%
 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 step%=160
 3540 FOR I%=1 TO 5
 3550   MOVE -175,step%*I%+10
 3560   Y=(Ymax-Ymin)/5*I%+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$:MOVE
-175,step%*I%-22:PRINT "E"+STR$(exp)
 3600 NEXT
 3610 VDU4
 3620 ENDPROC
 3630DEF FNXtransform(X,option%)
 3640 LOCAL store
 3650 store=X
 3660 IF option%=3 OR option%=5 store
=LN(X)
 3670 =store
 3680DEF FNYtransform(Y,option%)
 3690 LOCAL store
 3700 store=Y
 3710 IF option%=4 OR option%=5 store
=LN(Y)
 3720 IF option%=2 store=1/Y
 3730 =store
 3740DEF FNAtransform(A,option%)
 3750 LOCAL store
 3760 store=A
 3770 IF option%=4 OR option%=5 store
=EXP(A)
 3780 =store
 3790DEF PROCpoint
 3800 VDU5
 3810 FOR I%=0 TO pts%
 3820   IF X(I%)=-1E38 OR Y(I%)=-1E38
 GOTO 3870
 3830     X%=FNscreen(X(I%),1000,Xmin
,Xmax)
 3840     Y%=FNscreen(Y(I%),800,Ymin,
Ymax)
 3850     MOVE X%-16,Y%+16
 3860     IF X%>=0 AND Y%>=0 AND X%<=
1000 AND Y%<=800 PRINT "+"
 3870 NEXT
 3880 VDU4
 3890 ENDPROC
 3900DEF PROCcurve
 3910 MOVE 0,INT(800*(FNYcalc(Xmin,op
tion%)-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,option%)
 3970   X%=FNscreen(X,1000,Xmin,Xmax)
 3980   Y%=FNscreen(Y,800,Ymin,Ymax)
 3990   IF X%>=0 AND Y%>=0 AND X%<=10
00 AND Y%<=800 DRAW X%,Y% ELSE MOVE X
%,Y%
 4000 NEXT
 4010 ENDPROC
 4020DEF FNscreen(x,l%,min,max)
 4030 LOCAL X
 4040 X=((1E-10*l%*(x-min))/(max-min)
)*1E10
 4050 IF X>5000 X=5000
 4060 IF X<-5000 X=-5000
 4070 =INT(X)
 4080DEF FNYcalc(X,option%)
 4090 ON option% 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,option%)
 4160 ON option% 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 option% GOTO 4280,4290,4320,
4350,4380
 4280   GOTO 4420
 4290   FOR I%=0 TO pts%
 4300     IF Y(I%)=0 AND X(I%)<>-1E38
ok=FALSE: PROCerror(4,I%)
 4310   NEXT: GOTO 4420
 4320   FOR I%=0 TO pts%
 4330     IF X(I%)<=0 AND X(I%)<>-1E3
8 ok=FALSE: PROCerror(5,I%)
 4340   NEXT: GOTO 4420
 4350   FOR I%=0 TO pts%
 4360     IF Y(I%)<=0 AND Y(I%)<>-1E3
8 ok=FALSE: PROCerror(6,I%)
 4370   NEXT: GOTO 4420
 4380   FOR I%=0 TO pts%
 4390     IF X(I%)<=0 AND X(I%)<>-1E3
8 ok=FALSE: PROCerror(7,I%)
 4400     IF Y(I%)<=0 AND Y(I%)<>-1E3
8 ok=FALSE: PROCerror(8,I%)
 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(LOG(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$(2)="Recall data"
 4530 PROCmenu(2): IF choice%=3 ENDPR
OC
 4540 CLS: PRINT
 4550 IF choice%=1 PROCsave ELSE PROC
recall
 4560 ENDPROC
 4570DEF PROCsave
 4580 PRINT
 4590 PRINT "Saving";y$;"DATA"
 4600 X=OPENOUT("DATA")
 4610 PRINT#X,title$,Xtitle$,Ytitle$,
printer%,grid%,H%,V%,option%,pts%
 4620 FOR I%=0 TO 99: PRINT#X,X(I%),Y
(I%): NEXT
 4630 CLOSE#X
 4640 ENDPROC
 4650DEF PROCrecall
 4660 PRINT
 4670 PRINT "Loading";y$;"DATA"
 4680 X=("DATA")
 4690 INPUT#X,title$,Xtitle$,Ytitle$,
printer%,grid%,H%,V%,option%,pts%
 4700 FOR I%=0 TO 99: INPUT#X,X(I%),Y
(I%): NEXT
 4710 CLOSE#X
 4720 ENDPROC
```

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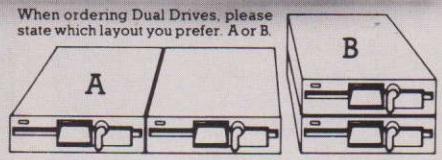

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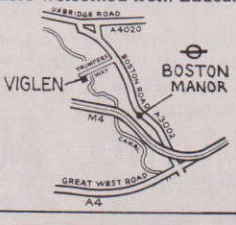

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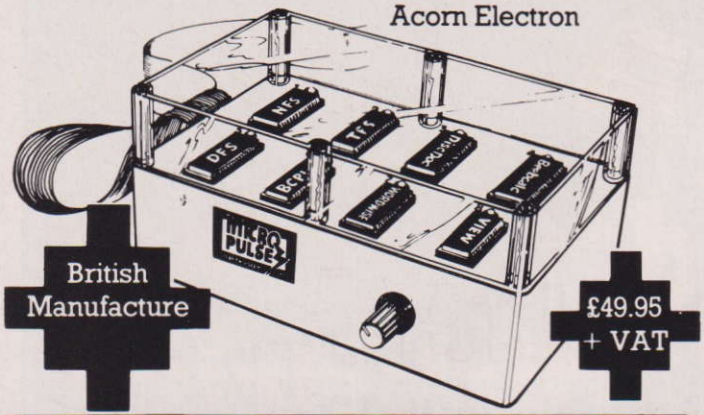

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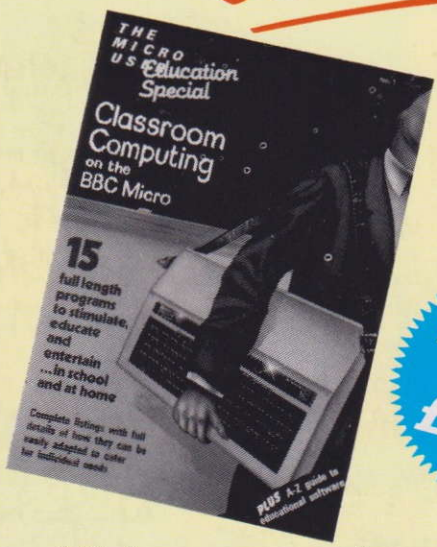

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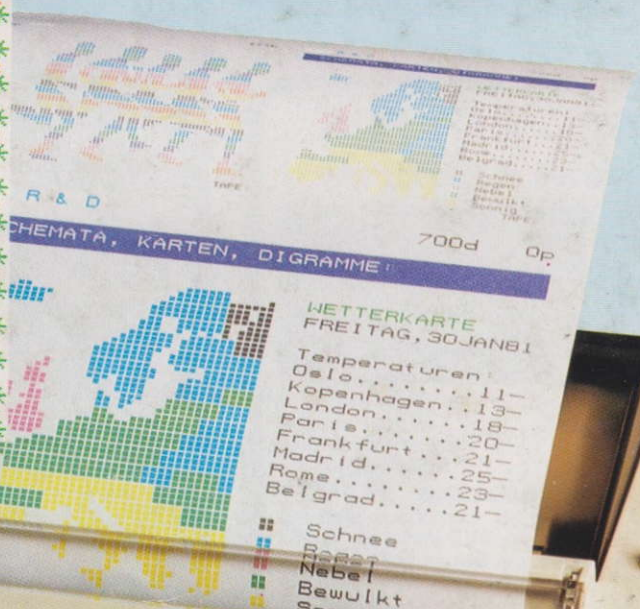

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